ICERI 2020
The 8th International Conference on Educational Research and Innovation

PROCEEDING

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Freedom to Learn

November 4 – 5, 2020

Host and Co-Host

Lembaga Penelitian dan Pengabdian kepada Masyarakat
Universitas Negeri Yogyakarta
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WORDS FROM THE RECTOR

Assalamualaikum wr. wb.

Dear speakers and participants.
Welcome to The International Conference on Educational Research and Innovation 2020 (8th ICERI 2020) in Universitas Negeri Yogyakarta (UNY).

The outbreak of the Covid-19 pandemic from earlier this year has affected many aspects of life, including education globally. Students cannot go to schools, and lessons have been conducted online. Online learning becomes the most visible mode of learning. There are a lot of work need to be done to prepare and implement online learning. Apart from various learning modes and management systems, teachers and students need to adjust to the new classrooms, the virtual classrooms. New alternatives of learning need to be supported, and choices should be provided. Covid-19 has led to the emergence of a new era where freedom of learning is inevitable. Particularly in the higher education, the government of Indonesia has responded to this new era of learning by initiating a policy called *Merdeka Belajar Kampus Merdeka* (MBKM) to support the freedom of learning.

MBKM is a policy aims, among others, to provide students new experiences of learning that can enrich their perspectives about world outside their campuses. MBKM is set out on the basis of the beliefs that learning can be everywhere, not only in campuses. Learning in the real life will give students hand-on experiences that enable them to have more comprehensive understanding and knowledge, as well as better skills. As a program MBKM is also supported by cooperation between universities and industries. This is also believed to be able to equipped university graduate abilities that are relevant with the development of society, technology and industries. MBKM, however, requires students to be creative and innovative. Students need to have a set of skills that are needed as true leaners.

UNY as one of the biggest universities in Indonesia, ranks 12 of more than 4000 universities, has also evolved in accordance to MBKM policy and program. UNY has revised the curriculum to response to and support the freedom of learning. An example of program that has run in UNY is the implementation of a community based 20-credit package of education practicum (PK), Community Service Program (KKN), and thesis writing conducted in the society or industries. UNY has also conducted discussions and seminar to sharpen the formulation of ideas and practices as efforts to support the implementation of MBKM. This 8th International Conference on Educational Research and Innovation is among the efforts. We hope that it can be a good forum for teachers, researchers, and practitioners to share ideas, research findings, and best practices in the implementation of freedom of learning.

Finally, I wish all the speakers and participants a fruitful discussion. For all members of the committee, I would like to express my gratitude for making this conference happens.

Wassalamualaikum wr.wb.

Acting Rektor
Prof. Dr. Margana, M.Hum, M.A.

REMARKS BY CONFERENCE CHAIR

Assalamu'alaikum warrahmatullah wabarakatuh.
May peace and God's blessings be upon you all.

First of all allow me to extend my warmest greetings and welcome to the 8th International Conference on Educational Research and Innovation, organized by Universitas Negeri Yogyakarta. The conference is virtually held for two days – November 4 and 5, 2020 due to the condition of the pandemic Covid-19 which does not allow us to meet face to face.

This year "The Freedom to Learn" is raised as the conference theme. The theme is raised to bring enlightenment, triggers of fresh ideas that can be applied, and other alternatives in order to make the implementation of Freedom to Learn - Freedom Campus run smoothly.

The eighth ICERI is aimed at spreading the ideas, experience, and findings of the researches conducted by lecturers, teachers, and researchers to improve the quality of research in determining and developing knowledge.

For your information, we proudly present one keynote speech, two plenary presentation sessions and two parallel presentation sessions. Stefanie A. Lindquist, JD, PhD. from Arizona State University, the US speaks as the keynote speaker. A special gratitude is addressed to Dr. Bradley Horn from RELO US Embassy as the middle man who has facilitated the committe to invite the keynote speaker. Five outstanding speakers in their fields have been invited. They are Wikan Sakarinto, S.T., M.Sc., Ph.D. (Directorate General of Vocational Education, Ministry of Education and Culture of the Republic of Indonesia), Associate Professor Dr. Vijay Kumar Mallan (University of Otago, New Zealand), Prof. Suwarsih Madya, M.A, Ph.D. (Universitas Negeri Yogyakarta), Dr. Norwaliza Abdul Wahab (Universiti Pendidikan Sultan Idris, Malaysia) and Assoc. Prof. Dr. Minako Sakai (The University of New South Wales, Australia).

We have done our best to prepare this conference. So, my highest appreciation and heartfelt thanks go to all committee members. As to err is human, shortcomings may occur here and there. On behalf of the committee, I would therefore like you all to accept our apologies.

To conclude, let me wish you a productive discussion and a fruitful conference.
Wassalamu'alaikum warrahmatullah wabarakatuh.
May peace and God's blessings be upon you all.

Yogyakarta, November 4, 2020
Conference Chair
Pangesti Wiedarti, M.Appl.Ling., Ph.D.

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WELCOME MESSAGE FROM THE ORGANIZING COMMITTEE

Assalamu'alaikum warrahmatullah wabarakatuh.
May peace and God's blessings be upon you all.

On behalf of the Institute of Research and Community Service of Universitas Negeri Yogyakarta, I am pleased to welcome you to the International Conference on Educational Research and Innovation. It is with great pride, pleasure and honour that we have been successful in organizing the 8th International Conference on Educational Research and Innovation in a challenging situation of the Covid-19 pandemic we are currently facing. No matter how difficult the situation is it is often said that in the middle of every difficulty lies an opportunity and it is true. With the support of the university, speakers, and many other parties the organising committee has collectively made this event a reality.

The ICERI 2020 theme is different from the previous ICERIs which generally emphasized the research results. This year it provides an opportunity for participants to express opinions, in addition to the results of research because ICERI 2020 discusses FREEDOM TO LEARN - FREEDOM CAMPUS which is a new concept presented by Minister of Education and Culture of the Republic of Indonesia - Nadiem Makarim.

Therefore, this conference can be expected to facilitate the contribution of ideas and research results so that participants get enlightenment, triggers of fresh ideas that can be applied, and other alternatives in order to make the implementation of Freedom to Learn - Freedom Campus run smoothly. I believe we will have a great opportunity to network, discuss and understand how the Freedom to Learn - Freedom Campus is implemented through the discussions and ideas presented at ICERI 2020.

I wish to thank our keynote speaker - Stefanie A. Lindquist, JD, PhD. - and the invited speakers - Wikan Sakarinto, S.T., M.Sc., Ph.D., Associate Professor Dr. Vijay Kumar Mallan, Prof. Suwarsih Madya, M.A, Ph.D., Dr. Norwaliza Abdul Wahab and Assoc. Prof. Dr. Minako Sakai - for accepting our invitation to share their wealth of expertises.

Our local researchers have also contributed oral presentations that will provide engaging and informative sessions highlighting the issue of Freedom to Learn being carried out in the today. We are greatly appreciative of their commitment to our conference. Finally, a warm welcome to all our speakers and participants, thank you for your participation in what promises to be a great forum to share knowledge and grow valuable collaborations.

Warm regards,
Head of Research Institute and Community Service of Universitas Negeri Yogyakarta
Prof. Dr. Siswantoyo, M.Kes.

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WEB LEARNING STRATEGY THROUGH THE PANEL CONTROL MANAGEMENT IN VOCATIONAL MIDDLE SCHOOL

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Abstract

Entering the industrial revolution 4.0, students are required to be able to master the use of information technology which continues to grow rapidly to be able to adapt to the competitive world of work. Web-based information technology is built on 2 elements, namely management panel and software administration system. An information system administrator is required to be able to understand well the use of these two elements. This study aims to find feasible strategies to use in integrating web-based learning and management control panel so that it can facilitate students to learn and develop information systems independently. The methodology in this study is divided into three stages: 1) reviewing the literature on learning information systems, panel management, and e-learning, 2) modifying the structure so that a feasible strategy is produced to teach the information system by integrating moodle and panel, and 3) acceptance test strategy to the expert. The findings show that one of the strategies that can be used to teach web learning and panel management in learning information systems to students is to use 15 steps starting from creating a domain and choose hosting services according to the desired disk space requirements and ends with periodically evaluating information systems. The proposed strategy has been assessed by ten IT experts and practitioners and declared to be suitable for use in the development of information technology learning tools at the Vocational Middle School.

Keywords—industrial revolution 4.0, panel management, moodle

INTRODUCTION

The modern economic world requires workers who are reliable and highly dedicated to be able to create new findings and be able to act as a solution to the problem [1]. To anticipate this, students are required to be able to master the use of information technology that continues to evolve in order to adapt to the competitive world of work in the era of the industrial revolution 4.0. Most information system management failures are caused by lack of flexibility of the information technology used or developed [2]. Therefore skills using information technology must be supported by theoretical understanding of information systems supported by practical mastery of management of application programs to be used. Building information systems must also pay attention to the needs of existing organizations [3]. The most difficult component in a series of information system development cycles is in the communication section. Fault in communication can result in misinterpretation by users of the information system developed [4].

Delone and McLean (D&M) information system success models are oriented to the quality of the system, the quality of information, and the quality of service that has an impact on the intensity and satisfaction of the use of information systems by customers which leads to profits in building networks [5]. In addition, external variables based on the Technology Acceptance Model (TAM) as a test standard for developing information systems must also be considered [6]. TAM is oriented to the number of users, attractiveness, technological facilities, and sometimes even coercion so as to create the value of usefulness and convenience for users of information systems [7]. TAM uses the theory of reasoned action to determine the causal relationship between two basic beliefs namely perceived usefulness and perceived ease of use [8]. Thus TAM requires an integrated relationship between users, tasks, technology and structure.

Information systems must pay attention to socio-technical factors and their suitability and ongoing evaluation [9]. This needs to be built because user satisfaction with information systems that are developed will greatly affect the loyalty and interest of users to be able to use information systems in a sustainable manner [10]. Therefore, in building information systems, a developer must pay attention to the acceptance of culture, sociological issues, organizational structuring, technology as a strategy, the use of science and technology as culture. Software acceptance must include technology acceptance and also social acceptance based on psychology including: system quality, information quality, and service quality that can lead to user satisfaction and interest which leads to benefits for information system developers [11].

At present there are many Internet Service Providers (ISPs) that provide information system usage services. This provider offers domain and hosting products that can be managed and monitored through panels and are equipped with technical

support facilities for user consultation with providers if there are things that are not or have not been understood by users of web services. The panel plays an important role in the process of planning, implementing, analyzing and reporting data [12]. Various studies have been conducted to determine the factors that can influence the development of information systems, one of which is the perspective of emotional intelligence between users and web service providers [13]. Among the advantages of using e-learning for students are increased accessibility of information, more perfect data transfer, personal learning, accountability, interactive, and a combination of technological elements and other user behavior [14].

One of the application programs in panel management that can be utilized for e-learning is the moodle program. Moodle is an e-learning software based on virtual learning environment (VLE) that uses php and mysqL programs in the preparation of program syntax and can be developed open source as an online learning media or e-learning [15]. VLE is often associated with the Learning Management System (LMS). LMS is defined as online interactive learning accompanied by learning process feedback from students [16]. Moodle has been proven to be very supportive of the success of collaborative learning [15]. Success in creating an e-learning system is determined by three factors, namely the suitability of the use of technology, ease of access to end users, and program execution in the system [17].

Seeing the synchronization demands of learning in the era of the industrial revolution 4.0 that direct students to be able to design web-based learning tasks, it is necessary to integrate the understanding of information systems, panel management, and e-learning moodle management in teaching information technology to students, especially in vocational high schools. Meaningful learning steps can be created through a sequence of processes of constructing theory, finding the proportion of theories, explanations for justification of the theory, the scope of the theory, and testing the theory through empirical research [18]. There are 4 components of total quality management information systems that can be used to teach e-learning in schools, namely: the principles of model development, information systems development based on the principles of system development life cycle, information on practice results, and assessment of information system results [19]. In order to obtain optimum results, information technology learning in the 21st century must be able to combine the availability of physical devices (hardware, software, and network systems) with practical and advanced skills, including feedback to evaluate students, teachers, and technology systems as tools [20] - [23]. The advantages of learning to use e-learning for students include increasing interest in learning, building collaboration, eliminating boredom and increasing motivation, and stimulating students to think initiative, creative, and innovative [24] - [27]. As for teachers, learning using e-learning is very helpful for evaluating learning outcomes with a high level of examination security for objectivity of results [28].

However, from various existing literature studies there has not been found research results that describe in more detail how the sequence of steps is effective for beginners to be able to work independently starting from the planning, procurement, and management panel management to the execution of the moodle program as an e-platform learning. Therefore, the aim of this research is to find an effective sequence of steps for beginners to be able to work independently from the planning, procurement, and management panel management to the execution of the moodle program as an e-learning platform so that it can be used as an alternative strategy in learning information technology in vocational high schools.

The purpose of this research is to find a feasible strategy to use in integrating e-learning moodle learning and management panel so that it can facilitate students to learn and develop Information Technology independently.

METHOD

This research is divided into three stages: 1) reviewing the literature on learning information systems, panel management, and e-learning moodle, 2) modification of the structure so that a feasible strategy is produced to teach information technology by integrating moodle and panel, and 3) acceptance strategy test to the expert. The proposed strategy were assessed by ten IT experts and practitioners. The data analysis technique used is descriptive statistics to see averages, standard deviations, and the level of agreement of expert judgments on the order of structural modification steps and sequence strategies in learning information technology.

RESULTS

Based on the results of the literature study, the constituent components of the information system, panel, and e-learning moodle are as follows:

1. Components of the preparation of information systems. Includes Information Systems definitions, portrayals at the level of abstraction, communication, modeling, testing, deployment, SI success models, and Technology Acceptance Model (TAM).

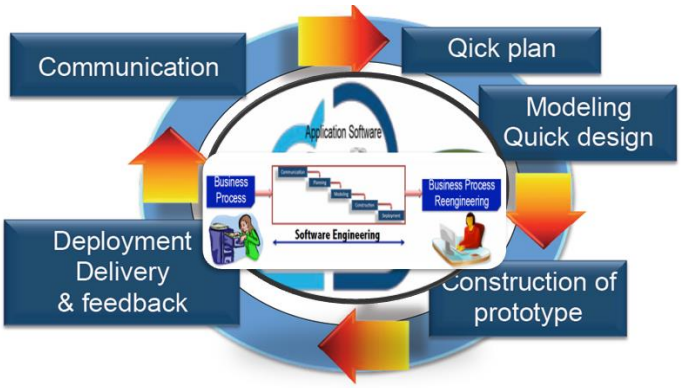

Fig 1. Basic components of the preparation of information systems

2. Panel drafting component. Includes hosting and domain services, server, SSL, online technical support, e-mail accounts, MySQL, FTP accounts, data transfers, park/ addon/ sub domains, registers, quota, uptime, features, typical packages, extensions, configurations, order summaries, invoicing, identity review and checkout, DNS propagation, index file storage, IP server, file management, jetbackup, billing and support, databases, metrics, security, preferences, and softaculous app installer.

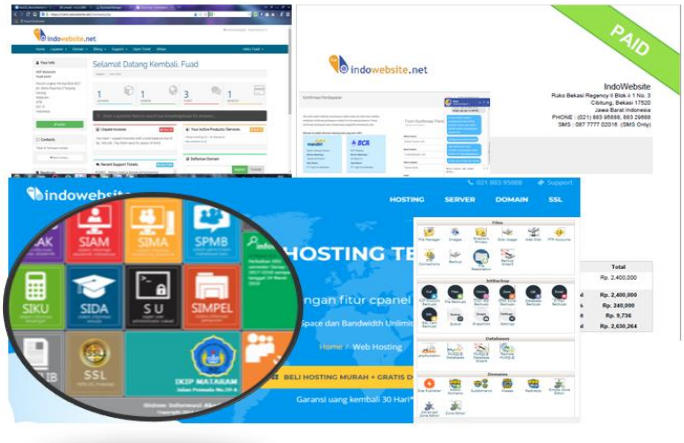

Fig 2. Panel management

3. The main components of the e-learning moodle. Includes setting full site name, front page description, topic section, courses & new items, categories, add a new course, course editting, course display at students, lecturing and student, add a resource, download material, quiz, print marks, Id users, txt format, assign roles, define roles, and user accounts.

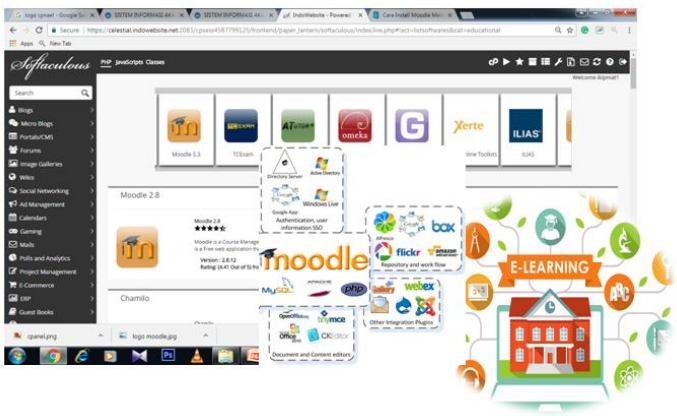

Fig 3. Moodle E-learning

The structure modification to teach Information Technology is then done by integrating the three component partitions above in the form of learning activities so that students have practical skills using the six stages of the Scientific Imagineering through Augmented Reality (SIGAR) learning process developed by Techakosit and Nilsook's SIGAR [29] as following:

(1) Imagine ie students are able to identify learning problems using e-learning moodle and correlated panel management; (2) Study and Research, namely students are able to find new ideas or ideas that continue to develop to solve the problems found; (3) Design, namely students are able to apply the use of e-learning and modify provider-assisted panels; (4) Develop, namely students are able to solve problems faced with the ability of the application of information technology that has been owned, (5) Present namely students are able to communicate to others about how to use information technology to solve relevant problems; and (6) Evaluation, namely students are able to make decisions or final conclusions from a series of processes using information technology.

Table 1. Structural modification steps

Learning stages	Mean	S.D.	Level of agreement
Identification of learning problems	4.70	0.52	Strongly agree
Found new ideas	4.90	0.32	Strongly agree
Apply the use of e-learning	5.00	0.00	Strongly agree
Solve the problem	5.00	0.00	Strongly agree
Communicating ideas	4.70	0.52	Strongly agree
Make conclusions from a series of processes	4.90	0.32	Strongly agree

Based on the results of the existing literature review and development methods, strategies were developed to teach Information Technology as follows:

1. Create a domain and choose a hosting service according to the desired disk space needs. This stage begins with planning the domain name along with the extension options desired by the learner and selecting the desired provider as an ISP, analyzing the disk space data needs to be stored (storage) by considering the hosting services provided by the provider. Communication with online technical support can also be done from this initial stage.
2. Study the list of available menu package offers. The list of available menus is usually adapted to the user's situation whether students, business needs, professionals, or experts. Each package has different qualifications for sub menus offered, namely disk space, FTP accounts, servers, quota, uptime, and typical packages. Qualifications offered depend on the price paid.
3. Place an order. Before making an order, it is necessary to reconsider the domain extension chosen because it also has implications for the requirements for requesting personal/ institutional documents from the provider.
4. Perform hosting configuration. The hosting configuration is required for the final order summary justification needs to be asked before sending the invoice and proof of physical payment, identity review and checkout.
5. Invoice issuance and online invoice payment via bank. Payments at the bank include provider identity, invoice number and status, invoice destination, description and payment transaction, and deadline payment.
6. Payment acceptance and agreement. Payment reporting is required for domain activation purposes.
7. Propagation info. Propagation info is related to DNS propagation and the use of temporary URLs, uploading files to the PUBLIC_HTML directory, saving index files, and downloading FileZilla.
8. FTP access and control panel. Contains domain data identity, username, password, web hosting package, and IP server.
9. Management panel. It includes a file manager that accumulates directory privacy, web disks, file managers, directory privacy, web disks, FTP connections, backup wizards, file and directory restoration, images, disk usage, FTP accounts, backups, and version control; Jetbackup which accumulates the use of full account backups, cron job backups, database backups, SSL cert backups, snapshots, file backups, DNS zone backups, e-mail backups, queues, and settings; Billing & Support that accumulates the use of news & announcements, download resources, view invoice history, check network status, manage profiles, transfer a domain, view support tickets, manage billing information, view email history, search our knowledgebase, view billing information, register new domain, open ticket, and upgrade/ downgrade; databases management includes phpMyAdmin, MySQL Database Wizard, MySQL Databases, Remote

MySQL; Domains consisting of addon domains, aliases, zone editors, subdomains, and redirects; Metrics namely visitors, bandwidth, awstats, webalizer, metrics editor, errors, raw access, analog stats, FTP webalizer, CPU and concurrent connection usage; Security consists of IP blockers, hotlink protection, SSL/ TLS wizard, SSL/ TLS status, SSL/ TLS, leech protection, modsecurity, two-factor authentication; and Preferences that have password & security, change style, user manager, change language, and contact information features.

10. Download moodle on softculous app. For the purposes of downloading the moodle application program it can be done through the softaculous apps installer function. Apart from that file management can also be done through this item.
11. Building relationships with technical support. The forms of relations that can be done are generally in the form of open tickets online, peer teaching, and testimonials.
12. Moodle display management. It can be done through setting full site name, front page description, topic section, couses & new items.
13. Course management. It can be modified through categories, add a new course, editing courses, display courses at students, lecturing and student, add a resource, download material, quiz, and print grades.
14. User management. Includes user id, txt format, assign roles, define roles, and user accounts.
15. Evaluate the information system regularly. Periodic evaluations are used to find out which version of the application program is updated and to test for information system vulnerabilities that can be caused by system provider problems or user and administrator information system errors.

Table 2. Sequence learning strategies for Information Technology

Learning stages	Mean	S.D.	Level of agreement
Create a domain and hosting service	4.70	0.52	Strongly agree
Study the menu package list offers	4.90	0.32	Strongly agree
Place an order	5.00	0.00	Strongly agree
Perform hosting configuration	5.00	0.00	Strongly agree
Issuance of invoices and payment of invoices	4.70	0.52	Strongly agree
Payment acceptance and agreement	4.90	0.32	Strongly agree
Propagation info	4.70	0.52	Strongly agree
FTP access and control panel	5.00	0.00	Strongly agree
Panel management	5.00	0.00	Strongly agree
Download moodle on the softculous app	5.00	0.00	Strongly agree
Building relationships with technical support	4.70	0.52	Strongly agree
Moodle display management	4.90	0.32	Strongly agree
Lecture Management	5.00	0.00	Strongly agree
User Management	5.00	0.00	Strongly agree
Evaluating information systems regularly	4.90	0.32	Strongly agree

CONCLUSION

The findings in this study indicate that one of the strategies that can be used to teach e-learning moodle and panel management in teaching Information Technology to students is to use 15 steps as follows: (1) create a domain and choose hosting services according to the needs of the disk space desirable, (2) study the list of available menu package offers, (3) place an order, (4) perform hosting configuration, (5) issue invoices and online invoice payments via bank, (6) payment acceptance and agreement, (7) info propagation, (8) FTP access and control panel, (9) management panel, (10) download moodle, (11) build relationships with technical support, (12) moodle management, (13) lecture management, (14) user management, and (15) periodically evaluating information systems. The proposed strategy has been assessed by 10 IT experts & practitioners and declared appropriate to be used for the development of IT learning tools at the Middle Vocational School.

ACKNOWLEDGEMENT

This study is part of the dissertation project, so we would like to thank the Yogyakarta State University Graduate Program for agreeing to select this dissertation topic. Also, we thank the Ministry of Research, Technology and Higher Education of the Republic of Indonesia for supporting this research funding through scholarship funds (Grant no. 058/SP2H/LT/DRPM/2020).

REFERENCES

[1] Somsak, T., & Prachyanun, N. (2016). The Learning Process of Scientific Imagineering through AR in

Order to Enhance STEM Literacy. *International Journal of Emerging Technologies in Learning*, *11*(7), 57–63. https://doi.org/10.3991/**ijet.v11i07.5357**

[2] Bostrom, R. P., Heinen, J. S., & Heinen, J. S. (2016). STS Perspective MIS Problems and Failures : A Socio- Technical Perspective PART I : THE CAUSES By : Robert P . Bostrom, *1*(3), 17–32.

[3] Abrego Almazán, D., Sánchez Tovar, Y., & Medina Quintero, J. M. (2017). Influencia de los sistemas de información en los resultados organizacionales. *Contaduria Y Administracion*, *62*(2), 321–338. https://doi.org/10.1016/j.cya.2017.03.001

[4] Siau, K., & Tan, X. (2005). Technical communication in information systems development: The use of cognitive mapping. *IEEE Transactions on Professional Communication*, *48*(3), 269–284. https://doi.org/10.1109/TPC.2005.853933

[5] DeLone, W. H., & Mclean, E. R. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems / Spring*, *19*(4), 9–30. https://doi.org/10.1073/pnas.0914199107

[6] Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology : Extending the Unified Theory. *MIS Quarterly*, *36*(1), 157–178. https://doi.org/10.1017/CBO9781107415324.004

[7] Taylor, S., & Todd, P. (1995). Assessing IT Usage: The Role of Prior Experience. *MIS Quarterly*, *19*(4), 561. https://doi.org/10.2307/249633

[8] Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology : a Comparison of Two Theoretical Models *, *35*(8), 982–1003.

[9] Yusof, M. M. (2015). A case study evaluation of a Critical Care Information System adoption using the socio-technical and fit approach. *International Journal of Medical Informatics*, *84*(7), 486–499. https://doi.org/10.1016/j.ijmedinf.2015.03.001

[10] Lankton, N., McKnight, D. H., & Thatcher, J. B. (2014). Incorporating trust-in-technology into Expectation Disconfirmation Theory. *Journal of Strategic Information Systems*, *23*(2), 128–145. https://doi.org/10.1016/j.jsis.2013.09.001

[11] Condori-Fernandez, N., & Lago, P. (2018). Characterizing the contribution of quality requirements to software sustainability. *Journal of Systems and Software*, *137*, 289–305.

[12] Febrero, F., Calero, C., & Moraga, M. Á. (2016). Software reliability modeling based on ISO/IEC SQuaRE. *Information and Software Technology*, *70*, 18–29. https://doi.org/10.1016/j.infsof.2015.09.006

[13] Xiang, C., Yang, Z., & Zhang, L. (2016). Improving IS development teams' performance during requirement analysis in project—The perspectives from shared mental model and emotional intelligence. *International Journal of Project Management*, *34*(7), 1266–1279. https://doi.org/10.1016/j.ijproman.2016.06.009

[14] Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers and Education*, *58*(2), 843–855. https://doi.org/10.1016/j.compedu.2011.10.010

[15] Muhson, A. (2017). Pengembangan Media Pembelajaran Berbasis Moodle Pada Matakuliah Fisika DASAR Lovy. *Jurnal Pendidikan Akuntansi Indonesia*, *36*(1), 210–219. Retrieved from http://journal.uny.ac.id/index.php/jpakun/article/view/949

[16] Saraswat, S. (2014). Customization and implementation of LMS moodle, *4*(5), 1–4.

[17] Yu, C. P., Chen, H. G., Klein, G., & Jiang, R. (2015). The roots of executive information system development risks. *Information and Software Technology*, *68*, 34–44. https://doi.org/10.1016/j.infsof.2015.08.001

[18] Wohlin, C., Šmite, D., & Moe, N. B. (2015). A general theory of software engineering: Balancing human, social and organizational capitals. *Journal of Systems and Software*, *109*, 229–242. https://doi.org/10.1016/j.jss.2015.08.009

[19] Srima, S., Wannapiroon, P., & Nilsook, P. (2015). Design of Total Quality Management Information System (TQMIS) for Model School on Best Practice. *Procedia - Social and Behavioral Sciences*, *174*, 2160–2165. https://doi.org/10.1016/j.sbspro.2015.02.016

[20] Murnane, J., & Jones, a. (2010). Technology Integration in Higher Education. *International Journal of Emerging Technologies in Learning (iJET)*, *22*(2006), 2010–2012. https://doi.org/10.4018/978-1-60960-147-8

[21] Garba, S. A., Byabazaire, Y., & Busthami, A. H. (2015). Toward the use of 21stcentury teaching-learning approaches: The trend of development in Malaysian schools within the context of Asia Pacific. *International Journal of Emerging Technologies in Learning*, *10*(4), 72–79. https://doi.org/10.3991/ijet.v10i4.4717

[22] Raso, D., Tungkunanan, P., & Anukulwech, A. (2017). Factors supporting an information technology management: Teachers in primary schools in Thailand. *International Journal of Emerging Technologies in Learning*, *12*(4), 126–140. https://doi.org/10.3991/ijet.v12i04.6654

[23] Amornkitpinyo, T., & Piriyasurawong, P. (2015). Causal Relationship Model of the Information and Communication Technology Skill Affect the Technology Acceptance Process in the 21 st Century for Undergraduate Students. *International Journal of Emerging Technologies in Learning (iJET)*, 68–71.

[24] Almarabeh, T. (2014). International journal of emerging technologies in learning. *International Journal of Emerging Technologies in Learning (iJET)*, *9*(3), 31–35. https://doi.org/10.3991/ijet.v9i3.3347

[25] Mtebe, J. S. (2016). A Blended Learning Model for Learning Achievement Enhancement of Thai Undergraduate Students. *Australasian Journal of Educational Technology*, *11*(4), 1–17. https://doi.org/10.3991/ijet.v11i04.5325

[26] Wu, J. (2018). A Space Design Teaching Model Using Virtual Simulation Technology State of the art, *13*(6), 163–175.

[27] Wu, J. (2016). Research and Software Development of Active Learning Mode for College Students Based on Computer Network. *International Journal of Emerging Technologies in Learning (iJET)*, *11*(8), 71. https://doi.org/10.3991/ijet.v11i08.6052

[28] Khlifi, Y., & El-Sabagh, H. A. (2017). International journal of emerging technologies in learning. *International Journal of Emerging Technologies in Learning (iJET)*, *12*(4), 62–89. https://doi.org/10.3991/ijet.v12i04.6478

[29] S. Techakosit and P. Nilsook. (2016). The Learning Process of Scientific Imagineering through AR in Order to Enhance STEM Literacy. iJET. Vol.11 No.7: 57-63.

THE EXTERNAL FACTORS OF TEACHERS 'WELL-BEING' IN REGULAR TEACHER'S TEACHING: IMPLEMENTATION OF INCLUSIVE ELEMENTARY SCHOOLS

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Abstract

This study aims to obtain an overview of The external factor of teachers' well-being from the phenomenon of regular teachers who teach in an inclusive elementary school. The external factors are teacher stress, job satisfaction, teacher employment, and sociodemographic characteristics. This research uses a Qualitative-Phenomenological approach, and the data collection methods are Interviews and Observations through WhatsApp. The subjects of this study are two regular teachers who teach in an inclusive elementary school. In one class that they teach, there are more than two students with special needs. This study shows that both regular teachers felt stress because their workload is getting higher, and the class condition if the special needs students are tantrum. However, because of their training experiences and teaching experiences for many years, they can reduce stress because they can handle special needs students. EA and WS did not think those special needs students as a burden, but they love them and regular students. They give their best to teach them well. Both of them felt satisfied with their job because being a regular teacher in an inclusive school taught them to be more patient and sincere and love them. Both of them also felt well-being of themselves because they always are optimistic in their life.

Keywords: The external factor of teachers' well-being, Regular teachers who teach in an inclusive elementary school, There are more than two students with special needs in one class.

INTRODUCTION

Education for children with special needs (ABK) is not only available in special schools (SLB), but also at regular schools which offer inclusive education. The PLB Directorate describes education as an educational program that requires children with special needs to be studied in a regular school nearest to their home (Handayani & Rahadian, 2013). The integration of regular schools is one way for children who have special needs to attend school, to learn with normal students without noticing the difference in care. Elementary school is the first step that will be taken by children with special needs.

In recent years, according to Article 4(1) of the Regulation of the Minister of National Education of the Republic of Indonesia (Permendiknas) No 70 of 2009, the Government has made it compulsory for regular schools to recognize children with special needs. Therefore, regular schools must prepare various aspects related to the implementation of inclusive education programs. One of them is the teaching aspect of the teacher. Teachers who teach in inclusive implementation primary schools consist of two types, namely regular teachers and special guidance teachers (GPK). Regular teachers who teach are usually teachers who have graduated from the Elementary School Teacher Study Program (PGSD). It is also because the initial form of the school, which was initially a regular elementary school, then changed its shape to an inclusive school so that the teachers are teachers who have graduated from the study program.

Changing the form of a regular school to an inclusive school makes regular teachers experience difficulties when faced with students with special needs. Regular teachers have limited knowledge about children with special needs. So that sometimes, there are teachers who do not understand the characteristics of children with special needs and think they are stupid children. This will undoubtedly have an impact on students with special needs because they will not advance. Regular teachers need to collaborate with GPK to treat students with special needs since GPK has academic credentials relevant to the control of children with special needs. GPK does not go to school every day and does not routinely accompany teachers to teach so teachers must have a unique opportunity to understand each student's characteristics.

A regular teacher has an important role in the progress of all students. The teacher must be able to make the students reach the next level of education with a considerable amount of workload and responsibility. This is not easy because teachers frequently encounter difficulties in teaching. According to findings from interviews and observations, regular teachers in primary and inclusive schools are having some difficulties: there are no specific

guidelines for children with special needs, no particular instructions for teachers to treat children with special needs; lack of guidance to deal with children with special needs, no particular tools to deal with children with special needs. Besides, there are no exceptional teaching staff who are capable and competent to assist regular teachers in educating children with special needs. The teacher must also be able to provide understanding to other regular children that they have special friends so that regular students can develop closeness with children with special needs in class.

A regular teacher has an important role in the progress of all students. The teacher must be able to make the students reach the next level of education with a considerable amount of workload and responsibility. This is not easy because teachers frequently encounter difficulties in teaching. According to findings from interviews and observations, regular teachers in primary and inclusive schools are having some difficulties: there are no specific guidelines for children with special needs, no particular instructions for teachers to treat children with special needs; lack of guidance to deal with children with special needs, no particular tools to deal with children with special needs. Besides, there are no exceptional teaching staff who are capable and competent to assist regular teachers in educating children with special needs. The teacher must also be able to provide understanding to other regular children that they have special friends so that regular students can develop closeness with children with special needs in class. These difficulties are jobs that teachers have to face every year. If the regular teacher is not able to face and interpret it well, then he cannot feel the Well-Being in the school where they teach. Collie et al. (2015) described teacher welfare (teachers' well-being) wellness perceived by teachers in the workplace (in this case the school) as the outcome of perception of interactions, as a result of being open, involved and fully functioning. Collie also explained that several factors can increase or decrease the well-being of teachers in schools. There are three factors, namely, Workload Well-Being, Organizational Well-Being and Student Interaction Well-Being.

Apart from the three factors above, other factors are external factors of Teachers' Well-Being, namely the stress felt by the teacher (Teachers Stress) (described as negative well-being), Job Satisfaction (described as positive well-being related to satisfaction, teacher employment, absence of teacher retention), general well-being and sociodemographic characteristics (such as gender, age, teacher tenure, teaching position, school setting and school level). Collie et al. selected these three factors. Conceptually assist in the extraction of factors which are connected to the well-being of teachers (e.g., Collie et al . 2012; Duckworth et al. 2009). Taking account of the massive workload of the teacher, which if the teacher can not understand positively, then the teacher can experience stress, these three external factors are essential to study. In order to teach well at school, the teacher must also feel satisfied and well-being. Teachers' experiences are something that must be viewed positively by the teacher so that they can escape the tension and can feel the presence of well-being in themselves.

Based on the description above, the researcher is interested in how regular teachers in inclusive elementary schools can represent the external factors of the well being of the teachers.

METHODS

This research employs a phenomenological approach with a qualitative method. The method of sampling used was Non-probability sampling in the form of Purposeful sampling. The study's subject requirements were: daily teachers who have taught in primary schools for inclusion, there are more than two special needs students in one class. The study requirements are in line with two topics. The two subjects taught at the Implementation of Inclusive Elementary School in South Jakarta which was appointed by the Government as one of the inclusion pilot schools in Setiabudi District in 2006/2007. The methods of data collection used were online interviews and observations from the WhatsApp application in July 2020. Data analysis proceeded by typing the results of the conversation to form a text (verbatim interview), then reading the entire text while highlighting and summarizing relevant words, and then coding and classification to produce a summary of the data collected. The Triangulation Method and Source Triangulation were used to verify the validity of the results.

RESULTS

EA and WS have differences when considering from socio-demographic parameters. Gender, age, tenure of teachers, teaching position, school setting, and school level are socio-demographic parameters. Their age gaps in which EA is 11 years older than WS. EA is 48 and WS is 37 years old. Then in terms of tenure, EA has taught in private elementary and inclusive implementation elementary schools for 27 years and has various experiences, while WS has taught at inclusive elementary schools for 16 years, and thus WS wants to explore new experiences about teaching.

Furthermore, in terms of a teaching position, both of them are homeroom teachers in different classes. In the 2019-2020 school year, EA became the homeroom teacher in first grade with 29 children (5 children with special needs and 24 regulars) while WS was the homeroom teacher for grade 6 with 16 children (11 children with special needs and 5 regulars). By paying attention to the

children with special needs held by EA, it is indeed less and more controllable. However, the number of students in their class is quite large, besides that EA also has to learn the behaviour of all students themselves because they are all new students, different from WS who can get information from teachers in grade 5. EA said that in first grade, students were very excited about learning, so she enjoyed teaching.

Contrary to the WS case, where there are still fewer students in her class than EA. However, there are more students with special needs with three different disabilities, namely Mild Disabilities, Borderline and Slow Learner. Particular attention should be given in sixth grade since there are special needs for puberty students, one of whom is 16 years old, and the WS needs to concentrate their actions better so that uncomfortable circumstances do not arise. Being a homeroom teacher in the upper class (4th - 6th grades) must pay full attention because based on information obtained during interviews with the principal at the school. Students with special needs experience puberty faster than regular students due to age differences so that sometimes complaints arise from people. It can lead to complaints from regular student parents concerning the actions of children with special needs who tend to "touch" or "dab" and speak with inappropriate words or "rude" occasionally.

DISCUSSION

Based on research carried out and reviewed from external factors of the well-being of teachers, regular teachers who taught the implementation of inclusive elementary schools were found to be overwhelmed by a massive workload at the beginning of their teaching period.

Subject I (EA) is a 48-year-old teacher who has 23 years of experience in private elementary schools, and in 2016 he was appointed as a civil servant and transferred to an inclusive implementation primary school where this research was carried out. EA explained that there were differences in workloads. She explained that her workload increased because she had to pay attention to regular students and children with special needs simultaneously, not to mention having to learn the characteristics of each child with special needs in her class. At first, she was surprised by the tantrum behaviour of children with special needs, which was very different from the tantrums of the regular students where she used to teach. She is also exhausted because there are nine children with special needs in her class with various disabilities. Not to mention that in that year the selection of students with special needs was not as strict as this year. In the 2019-2020 school year, she also held five children with special needs in first grade. As a regular teacher, of course, this is not easy and does not comply with the provisions where there should only be a maximum of two students with special needs in the class.

Along with her increasing experience at primary school, she felt influenced by inclusion in her class for students with special needs. Thus, EA's attitude has steadily shifted. She grew more affectionate and did not make children with special needs a class burden. EA is increasingly trying to provide appropriate teaching for children with special needs, such as providing additional hours for students who cannot read yet, to learn to read after school for approximately 1 hour.

EA has its satisfaction with her job as a teacher; one of the reasons is that being a teacher is her goal. She explained that after becoming a teacher in an elementary school, the implementation of inclusion made her a more patient and sincere teacher. A better comprehension of their students' condition from an economic standpoint, families and so forth. Because before she taught at private elementary schools, the situation was different.

Subject II (WS) is a 37-year-old teacher who has taught for 16 years in implementation of inclusive elementary schools. In her first teaching years, she felt overwhelmed because of the increased workload and because she had never experienced the teaching of those students of Autism or Down Syndrome. She was also surprised and exhausted in the face of children with special needs. The presence of government and private-sector training helped her feeling so that she could eventually learn the characteristics of children with special needs. In the 2019-2020 school year, she teaches in sixth grade with 16 students, of which 11 students are students with special needs with the criteria of Mild, Borderline and Slow Learner. While she has been teaching at inclusive elementary school for 16 years, it still finds it challenging because of her students' limited ability. Not only students with special needs, but all students can not force the results according to her standards.

She did not expect more students with special needs in inclusive elementary schools than regular students in a one class.

WS has satisfaction with her job. Despite difficulties when she taught, she always tried her best to get her students to graduate from elementary school and wished for the best for all her students. The successful partnership between all school members also encourages their job satisfaction in order to teach in elementary schools for 16 years.

The EA and the WS addressed the three questions regarding General Wellbeing that they lived with optimism and enthusiasm. They always have to remember to pray to Almighty God because life is a struggle.

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The preferred spelling of the word "acknowledgment" in America is without an "e" after the "g." Try to avoid the stilted expression, "One of us (R. B. G.) thanks …" Instead, try "R.B.G. thanks …". Put sponsor acknowledgments in the unnumbered footnote on the first page.

REFERENCES

[1] Acton, R., & Glasgow, P. (2015). Teacher Wellbeing in Neoliberal Contexts: A Review of the Literature. *Australian Journal of Teacher Education*, 40(8).

[2] Aelterman, A., Engels, N., Petegem, K. V., & Verhaeghe, J. P. (2007). The Well-Being of Teachers in Flanders: The Importance of A Supportive School Culture. *Educational Studies, 33*(3), 285-297. doi:10.1080/03055690701423085.

[3] Aldrup, K., Klusmann, U., Lüdtke, O., Göllner, R., & Trautwein, U. (2018). Student Misbehavior and Teacher Well-Being: Testing The Mediating Role of The Teacher-Student Relationship. *Learning and Instruction, 58*, 126-136. doi:10.1016/j.learninstruc.2018.05.006.

[4] Bachri, B.S. 2010. Meyakinkan Validitas Data Melalui Triangulasi pada Penelitian Kualitatif. *Jurnal Teknologi pendidikan*, 10(1), 46-62.

[5] Collie, R. J., Shapka, J. D., Perry, N. E., & Martin, A. J. (2015). Teacher Well-Being: Exploring Its Components and A Practice Oriented Scale. *Journal of Psychoeducational Assessment, 33*(8), 744-756. doi:10.1177/0734282915587990.

[6] Desiningrum, D. R. (2016). *Psikologi Anak Berkebutuhan Khusus.* Yogyakarta: Psikosain.

[7] Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D., Oishi, S., & Biswas-Diener, R. (2009). New Measures of Well-Being: Flourishing and Positive and Negative Feelings. *Social Indicators Research, 39*, 247-266.

[8] Firmansyah, I., & Widuri, E. L. (2014). *Subjective Well Being* pada Guru Sekolah Luar Biasa (SLB). *EMPATHY, 2*(1), 1-8.

[9] Handayani, T., & Rahadian, A. S. (2013). Peraturan Perundangan dan Implementasi Pendidikan Inklusif. *Masyarakat Indonesia, 39*(1), 27-48.

[10] Hardani, dkk. (2020). *Metode Penelitian Kuantitatif dan Kualitatif*. Yogyakarta: CV. Pustaka Ilmu Group Yogyakarta.

[11] Hasbiansyah, O. (2008). Pendekatan Fenomenologi: Pengantar Praktik Penelitian dalam Ilmu Sosial dan Komunikasi. *Mediator, 9*(1), 163-180.

[12] Maxwell, J.A. (2013). Qualitative Research Design an Interactive Approach 3rd Edition. California: SAGE Publications Inc.

[13] Permendiknas No.70 Tahun 2009 tentang Pendidikan Inklusif Bagi Peserta Didik yang Memiliki Kelainan dan Memiliki Potensi Kecerdasan dan/atau Bakat Istimewa.

[14] Purnomo, E. (2016). Kebutuhan Guru Sekolah Dasar Inklusi dalam Meningkatkan Kompetensi Melalui Media Video. *Kwangsan, 4*(2), 95-109.

[15] Raco, J.R. (2010). Metode Penelitian Kualitatif: Jenis, Karakteristik dan Keunggulan. Jakarta: Grasindo.

[16] Rae, T., Cowell, N., & Field, L. (2017). Supporting Teachers' Well-Being in The Context of School for Childern with Social, Emotional and Behavioural Difficulties. *Emotional and Behavioural Difficulties, 22*(3), 200-218. doi:10.1080/13632752.2017.1331969.

[17] Roffey, S. (2012). Pupil Wellbeing - Teacher Wellbeing: Two Sides of The Same Coin? *Educational and Child Psychology, 29*(4), 8-17.

[18] Smetackova, I., Viktorova, I., Martanov, V. P., Pachova, A., Francova, V., & Stech, S. (2019). Teachers Between Job Satisfaction and Burnout Syndrome: What Makes Difference in Czech Elementary Schools. *Frontiers in Psychology, 10*(2287). doi:10.3389/fpsyg.2019.02287.

[19] Tarnoto, N. (2018). Permasalahan-Permasalahan yang Dihadapi Sekolah Penyelenggara Pendidikan Inklusi pada Tingkat SD. *Humanitas, 13*(1), 50-61.

[20] Turner, K., & Thielking, M. (2019). Teacher Wellbeing: Its Effects on Teaching Practice and Student Learning. *Educational Research, 29*(3), 938-960.

[21] Undang-Undang No. 20 Tahun 2003 tentang Sistem Pendidikan Nasional.

[22] Wessels, E., & Wood, L. (2019). Fostering Teachers' Experiences of Well-Being: A Participatory Action Learning and Action Research Approach. *South African Journal of Education, 39* (1), 1-10.

[23] Laporan hasil wawancara dan Observasi di beberapa Sekolah Dasar Inklusi

[24] At-Tsani, M.R., dkk. 2019. Fenomena Penanganan Mengajar Siswa ABK di SDN Pancoran 05 Pagi. Makalah. Jakarta: Universitas Negeri Jakarta.

[25] Faradila, M., dkk. 2019. Fenomena di Sekolah Inklusi SD Negeri 03 Gedong Pagi Berdasarkan Hasil Observasi dan Wawancara. Makalah. Jakarta: Universitas Negeri Jakarta.

[26] Muthia, A., dkk. 2019. Laporan Observasi dan Wawancara di Islamic Green School. Makalah. Jakarta: Universitas Negeri Jakarta.

[27] Noval, A., dkk. 2019. Fenomena di Sekolah Inklusi Purba Andhika berdasarkan Hasil Observasi dan Wawancara. Makalah. Jakarta: Universitas Negeri Jakarta.

[28] Sabila, Z.N., dkk. 2019. Fenomena Pola Asuh Orang Tua Murid di Sekolah Cikal Berdasarkan Hasil Observasi dan Wawancara. Makalah. Jakarta: Universitas Negeri Jakarta.

[29] Simehatte, A., dkk. 2019. Laporan Observasi dan Wawancara Sekolah Inklusi SDN Cempaka Putih Barat 07 Pagi. Makalah. Jakarta: Universitas Negeri Jakarta.

[30] Utami, A.U., dkk. 2019. Fenomena Pendidikan di Sekolah Dasar Pantara Tebet. Makalah. Jakarta: Universitas Negeri Jakarta.

[31] R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

[32] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn.Japan, vol. 2, pp. 740-741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
[33] M. Young, The Technical Writer's Handbook.Mill Valley, CA: University Science, 1989.

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EFFECTIVENESS OF REALITY GUIDANCE PROGRAM FOR DEVELOPING CAREER CHOICE ABILITY OF HIGH SCHOOL STUDENTS

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Abstract

This study aims to produce a reality guidance program to develop the career choice abilities of high school students. The study uses a quantitative approach and a quasi-experimental method with a nonequivalent (pre-test and post-test) control group design. The study population was students of grade XI SMA X Bandung academic year 2019/2020 as many as 246 students, and the study sample was 58 students. The instrument used was a student career choice ability questionnaire. Based on the results of the effectiveness test, there is a change in ability before and after the treatment is given in the form of reality guidance. The change in ability is characterized by an increase in the aspects of knowledge and the skills in the indicators: 1) understanding of self-interest and talent; 2) self-strength and weakness analysis; 3) gathering information about the continuation of study and work; 4) self-development; and 5) planning further studies. Whereas the indicators for identifying challenges and obstacles in the environment did not increase significantly. This means effective reality guidance to develop the career choice abilities of high school students.

Keywords: career choice ability, high school students, reality guidance

INTRODUCTION

A person's ability to choose a career will influence success. A person can be said to be successful in a career if someone feels proud of a job that matches expectations. Meanwhile, decisions made by a person regarding career aspects to be pursued cannot be separated from the consideration of various factors that exist in the order of community life, where society is a source of values and a place where various things are available that can be used by someone to develop themselves. In achieving a good career, careful career planning is needed [1]. Most individuals have an interest in or affinity toward certain career fields or occupations. Career choices result when individual aspirations and preferences are reexamined in light of the constraining forces imposed by the social environment in which that individual lives. Career decisions are complex ones, influenced by myriad factors, including family background, peer group achievement, cultural norms, personal aptitudes and educational attainment [2].

When teenagers prepare for further study and choose a job, they often experience many problems. The importance of self-understanding, the ability to make career choices and career insights will determine one's career maturity [3]. Career maturity is needed in choosing and planning the right career, including self-knowledge, knowledge about work, ability to choose jobs, and the ability to plan expected career steps [4]. Students who do not optimize themselves for career choices will experience obstacles in determining future career decisions and have an impact on the mismatch of the chosen job with their potential.

Research conducted by the Indonesian Career Center Network (ICCN) in 2017, it is known that a number of 87% of Indonesian students admit that the major they take does not match their interests. Meanwhile, 71.7% of workers have a profession that is not suitable for their education. In this case, high school students experience confusion, especially in choosing a major or study program at a college and planning a future career. Confusion in understanding the role of the environment as one of the factors influencing one's ability to make career choices [5], [6], [7], [8].

Career development at the age of 15-24 years is included in the exploration stage, where adolescents develop new awareness about themselves and the world of work and begin to try new roles related to further study and career choices. Super argues that the success and readiness of adolescents to fulfill the organized tasks contained in each stage of career development is referred to as career maturity. A person's career maturity is also influenced by age [9]. The age conformity referred to in this definition is based on the Life-Span theory, Life-Space of Super, which says that each individual at a certain age level has a role according to the developmental stage. Career maturity at adolescence is important and necessary to support career development in the future.

This research is motivated by the phenomenon of the large number of students in high school who

experience confusion in choosing study programs in tertiary institutions as well as ignorance of their future careers. Meanwhile, the ability to choose a study program and know the career direction according to one's potential can determine a person's success. The focus of the problem in this study is the inability of high school students in choosing study programs in higher education and planning future careers. If students can plan their careers well, then at a later stage they can make their decisions to prepare for a better future. Conversely, if students cannot plan a career well, then at a later stage they cannot make career decisions, and cannot realize their decisions to prepare for a better future. For high school students, determining the choice of study program in college is important to determine future careers. The suitability in choosing a study program in higher education according to their potential and interests will determine the job they will take, and affect their subsequent career development. By knowing the profile of the development of career choice abilities, it can be the basis for formulating guidance services. The reality guidance program in Senior High Schools aims to develop students' skills in the ability to choose careers, especially in the selection of study programs in higher education.

Through the reality guidance program provided to all high school students, it is hoped that it can facilitate the career development of students so that they have preparedness and careful planning in determining the choice of further study programs and career choices in the future.

METHOD

This study aims to produce an effective reality guidance to develop the career choice abilities of high school students. This study uses a quantitative approach with an experimental research design. Experimental research design is research to test a thought or practice in order to find out whether it affects the dependent variable. The experimental research design is divided into 6 types, namely: 1) true experiment, 2) quasi experiment, 3) factorial, 4) time series, 5) repeated measure, and 6) single subject. This study used a quasi-experimental research design [10].

Quasi experimental design is a type of experimental research that does not provide opportunities for all members of the population to become research samples. In quasi experimental research, there is a control group, but it does not fully function to control the external variables that affect the implementation of the experiment. The research sample was taken nonrandom sampling, but was selected based on class members who have the same characteristics as the population. The class selected as the control group and the experimental group is called the natural (non-formal) group.

The pre-test and post-test are giving tests using career choice instruments to reveal the career choice ability profile of students. Whereas the treatment in question is in the form of reality guidance services to improve the career choice abilities of high school students. The treatment was only given to the experimental group, while the control group was not given treatment. The experimental design of the nonequivalent control group was used to determine how much influence the reality guidance has on developing the career choice abilities of high school students. The research method used in this study was a quasi-experimental design with a nonequivalent (pre-test and post-test) control group design.

The quasi experimental research design consists of four stages, namely: 1) determining the control group and the experimental group, 2) giving a pre-test to the control group and the experimental group, 3) giving treatment to the experimental group while the control group is not given treatment, 4) giving post-test to the control group and the experimental group.

The study population was 246 grade XI students for the academic year 2019/2020. This population was chosen based on the consideration that the students were adolescents aged 15-17 years who in their career development were included in the exploration stage, where adolescents developed new awareness about themselves and the world of work and began to try new roles related to choosing more studies and careers. Continued. In addition, students of grade XI should be able to prepare themselves and determine the choice of study programs in higher education to be taken after graduating.

The development of instruments is intended to obtain accurate data, so that a viable career choice instrument is developed. The stages of instrument development include: 1) formulation of a conceptual definition of career choice according to experts, 2) formulation of operational definition of career choice, 3) formulation of career choice instrument grid, 4) determination of scoring and interpretation guidelines, 5) testing judgment statement items instrument; and 6) the results of the judgment instrument.

Testing the validity of the statement items was carried out using the product moment correlation formula with rough numbers, namely by looking for the correlation between the item scores and the total score. The instrument in this study was a questionnaire compiled from a developed grid. Based on the results of the validity test calculations on the understanding variable, it is known that of the 50 valid questions and 8 invalid questions. Measurements were made using the correlation coefficient between each item and the total item, the value was then compared with the r table (at a significance of 0.05 with a 2-sided test and N = 246). If r count < r

table then it is declared invalid, or vice versa. The value of r table obtained is 0.166.

Measurement of instrument reliability using SPSS 21 and using Cronbach's Alpha formula, the career choice instrument reliability coefficient was obtained of 0.661. It can be concluded that the career choice instrument is reliable and is in the good category. This shows that the instrument of career choice ability in this study is reliable with a high level of reliability. The high level of reliability indicates that the instrument used is good and can be trusted as a measurement and data collection tool for the career choice abilities of high school students.

The development of a reality guidance program is carried out to develop career guidance services that can be used to develop the career choice abilities of high school students. The development of reality guidance includes: 1) theoretical studies; 2) structuring the reality guidance; and 3) reality guidance trials. The reality guidance activities include: 1) understanding interests and talents; 2) analysis of strengths and weaknesses; 3) collection of information about continuing studies and work; 4) identification of challenges and barriers in the environment; 5) self-development skills and further study planning.

The reality guidance trial was carried out on grade XI students as a sample of the experimental group. The first stage in the program trial was carried out by providing a pre-test to reveal the initial conditions of students who became the control group and the experimental group. Furthermore, providing reality guidance to the experimental group, while the control group in this study was not provided reality guidance.

The reality guidance provided follows the procedure for implementing reality guidance to develop the career choice abilities of high school students that have been designed. The procedure consists of three stages, namely: 1) initial stage or orientation, 2) core stage or intervention; and 3) the final stage or evaluation

RESULTS

The results showed that in general, the career choice ability profiles of grade XI students of SMA X Bandung academic year 2019/2020, in the medium category. In the knowledge aspect, as many as 29.7% (73) of students were in the high category, as many as 48.8% (120) of students were in the medium category, and as many as 21.5% (53) of students were in the low category. In the aspect of skills, as many as 37.4% (92) of students were in the high category, as many as 42.7% (105) of students were in the medium category and 19.9% (49) of students were in the low category.

The ability of career choice in the high category means that students are able to understand their interests and talents; able to analyze their strengths and weaknesses; can obtain information about continuing studies and work; can identify challenges and obstacles in the environment, can develop themselves; and can plan follow-up studies. In other words, students who are in the high category are students who are able to make career choices. The career choice ability in the medium category means that students are sufficiently able to understand their interests and talents; sufficiently able to analyze one's strengths and weaknesses; sufficiently capable of obtaining information about continuing studies and work; sufficiently able to identify challenges and obstacles in the environment, sufficiently capable of self-development; and sufficiently capable of planning further studies. In other words, students who are in the medium category are students who are sufficiently capable of making career choices. Then in the low category, it means that students have not been able to understand their interests and talents; not able to analyze their strengths and weaknesses; unable to obtain information about continuing studies and work; unable to identify challenges and obstacles in the environment, not able to develop themselves; and have not been able to plan further studies. In other words, students who are in the low category are students who have not been able to make career choices.

Reality guidance is formulated based on considerations in accordance with theoretical and practical views. The concept of reality guidance is derived based on the concept of reality counseling. Reality counseling is a system that focuses on current behavior and is a form of behavior modification. This functions so that the counselee is able to help himself in facing reality and fulfilling basic needs without harming himself or others and is brave enough to take responsibility for all his behavior [12]. The reality counselor teaches the counselee the skills to make choices and at the same time encourages the counselee to take responsibility for making choices that will meet the basic needs of the counselee [13].

Glasser [14] defines reality counseling as an effort of assistance provided by the counselor to the counselee to be able to face reality and meet their needs. Reality counseling is a short-term, present-day therapy that emphasizes personal power in learning behavior and is more realistic. Reality counseling focuses on actions and thoughts that are carried out now, not on things in the form of understanding, feelings, past experiences, or unconscious motivations. The main technique of reality counseling is to teach the counselee how to use choice theory to meet his basic needs in responsible ways.

The hypothetical design of the reality guidance program to develop students' career choice abilities is based on the development results which include: 1) theoretical studies; 2) structuring

the reality guidance; 3) reality guidance feasibility test; and 4) reality guidance trials.

The hypothetical design of the reality guidance program to develop students' career choice abilities is defined as a unit of service activities provided by counseling teachers to facilitate the needs of students who are responsible for making career choices, developing positive behaviors and evaluating the effectiveness of behaviors that are useful for students in daily life.

The effectiveness of reality guidance in developing the career choice abilities of grade XI students of SMA X Bandung academic year 2019/2020 using the anakova technique. Anacova is a statistical technique used in experimental research. The stages include: 1) normality test; 2) homogeneity test; 3) Mann Whitney difference test.

The normality test is carried out to determine the normality of the normal data distribution or not, as one of the requirements to determine the two-difference test mean of the pre-test data for the experimental class and the control class. The calculation of the normality test uses the SPSS 20 program with the Shapiro-Wilk statistical test. The results of the normality test can be seen in the following table.

Normality Test Result (*pre-test*)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Eksperimen	.059	29	.200*	.981	29	.857
Kontrol	.131	29	.200*	.965	29	.433

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

The results of the normality test on the test of 29 data show that the pre-test results are normally distributed (significance above 0.05). This is indicated by the significant value of the Kolmogorov-Smirnov test of 0.857 > 0.05. Whereas in the pre-test control class a significant value of 0.433 > 0.05, meaning that in the control class the data were normally distributed

Normality Rest Result (*post-test*)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Eksperimen	.075	29	.200*	.966	29	.450
Kontrol	.142	29	.140	.946	29	.147

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

The results of the normality test on the test of 29 data show that the pre-test results are normally distributed (significance above 0.05). This is indicated by the significant value in the Kolmogorov-Smirnov experimental class of 0.450 > 0.05, which means that the data is normally distributed. Whereas in the post-test control class the significant value was 0, 147 > 0.05, meaning that the data in the control class were normally distributed.

Homogeneity test is used to determine the similarity of the population. The homogeneity test was performed as a prerequisite for the Mann Whitney U Test analysis. As a test criterion, if the significant value is more than 0.05, it can be said that the variants of two or more data groups are the same.

a. If the significant value (sig) Based on Mean > 0.05, the data variance is Homogeneous

b. If the significant value (sig) Based on Mean < 0.05, the data variance is not homogeneous.

The results of the pre-test data homogeneity test in the experimental class and control class can be seen in the following table.

Homegeneity Test *(pre-test)*

Levene Statistic	df1	df2	Sig.
14.948	1	56	.056

Based on the results of the calculation of the homogeneity test with a level of α = 0.05, the pre-test in the experimental class and the control class is 0.056, which means that the pre-test data for the experimental and control classes have the same or homogeneous variants.

Homegeneity Test *(post-test)*

Levene Statistic	df1	df2	Sig.
20.993	1	56	.063

Based on the results of the calculation of the homogeneity test with a level of α = 0.05, the pre-test in the experimental class and the control class is 0.063 which means that the pre-test data for the experimental and control classes have the same or homogeneous variants. Based on the results of the pre-test and post-test data analysis using the Mann Whitney statistical difference test on each indicator of students' career choice ability, there are five indicators that have increased. The indicators referred to: 1) understanding of interests and talents; 2) analysis of weaknesses and strengths of themselves; 3) collection of information about continuing studies and work; 4) self-development and 5) further study planning.

Average Score of Career Choice Ability Indicators in the Experiment Class and Control Class

Career Choice Ability Indicators	Experiment Class		Control Class	
	Pre-test	*Post-test*	*Pre-test*	*Post-test*
Understanding of interests and talents	10,24	10,97	10,24	10,66
Analysis of weaknesses and strengths of themselves	12,59	14,52	13,31	15,14
Collection of information about continuing studies and work	5,24	6,21	5,10	5,31
Self Development	9,10	9,52	9,21	9,24
further study planning	14,10	15, 41	15,72	15,83

Based on data, average score of the career choice ability indicator score in the experimental

class and control class to strengthen the description of the effectiveness of reality guidance to develop students' career choice abilities, a comparison of the average score of the career choice ability indicators in the experimental class and the control class was carried out. The trial results showed an increase in the average score of the experimental class and the control class on each indicator, meaning that reality guidance was effective in developing career choice abilities on indicators: 1) understanding of self-interest and talent; 2) analysis of weaknesses and strengths of themselves; 3) collection of information about continuing studies and work; 4) self-development and skills aspects with indicators of further study planning. However, reality guidance is not effective for developing career choice skills on indicators of identifying challenges and obstacles in the environment.

DISCUSSION

Super, Crites, Hummel, Moser, Overstreet, & Warnath stated that career development during high school is an exploration stage that starts at the age of 15 to 24 years [15]. At this stage, adolescents develop awareness of themselves and the world of work, and begin to try new roles, so in this case career maturity is needed. The accuracy in choosing advanced study programs according to their interests and potentials will determine the work they undertake, and will have an effect on further career development [16]. Jaffe and Scott explain that career planning has stages of self-assessment, exploring opportunities, compiling career plans, implementation, and evaluation [17].

Meanwhile, Shetzer and Stone state that differences in adolescent career development are influenced by two factors, namely internal factors and external factors [18]. Internal factors that affect the development of adolescent careers such as life values, level of intelligence, special talents, interests, traits, knowledge, physical condition. In connection with these internal factors, Roe and Hoppock state that a person's career choices are motivated by the needs that drive them to choose [19] [20]. Supriatna explains that interest is different from intelligence and talent, therefore interests tend to change according to environmental demands. In addition, adolescents tend to be unstable and easily influenced by the environment in which they are located. Simpson, in Gabbidon, et. al., found that among adolescents in African Americans, the sex of the student determines the choice of major; female students tend to prefer engineering majors, while males prefer to choose science majors [21]. Therefore, to be able to make appropriate career choices students need to develop self-understanding, career exploration, and career choices through strategies in career guidance as an effort to help them [22].

One indication that students have readiness to make career choices is an effort to seek information about careers and have a positive view of the opportunities and challenges in choosing advanced [23]. This is in accordance with the opinion expressed by Jordaan who stated that being responsible for obtaining information is one of the tasks of adolescent career development [24].

Meanwhile, external factors that influence adolescent career development include: social environment, state or regional socio-economic conditions, family socio-economic status, influence of extended family members and nuclear families, school education, peer interaction and other demands attached to the position or study program. Yusuf stated that students have a developmental environment that will affect their development including career development. The development environment concerns the family environment, school, peer group and community [25].

Making decisions about the chosen career must be combined between the desired job and career with personal potentials [26]. Decision making students in the specialization are assumed to have broader knowledge of career information, so that they have better attitudes and abilities in making decisions [27]. Glaize and Myrick concluded that students who were given complete job information saw the world of work more realistically and were increasingly trying to develop their careers [28].

In one's career planning, there are significant-other influences. Such a very meaningful person is especially influential on individuals in identifying career planning and selection. According to several studies put forward by Okiishi, other people referred to are teachers, peers and parents who have a significant influence on the development and career expectations or expectations of adolescents [29]. Other people who are significant (significant-other) to someone can be a tool in planning and career selection. In other words, when someone identifies and makes career choices, it is influenced by other people who mean a lot to him.

Student counselors are included as one of the significant-other influences that can help students in the career selection process. The role and duties of student counselor in schools are not only guiding students in making career choices, but also guiding students to understand themselves and their environment in the context of career planning and career determination in future life which includes career planning and appropriate decision making. with the abilities they have.

Guidance is aimed at students so that they are able to make appropriate and responsible career decisions so that the career that has been chosen can match their abilities, interests and talents. Mondy argues that career planning is a process for: 1) self-awareness of various opportunities,

opportunities, constraints, choices and consequences, 2) identifying career-related goals, 3) preparing work, education, and relating to experiences that are developmental and the sequence of steps taken to achieve career goals [30]. Each individual evaluates his abilities and interests, considers alternative career opportunities, sets career goals, and plans practical development activities. The main focus of career planning is to match personal goals and realistically available opportunities.

The existence of guidance and counseling services in schools as a process of continuous development in an effort to help individuals prepare for careers through activities related to career planning, decision making, development of problem-solving skills, career information and self-understanding, understanding positive attitudes towards all types of work, and develop positive living habits. Guidance and counseling services in the career field aim to help students gain understanding and adjustment in relation to work problems. Holland argues that guidance in a career is very important for students in making career choices, preparing to enter the world of work and knowing job information in the form of job recruitment and selection, job placement, career management, and job design [31].

Reality guidance is formulated based on considerations in accordance with theoretical and practical views. The concept of reality guidance is derived based on the concept of reality counseling. Reality counseling is a system that focuses on current behavior and is a form of behavior modification. This functions so that the counselee is able to help himself in facing reality and fulfill his basic needs without harming himself or others and has the courage to take responsibility for all his behavior [32].

In reality counseling, the counselor functions as a teacher and a model who teaches the counselee to control his life [33]. At the heart of reality counseling is the acceptance of personal responsibility as equated with mental health. The reality counselor teaches the counselee the skills to make choices and at the same time encourages the counselee to take responsibility in making choices that will meet the counselee's basic needs [32].

Glasser defines reality counseling as an effort of assistance provided by the counselor to the counselee to be able to face reality and meet their needs. Reality counseling is a short-term, present-day therapy that emphasizes personal strengths in studying behavior and is more realistic. Reality counseling focuses on actions and thoughts that are carried out now, not on things in the form of understanding, feelings, past experiences, or unconscious motivations. The main technique of reality counseling is to teach the counselee how to use choice theory to meet his basic needs in responsible ways [34].

Overall, the core stage (intervention) carried out during the provision of reality guidance to develop students' career choice abilities is to adapt to reality counseling techniques. The main technique of reality counseling is to teach the counselee how to use choice theory to meet his basic needs in responsible ways. There are four stages of counseling, which are given the acronym WDEP [35] which are as follows:

W – want: the desire, need, or perception of the counselee. In this first stage, the counselor helps the counselee to find his wants and hopes. Researchers applied this technique in the second and third sessions, where students were given the task to better understand and analyze their strengths and weaknesses, so that it becomes a necessity in developing career choice abilities.

D – direction and doing: what the counselee does or does to achieve what he wants. Researchers applied this technique in the fourth and fifth sessions, where students were given the task of analyzing, exploring and identifying challenges and obstacles in the environment. Researchers also help direct students to be able to develop career choice abilities.

E – self evaluation: this stage is the main concept in reality counseling. Self-evaluation involves the counselee to test the direction of behavior, special activities, thoughts, feelings, desires, perceptions, and other psychological components as a whole behavior within the scope of the counselee's responsibility. Researchers applied this technique in the sixth session, where students were given the task of evaluating what they had done. Researchers also direct students to improve their skills so that students are able to develop career choice abilities.

P – planning: this last stage helps the counselee plan meaningful changes to meet his needs more effectively. Effective planning has the characteristics of being simple, achievable, measurable and can be done immediately. Researchers apply this technique in the seventh session, where students are expected to be able to control their lives effectively with planning that is easy to do responsibly and in accordance with their own potential so that students are able to develop career choice abilities.

REFERENCES

[1] S. Mamat, “Layanan Bimbingan Karir di Sekolah Menengah”. Bandung: Departemen Pendidikan Nasional Universitas Pendidikan Indonesia, 2009.

[2] F. K. Owen, S. Demirtas-zorbaz, and T. Mutlu, “Career Sailboat Model as a tool for the Guidance Counsellor”, no. March. National Centre for Guidance in Education (NCGE), 2015.

[3] Crites, John. O. "Career Counseling: Models, Methods and Material". New York: McGraw-Hill Book Company, 1981.
[4] Osipow, S.H. "Theories of Career Development." New Jersey: Prentice-Hall Inc, 1983.
[5] Zhao-Ping Jiang & Zhang-Ran Zhang. "Using Social Cognitive Career Theory to Predict the Academic Interests and Goals of Chinese Middle Vocational Technical School Students." Public Personnel Management. Vol. 41, No. 5, 2012.
[6] Rajabi, S. Abdolhamid Papzan and Gholamreza Zahedi. "Application of Social Cognitive Career Theory to Investigate the Effective Factors of the Career Decision-Making Intention in Iranian Agriculture Students by using ANN." Sage Open. 1-13. October-December 2012.
[7] Wong, Chi-Sum: Wong, Ping-Man & Pen, Kelly Z. "An Explanatory Study on the Relationship between Parents' Career Interest of Young Adults. International Journal of Education and Vocational Guidance." 2011. p. 11:39-53.
[8] Brown, D., & Associates. "Career Choice and Development (Forth Edition)." San Francisco: John Willey & Sons, Inc., 2002.
[9] Gonzales, M. "Career Maturity: a Priority for Secondary Education." Journal of Researching Educational Psychology. ISSN. 1696-2095. No. 16. Vol. 6 (3) 2008, pp:749-772. Spain:Department of Educational Research Methods and Diagnostics, University of Barcelona, 2008.
[10] Creswell, J. W. "Education Research, Planning, Conducting and Evaluating Quantitative and Qualitative Research 4th Edition." Boston: Pearson, 2012, p. 295.
[11] Andersen, P. & Vandehey, M. "Career Counseling and Development in Global Economic". USA: Bonks/Cole, 2012.
[12] Corey, G. "Theory and Practice of Counseling and Psychoterapy". Translated by E. Koswara. Bandung: Refika Aditama, 2010, p. 263.
[13] Corey, G. "Teori dan Praktik Konseling dan Psikoterapi." Translated from book Theory and Practice of Counseling and Psychoterapy by E. Koswara. Bandung: Refika Aditama, p. 269. 2010.
[14] Glasser, W. Reality Theraphy "A new Approach to Psychiatry." New York: Herper & Row Publisher Inc, p. 75. 1975.
[15] Super, D. E., Crites, J. O., Hummel, R. C., Moser, H. P., Overstreet, P. L., & Warnath, C. F. Vocational development: A framework for research. New York: Bureau of Publications, Teachers College, Columbia University. 1975.
[16] Agustini, N.L.R., Sulastri, M. & Sedanayasa, G. "Efektivitas Konseling Trait and Factor dengan Layanan Informasi terhadap Rencana Pilihan Karier Siswa Kelas X SMA Negeri 1 Sukasada Tahun ajaran 2013/2014". E-Journal Undiksa Jurusan Bimbingan Konseling Volume 2. 2014.
[17] Jaffe, D. T., & Scott, C. D. "Career development for empowerment in a changing work world". in Kummerow, J. M. (Ed.). New directions in career planning. Palo Alto, California: CPP Books. p. 35-39. 1991.
[18] Winkel.W. S. "Bimbingan dan Konseling di Institusi Pendidikan". Jakarta: PT. Gramedia Widiasarana Indonesia. 1991
[19] Crites, John O. "Career Counseling Models, Methods, and Material." New York: McGraw-Hill Company. 1981
[20] Dillard, J M. "Life Long Career Planning". Columbus Ohio: A Bell & Howell Company. 1985
[21] Gabbidon, Penn, dan Richards. Career Choices and Characteristics of African -American Undergraduates Majoring in Criminal Justice at Historically Black Colleges and Universities. Journal of Criminal Justice Education, 14 (2). p. 229. 2003
[22] Peterson, G. W., Sampson, J. P., Jr., Lenz, J. G., & Reardon, R. C. "Becoming career problem solvers and decision makers: A cognitive information processing approach". in D. Brown (Ed.), Career choice and development (pp. 312-369) (4th. Ed.). San Francisco, CA: Jossey-Bass. 2002
[23] Sharf, R. "Applying Careeer Development Theory to Counseling". California: Brooks/ Cole Publishing Company. 1992
[24] Rahmaniar. "Pelaksanaan Bimbingan Karier bagi Siswa SMA sebagai Persiapan Awal Memasuki Dunia Kerja". SELAMI IPS. Edisi 34, Volume 1 Tahun XVI. p. 139. 2011.
[25] Yusuf, S. "Psikologi Perkembangan Anak & Remaja". Bandung: PT Remaja Rosdakarya. p. 26. 2010.
[26] Sukardi, D.K. "Bimbingan Karier di Sekolah". Balai Pustaka. Jakarta. 1987.
[27] Wicaksono, L. "Pengaruh Informasi Karier Terhadap Pengambilan Putusan Karier Siswa SMA. Jurnal Pendidikan Universitas Tanjungpura". 1. 3. 21-29. 2007.
[28] Glaize, D dan Myrick, R. D. "A Study of Career Maturity and Careeer Decidedness". The Vocational Guidance Quarterly . 2. 3. 101105. 1984.
[29] Okiishi, R.W. "The Genogram As A Tool In Career Counseling". in Journal of Counseling and Development. Vol. 66. November 1987, 139147. 1987.
[30] Margaretha. "Perencanaan Karier Siswa SMA dan Keterkaitannya Dengan Orientasi Nilai, Aspirasi Karier Orang Tua, dan Kesempatan yang Tersedia di dalam Masyarakat". Tesis. Universitas Pendidikan Indonesia. Bandung. 1992.
[31] Donohue, R. "Holland's constructs in relation to career persistence and career change: A study of Australian managerial and professional workers". Australian Journal of Management. p.1-23. 2013.
[32] Corey, Gerald. "Teori dan Praktek Konseling dan Psikoterapi". Bandung. PT. Refika Aditama, p. 263. 2003.
[33] Yusuf, S. "Konseling Individual Konsep Dasar dan Pendekatan". Bandung. PT. Refika Aditama. 2016.
[34] Glasser, W. "Reality Theraphy (a new approach to psychiatry)". New York: Herper & Row Publisher Inc, p. 25. 1975.
[35] Glasser & Wubbolding. 1995 in Yusuf, p. 248. 2016

IMPLEMENTATION OF ONLINE LEARNING IN COVID-19 PANDEMIC FOR THE DYSLEXIA STUDENT

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Abstract

This type of research is a research development (Research and Development) with quantitative and qualitative descriptive methods. The research was carried out to determine the extent to which online learning was implemented in the Covid-19 situation in students with dyslexia. The data analysis in this research will be divided into two stages, namely, data analysis validation of online learning through two stages, namely qualitative and quantitative descriptive analysis. The score for the percentage of display aspects given by the validator is 85.70%. For the operational aspect, the percentage score data is 92.12% and the interaction aspect of the validator gives a percentage score of 91.22%. Based on these data, the developed online learning media can be categorized as good and suitable for use as supporting analysis.

Keywords: Online Learning, Covid-19 Pandemic, Dyslexia Student

INTRODUCTION

The main symptoms of students experiencing dyslexia are marked by difficulty in recognizing printed words that are not seen accurately, spelling difficulties that affect the fluency of reading, understanding and expressing writing. According to the International Dyslexia Association, 10-15% of the world's population is dyslexic. In line with that, the Chief Executive of the Indonesian Dyslexia Association also said that 5 million of the 50 million school children in Indonesia are dyslexic with an average of 2 million cases each year[1]. The characteristics of dyslexia can include a mismatch between intelligence possessed with learning abilities, memory skills with retrieval of words in memory, speed of reading and solving words morphologically. Examples of misrepresentation of sounds experienced by dyslexia include "run" with "search", errors in pronouncing letters such as "b" becomes "d", "a" becomes "e", and "m" with "n". Dyslexic difficulties also affect their social life with their peers because they cannot follow simple instructions in the form of rules which for others is easy[2]. The results of the study in children with the same chronological age obtained data that the ability of visual fixation in dyslexia has visual disturbances which is influenced by the deficit in attentional involvement when reading[3]. The attention deficit experienced by dyslexia will affect their academic life and social environment. This must be a serious concern for a teacher if a student has dyslexia. Direct teacher-student interaction is very important so that the teacher can be close and face to face providing direction and guidance. However, what is happening to students who have been dissected during the current COVID-19 pandemic is of course a special concern for teachers and schools. The COVID pandemic situation requires students to study online without being able to meet face to face with the teacher.

The COVID-19 pandemic outbreak has presented unique challenges for all academicians, especially in the field of education. Social distancing that prevents students and teachers from gathering causes a crisis in education, especially for students who have learning difficulties. The COVID-19 pandemic situation happened unexpectedly, therefore education must also quickly change to online learning so that dyslexia does not worsen the condition of students who experience it[4]. A teacher is certainly not uncommon to find students who have difficulty learning, both in reading, writing and arithmetic. Sometimes the teacher feels confused in seeing the student's condition where in life and other things the student's interaction looks normal but when learning signs of learning difficulties appear and become an obstacle to the student's academic progress. In addition, many parents also feel confused and think it will definitely disappear by itself. In cases like this, students are labeled as lazy and “stupid” children even though in other fields the child appears skilled and masters other fields[5]. Dyslexia as a specific learning difficulty that primarily affects the development of reading and language skills[6]

It is not practical if the teacher checks every student who has just entered the school to check and assess responses to reading activities whether they have dyslexia. But even so, it is also necessary for a teacher to pay attention and have an accurate understanding of the behavioral and cognitive difficulties in the occurrence of dyslexia so that later they can identify and improve the symptoms associated with dyslexia [4]. Dyslexia is defined as a developmental disorder associated with significantly lower reading

abilities in dyslexics than would be expected from normal intelligence[7].

Learning with an online system is not a new phenomenon nowadays because most people have done it during the Covid -19 pandemic. Covid-19 has changed the landscape of education around the world [8] Changes in the learning system do not necessarily provide more benefits than face-to-face learning. Hope for the Covid-19 situation is brief, despite the fact that it is still ongoing. Students who study online certainly have a different impact, especially for students who experience dyslexia. The assistance that is expected from the role of teachers and other supervisors is less for students who experience dyslexia [9]

Online learning is described as access to a learning experience through the use of the Internet and is considered a newer version of distance learning. Online learning has historical roots in distance education and educational programs for non-traditional learners.

METHOD

This type of research is a research development (Research and Development) with quantitative and qualitative descriptive methods[10]. The location of this research was conducted in Medan Denai Subdistrict, namely SD Padamu Negeri Medan and SD Negeri 0609011. The trial for multimedia development was carried out first at SD Negeri 0609010 which is located in Medan Denai District. This data analysis technique was carried out by grouping information from qualitative data in the form of input, response, criticism, and improvement using a budgetary scale, and for media validation, two stages were used, namely a) review by content experts and design experts, b) testing individual, small group trials and field trials. The subject of the product trial results of this research and development is students who experience dyslexic, one person field trials. The data collected through the implementation of formative evaluation are grouped into two parts, namely; 1) data from the first stage evaluation is in the form of expert review data from the teacher and 2) data from the results of individual trials, group trials and field trials in the form of reviews from students.

RESULTS

Students were tested by giving examples and doing it themselves. After students use this online learning media, it is carried out by measuring the media by giving a questionnaire that is filled in by the student. From the results of the questionnaire given, it was found that the average result of students expressed their interest in using online learning media.

Tabel 1. Expert assessment of instructional media

Number	*Aspect*	*Number of items*	*Average*	*Score Percentage*
1	Display	14	3,12	85,70
2	Operational	5	3,34	92,12
3	Interaction	6	3,72	91,22
Total		25	3,65	89,68

The activity data of students who experience student dyslexic are presented in the following table, namely:

Tabel 2. Data on student dyslexic activity at Padamu Negeri School

No	Respondents	Score	Category
1	Respondents 1	4,24	Good
2	Respondents 2	4,12	Good
3	Respondents 3	4,23	Good
4	Respondents 4	4,34	Good
5	Respondents 5	4,12	Good
Average		4,21	Good

Tabel 3. Data on student dyslexic activity in SD Negeri 060910

No	Respondent (Student)	Score	Category
1	Respondents 1	4,22	Good
2	Respondents 2	4,12	Good
3	Respondents 3	4,02	Good
4	Respondents 4	3,89	Good
5	Respondents 5	3,78	Good
6	Respondents 6	4,23	Good
7	Respondents 7	4,11	Good
8	Respondents 8	4,22	Good
Average		4,07	Good

From the data above, the results show that the use of on line learning can help the learning process for dyslexia students. On line learning can help learning that is used as a digital media assisted learning process in the learning process. On line learning is learning that develops on the basis of conventional learning that is unable to understand the circumstances and needs of students. The development of technology using digital devices began to be used in schools to help students who have learning disabilities experienced by dyslexic students who are affected by impaired function of a person's language development.

DISCUSSION

The results of the research on the implementation of online learning in the Covid-19 situation can be used as a medium that helps students experiencing dyslexic students. The results of this study can be used as input and reference for schools to overcome students who have learning difficulties. The results of this study need to be applied in elemen-

tary schools where students have difficulty learning. The research plan in the next stage is to design software so that it is able to overcome problems in online learning for students who have dyslexia. The aim is to make it easier for students who have learning difficulties to use it easily so that it can be resolved as early as possible.

The use of online learning can help the learning process for dyslexic students (students who have dyslexia). Online learning is learning that is used as a process using digital media in the learning process. Online learning is learning that develops on the basis of conventional learning that is unable to understand the circumstances and needs of students. In line with the times, technological developments using digital devices began to be used in schools. The learning disabilities experienced by dyslexic students involve severe impairments in reading ability that affect and interfere with the function of a person's language development. For example, when reading a word, a dyslexic student experiences spelling incompleteness of the word, such as the word "sad" reads "desih" or the word "eye" is read "tama". Dyslexia children cannot pronounce whole words and always face confusion between letters which have the same shape. In the cognitive theory, the messages given in Online learning are divided into small parts so that they are younger to be managed and follow users so that they can be sustainable.

REFERENCES

[1] Reflina Sinaga and D. S. Tanjung, "Efektifitas Penggunaan Interactive Educational Multimedia Learning Berbasis Teori Kognitif Terhadap Dyslexic Student di Sekolah Dasar," *JGK (Jurnal Guru Kita)*, vol. 3, 2019, doi: https://doi.org/10.24114/jgk.v3i4.15078.

[2] M. Leseyane, P. Mandende, M. Makgato, and M. Cekiso, "Dyslexic learners' experiences with their peers and teachers in special and mainstream primary schools in North-West Province," *African J. Disabil.*, vol. 7, Mar. 2018, doi: 10.4102/ajod.v7i0.363.

[3] A. Tiadi, C.-L. Gérard, H. Peyre, E. Bui-Quoc, and M. P. Bucci, "Immaturity of Visual Fixations in Dyslexic Children," *Front. Hum. Neurosci.*, vol. 10, Feb. 2016, doi: 10.3389/fnhum.2016.00058.

[4] H. C. Rhim and H. Han, "Teaching online: foundational concepts of online learning and practical guidelines," *Korean J. Med. Educ.*, vol. 32, no. 3, pp. 175–183, Sep. 2020, doi: 10.3946/kjme.2020.171.

[5] Reflina Sinaga and Ester Julinda Simarmata, "MEDIA GAMBAR TERHADAP DISKALKULIA DI SEKOLAH DASAR," *J. Tunas Bangsa*, vol. 7, no. 2, pp. 219–234, Aug. 2020, doi: 10.46244/tunasbangsa.v7i2.1135.

[6] R. Kamala and E. Ramganesh, "Difficulties in Identifying the Dyslexics in Multilingual Context," vol. 4, no. 1, pp. 2319–7722, 2015.

[7] Z. Kapoula *et al.*, "Education Influences Creativity in Dyslexic and Non-Dyslexic Children and Teenagers," *PLoS One*, vol. 11, no. 3, p. e0150421, Mar. 2016, doi: 10.1371/journal.pone.0150421.

[8] Arfan Ul Bari - Bahria University, "Dermatology Residency Training in COVID-19 Pandemic: Transition from Traditional to Online Teaching," *J. Coll. Physicians Surg. Pakistan*, vol. 30, no. 1, pp. 63–66, Jun. 2020, doi: 10.29271/jcpsp.2020.Supp1.S63.

[9] M. S. C. Thomas and C. Rogers, "Education, the science of learning, and the COVID-19 crisis," *Prospects*, May 2020, doi: 10.1007/s11125-020-09468-z.

[10] Sugiyono, *Metode Peneelitian kualitatif Kuantitatif dan R&D*. Bandung: Alfabeta, 2010.

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EFFECTIVENESS OF CORRESPONDENCE LEARNING THROUGH GOOGLE CLASSROOM AS ONE OF THE DISTANCE LEARNING MEDIA IN THE COVID-19 PANDEMIC ERA

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Abstract

This study aims to describe the effectiveness of the use of google classroom in the learning process for correspondence subjects in the era of covid-19 pandemic. The type of study used in this study is quantitative descriptive research with the design of One Shot Case Study. The subjects in this study were grade X students of the Department of Automation and Office Governance of SMK Muhammadiyah 2 Yogyakarta which numbered 22 people. The research was conducted in the odd semester 2020/2021. Instrument data used is the analysis of student learning test results and analysis of the effectiveness of the use of google classroom as one of the distance learning media. The results showed that the google classroom application was considered quite effective in the distance learning of correspondence subjects as evidenced by the results of the study tests of students who achieved grades above 70 as much as 19 children or 86% and who were still under 70 as much as 3 children or 14% with an average grade score of 76.22 with a high category. Meanwhile, the survey results show that google classroom application is considered quite effective. The 3 variables provided showed the results of the first variable showing an average of 4.05, the second variable showed an average of 4.04 and the third variable showed an average of 4.02 and was rated effectively used in distance learning in the covid-19 pandemic era.

Keyword: Google Classroom, Correspondence, Distance Learning

INTRODUCTION

The world is currently being shocked by the outbreak of a disease derived from a virus called corona with the term known today as Covid-19 (Corona Virus Diseases-19) is no exception to Indonesia. The virus, which started in the Chinese city of Wuhan, began to horrify the world in December 2019 and began to enter Indonesia around March 2020 with the identification of 1 covid-19 positive person from Depok City in West Java. The virus has spread to almost every country in the world and has infected millions of people.This led the WHO as of March 11, 2020 to designate the outbreak as a global pandemic.

Transmission through unpredictable human contact causes the virus to spread so quickly and is difficult to avoid. Vaccines that have also not been found are also a high cause of death. Social distancing policy is an option that is considered effective enough to prevent the spread of coronavirus. But in reality the policy has a considerable influence on the wheels of life such as the economy, health and education.

Education is one of the areas affected by covid-19. To prevent the spread of the virus, the Ministry of Education and Culture (Kemendikbud) issued a circular on the prevention of Covid-19 in the education unit by applying online learning (online) both at the higher level, secondary schools and elementary schools.The online study is expected to break the chain of the spread of coronavirus.

Online learning can be done through many media and forms. Online learning has its own strengths, challenges and obstacles. Through technology that is now growing rapidly will make it easier to deal with the current situation [1]. Technology and media can play a big part in learning [2]. Research conducted shows that the use of the internet and multimedia technology is able to change the way knowledge is delivered and can be used as an alternative to learning implemented in traditional classrooms [3]. If the teaching is centered on teachers, technology and media play a role as a support for teaching, whereas if the teaching is centered on the learner then the learner as the main user of technology and media. One of the technologies and media that can be used in learning is E-Learning.

Elearning stands for elektronic learning, where the learning process of teaching that uses electronic media specifically the internet as its learning system [4]. E-Learning can be utilized in the learning process and increase the learning activities of students for distance or online learning. E-learning as instruction delivered on a digital device (such as a desktop computer, laptop computer, tablet, or smart phone) that is intended to support learning [5]. Thus, the use of technology in learning can be more effective by using E-Learning. One of the e-learning media that can be

utilized easily is to use Google Classroom as one of the online learning applications.

Google classroom is a mixed learning foyer for educational scope that can make it easier for teachers to create, share and classify each assignment without paper [6]. Google classroom can also be used to share materials, upload tasks and even assess exams as learning evaluations. Google classrooms are designed to make it easier for teachers to share materials, manage classes and improve communication with their students [7]. Google Classroom makes it easy for students and teachers to connect with each other both inside and outside of school. E-learning can be used as a tool for learning in vocational schools that have a percentage of learning in vocational schools between theories with a fewer percentage than practice [8].

Learning through E-Learning is one of them by using the Google Classroom app is learning by utilizing the internet network to improve the learning environment and enrich the content and wider scope of materials.

Through google classroom is assumed that learning objectives can be more easily conveyed to students and have more meaning. Google Classroom has several benefits, including: 1) classes can be set up easily, teachers can set up classes and invite students and teaching assistants. As well as being able to share information such as assignments, announcements, and questions. 2) save time and paper, teachers can create classes, provide materials, give assignments, communicate and manage classes in one place. 3) Better management in which case students can view assignments on the assignment page. 4) improved communication and feedback, teachers can create assignments, send announcements, and start classroom discussions directly. 5) can be used with applications you use such as google document, calendar, gmail, google drive and google form. 6) safe and affordable, classes through google classroom are available for free [9]. The advantages of Google Classroom are easy to use, time-saving, cloud-based, flexible, and free [10]. This is a consideration that google classroom is suitable for one of the learning media. Although it still has drawbacks such as the absence of external services such as automated bank questions and private chats between teachers for feedback [11].

The importance of implementation in E-Learning-based learning with google classroom, this research aims to identify the effectiveness of google classroom-based learning in the covid-19 pandemic, among others:

a. Know the effect of google classroom implementation on the learning process of teaching online
b. Identify the effectiveness of distance learning through google classroom
c. Know student's responses to learning using google classroom applied to distance learning

A method can be said to be effective if the desired learning achievement can be achieved using the right method [12]. The effectiveness of learning can be measured using the following four indicators: 1) The quality of learning, how much information is presented so that students can easily learn it or the error rate is smaller. The smaller the level of mistakes made means the more effective the learning. 2) The suitability of the learning level is the extent to which the teacher ensures the level of readiness of students in receiving new materials. 3) Incentives are how much effort teachers motivate students to complete or do tasks and learn the materials provided. The greater the motivation given, the greater the activeness of students thus learning will be effective. 4) Time, which is the time it takes students to complete the learning activities [13]. Learning will be effective if students can complete the lesson according to the specified time.

Learning is said to be effective when achieving the desired goals, both in terms of learning objectives and maximum student achievement. There are several indicators in determining the effectiveness of learning: 1) Achievement of learning completeness. 2) Achievement of the effectiveness of student activities (i.e. the achievement of the ideal time that students use to perform each activity included in the learning plan). 3) Achievement of the effectiveness of the teacher's ability to manage learning, and the student's response to positive learning [14].

METHODS

The type of research used is quantitative descriptive research. This research is used to describe the effectiveness of using google classroom as one of the distance learning media in the covid-19 pandemic. The design of the study used is one shot case study, i.e. the subject is given a certain treatment followed by observation at the time of application of the treatment and take measurements on the consequences of the treatment. The treatment referred to in this study is distance learning using google classroom and seeing the effectiveness of learning using google classroom.

This research was conducted in the odd semester of the 2020/2021 school year in class X Automation and Office Governance SMK Muhammdiyah 2 Yogyakarta as many as 22 people. This study only tested the effectiveness of the use of google classroom in correspondence learning, therefore the questionnaire was distributed to grade X Vocational High School Department of Automation and Office Governance who had used google classroom in distance learning during the covid-19 pandemic period at home. Data collection techniques in this study are two, namely the test of student learning results and the effectiveness of

using google classroom which is described as follows:

Study Results Test

Data on student learning outcomes is descriptively analyzed. The data of the study results is obtained from the value of The Odd Midterm Assessment in 2020/2021. Data is descriptively spelled out on the frequency table so that students will see achievements in certain scores. The criteria used determine the category of student learning outcomes. This research points to the scale shown in the following table:

Table 1. Learning Outcome Criteria

Mastery Level	Category
85 – 100	Very High
70 – 84	High
56 – 69	Medium
45 – 55	Low
0 – 44	Very Low

The use of google classroom in this study is said to be effective if the student's learning results have reached a grade of 70. Furthermore, the score scoring of the study results is categorized in the form of a completed percentage with the following formula:

$$P = \frac{f}{N} \; x \; 100\%$$

Description:
P : Percentage
f : Frequency sought percentage
N : Number of Subjects (sample)
Source: Tiro (2004: 242) [15]

The questionnaire

The questionnaire is divided into three variables where each variable consists of 5 questions, namely the variable of students' opinions about the ease of google classroom as a correspondence learning in the covid-19 pandemic, students' acceptance of the ease of google classroom as a distance learning medium, and students' expectations about the use of google classroom.The score used is with the following likert scale:

Table 2. Likert Scale Instruments

Rating	Score
Very Agreed (SS)	5
Agree (S)	4
Less Agreed (KS)	3
Don't Agreed (TS)	2
So Do Not Agree (STS)	1

Source: Sugiyono (2016: 132) [16]

RESULTS

Based on the results of the study assessment students obtained the results after using google classroom applied as a medium of distance learning during the covid-19 pandemic period. The scores of the student's study results can be seen in table 4 below:

Table 4 Results Of Student Learning Outcomes Test Analysis

Data	Result
The subject of research	22
The Ideal Value	100
Mean	76,22
Maximum Value	91
Minimal Value	65
Median	75
Mode	75
Std. Deviation	7,55
Variance	57,041
Range	26

Table 5 Results Average of Effectiveness of Google Classroom Usage Questionnaire

No	Statement	Average Value	Average Each Variable
First variable: Ease of google classroom in correspondence learning			
1	Using google classroom allows me to get things done faster	4,00	4,05
2	*Google classroom improves my correspondence learning skills*	3,55	
3	Use google classroom efficiently in correspondence learning	3,82	
4	*Google classroom improves my productivity in learning*	3,68	
5	*Google classroom is very useful in my correspondence learning process*	4,09	
Second variable: Student acceptance of the ease of google classroom as a distance learning medium			
6	*Google classroom is easy to learn and use*	4,05	4,04
7	The look of google classroom is very clear and easy to understand	4,02	
8	Easy for me to use google classroom as desired	3,95	
9	With google classroom it's easy to get instructions, materials, and task collection	4,05	
10	It's easy for me to use google classroom	4,15	
Third Variable: Expectations about using google classroom			
11	The google classroom application is very useful in distance	4,05	4,02

	learning	
12	The look of the google classroom app is very clear and easy to understand	3,95
13	*Google classroom* is easy to use	4,09
14	*Google classroom* is easy to learn	3,95
15	*Google classroom* is easy to access	4,05

DISCUSSION

Based on table 4 above, it can be noted that the average score of student learning results after using google classroom obtained 76.22 with a standard deviation of 7.55. The grades achieved by students are scattered with the highest score of 91 and the lowest score of 65 with a range of 26 grades.

Many students who have completed or scored above 70 are as many as 19 children with a percentage of 86% and who have not completed or scores below 70 as many as 3 children with a percentage of 14%. While the average grade of student learning is 76.22 with a high category.

Furthermore, the results of the student response using the questionnaire through the google form application given to 22 Grade X students majoring in Automation and Office Governance for correspondence subjects show the following results:

The results of a descriptive survey of the use of google classroom as one of the media distance learning in the covid-19 pandemic era of the three variables obtained the result that the first variable obtained an average result of 4.05 which means that from 5 statements that are questionnaires can be said students agree with each statement related to the acceptance of google classroom as a correspondence learning medium where it can be said that google classroom is already effective in correspondence learning.

In the second variable, the average result was 4.04, meaning that from the 5 statements in the questionnaire it can be said that students agree with each statement regarding the ease of google classroom as one of the distance learning media where it can be said that google classroom has been effectively used in distance learning in the era of covid-19 pandemic.

In the third variable obtained an average result of 4.02, meaning that from the 5 statements in the questionnaire it can be said that students agree with each statement regarding the expectation of using google classroom where it can be said that google classroom is effective as a learning application because google classroom is easy to understand, easy to use, easy to learn and easy to access.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the use of google classroom is effective enough to be used as one of the distance learning media in the era of covid-19 pandemic because of some advantages of google classroom that allows students and teachers easy to use and access and easy in learning the application.The effectiveness of google classroom as one of the distance learning media is characterized by the results of the student learning test that has achieved an average KKM score of 70 with an average grade of 76.22 and the results of the survey that stated that most students expressed agree with the positive statement of the survey that has been given regarding the use of google classroom.

Based on the research that has been done, the researchers suggested for further research that is to develop google classroom learning with a more attractive and organized view so that it makes it easier for students to access the materials and tasks provided by the teacher.

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REFERENCES

[1] Jamaluddin, D., Ratnasih, T., Gunawan, H., & Paujiah, E. (2020). Pembelajaran daring masa pandemik Covid-19 pada calon guru: hambatan, solusi dan proyeksi. LP2M.

[2] Smaldino, S.E., Lowther, D.L. & Russell, J.D.,.2008. Instructional technology and media for learning.

[3] Zhang, D., Zhao, J. L., Zhou, L., & Nunamaker, J. F. (2004). Can e-learning replace classroom learning? Communications of the ACM. https://doi.org/10.1145/986213.986216

[4] Komendangi, 2016. Analisis dan Perancangan Aplikasi E-learning berbasis Learning Manajemen Sistem (LMS) Moodle di Program Study Teknik Pertanian Universitas Sam Ratulangi. Manado : Universitas Sam Ratulangi

[5] Ruth Colvin Clark & Richard E. Mayer. 2016. E-Learning and The Science of Instruction. Canada: John Wiley & Sons, Inc.

[6] Mayasari, F., Dwita, D., Jupendri, J., Jayus, J., Nazhifah, N., Hanafi, K., & Putra, N. M. (2019). Pelatihan Komunikasi Efektif Media Pembelajaran Google Classroom Bagi Guru Man 2 Model Pekanbaru. Jurnal Pengabdian UntukMu NegeRI, 3(1), 18-23.

[7] Class Alexa. 2018. Google Classroom: 2018 User Manual To Learn Everything You Need To Know About Google Classroom. Createspace Independent Publishing Platform.
[8] Hanum, N.S., (2013). Keefetifan E-Learning sebagai Media Pembelajaran (Studi Evaluasi Model Pembelajaran E-Learning SMK Telkom Sandhy Putra Purwokerto). Jurnal Pendidikan Vokasi, 3(1).
[9] Brock Annie. 2015. Introduction To Google Classroom: An Easy-To-Use Guide To Taking Your Classroom Digital.Createspace Independent Publishing Platform.
[10] Keeler Alice & Miller Libby. (2016). 50 Things You Can Do With Google Classroom.Dave Burgess Consulting, Incorporated.
[11] Pappas, Christopher (2015). "Google Classroom Review: Pros And Cons Of Using Google Classroom In eLearning". Diakses 1 september 2018 dari https://elearningindustry.com/google-classroom-review-pros-and-cons-of-usinggoogle-classroom-in-elearning.
[12] Surachim, Ahim. 2016. Efektivitas Pembelajaran Pola Pendidikan Sistem Ganda. Bandung: Alfabeta.
[13] Ali Eryılmaz Assoc. 2015. Psikologi Positif di Kelas: Efektivitas Metode Pengajaran Berdasarkan subjektif Kesejahteraan dan Engagement Meningkatkan Aktivitas. International Journal of Instruction . Vol.8, No.2 e-ISSN: 1308-1470
[14] Nguyen, G. N. 2015. Designing and using interactive e-books in Vietnam. International Journal of Learning, Teaching and Educational Research, 11(1)Retrivied from: http://ijlter.org/index.php/ijlter/article/download/299/133 .
[15] Tiro, Arif. 2004. Dasar-Dasar Statistik. Ujung Pandang: UNM
[16] Sugiyono. 2016. Metode Penelitian Kuantitatif, Kualitatif dan R&D. Bandung: PT Alfabet.

BIMA FOLKTALES AS TEACHING MATERIALS TO INCREASE STUDENTS' CREATIVITY AND LEARNING INTEREST

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Abstract

The purpose of this study is to develop English teaching material by using Bima folktales to increase students' creativity and learning interest. English teaching material products being developed are include in listening, speaking, reading, writing, vocabulary, and structure. This research used research and development models; analysis: in this steps the researcher did an observation, and collect the initial data. Design: this steps researcher design the English teaching material by using Bima Folktales as product. The design of English teaching material developed by use Bima Folktales. Next steps were implementation. The product implemented by try it out at the class as teaching material, and then the researcher collaborate with the English teacher to evaluate the implementation of this product. This research was conducted at XI MIA grade students of SMA Muhammadiyah Bima. The instrument used to gain the data were creativity and learning interest observation sheet, test to know the students ability in English, and validation sheet to assess the teaching material. The result of this research was English teaching material by using Bima folktales product are good to be implemented by teacher in teaching learning process in local area Bima, this product also can be used to increase the students' creativity and learning interest in English subject.

Keywords: Bima Folktales, English Teaching Material, Creativity, Learning Interest.

INTRODUCTION

Education is a conscious and deliberate effort to create an atmosphere of learning and learning process so that students are able to actively develop their potential to have the spiritual power of religion, self-control, personality, intelligence, character, and skill which can be useful for themselves, society, nation, and state [1]. The important of education quality is one of the national development programs which are largely determined by the increasing of learning process. The improvement of education quality is the key to success in improving the quality of education, while the qualified teachers and educators are the main key to improve the quality of learning [2]. One of the improvement need in education is teaching materials. Teaching material is essential for teaching learning process in the class, because it is like tools for teacher, to help in deliver instructions. Material is used to refer to anything which is used by teachers or the learner to facilitate the learning of a subject [3].

Teacher must provide the good and suitable teaching materials to get best students achievement. This material should design based on curriculum and syllabus, but the teacher must develop it based on the students need. To design a good material for teaching learning process, the teachers should do an observation about the students' need and condition. Teaching materials should help the students to learn or as part of the activities of instruction learning in the class that help both teachers and learners [4], and by developing of the teaching material it hope can give impact to the quality of teaching. Quality of teaching can be measure by the students' participation, interest and creativity during teaching learning process in the class. That aspect will lead the students to get achievement in learning.

One of development or innovation is the use of Bima Folktale as teaching material. Bima Folktales is local story from Bima, which this story can make students enjoy the teaching learning process at the class, because it contains social value, culture value, religion value, and they can participate to make this culture heritage exist. A folktale is one of national culture heritage and it contains moral message, and value, and it can be develop or use to educate the learner [5]. Folktales had existed since a long time as one of way to make society understand about good or bad values. So, folktales are familiar and easier to be understood by society or students. Based on the description, it can be conclude that folktales is one of familiar part for society, likewise when it used as teaching material for students, it can give positive impact to the students characters', moral value, learning interest, students creativity, and increase the students achievement in learning English. The design of teaching material by using Bima's folktales also can give the students authentic and contextual learning experience.

Based on the description above, the purpose of this study is to design English teaching material through Bima folktales for students of Senior High School. The design of this teaching material is made by developing the previous teaching material from English teacher at the school. The step began by did need analysis of the students, measure the

students achievement, learning interest, and creativity. This research is important to have innovation in English teaching material design by using Bima folktales to enrich the students' knowledge and get achievement.

METHOD

This study is used research and development learning model, specially learning through Bima folktales as English teaching material to XI grade MIA students of SMA MuhammadiyahBima, which this material also design to make students' creativity and learning interest increase during teaching learning process. In this research there are 3 steps namely pra-model development, model development and model implementation, and evaluation, which this model refers to R & D "ADDIE" theory; analysis, design, development, implementation, and evaluation, with the description that have been modified and connected with purpose and actual research condition.

The stages and steps Research and development method consist of 5 steps, which the steps and the description have been modified and connected with purpose and actual condition of research. It describe in the Table 1.

Table 1. Stage and steps

Stages	Steps	Activity
Analysis	1	Observation, initial data collection, preliminary research, compilation the result of preliminary research, conducted need analysis, and design the model of product (English teaching material by using Bima Folktales)
Design	2	Design the English teaching material
Development	3	Developed the English teaching material (LKPD) students by using Bima folktales
Implementation	4	Conducted field trial to the sample XI MIA grade students of SMA Muhammadiyah Bima
Evaluation	5	Discuss, consult, and review the result of field trial with expert (English lecture, and English teacher) to get revision

Technique of collecting data in this research was: 1) giving essay test to measure the students' achievement and creativity; 2) did an observation to know the students' creativity and learning interest during teaching learning process conducted by using Bima Folktales as teaching materials.

The data was analyzed from the result of validation analysis, and the techniques were: (a) Tabulation of data obtained from the assessment items, (b) Calculating the average score, (c) Converted the total average score into a criteria score.

Tabel 2. Conversion of score to scale

No	Score Range	Category
1	$X > M + 1{,}5\ s$	Very high
2	$M + 0{,}50\ s < X \leq M + 1{,}5\ s$	High
3	$M - 0{,}5\ s < X \leq M + 0{,}5\ s$	Moderate
4	$M - 1{,}5\ s < X \leq M - 0{,}5\ s$	Low
5	$X \leq M - 1{,}5\ s$	Very low

(Azwar 2010)

Ket: M: average ideal score = ½ (max score + min score)
S: Standard deviation = 1/6 (max score - min score)
X: The number of scores obtained by students

The data was analyzed from Students Creativity observation sheet. There are 12 characteristics and indicator of creativity listed on the table to be observed.

Table 3. The indicator of students creativity

No	Creativity characteristics of students creativity	Indicator
1	Students have a great curiosity	Students give full attention to the teacher explanation
2	Students frequently asking a questions	Students asking question to the teacher explanation in relevance with Bima Folktales material
3	Offering a lot of ideas and suggestion	Students offering suggestion and ideas when discussion time or when teaching learning process conducted by using Bima Folktales as material
4	Able to express spontaneously their opinion and not bashful	Students express their opinion in related with explanation or response of teacher or classmate when teaching learning process
5	Have a sense of	Students are able to express

No	Creativity characteristics of students creativity	Indicator
	beauty	verbally or written the values contained in folktales
6	Have personal opinion and not easy to be influenced by others	Students have personal opinion when discussion or teaching process conducted, they are not easy to be influence by others' opinion, stay confident of the answer of question or task that have been done even there are many criticism from others
7	Has a great sense of humor	Students attend the class look enjoy
8	Have a great imagination	Students complete or answer question in different way with example and it is based on their imagination, they are easy to identify incomplete answer or solution of a question
9	Able to propose thoughts and ideas that are different from others (original)	Students can answer questions or assignments verbally or in writing that are different from other students
10	Can work alone	Students can complete the questions or assignments that are given individually without help from others
11	Enjoys trying new things	Students dare to accept difficult assignments, students are enthusiastic about new information
12	Can develop an idea	Students can develop an idea or ideas related to the ongoing learning material

Students learning interest categories shown on the Table 4.

Table 4. Students learning Interest

No	Learning Interest Indicators
1	Focus of attention, feeling, and thoughts on learning because of the interest, show from attitude and enthusiasms of students during teaching learning process
2	Feeling pleasure in learning which is shown by participation during learning activities
3	Willingness or tendency of the subject to be actively involved in learning and to get best result

RESULTS

After implementing the English teaching material by using Bima Folktales in XI MIA grade students of SMA MuhammadiyahBima, students were given an essay test. The function of the test is to evaluate the product, and the result of students score can be seen on the Figure 1.

Description	Score
Minimum Score	42
Maximum score	77
Range	35
Mean Score	52.95
Standard Deviation	19.98

Figure 1. Description of students' final score

Based on observation during conducted the research, the students' creativity shown on the table. In the table there are 12 characteristics and indicator of creativity, all of them calculate and percentage based on students creativity that occurs in the class.

Table 5. Students creativity percentage

Creativity characteristics of students creativity	Percentage
Students have a great curiosity	81,7%
Students frequently asking a questions	80%
Offering a lot of ideas and suggestion	58,4%
Able to express spontaneously their opinion and not bashful	90%
Have a sense of beauty	83,4%
Have personal opinion and not easy to be influenced by others	80%
Has a great sense of humor	76,7%
Have a great imagination	73,3%
Able to propose thoughts and ideas that are different from others (original)	66,7%
Can work alone	74,4%
Enjoys trying new things	90%
Can develop an idea	66,7%

While the result of students learning interest can be seen on the table above.

Table. 6. Students learning interest percentage

Learning Interest Indicators	Percentage
Focus of attention, feeling, and thoughts on learning because of the interest, show from attitude and enthusiasms of students during teaching learning process	83,3%
Feeling pleasure in learning which is shown by participation during learning activities	73,3%
Willingness or tendency of the subject to be actively involved in learning and to get best result	78,4%

DISCUSSION

On the table or figure 1 shown the description of final score students' after implementing Bima Folktales as teaching materials.Based on the score obtained by the students after implementing English teaching material using Bima folktales product's to the XI MIA grade students' of SMA MuhammadiyahBima the minimum score that students' get is 42, maximum score is 77, range the score 35, mean score 52,95, and the standard deviation is19,98. The data description were converted into criteria score were included into high category. It means the product of English teaching material using Bima folktales can be used as teaching material in the class and it quite effective to make the students creativity and learning interest increase.

While, the students' creativity from 12 indicators, there were 2 categories of the students' creativity which dominant and it shown by the high percentage is 90%. Therefore, students' learning interest, based on the table, it can be conclude that there is one category of learning interest students get high percentage is 83,3%, which the students focus during teaching learning process conducted by using English material with Bima folktales product.

This is indicated that Bima folktales can be developed as English teaching material especially for local Bima students. Folktales can make students know the culture and a lot of information about their local place [12].

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REFERENCES

[1] Abidin Yunus. (2012). Pembelajaran Bahasa Berbasis Pendidikan Karakter. Bandung Reflika Aditama.

[2] Mei Wulan Kurniawati, Sri Anitah, Suharno. 2017. Developing Learning Science Teaching Materials Based On Scientific To Improve Students Learning Outcomes In Elementary School. European Journal of Education Studies Volume 3. ISSN

[3] Fitriah. 2015. Teaching Material . Jurnal Itqan, vol. VI, No 2, pp. 129-1134. juli- Desember 2015

[4] Burkill Bob & Eaton Ray. 2011. Developing Teaching and Learning. Cambridge University Press.

[5] Nunung Fatimah. 2017. Penggembangan buku cerita rakyat Bima berbasis kearifan local. Jurnal NOSI Volume 5, nomor 3, pp.267-268.

[6] Machmuda Ayu. 2013. Penggembangan bahan ajar membaca cerita anak berbasis cerita rakyat Jawa Timur untuk siswa kelas V MI Nurul Huda Mulyorejo Malang. Skripsi. UIN Maulana Malik Ibrahim Malang.

[7] Masnur Muslich. 2010. Text Book Writing. Ar-ruzz Media Yogyakarta.

[8] Agustinasari & Endang Susilawati. 2018. Pemanfaatan potensi lokal dalam pembelajaran fisika untuk meningkatkan keterampilan berpikir kritis siswa SMA. Prosiding ISBN

[9 & 10] wilda, salwah, shindy Ekawati. 2016. Pengaruh Kreatifitas dan Minat Belajar Terhadap Hasil Belajar Matematika siswa. Jurnal vol. 2 nomor 1. Diunduh dari jurnal.uncp.ac.id

[11] Azwar. 2010. Tes prestasi fungsi pengembangan dan pengukuran prestasi belajar. Yogyakarta: pustaka belajar.

[12] annisah, samsudin, waliyudin. 2020. Peningkatan kreatifitas dan minat belajar siswa pada mata pelajaran bahasa Inggris dengan menggunakan cerita rakyat Bima. journal ISSN

BUILDING CREATIVITY THROUGH FREEDOM TO LEARN IN DIGITAL DISRUPTION ERA

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Abstract

Creativity is an important skill for every individual to possess. Starting from a creative idea will produce innovation. In other side, Education is the agent production of creative human resource. Consequently, alteration in the learning process is required in building creativity. In addition, creativity also has an impact on digital disruption where humans can survive by developing new products and even creating new digital-based products. This study provides a literature review of building creativity through freedom to learn in digital disruption era. Then, the comprehensive led to the constructing a conceptual framework that discuss the three main highlight about Process of Creativity, Creating Freedom to Learn Environments to Build Creativity, and The impact of Creativity on Digital Disruption. The result indicates a gap the implementation of freedom to learn in learning process by teacher and education system, Rogers person center model – freedom to learn environment can be adapt as strategy for freedom to learn and build creativity, various technology-based resources and facilitation from teachers encourage students to be more creative, and creativity as new trend job and competence that required in future to encounter digital disruption.

Keywords: creativity, freedom to learn, digital disruption

INTRODUCTION

The creativity becomes important skill that necessary to have in individuals. Moreover, Indonesia's global creativity index data in 2015 was in position 115 out of 139 countries in the world [1]. Besides, In 2020 the number of unemployed people in Indonesia reach 6.88 million people. Record level of education with the largest number of unemployed is Vocational High School 8.49 percent. Followed by Senior High School 6.77 percent, Diploma 6.76 percent, Universities 5.73 percent, Junior High School 5.02 percent, and Elementary High School and below 2.64 percent [2]. Moreover, it is possible that the data will escalate due to Covid 19. Consequently, job opportunities have become increasingly narrow and competitive. In addition, there are other causes such as skill are not in accordance with the needs, limited work field provision, and high income expectation [3]. Furthermore, digital disruption present a new market based on sophisticated technology, be required for those who are skilled in utilizing technology. On other hand, education is a production of quality human resources with global adaptive competence. One of the goals of education is to produce a creative generation [4]. Accordingly [5], creativity becomes the main point for discussion because it will be the 3rd most required skills for 2022 job landscape which are all digital technology based. In addition, creative human resources can contribute to improving the country's economy [6] Nevertheless, digital Disruption provides the education sector a defiance to develop a learning process that aims to have creative skills. Then, the efforts are to change the concept of learning which beginning with full context and teacher centered into freedom to learn and student centered [7]. Conversely, in the reality, the teachers is still using old method in learning process such as memorizing, chapter completing, and testing. Furthermore, the concept of freedom to learn in learning process is still confusing for teacher. According [8], every individual has full potential which can be actualized in a deliberately created situation. Then, learning mode should implement freedom to learn. In addition, the freedom to learn is the ideas of the father of education in Indonesia which is essential to give freedom of thinking and how to shape human beings must start from developing talents and building creativity. Therefore, this paper will discuss about how does the creativity process in individuals happen? How does the teacher role in creating freedom to learn environments to build creativity? And how the impact of creativity on digital disruption?

METHOD

A literature review was carried out, which focused on describing and discussing the topic from theoretical and conceptual viewpoints. Furthermore, this study utilize the British Educational Research Association's guidelines for conducting a review [9] which comprise: First, an initial search for precise sources was carried out using Google Scholar and electronic databases from several academic fields to identify Creativity and Freedom to Learn-related articles. The seeking strategy included the terms "Building Creativity in Learning Process" and "Freedoom to Learn". Second, the abstracts

were read to screen the initial list of articles for the three main topics (Definition of Creativity and Creativity Process in Individuals, Concept of Freedom to Learn and Creating Freedom to Learn Environments to Build Creativity, and The impact of Creativity on Digital Disruption). Then, these three topics were used to form the base of the conceptual framework of the present study. Third, a conceptual framework was designed, which summarised the main arguments among the researchers in this field. A systematic search focusing primarily on theoretical and empirical review studies on building creativity and freedom to learn was carried out according different databases, including Education Full Text, Researchgate and Sciencedirect. Finally, a comprehensive review was conducted in terms of the conceptual framework of the research.

RESULT AND DISCUSSION

Definition of Creativity and Creativity Process in Individuals

A concept of creativity has been discussed by multiple authors.

There are similarities in terms related to creativity and various perspectives from experts on the definition of creativity. [10] Define creativity as the ability to encounter a given problem in an original way which involves the capacity to look problem from a different perspective. In line with [11] state that creativity is the capacity to come up with new ideas that are surprising yet intelligible, and also valuable in some way which involves various types of thinking such as combinational, exploratory and transformational thinking. Furthermore, the author agrees to define creativity as the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context [12]. Besides, the definition of creative thinking is the thinking that sustains students to apply their imagination to producing ideas, questions and hypotheses, experimenting with alternatives and to evaluating their own and their peers' ideas, final products and processes [13]. Then, how the creative process happened? The creative process is a sequence of minds and actions leading to original and appropriate productions. There are five stage of creativity processes: (a) Preparation, initial actions to find the gap, (b) Incubation, perception taking hold which in turn leads to an idea, (c) Illumination, experiencing various possibilities and having a creativity leap via clear insights and intuition, (d) Verification, this is where the analytical, convergent thought processes jump into action, and (e) Elaboration, this is where we add to and connect our ideas, where we build upon an idea with relevant information and details [14]. Those statement lead a conclusion that creativity is ability to confront the problems by interaction among aptitude, process (preparation, incubation, illumination, verification, elaboration), and environment.

Concept of Freedom to Learn and Creating Freedom to Learn Environments to Build Creativity

The concept of freedom to learn has been introduced by Carl Rogers, he state that Freedom is essentially an inner thing, something which exists in the living person, quite aside from any of the outward choice of alternatives which we so often think of as constituting freedom [15]. Besides, education can encourage creativity through conditions that are deliberately created for the development of creativity namely freedom [16]. A student who acts in an without freedom condition never dares to propose a new idea, initiates a project that the school system had not planned before or asks a question in a way that has not been asked before. Consequently, a student without freedom is limited to develop only on the axis determined by his educational system. They will be able to reach considerable achievement in gathering knowledge and mastering information processing techniques, but they will never be competent to create ideas or raise new problems. Then, Rogers place the students at the center of learning which has alternative ways to actualize their potential and to reach their learning goals. It means they are as active learner who follow the learning process while the teacher as facilitator who provides a variety of processes and resources to students for achieving learning goals. Consequently, the students have freedom to explore their potential by utilizing the facilities provided or utilizing other sources that are more appropriate to their learning speed. Furthermore, to make freedom to learn environment we can adapt and utilize the person center model by Rogers [15] which illustrated in figure 1.

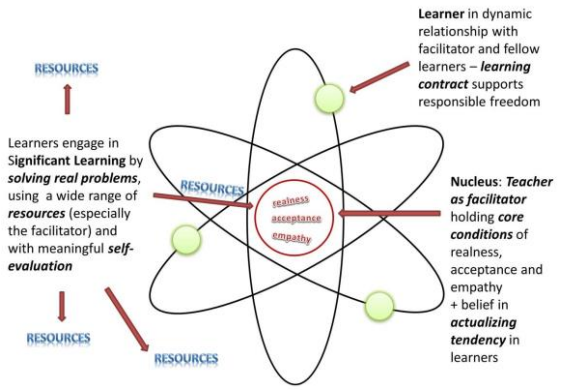

Figure1 the person center model – freedom to learn environment

Based on the schema, Rogers illustrating the environment of freedom to learn like atomic structure which are three part involves: core, electron and orbit. The electron that always move in the orbit reflected student as active learners and they

capable to gain advantage of a variety of learning facilities both from teachers and from outside. Conversely, there is a core in the middle which described teacher as facilitator holding core condition of realness, acceptance, and empathy. Then, the orbit as the track movement of students. Notwithstanding, the students are given the freedom to take advantage of various facilities to achieve their learning goals. They still have to a learning contract as support responsible freedom. In line with the statement Ki Hajar Dewantara that independent human is personal freedom limited by responsibility [18]. Besides, [15] state that Freedom is also important for developing responsibility. One cannot appeal responsibility from someone who is not free to decide his or her actions. When a student gets some freedom in their learning process, they are actually taking upon themselves some responsibility for the educational process.

In the outside of orbit, there is resources that can utilize by students to solve the problem in learning process. Nevertheless, related with the rapid development of digital technology today, a wide variety of sources that are very easy to acquire and distributed quickly and flexibly. Ordinarily, in these sources there are various media such as images, videos, sounds, and animations which are basically made to communicate knowledge in various forms according to student learning styles. They can view, read, watch, and even download through internet access. Consequently, utilize of different learning materials and various resources enables students with various principal learning styles to understand information in the most effective way. In line with [17] that learning is fostered by multidimensional interactions between students and teachers. Besides, students can also build a network in a community in utilizing the open access resource platform. They can connect directly with experts and writers. In addition, they can also develop their own skills by join open courses and taking multidisciplinary subject that provided by the MOOCs platform. On other side, teacher design the instructional based technology and using problem based learning in learning process can help build creative thinking skill in student. According to the stage of creative processes, the decisions in choosing resources is one of stage in creative process. Students have a control for students have control within themselves to explore various kinds of knowledge in certain ways by utilizing digital technology according to their learning speed. It is possible through the learning process freedom to learn and stage processes creativity they can produce novel technology in the future. Furthermore, the goals of national education can be achieved [4].

The importance of producing a creative generation is to prepare quality human resources in the future who are able to adapt to global changes. The global change that has occurred today is digital disruption. All sectors undertake digital transformation to produce products that can be distributed effectively, efficiently and affordably. The emergence of artificial intelligence, MOOCs, big data has colored the digital environment. Consequently, it is possible that in the future human services will be replaced by robots. However, there is one human service that is still maintained, namely creative services. The existence of some of the above products is a creative idea from the creator. Then, creative skills are very important for everyone to have in the future. Digital disruption will continue to spread in all sectors. So the current generation needs to prepare for the challenges of global change. Creativity is an important asset to create new innovations. By having creative skills, individuals are not dependent on one field to work. They can become multitalented individuals in the future and survive in an era of disruption.

The environment that is deliberately conditioned to provide freedom of learning will provide space for creativity for students. Moreover, today students live in digital environment which the technologies allow them to exploration of new areas of learning and thinking. Consequently, it could be support creative learning and innovative teaching and foster individual potential. Besides, diverse of online applications could be utilized to sustain teachers to become more innovative in their teaching styles, as well as students to develop their analytical, creative skills, and think creatively.

The impact of Creativity on Digital Disruption

Digital disruption is the rapidly unfolding processes through which digital innovation comes to fundamentally transform historically sustainable logics for value creation and seize by unbundling and recombining linkages among resources or generating new ones. Then, there are three fundamental characteristics of digital disruption. First, digital disruption processes came from digital innovations and quickly erode competitive positions. Second, they impact systems of value-creating actors by breaking and recombining linkages among resources, often facilitating more direct interactions and transactions. Third, the originating digital innovation processes are orchestrated by one or multiple firms, but effects on value creation and capture are systemic [19]. In the future, digital disruption will have an impact on the development of the creative industry (business, economy, advertising and marketing). Explore how robotics, artificial intelligence, blockchain, global digital platforms and autonomous systems will shape the design, production and consumption of culture. These innovations are the result of creative thinking of creators. Hence, creativity is a very influential skill in terms of the production of technological innovations that has led to the expansion of digital disruption [20].

CONCLUSION

Creativity process happened when there is interaction between aptitudes, process, and environment produce a novel product. Beside, in the concept freedom to learn, student as active learner that have a full potential. Therefore, they can actualize their potential in learning process by utilize various resource. Then, teacher as facilitator, motivator, and student learning partner. They also giving trust to students as independent learner to build their responsible and creativity. On the other hand, sophisticated technology has colored digital disruption which affect in creative industry. The contribution of artificial intelligence, big data, open resources, MOOCs, and global platform will shape the design, production and consumption of culture. All the product is the creativity idea from creator. That's why having creative skill important to face global change in the future.

REFERENCES

[1] R. Florida, C. Mellander, and K. King, "The Global Creativity Index 2015",Rotman. Martin Prosperity Institute.

[2] Central Bureau of Statistics (BPS), Open Unemployment Rate, 2020 access on: https://www.bps.go.id/pressrelease/2020/05/05/1672/februari-2020--tingkat-pengangguran-terbuka--tpt--sebesar-4-99-persen.html.

[3] Y. Pusparisa, Unemployment Rate of University Graduates Increases, 2019 access on: https://katadata.co.id/ariayudhistira/infografik/5e9a51911b282/angka-pengangguran-lulusan-perguruan-tinggi-meningkat

[4] Depdiknas, "Undang-undang RI No.20 tahun 2003 tentang Sistem Pendidikan Nasional".

[5] World Economic Forum, The Job Landscape in 2022, 2018 access on: https://www.weforum.org/

[6] S. Setiawan, "Prospects and Competitiveness in Creative Economy: Evidence from Indonesia," International Journal of Research in Business and Social Science, vol. 7, pp. 47-56, 2018. https://doi.org/10.20525/ijrbs.v7i2.888

[7] G. D. Catalano and K. C. Catalano, "Transformation: from teacher-centered to student-centered engineering education," Proceedings Frontiers in Education 1997 27th Annual Conference. Teaching and Learning in an Era of Change, Pittsburgh, PA, USA, 1997, pp. 95-100 vol.1, https://doi.org/10.1109/FIE.1997.644819

[8] M. Greene, "The Dialectic of Freedom", 1988. New York. Teachers College, Columbia University.

[9] Cohen, L., Manion, L., & Morrison, K. Research methods in education (7th ed.), 2011. USA and Canada: Routledge.

[10] Sternberg, R., & Lu b a rt, T. Cre a t i ve giftedness: T h e o ry, speculation, and data. In N. Colangelo, S. G. Assouline, & D. L. Ambroson (Eds.), Talent deve l o p m e n t : Proceedings from the 1991 He n ry B. and Jocelyn Wa l l a c e Symposium on Talent Development (pp. 66–89), 1992. New York: Trillum Press

[11] Boden, M. Creativity and knowledge. In A. Craft, B. Jeffrey, & M. Leibling (Eds.), Creativity in education (pp. 95-102), 2001. London: Continuum Publishing.

[12] J.C. Kaufman and R.J. Strenberg, The Cambridge Handbook of Creativity, 2010, USA. Cambridge University Press.

[13] P. Kampylis and E. Berki, Nurturing creative thinking. [pdf] International Academy of Education, UNESCO, 2014, p. 6. Available at: HYPERLINK "http://unesdoc.unesco.org/images/0022/002276/227680e.pdf" http://unesdoc.unesco.org/images/0022/002276/227680e.pdf

[14] M. Botella, F. Zenasni and T. Lubart, "What Are the Stages of the Creative Process? What Visual Art Students Are Saying," Front. Psychol., 21 November 2018 |, vol. 9, pp. 1-13, 2018. HYPERLINK "https://doi.org/10.3389/fpsyg.2018.02266" https://doi.org/10.3389/fpsyg.2018.02266

[15] C. R Rogers and H. J Freiberg, "Freedom to Learn: a View of What Education Might Become", 1969.

[16] Ronny Erez. "Freedom and Creativity: An Approach to Science Education for Excellent Students and Its Realization in the Israel Arts and Science Academy's Curriculum," The Journal of Secondary Gifted Education, Vol. XV, No. 4, pp. 133–140, 2004.

[17] M. Mirjana and M. Dusan, "A New Model of Education: Development of Individuality through the Freedom of Learning," Eruditio, 2012

[18] E. Yanuarti, "Ki Hajar Dewantara Thoughts and Its Relevance With Curriculum 13," Journal of Research, vol. 11, pp. 237-266, 2017.

[19] D. A. Skog, H. Wimelius, and J. Sandberg,"Digital Disruption," Springer, Business & Information Systems Engineering, 2018 HYPERLINK "https://doi.org/10.1007/s12599-018-0550-4" https://doi.org/10.1007/s12599-018-0550-4

[20] H. Greg, The Future of Creative Work: Creativity and Digital Disruption. Edward Elgar Publishing, Cheltenham, 2020

COMMUNITY ECONOMY LECTURE BY USING LOCAL ECONOMIC POTENTIAL OF VILLAGE TOURISM LEARNING RESOURCES

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Abstract

Conventional economic learning tends to focus on formal and large economic activities that prioritize competition, always focusing on liberal and capitalist economic theories and systems. There also always use learning resources on large and global economic activities, in the context of global economic competition, it is rarely using local learning resources. The presence of populist economic courses by national economic ideology is required to play a role in supporting local economic activities, which are non-formal and small and medium-sized economies (SME). Through the results of this research in Yogyakarta can be concluded that local economic activities combined with the rural economic potential of the natural environment, cultural arts, works of community products both culinary, entertainment, lodging, and transportation framed in a tour package, has effectively become a learning resource for the learning of public economy lectures. The popular economy course is very important to build knowledge, attitude, and the tendency of students to love local economic activities in the surrounding area, love the national economic system. Support from stakeholders to support populist economic activities is indispensable, the role of partnerships between governments, universities, and the local businesses community.

Keywords: Local economic activities, Community Economy lectures, rural tourism economic activities.

INTRODUCTION

In the study of conventional economic systems, the implementation of lectures emphasizes more on strengthening theory and the liberal market economic system. Learning resources are often directed at foreign and global contexts, so students often lose their national context. As a result in understanding the theory associated with its national context is often unrelated. So the theory studied is in wishful thinking. Such conditions required an economic learning model based on theory and learning resources that fit the local context. An alternative is an economic learning effort based on the Community Economy or local-based economy.

During this time, the Community Economy lectures are dominated by the source of learning in the form of books. The literature book is a foreign economic book, whose ideology is different from the national economic system. More learning is done in the classroom through cooperative learning methods type TGT, STAD, *Role-Playing* [1] [2].Learning resources in the form of books and modules. Learning methods and resources have not been able to give a real picture of the problems that exist in society. [3].), suggest that students should expand their knowledge with a variety of other learning resources.

Digging into the learning resources derived from local economic activities for the study of Community Economy now is expected to provide important benefits, in growing rural local economic activities in the new era situation. Local economic activities in the form of SME are still an alternative to addressing the national economic crisis, especially those in the formal and large-scale sectors.

The purpose of this research is to know the effectiveness of utilizing the economic activities of local people as a tourist village for the source of people's economic learning in the faculty of economics. Effectiveness can be based on the process of changing students' behavior, attitudes, and tendencies towards the love of the nation, and environmental care.

METHOD

Using a qualitative research approach. The research aims to understand how the process of utilizing tourist villages as a learning resource for Community Economy lectures at universities. The research was conducted in the odd semester for the Community Economy subject.

The respondents as well as the research informants were 66 students and management of the Tourism Village. Students got the task of

creating learning media by using the learning resources of the tourist village. Research data were collected through observation, in-depth interviews, and documentation. The stages of research were: data collection, data reduction, data presentation, and conclusion.

RESULTS

The problem-based learning process begins with learning in the classroom. Classroom learning was attended for 14 meetings. Among them are basic competencies and interconnectedness about: 1)& 2). development of tourist villages and villages; 3). Model of people's economic development; 4) economic policy models of populists and tourist villages; 5). poverty reduction; 6). tourism village development strategy as a solution to alleviate poverty; 7 and 8). study of the example of tourist villages in Sleman as an effort to develop SME and its various problems; 9 and 10). Problems of cooperatives and tourist villages in Pulesari Sleman; 11 and 12). Economic empowerment of local people in tourist villages; 13 and 14). Kelor tourism village as a study material in terms of a partnership.

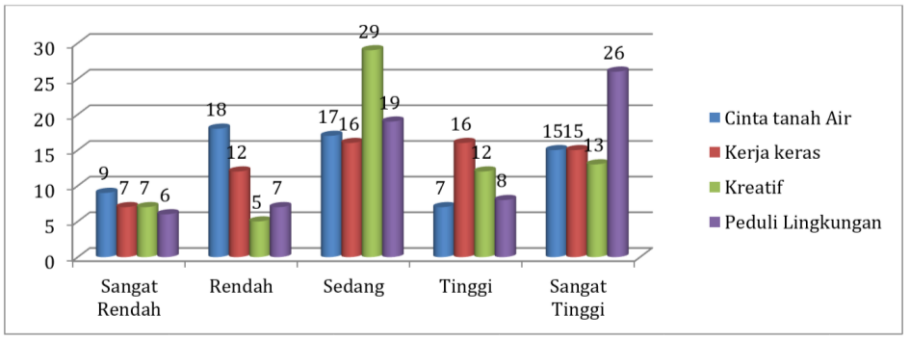

Figure1. Conditions and Attitudes of Student Behavior after learning.

In the process of learning with the learning resources of the tourist, the village has improved the insight, skill attitude, and positive behavior of students towards the nationality and care for the environment. In the learning process, students become more active in classroom discussions, more creative and innovative in solving problems in the environment. Students become more concerned about the problems or problems of people economic lives, and environmental issues.

Here are the results of the achievement of attitudes and behaviors between before and after the learning of the Community Economy with the tourist village as a learning resource**.**

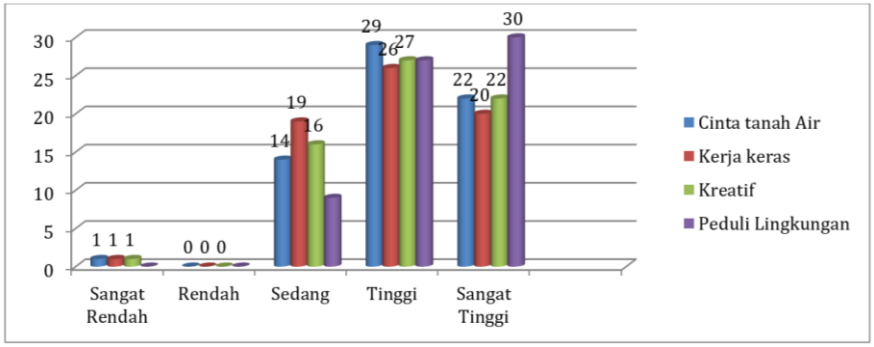

Figure 2. Conditions and Attitudes of Students' Behavior after learning

DISCUSSION

Changes in the high category increased by 27.9%, the very high category increased by 18.3%. Thus, there is an increase in the character of the love of the nation before and after the utilization of the learning resources of the tourist village, as a form of positive change of insight, and attitude of the behavior of love of the nation and environmental concerns

Based on the table above it is known that there has been an increase for high, and low categories. While the low category becomes none. This signifies efforts to improve the value of the love of the

nation that has already shown improvement. This is demonstrated by student activities in learning activities such as:

a. students think positively after seeing various sources when compared to other village tourism villages in Indonesia.
b. proud of the rich culture, nature, history in the village
c. proud to work in the village
d. the positive attitude of environmental care

Through this model, students are invited to love the country through a tourist village that they can observe. The love of this homeland is important to prove student nationalism. They are the generation of the future that will hold the country's leadership.

Changes at the beginning and end in high category categories increased by 23.4%. Thus, there is an improvement in the character of hard work at the beginning and end of learning.

Based on the table above it is known that there has been an increase for the high, and medium categories. While the low category becomes zero. This signifies efforts to improve the value of Hard Work already showing improvement. This is demonstrated by student activities in learning activities such as:

a. Students thinking of developing a tourist village in their hometown.
b. Proud to be able to advance the village

After visiting the tourist village students will try to develop a tourist village in their residence.

These findings are in line with Arantes do Amaral, JA, & Lino dos Santos, RJR [4]., which shows that PBL directly develops skills such as critical thinking, the ability to work in groups effectively, and the capacity to solve real-world problems. Overcoming obstacles in developing rural tourism, Trying to convince villagers to be willing to develop rural tourism and projects for students to promote their achievements [5].

Through this model, students are invited to work hard through tourist villages that they can observe. This hard work is capital for them to progress. With hard work, the goal of producing a better life will be achieved. They also witnessed how the tour village administrators worked hard in building this tourist village.

Support from stakeholders to support people's economic activities is indispensable, the role of partnerships between governments, universities, and local economic enterprise communities. Local governments are tasked with providing regulation for the creation of a conducive business climate. The local community is tasked with carrying out production, distribution, and consumption activities by their respective roles optimally. Universities are tasked with creating innovations that can be used by the tourism industry and providing input on government policy.

CONCLUSIONS

Learning community economy by utilizing tourism villages encourages students to have the character of loving the country, working hard, being creative and caring for the surrounding environment. This is a learning model that can be applied to integrate classroom learning and local potential.

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REFERENCES

[1] Baroroh, Kiromim.,Lestari, Barkah., Suwarno. Implementasi Metode Simulasi Dan Pemanfaatan Barang Bekas Sebagai *Media* Pembelajaran (Strategi Meningkatkan Nilai-Nilai Karakter Dalam Mata Kuliah Ekonomi Kerakyatan)(2011). *Laporan Penelitian*.FE UNY

[2] Baroroh, K. (2009). Efektivitas pembelajaran kooperatif dalam meningkatkan aktivitas dan prestasi belajar mahasiswa. *Jurnal Ekonomi dan Pendidikan*, *6*(2).

[3] Wijiningsih, N., Wahjoedi, W., & Sumarmi, S. (2017). Pengembangan Bahan Ajar Tematik Berbasis Budaya Lokal. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, *2*(8), 1030-1036.

[4] Arantes do Amaral, J. A., dos Santos, L., & Rodrigues, R. J. (2018). Combining Project-Based Learning and Community-Based Research in a Research Methodology Course: The Lessons Learned. *International Journal of Instruction*, *11*(1), 47-60.

[5] Kizkapan, O., & Bektas, O. (2017). The Effect of Project Based Learning on Seventh Grade Students' Academic Achievement.*International* Journal *of Instruction*, *10*(1), 37-54.

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DEVELOPMENT OF ANDROID-BASED MULTIMEDIA APPLICATIONS TO INCREASE STUDENT ACTIVENESS IN MUHAMMADIYAH LEARNING AT SMK MUHAMMADIYAH 3 WATES

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Abstract

This study aims to determine the development process and effectiveness of Android-based multimedia applications to increase student activism in learning kemuhammadiyahan at Muhammadiyah 3 Wates Vocational High School. This research uses research and development or Research and Development (R & D), which is a research method used to produce certain products, and testing the effectiveness of these products uses needs analysis research (survey or qualitative methods are used).The results of the study through several stages, namely the material expert validation test and the media expert validation test, namely that the media is suitable to be used to increase learning activity. kemuhammadiyahan students at SMK Muhammadiyah 3 Wates.

Keywords: development, applications, multimedia, android, activity, learning.

INTRODUCTION

Education is one of the containers for developing the potential of students. In facing competition in this globalization era, the wheels of education must be designed in such a way that the educational process can go hand in hand with the development of advanced technology.

Teaching and learning activities in educational institutions are activities that must be supported, both from learning media, places, teachers and students. Therefore, in addition to schools providing complete facilities for students, students must also be well conditioned so that learning can be effective. The success in the learning process can be seen in learning achievement.

Kemuhammadiyahan is a subject in SMK Muhammadiyah 3 Wates, this subject has an important role in relation to the vision and mission of vocational high schools as a characteristic of Muhammadiyah schools which are required to not only understand the material, but Muhammadiyah subjects are expected to be able to produce Muhammadiyah cadres.

One of the obstacles that causes low student knowledge is that students feel bored and less enthusiastic in studying the history of Muhammadiyah (Griha indra: 2017) learning kemuhammadiyahan is a subject that most students do not like comes from backgrounds that are not from Muhammadiyah, so the level of student interest in studying low kemuhammadiyahan

Less active learning atmosphere, and students' difficulties in understanding Muhammadiyah material. This can be seen in the passive classroom atmosphere when learning takes place. Most of the students are less interested in Muhammadiyahan subjects.

The problem above is caused by learning in the classroom which tends to be monotonous, passive, boring both from the method which is still using the lecture model and the facilities of books.

Inadequate support and teacher-centered learning, the absence of attractive learning media results in a lack of student interest in learning Muhammadiyah material, so that the learning outcomes in class are not optimal.

Therefore, teachers need to foster student motivation. To obtain optimal learning outcomes, teachers are required to be creative in arousing student motivation. According to SupRYin (2015: 73), a teacher must be able to design learning in such a way that it is interesting for students to understand later.

Demands and civilization have experienced a shift from the analogue world to the digital dimension through the rapid advancement of information technology. At the same time teachers are challenged to combine traditional learning models and advances in information technology to keep up with the diverse learning styles of students. (syarif 2012: 235).

In the author's observation at SMK M 3 WATES it can be said that 90% of students are already using an Android cellphone, then here the teacher's task is how to use the cellphone then it can be used as a tool or media for delivering learning in school in the hope that students are interested in learning.

Therefore, researchers are interested in solving these problems, making multimedia applications of Muhammadiyah Muhammadiyah by the author as a

learning medium to facilitate users and students in learning Muhammadiyah lessons, namely MKCHM material which is more interesting and fun.

METHOD

This study uses research and development or Research and Development (R & D). Sugiyono argues that the research and development method is a method

Research used to produce certain products, and testing the effectiveness of these products. To be able to produce certain products, research that is needs analysis is used (survey or qualitative methods are used). (Haryati Sri 2012: 13)

This study used 3 validation experts namely material expert validation, IT material expert validation and learning media expert. Material experts focus on MKCHM material on Muhammadiyah lessons, IT experts focus on the quality of the products produced, then media experts focus on aspects of the media used for learning. The product testing will be conducted twice, namely large group trials using instruments in the form of questionnaires, observation sheets and interviews.

1. Potentials and Problems
   The research that was carried out started from a potential or problem. The potential in question is that if research is carried out it will provide added value and be utilized appropriately. The problem is a situation where there is a deviation between expectations and reality. Potentials and problems in a study can be taken from empirical data and can also be taken from previous research which is still new.
2. Product Design
   At this stage the researcher carries out a new work plan based on the old work plan so that weaknesses are found in the system. The resulting product design is still hypothetical because its effectiveness has not been proven. Each new design needs to be shown in a working drawing or chart so that it is easy for the other party to understand.
3. Design Validation
   This stage is an activity to assess whether the new product design is more effective than the old one or not. Design validation is carried out by bringing in experienced experts or experts to assess the design.
4. Product Trials
   Testing is done by comparing the effectiveness and efficiency of the old work system with the new one. Experiments were carried out by comparing the conditions before and after using the new system.
5. Trial of Use
   After successful testing of the product, the product can be applied in real conditions and in a wider scope.
6. Product Revisions
   Revisions are made if in real conditions the use of deficiencies and weaknesses

Borg & Gall (1983: 775) developed 10 stages in developing a model, namely:

1. Research and information collecting, including in this step include literature studies relating to the problems studied, measurement of needs, research on a small scale, and preparation to formulate a research framework;
2. Planning, including in this step, compiling a research plan which includes formulating skills and expertise related to the problem, determining the objectives to be achieved at each stage, design or research steps and if possible / necessary carrying out a limited feasibility study;
3. Develop preliminary form of product, which is to develop the initial form of the product to be produced. Included in this step is the preparation of supporting components, preparing guidelines and manuals, and evaluating the appropriateness of supporting tools. Examples of developing learning materials, learning processes and evaluation instruments;
4. Preliminary field testing, namely conducting initial field trials on a limited scale, involving 1 to 3 schools, with a total of 6-12 subjects. In this step, data collection and analysis can be done by means of interviews, observations or questionnaires;
5. Main product revision, namely making improvements to the initial product produced based on the initial trial results. It is very possible for this improvement to be done more than once, according to the results shown in a limited trial, so that a broader draft of the main product (model) is ready to be tested.
6. Main
   Main field testing, which is usually called the main test involving a wider audience, namely 5 to 15 schools, with 30 to 100 subjects. Data collection is carried out quantitatively, especially on the performance before and after the implementation of the trial. The results obtained from this trial are in the form of evaluation on the achievement of trial results (model design) compared to the control group. Thus, in general, this step uses an experimental research design;
7. Operational product revision, namely making improvements / enhancements to the wider trial results, so that the product being developed is already an operational model design that is ready to be validated.
8. Final product revision, namely making final improvements to the developed model in order to produce the final product (final);Dissemination and implementation, namely the step of disseminating the product / model

that was developed to the public / the wider community, especially in education. The main step in this phase is to communicate and disseminate the findings / models, either in the form of research seminars, publication in journals, or exposure to stakeholders related to the research findings. Haryati Sri (2012: 13).

Penelitian This research on the development of learning media was carried out at SMK Muhammadiyah 3 Wates Kulon Progo, which is located at Jalan Kedunggon, Wates Kulon Progo Regency, Yogyakarta 55661. SMK Muhammadiyah 3 Wates was founded in 2004 One of the SMKs in Kulon Progo accredited A with a field of expertise, namely : mechanical engineering, automotive mechanical engineering, information and communication technology, with computer network engineering expertise programs, pharmacy and nursing and multimedia expertise programs. In this study, the authors took a sample of class XI in vocational MM (Multimedia class) as research, when the research was carried out on the initial observations made by the author in the last semester then continued in the odd semester.

To obtain data that is relevant to the research objectives, the following data collection techniques are used:

1. Observation is systematic observation and recording of the phenomena being investigated. This technique is used to determine the initial conditions of the research site, namely SMK Muhammadiyah 3 Wates and the possible problems. In addition, observations are also carried out to see the attractiveness of students when testing the products developed.
2. Documentation
   Documentation is a method used to find data about things in the form of notes, book transcripts, newspapers, magazines, minutes, and so on. This method is used to obtain data about the general description of SMK Muhammadiyah 3 Wates, and to capture each stage of the research process carried out.
3. Uestionnaire
   Questionnaires are a number of written questions that are used to obtain information from respondents in the sense of reports and known results. The questionnaire used is an open questionnaire (answers are filled in by the reviewer himself), as well as a closed questionnaire (the answer is there, just needs to be selected by the reviewer). Which questionnaire is used to assess products that have been developed.

The questionnaire is intended for:

a. Questionnaire for material expert responses. Questionnaire for material expert responses is what researchers use to be given to material experts to assess or provide responses and suggestions for material in learning media according to the curriculum or not. Researchers also conduct discussions and submit products and material designs made and evaluation sheets for expert review, and ask for comments and suggestions for improving the developed application.
b. Questionnaire for responses from media expertsnamely a questionnaire that researchers use to be given to media experts to assess or provide responses and suggestions from the design in learning media whether or not it is feasible
c. Students,to assess the content, appearance, and clarity of the developed application. And to give an assessment used a questionnaire using a Likert or standard scale (scale five).

RESULTS

The research data was obtained from the process of developing an android-based multimedia application through several stages, namely:

Potential problems

This research is motivated by the potential problems found in Muhammadiyah learning class XI at SMK Muh 3 Wates. The main problem in this study is the lack of student interest in Muhammadiyah subjects. students are students who feel bored and less enthusiastic in learning the history of Muhammadiyah (Griha indra: 2017) learning kemuhammadiyahan is a subject that is less desirable.

From students who come from backgrounds that are not from Muhammadiyah, resulting in a low level of student activity in learning Muhammadiyah which ultimately affects the value of subjects that are far from KKM,

From the above problems, the researcher is interested in developing learning media for Muhammadiyah based learning to attract student,activity.

In making this application of Muhammadiyah learning media, the writer hopes that it will add color to learning so that learning runs smoothly and students are more enthusiastic and not bored. The prepared guide contains a brief description that is in the multi-media application, both material, manuals for use, and evaluation in the form of practice questions which will then show the score or value.

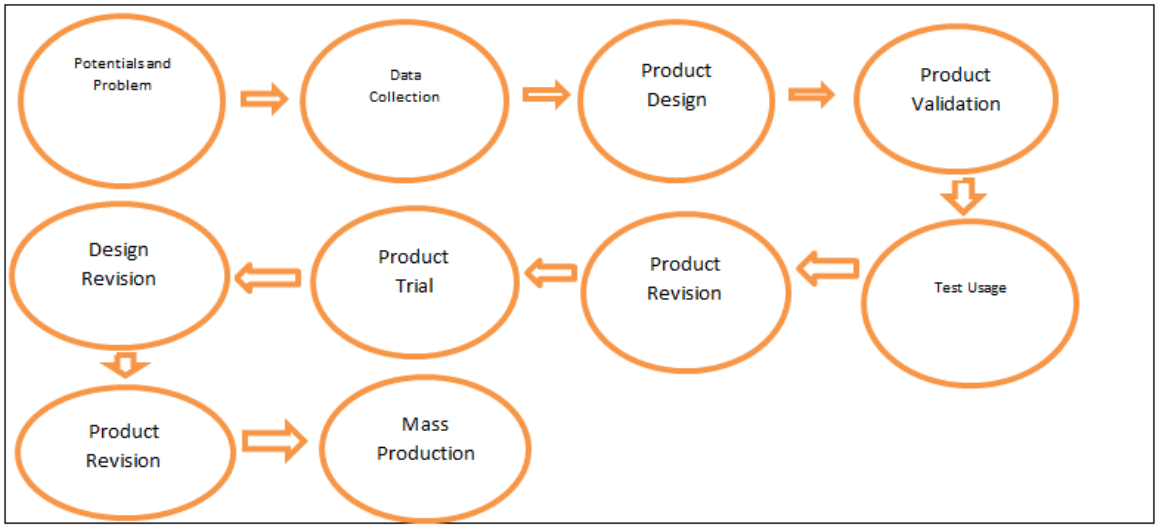

Figure 1. Research Stages

Product Design

From the results of product design related to the development of Android-based multimedia applications as follows:

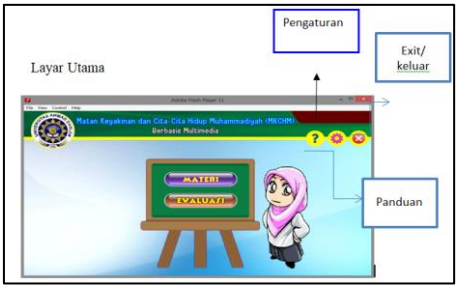

Figure 2. Initial View Of Aplication

The main screen is the initial display of the application which consists of several sub menus including

1) Guide menu is a menu that contains application guides
2) Settings menu is a menu that contains application settings consisting of Audio settings and display setting
3) The exit menu is a menu that functions to exit the application
4) The material menu is a menu that functions to display material materi MKCHM ((Matan Beliefs and Aspirations of Muhammadiyah Life)
5) The evaluation menu is a menu that functions to display evaluation questions related to the material

User guide

The procedure for using Android-based multimedia applications is as follows:

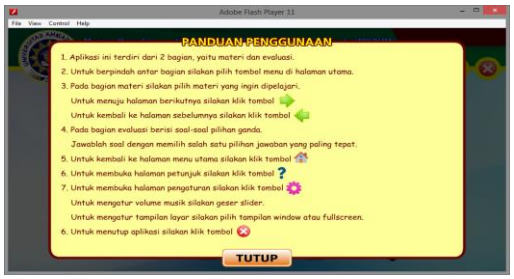

Figure 3. User Manual

1) This application consists of 2 parts, namely material and evaluation
2) To move between sections please select the menu button on the main page
3) In the material section, please select the material you want to study. To go to the next page, please click the button to return to the previous page, please click the button
4) The evaluation section contains multiple choice questions. Answer the questions by choosing the most appropriate choice
5) To return to the main menu page please click the button
6) To open the manual page please click the button
7) To open the settings page, please click the button. To adjust the music volume, please slide the slider to adjust the screen display, please select window or fullscreen display
8) To close the application, please click the Name naming display button. To enter the naming menu, select the settings menu, then a display will appear as above Click the name button then type the student's name for example: (SITI) then click save.

Figure 4. Name Giving

Menu material

On the material menu there is a discussion of material about MKCHK which includes:

A. Understanding MKCHM
B. History of the Formulation of the MKCH
C. Isi Contents of Muhammadiyah's belief and life aspirations
D. The essence of MKCHM
E. Fungsi MKCHM function
F. Systematics and guidelines for understanding the MKCHM formulation.
G. Understanding MKCHM

To select the desired material, please click on the display in accordance with the desired material, for example: selecting material MKCHM function then clicking it will appear material understanding MKCHM.

Figure 5. Content Menu

Evaluation Menu

Select the Evaluation menu, then a display of question instructions will appear as shown above. To start the evaluation exercise, select or click the start button, then a display of 20 questions will appear in the form of multiple choice a, b, c, d questions, after finishing working on the question, click the save button, the scores will automatically appear along with the competent or incompetent results.

Figure 6. Evaluation Menu

DISCUSSION

From the results of data analysis, it can be found that it combines traditional learning models and advances in information technology to compensate for the diverse learning styles of students. (Syarif 2012: 235) can increase student learning activity. This can be seen from the various positive activities of students in the learning process.

REFERENCES

[1] Arsyad Ashar, Media Pembelajaran. Depok. Kharisma Putra utama Offset. 2019

[2] Arqom Lailan, Pengembangan Multimedia Pembelajaran Pada Mata Pelajaran Kemuhammadiyahan Bagi Siswa Kelas I Madrasah Mu'allimin Muhammadiyah Yogyakarta. 2019.

[3] Budi Permana1, Aplikasi Ensiklopedia Pakaian Adat Dunia Berbasis Android. Jurnal Informatika: Jurnal Pengembangan IT (JPIT), Vol.03, No.02, Mei 2018.

[4] Fitriani Atika, Yanuatika Eka, Upaya Guru Pendidikan Agama Islam Dalam Menumbuhkan Kecerdasan Spiritual Siswa, Jurnal Pendidikan Islam, Vol. 3, No. 02, 2018

[5] Haryati Sri. 2012 Research And Development (R&D) Sebagai Salah Satu Model Penelitian Dalam Bidang Pendidikan, Vol. 37 No. 1, 15 September.

[6] Kurniawati diah Inung. Media Pembelajaran Berbasis Multimedia Interaktif untuk Meningkatkan Pemahaman Konsep Mahasiswa. Journal of Computer and Information Technology E-ISSN: 2579-5317 Vol.1, No. 2, Febuary 2018.

[7] Muhson Ali, Pengembangan Media Pembelajaran Berbasis Teknologi Informasi. , Jurnal Pendidikan Akuntansi Indonesia, Vol. 2 . 2010.

[8] Gumilang Tyas akbar .usaha guru PAI dalam meningkatkan religiusitas siswa melalui pendekatan multiple intelegences. 2013.

[9] Griha indra. Game Edukasi Sejarah Gerakan Kemuhammadiyahan dengan Metode Picture and Picture berbasis Android. Jurnal Buana Informatika, Volume 8, Nomor 3, Juli 2017: 171-180

[10] Sukmawat Fatma. Pengembangan Aplikasi Pembelajaran Biologi Smp Berbasis Android Untuk Bekal Menghadapi Uan Di Smp Islam Bakti 1 Surakarta. Jurnal Teknologi Informasi Vol . XI Nomor 31 Maret 2016.

[11] Wibowo nugroho. Upaya Peningkatan Keaktifan Siswa Melalui Pembelajaran Berdasarkan Gaya Belajar Di Smk Negeri 1 Saptosari. Jurnal Electronics, Informatics, and Vocational Education (ELINVO), Volume 1, Nomor 2, Mei 2016

THE EFFECTIVENESS OF USING MULTI-REPRESENTATION E MODULES AS A TEACHING MATERIAL FOR ELECTROLYTE AND NON-ELECTROLYTE SOLUTIONS MATERIAL IN SMA NEGERI 1 TUNTANG

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Abstract

Modules are learning resources that aim to make the students feel easier in learning the materials. Electrolyte and noneletrolite solution is one of the material in X class that requires elaboration on macroscopic, symbolic and microscopic aspects. This research aims to determine the effectiveness of using multi-representation e-modules. The subjects in this research were X MIPA 1 class and X MIPA 3 class. This research used a descriptive qualitative method. The steps in this research begin from the observation and interview stage, making the instrument stage, instrument validation stage, data analysis stage, and finally concluding the research results. The data collection method was carried out by test and questionnaire method. Detection test reliability was analyzed using R_{11}, obtained a score of 0.72, so that the test instrument fulfilled reliable criteria. The results obtained by the use of e-module in learning was effective to be used. This can be seen from the classical completeness of electrolyte and non-electrolyte solution material which was 89%. The results of student responses to the multi-representation e-module were good and very good. The use of multi-representation e-modules can help the students understand the material.

Keywords: Modules, Electrolyte and Non-Electrolyte Solutions, e-module

INTRODUCTION

All kinds of materials used by educators/instructors in carrying out the learning process are called teaching materials (MONE, 2008). Teaching material is needed in learning as a guide for the educators, student learning guidelines, and evaluation guidelines. Teaching materials are used by the teachers to provide material and facilitate their thoughts in teaching and to know the students' cognitive achievement objectively. Teaching materials are used to help the teachers and the students and encourage learning process in various fields. The use of teaching materials in teaching science is very important because it provides a foundation for conceptual thinking, motivates people to learn and captures the imagination that is used correctly (Nwike, 2013). One type of teaching material is e-module.

The e-module is a systematic and interesting teaching material that includes material content, methods and evaluations that can be used independently (Setyowati, 2012). The making of e-modules in learning activities has three main objectives, namely 1) that students can learn independently without or with minimal teacher guidance, 2) so that the role of educators is not too dominant and authoritative in learning activities, 3) so students are able to measure their own levels mastery of the material learned. The use of e-modules in learning chemistry can improve the student learning outcomes, such as electrochemical analysis material (Novianti et al, 2014), hydrocarbon compounds and their derivatives (Febriana, et al, 2014), mole concept (Sunaringtyas, et al. 2015) and chemical equilibrium (Yerimadesi, et al. 2016). The results also show that the use of e-modules can also stimulate students' intrinsic motivation to study chemistry, intrinsic motivation of students who study chemistry using e-modules is significantly higher compared to conventional learning (without e-modules) (Vaino, et al. 2012) .

Learning Chemistry means learning with abstract concepts and topics. Chemistry is difficult because it consists of microscopic, macroscopic, and symbolic aspects (Santos, 2016). Three categories of representation put forward by Johnstone in (Anwar, 2010) are defined as follows: (1) Macroscopically interpreted as observable chemical phenomena including those relating to everyday experience, (2) Microscopic

is an explanation in the form of microscopic particles that cannot be seen directly such as electrons, molecules, and atoms, (3) symbolic is a chemical phenomenon using a variety of symbols including images, algebra and computational forms. Electrolyte and non-electrolyte solution material is material containing theory and practicum, so it needs to be fully spelled out in multi-representation aspects.

The use of multi-representation e-modules is expected to be able to have a positive effect on student learning outcomes. Based on observations at SMA 1 Tuntang, learning only uses worksheets that do not describe microscopic aspects. Macro-

scopic and symbolic explanation without regard to microscopic aspects will lead to misconceptions (Shui-Te, et. Al. 2018). Referring to these problems, it is necessary to do research on the effectiveness of using multi-representation e-modules to determine the effectiveness of learning using multi-representation e-modules.

METHOD

This research is a qualitative descriptive research conducted at SMA 1 Tuntang. The population in this study were class X in the 2018/2019 school year consisting of 4 classes, while the sample were X IPA 1 and X IPA 3 class. Sampling using a cluster random sampling is a sample taken at random. The research design used was post-only design. The steps in this study began from the observation and interview stage of the problem, the stage of making the instrument, the stage of instrument validation, and the stage of data analysis, and finally the conclusion of the research results The method of data collection was carried out by the test and questionnaire method. The test uses three tier multiple choice tests to determine student learning outcomes, while the questionnaire is used to determine student responses to multi-representation e-modules. One of the criteria for learning effectiveness is classical completeness above the standard of 75%. The formula to find out the completeness of classical learning as follows.

$$\text{KBI} = \frac{Test\ Score}{Maximum\ Score!}\ x\ 100\%$$

$$\text{KBK} = \frac{\sum Individual\ Student\ Completeness}{\sum All\ students} x\ 100\%$$

KBI = Individual Study Mastery
KBK = Classical Learning Completeness

RESULTS

E-module Validity Test

The e-module validity test was conducted by two chemistry teachers and one expert lecturer. The results obtained from each validator of the media experts were 27, 35, and 38 from a total score of 40. The average score obtained was 33 in the category very feasible to use. The e-module is also validated by material experts. The results obtained from each material expert validator are 50, 61, and 62 from a total score of 70, so that an average of 58 is obtained with a category suitable for use.

Effective use of e-modules

The effectiveness of using multi-representation e-module can be said to be effective if the learning outcomes obtained by students have a classical completeness above 75%. Minimum completeness criteria of Tuntang 1 Public High School is 70. A total of 45 students from a total of 72 students have grades above the KKM, so the classical completeness obtained is 89%. This figure is obtained by analyzing students who answered correctly in the first tier of the three tier test questions. Student learning outcomes were measured using three tier multiple choice tests of 18 questions containing macroscopic, microscopic and symbolic problems. The distribution of items at the macroscopic level, symbolic level, and microscopic level are listed in Table 4.1.

Table 4. 1 Macrosopic, Symbolic, and Microscopic Level Item Distribution

Level	Question number					
Macrosopic	2	4	5	17	18	
Symbolic	7	8	9	11		
Microsopic	10	12	13	14	15	16

Student responses to e-modules

There are 15 statements in the questionnaire. The results of the acquisition scores of each validator are 24, 25, and 29 of the total score of 30. The average obtained on the validation of the student questionnaire responses is 26 with a very decent category. Each validator provides suggestions and comments in order to achieve a better instrument. A total of 15 questionnaires were tested for reliability using Conbrach-α. This is because the item scores in the questionnaire use a Likert scale of 4, 3, 2, and 1. The response questionnaire has a reliability number of 0.875 with a reliable category. This shows that the questionnaire sheet can be used in research at any time. Student responses to multi-representation e-modules are good and very good.

DISCUSSION

Multi-representation e-module was compiled against the background of the writer's observation at SMA 1 Tuntang. Previous learning sources only contain macroscopic and definitive aspects, whereas microscopic aspects are less emphasized. Multi-representation emphasis, especially at the microscopic and symbolic level is important because misconceptions are generally caused by a lack of understanding at that level (Wardhani et al., 2016). e-modules used for research include definitive, macroscopic, symbolic and microscopic levels.

The preparation of multi-representation e-modules aims to minimize the occurrence of misconceptions among students. The making of e-modules was compiled by linking the multi-representation aspects of the sub material, then validated by 3 validators, namely 1 expert lecturer and 2 Chemistry subject teachers. At the validation stage, the score obtained was 58/70 in the material

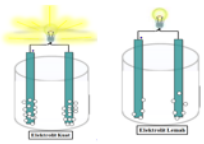
validation, and a score of 33/40 in the media validation, so the teaching material was categorized valid from the material and media aspects. e-modules are uploaded to Google Classroom to make students easier to learn. The following is the multi-representation explanation contained in the e-module.

1. Definitive level

The definitive level contained in the e-module is to explain the meanings of electrolyte solutions including strong electrolytes and weak electrolytes, and non-electrolyte solutions.

2. Macroscopic level

The macroscopic level contained in the e-module contains phenomena that can be observed by students during the practicum. An example is an electrolyte solution that has a bright lamp and there is a bubble of the electrode, while the non-electrolyte solution of the lamp does not turn on and there are no bubbles on the electrode



Sumber : www.google.com
Gambar 4. Perbedaan Uji Daya Hantar istrik Larutan Elektrolit Kuat dan Lemah

Selain ditandai dengan nyala lampu, gelembung-gelembung gas yang terbentuk pada elektroda juga dapat menjadi indikasi terbentuknya ion-ion dalam larutan yang diuji. Gelembung gas yang dihasilkan pada elektrode pada pengujian elektrolit kuat akan jauh lebih banyak daripada gelembung gas yang dihasilkan pada pengujian larutan elektrolit lemah.

Tabel 1. Perbedaan Larutan Elektrolit Kuat dan Elektrolit Lemah Berdasarkan Alat Uji

Jenis larutan	Lampu	Elektroda
Elektrolit kuat	Terang	Banyak gelembung gas
Elektrolit lemah	Redup	Sedikit gelembung gas

Figure 1. Examples of Macroscopic Aspects

3. Symbolic Level

At the symbolic level contained in the e-module material electrolyte and non-electrolyte solution is the ionization reaction of several examples of strong electrolyte solutions, weak electrolytes and non-electrolyte solutions.

4. Simbolis

Elektrolit kuat mengalami ionisasi sempurna menjadi ion-ionnya. Elektrolit lemah didalam reaksinya mengalami ionisasi sebagian. Dalam reaksi ionisasi elektrolit kuat, kesetimbangan bersifat irreversible (tanda panah satu arah) sedangkan elektrolit lemah bersifat reversible yang ditandai dengan tanda panah bolak balik. Sebagai contoh perhatikan di bawah ini.

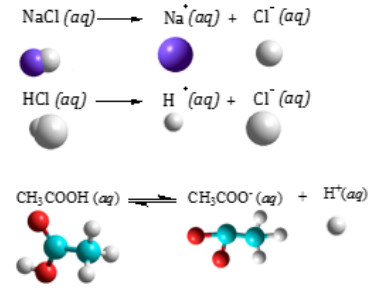
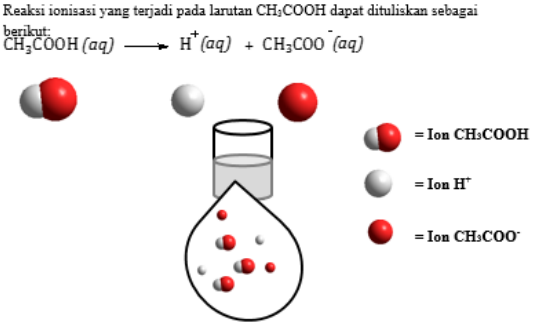


Figure 2. Examples of Symbolic Aspects

4. Microscopic Level

The microscopic level in the e-module contains an explanation of why macroscopic phenomena can occur. The sub-microscopic picture is abstract so it needs to be visualized (Dewi et al., 2016). In the electrolyte and non-electrolyte solution material to help students understand concepts, the teacher provides animation and video to students to illustrate the microscopic level.



Gambar 1. Example of Microscopic Aspect

Chemistry learning should be emphasized at the macroscopic, symbolic, and microscopic levels, so that it can help students understand concepts.

The advantages of using the first e-module are effective, students can download at any time, making it easier for students to learn. Almost all students already have an android mobile phone. This makes it very easy for students to use multi-representation e-modules. The use of e-modules means students utilize science and technology in the form of mobile phones as learning tools. Both are efficient, e-modules uploaded through Google Classroom will save students money and save on paper usage because e-modules are in electronic form that can be used without using print media. The third is multi-representation because the e-module used contains definitive, macroscopic, symbolic, and microscopic levels. The use of google classroom can help teachers in the delivery of material or announcements related to subjects. The difficulty faced during the study was the use of google classroom because not all students were active in using e-mail so only a few students were active in google classroom.

The effectiveness of e-modules in research can be seen from the results of student learning. There are 62 students with grades above KKM out of the total number of students, 72 students. The classical completeness obtained in electrolyte and non-electrolyte solution material by giving multi-representation e-module is 89%. This classical completeness already meets the classical completeness standard of 75%, so that the use of e-modules is effectively used as learning. Student responses to the multi-representation e-module are very good, good and quite good. A total of 27 students gave

very good responses to multi-representation e-modules, 43 students gave good responses, and 2 students gave sufficient responses to multi-representation e-modules.

CONCLUSION

Based on the research, it can be concluded that the use of e-modules in learning is effective. This can be seen from the classical completeness of electrolyte and non-electrolyte solution material which was 89%. From 62 students out of 72 students scored above the standard. The first advantages of using e-module were effective, students can download it any time, making it easier for the students in learning. Both are efficient, e-modules uploaded through Google Classroom will save students money and save on paper usage because e-modules are in electronic form that can be used without using print media. The third is multi-representation because the e-module used contains definitive, macroscopic, symbolic, and microscopic levels.

Based on the conclusions above, the suggestions that can be conveyed are as follows.

1. Multi-representation electronic module (e-module) can be developed for other learning materials.
2. Teachers should emphasize the microscopic aspects so that misconceptions do not occur in electrolyte and non-electrolyte solution materials and can improve the effectiveness of learning so as to improve the quality of Indonesian education

REFERENCES

[1] Dewi, R., Titin, S., & Gebi, D. 2016. Analisis Penguasaan Konsep Larutan Elektrolit-Nonelektrolit Siswa Menggunakan Siklus Belajar Hipotesis Deduktif. *Jurnal Kimia Dan Pendidikan*, 1(2), 98-109.

[2] Eilks, I., W. Torsten, & P. Verena. 2012. The Role and Potential Dangers of Visualisation When Learning about Sub-microscopic Explanitions in Chemistry Education. CEPS Journal, 2(1): 125-145.

[3] Febriana, BW., Ashadi, dan M. Masykuri. 2014. Pengembangan Modul Kimia Berbasis Problem Based Learning (PBL) Pada Materi Senyawa Hidrokarbon dan Turunannya Kelas XI SMK Kesehatan Ngawi. jurnal.fkip.uns.ac.id

[4] Jansoon, N., R. K. Coll, & E. Somsook. 2009. Understanding Mental Models of Dilution in Thai Students. International Journal of Enfironmental & Science Education, 4(2): 147-168.

[5] Novianty I, Oktavia S, dan Neena Z. 2014. Efektivitas Penerapan Modul Materi Analisis Elektrokimia Berbasis Inkuiri Terbimbing Terhadap Hasil Belajar Dan Persepsi Siswa Kelas XI Semester 1 Kompetensi Keahlian Kimia Analisis SMKN 7 MALANG. Universitas Negeri Malang: jurnal-online.um.ac.id.

[6] Nwike, Matthew C. 2013. Effect Of Use Of Intructional Materials On Stundent Cognitive Achivement In Agricultural Sciences. *Journal Of Educational And Social Research*, 3(5), 103-107.

[7] Philipp, S. B., D. K. Johnson & E. J. Yezierski. 2014. Development of a Protocol to Evaluate the Use of Representations in Secondary Chemistry Instruction. Chemistry Education Research and Practice, 15: 777-786.

[8] Santos, V.C. & Agnaldo, A. The representational levels: influences and contributions to research in chemical eduation. Journal of turkish science education, 13(1), 3-18.

[9] Setyowati, R., Parmin, Arif, W. 2012. Pengembangan Modul IPA Berkarakter Peduli Lingkungan Tema Polusi Sebagai Bahan Ajar Siswa Smk N 11 Semarang. Unnes Science Education Journal, 2(2), 65-75.

[10] Shui-Te, L., Irene, W.K., Sri, W., & Harjito. Hasil Identifikasi Miskonsepsi Siswa Ditinjau Dari Aspek Makroskopis, Mikroskopis, Dan Simbolik (MMS) Pada Pokok Bahasan Partikulat Sifat Materi di Taiwan. *Jurnal Inovasi Pendidikan Kimia,* 12(1), 2019-2030.

[11] Sunaringtyas K, Sulistyo S, Mohammad M. 2015. Pengembangan Modul Kimia Berbasis Masalah pada Materi Konsep Mol Kelas X SMA/MA Sesuai Kurikulum 2013. Jurnal Inkuiri. Vol. 4. No.2 . Hal: 36-46.

[12] Vaino K, Jack H and Miia R. 2012. Stimulating students' intrinsic motivation for learning chemistry through the use of context-based learning modules. Chemistry Education Research and Practice. Vol. 13, 410– 419.

[13] Wardhani, N.K., Pratitno., & Fauziatul, F. 2016. Studi Pemahaman Konsep dan Miskonsepsi Calon Guru Kimia Pada Topik Struktur Atom Menggunakan Instrumen Diagnostik *Two Tier*. *Jurnal Pembelajaran Kimia (J-PEK),*1(2), 38-41.

[14] Yerimadesi, Bayharti, Fitri H, dan Wiwit FL. 2016. Pengembangan Modul Kesetimbangan Kimia Berbasis Pendekatan Saintifik Untuk Kelas XI SMA/MA. Journal of Saintek. Vol. 8. No. 1 Hal: 85-97.

FACTORS THAT AFFECTS PARENTS' DECISION TO CHOOSE PRIVATE ELEMENTARY SCHOOLS IN THE NEW NORMAL AGE: EXPLORARTORY FACTOR ANALYSIS

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Abstract

Currently, the majority of private schools are considered by parents as an alternative school choice, especially at the elementary level. In many terms offered by this kind of school can greatly influence or even do not affect the parents' decision to prefer the school. The aim of this recent study is to investigate further points about what are the main considerations of parents in the middle of the New Normal age. The study was conducted in June in 4 cities with a fairly high spread of COVID-19, namely Jakarta, South Tangerang, Surabaya, and Semarang with 226 samples of parents who would register their children at the beginning of the 2020 and 2021 academic year. Data collection employed a questionnaire with 29 questions which were analysed using EFA. The reliability employed was *Cronbach Alpha* with a value of 0.943. Whereas, the KMO and Bartlett's Test values were 0.924> 0.05 and Sig. 0.0001 <0.05 accordingly. There were 5 factors formed by eliminating 7 statements, resulting in a total variance of 72.012%. These factors were categorized as (1) School Services, (2) Facilities, (3) Additional Activities, (4) Promotions, and (5) International Curriculum.

Keywords: Elementary School Choice, New Normal Age, EFA.

INTRODUCTION

The contagion of *Novel Coronavirus* (NCov-19) around the world has not yet shown signs of ending. In Indonesia, the increasing number of cases are still happening every day. Indeed, it will affect the world of education. The government is currently compiling a health protocol to implement the new normal age, such an age of prevalent condition, to be executed in schools [1]. The government's plan to reopen schools and to begin a new academic year in July 2020 also reaps the pros and cons of parents. Therefore, an initiative action has emerged such an online petition regarding postponing the new school year on the Change.org website [2]. It is due to the parents' lack of confidence in the protocol that the government will implement in schools later. Nevertheless, based on interviews conducted with 10 parents of students who had undergone *School From Home* activities, 7 of them admitted that they were turning to be overwhelmed by these activities. Admittedly, they wanted the school to reopen immediately. Some parents will also return to work outside the home, so they think of the need for teaching and learning activities to be conducted again at school so that their children can be more controlled.

The elementary school-age student defines an age group identified as an active characteristic. Parents will absolutely make a lot of considerations regarding their decision in choosing a school for them. Research on the factors which affect parental decisions has also been conducted in recent years. However, changes to the new normal age may lead to changes about parental decisions for now. There needs to be a renewal of research in the midst of the current new era, namely the Covid-19 pandemic condition.

There are four factors may influence decision making [3], namely cultural factors, social factors (reference group, role, social status, and family), personal factors (life cycle, occupation, economic conditions), and psychological factors (motivation, perception, learning process, beliefs, and attitudes). The four factors are general decision-making factors. In terms of deciding to choose a school, there identifies which are more specific than school as a choice. Other studies conducted specifically on school selection are summarized in Table 1.

Table 1. Influencing Factors in the Previous Research

Previous Studies	Factors
Rakhmanita (2012)	Price, promotion, place, and facilities.
Murdopo (2013)	Condition school, finance, and the location of school.

Previous Studies	Factors
Bokings, dkk. (2013)	The socio-economic background of parents, location, teachers, school status, environment, school condition, and cost factor.
Tangkilisan, dkk. (2014)	Price, promotion, facilities, process, product, and people.
Yaacob, dkk (2015)	Parents' income level, school syllabus, school facilities or environment, achievement, location, teacher quality, and distance.
Kristiani (2016)	Promotion, services, product (Graduates/Alumnae), fees, and accreditation status.

In contrast to the research conducted by Yacoop, Murdopo, Bokings which stated that location was an influential factor, other studies have shown the opposite [4, 5, 6]. Kristen, Tangkilisan, and Rakhmanita stated that location did not have a positive effect on factors that affected parents [7, 8, 9]. The same thing was revealed by several people who were interviewed before conducting this research. Those in metropolises said that they did not have a problem with the location of the school which was far from home. Some of their children can take a pick-up car or use a private vehicle (driven by the driver or driven by the mother because they were not working).

Prior to conducting further research, the researcher interviewed 10 parents. Five of them planned to enrol their children in school this academic year and the next year and the remaining had their children attend private elementary schools. The intended interview was to gain deeper information about the indicators representing factors that had previously been studied by other researchers. The research was listed in Table 1. Overall, no one had included the indicators they took, so the indicators appeared could vary widely. It was due to the many indicators which can be considered by parents who certainly had different preferences regarding the school need of their children.

The government has not announced a definite date regarding the return of teaching and learning activities (KBM) to schools. Nonetheless, some provinces have begun to prepare the KBM scenario in the *new normal* age. Amid those who have released the KBM mechanism is East Java Province [19]. The mechanism is not yet official since it is still waiting for direct directions from the Central Education Ministry. With the mechanism that has been designed, it hoped that it can be immediately evaluated by the centre of government then the revisions can be carried out soon.

The East Java Education Office presents the draft health protocol that will be conducted in schools later. The health protocol implemented is divided into 6 parts including the public health protocol in schools, facilities and infrastructure, teachers and education personnel, the health protocol going from home to school, while in school, and from school to home. This health protocol may affect parental factors in choosing a school. Therefore, some of the health protocols that could be observed prior to KBM started will be included in this study. By using the Exploratory Factor Analysis, this study has the objective to determine what factors influence parents' decisions in choosing private primary schools for their children.

METHOD

The population of this study was all parents of students who would enrol their children in private elementary schools in Java. Java Island has the highest distribution compared to other islands. The sample was random (*random sampling*) totalling 226 people. The number of samples was determined based on Hair which stated that the minimum sample size for EFA Analysis was 100 samples [10].

The retrieval data used a questionnaire which the factors were adapted from previous research. They included price, promotion, facilities and infrastructure, teachers, school status, syllabus, accreditation status, and school environment. These factors were then developed to fit the current pandemic condition. Thus, it conducted interviews with 10 parents of students to find out the indicators that affected the factors. The results were as shown in Table 2. The research instrument employed a *Likert* scale. The scale consisted of 1 - 5 category, which represented very insignificant (1) to very important (5). All statement items used were positive.

Table 2. The Blueprint of Questionnaire Instrument

Factor	Indicator	Item Number
Promotions	- Through *offline* media (pamphlet, banner in the centre of the crowd, etc.).	P1
	- Through *online* media (TV, radio, social media, etc).	P2
	- Promotion gotten from friends, relatives, kin, family (mouth to mouth)	P3

Factor	Indicator	Item Number
Fees	- School fees are proportional to the quality, service, school facilities and infrastructure, etc.	P4
	- School fees do not exceed the family's planned education budget.	P5
	- Deductions for certain circumstances (e.g., when an early bird of registration, scholarships for the learner achievement, gifted learner, etc.).	P6
Services	- Parenting activities.	P7
	- Student's progress report.	P8
	- Paying attention to individual potential, interests and talents.	P9
	- Student development counselling.	P10
Facilities and Infrastructure	- Classroom circumstances.	P11
	- Conditions of school facilities (playground, sports field, toilet, parking area, etc.).	P12
	- Shuttle facilities.	P13
	- The canteen sells healthy food and refreshment.	P14
	- Learning media.	P15
School Syllabus	- School' vision and mission.	P16
	- The curriculum is integrated with religion.	P17
	- International curriculum or international standard lessons.	P18
	- Varied Extracurricular.	P19
	- Various additional activities (such as community camps, study tours, performing arts, etc.).	P20
Teachers' Quality	- Teachers' image at schools.	P21
	- The availability of foreign teacher.	P22
	- Handling student delinquency.	P23
	- Understanding the diversity of students' abilities.	P24
Health Protocol	- The total number of students in the class and the spacing in the classroom as well as in the school environment.	P25
	- The readiness of a good distance learning system if at any time you have to run the school from home again.	P26
	- There are health workers.	P27
	- The optimization of the School Health Unit and its equipment.	P28
	- Hygiene facilities (hand washing station, hand sanitizer, spraying disinfectant, etc.).	P29

The reliability evidence of this instrument used *Cronbach Alpha*. Meanwhile, for the validity construct, the analysis factor was used in the form of Exploratory Factor Analysis (EFA). Data were analysed using Social Science Software (SPSS) version 25 to form the new form of factors. The number of factors based on the *Eigenvalue* which has a value of more than 1.

In EFA, the first test executed is the assumption test using *the KMO-MSA* (*Kaiser-Meyer-Olkin Measures of Sampling Adequacy*) value. The value used is to see the adequacy of the sample. It is indicated by the value of KMO MSA> 0.6 [10, 11, 12]. In the table of results from the same SPSS Software, it can also be seen the level of significance (Sig.) *of Bartlett's Test of Sphericity*. This kind of value used is to test the correlation between attributes that are measured largely enough or not [13], it requires the value around Sig. <0.05.

The use of EFA aims to explore data and it does not seek data validation. Therefore, it leads to many things to be considered. These include the value of *Anti-Image Correlation* and the value of *Communalities*. The minimum value for *Anti-image Correlation* is > 0.5 [10]. As for the value of *Communalities*, experts have different minimum values. Tabachnick & Fidell and Field suggested that the minimum value of Communalities is> 0.3 [12, 13]. Osborne, Costello, & Kellow and Gaskin recommended a higher value > 0.4 [14, 15]. Meanwhile, Heir proposed a value > 0.5 [10]. The value shows the amount of variance in the attribute which is is taken into account by two factors taken together [10]. In this analysis, the calculation uses the *Varimax rotation.*

Table 3. Measurement Indicator in EFA

Indicators	Minimum Range
KMO (Kaiser Mayer Olkin)	>0,6
Bartlett's Test of Sphericity	Sig. < 0,05
Anti-Image Correlation	>0,5
Communalities	>0,3 or >0,4 or >0,5
Factor loading	Higher value in each items in each factors

RESULTS

The result of the overall reliability *Cronbach's Alpha* analysis using resulted in a value of 0.943. The type of this test was carried out prior to the EFA analysis. The average answer from the respondents was 4.22 with a standard deviation of 0.84.

As shown in Table 4, it can be summarized that the instrument has met the initial requirements of the EFA analysis by the explanation that the KMO value of 0.924> 0.05 and Sig. 0.0001 <0.05. Then, the *Anti-image Correlation* value found in the calculation result ranges from 0.580 - 0.960. All these values have met the minimum value> 0.5. What stands out in the table leads to a little difficult to predict which items will be the target of elimination if needed later. The results of Communalities are different. The values formed uses *Varimax* extraction ranging from 0.432 - 0.754. If we use the minimum value suggested by Heir et.al, there will be 4 items that can be eliminated.

Table 4. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.924
Bartlett's Test of Sphericity	Approx. Chi-Square	4538.484
	df	406
	Sig.	.000

The purpose of eliminating an item is not only to fulfil the preliminary requirements analysis (KMO and Bartlett's Test), but also to affect the factors that are formed later. This factor is formed from the Eigen value which has a value> 1. By analysing 29 items, 5 factors are formed based on the Eigen value. Table 5 shows that factor 1 can explain 23.937% of the variance after the data is rotated, while Factor 2 can explain 14.947% after rotation, etc. This means that if it is only formed into 1 factor, then the instrument is able to explain 23.937% to measure the influence factor of parents choosing private primary schools. However, if formed into 5 factors, the instrument can measure 65.711% of the variable to be measured. The remaining are factors that have not been measured in this instrument.

Table 5. Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12,758	43,992	43,992	12,758	43,992	43,992	6,942	23,937	23,937
2	1,926	6,641	50,633	1,926	6,641	50,633	4,335	14,947	38,884
3	1,806	6,226	56,859	1,806	6,226	56,859	3,761	12,968	51,852
4	1,399	4,823	61,682	1,399	4,823	61,682	2,134	7,358	59,210
5	1,168	4,029	65,711	1,168	4,029	65,711	1,885	6,501	65,711

Based on the Rotated Component Matrix, the Loading Factor that is formed ranges from 0.390 - 0.851. A total of 13 items skew into a factor of 1; 4 items skew to a factor of 2; 6 items skew to a factor of 3; 3 items skew to a factor of 4, and 2 other items skew to a factor of 5. Several experts claimed that Loading Factors that have a value of> 0.5 are considered to provide better results [16, 17, 18]. It was also conveyed by Hair that the estimated Loading Factor should be greater than 0.5, but if the value is greater than 0.7, it will give even better results [10].

As previously explained, the instrument was able to explain 65.711% of the measured variables. Nevertheless, by considering the opinion of experts regarding the value of *Communalities* and *Loading Factors*, the *Total Variance* previously obtained can have a better value by eliminating items. Based on the *Communalities value*, 4 items can be eliminated. They are P6, P7, P13, and P17. Meanwhile, based on the Loading Factor, the items that can be eliminated are P3, P6, and P13. These two consideration values refer to P6 and P13 to be eliminated. Next, we will try to do elimination in stages to see the changes in Total Variance that occur.

Evidently, from the item elimination trial shown in Table 7, by eliminating the Communali-

ties value <0.5 and Loading Factor <0.5, it can increase the Total Variance. From these results, it shows that if one elimination of the item carries out, the value of Communalities will only experience a small alteration. Conversely, the Loading Factor value may experience significant change if there is an elimination of items.

The items eliminated represent 7 indicators, in the form of discounted fees (P6); parenting activities (P7); shuttle (P13); vision and mission of the school (P16); integrated religious curriculum (P17); the good figure of teachers in schools (P21); and the total number of students in the class (P25). The reduction in items was able to incline the Total Variance up to 72.012%.

Table 6. Rotated Component Matrix

	1	2	3	4	5
P24	.787	.224	.299	.036	.074
P23	.778	.204	.248	-.012	.059
P9	.749	.296	.306	.102	.033
P8	.744	.307	.293	.126	-.004
P26	.688	.186	.283	.094	.271
P4	.673	.297	.089	.142	-.041
P5	.667	.121	.049	.165	-.198
P29	.645	.179	.509	.097	.158
P10	.641	.423	.299	.085	.082
P15	.526	.508	.452	.081	.049
P25	.514	.429	.450	-.040	.078
P21	.504	.499	.194	.167	.246
P3	.488	.328	-.136	.459	-.004
P20	.128	.809	.032	.075	.180
P19	.323	.688	.181	-.027	.179
P17	.331	.568	.154	.091	.083
P16	.419	.536	.217	-.054	.213
P7	.361	.521	.224	.139	.025
P14	.233	.234	.757	.169	-.012
P28	.435	.056	.689	.120	.215
P27	.429	.048	.625	-.026	.360
P12	.338	.568	.582	.048	-.076
P11	.361	.474	.551	.094	-.084
P13	-.125	.363	.390	.245	.317
P1	.019	.038	.131	.851	.040
P2	.142	-.025	.052	.845	.134
P6	.259	.231	.326	.429	-.111
P22	-.108	.079	.115	.107	.826
P18	.221	.323	.006	-.003	.734

Table 7. The Effect of Item Elimination to the Total Variance

Item Elimination	Results	Total Variance
P6	Communalities P7, P13, P17 < 0,5 Loading Factor P13 < 0,5	66,859%
P6 and P13	Communalities P7, P17 < 0,5 Loading Factor P25 < 0,5	68,170%
P6, P13, P7	Communalities P17 < 0,5 Loading Factor P25 < 0,5	69,153%
P6, P13, P7, P17	Communalities all items > 0,5 Loading Factor P16, P21, P25 < 0,5	70,264%
P6, P13, P7, P25	Communalities P17 < 0,5 Loading Factor all items > 0,5	69,403%
P6, P13, P7, P17, P25	Communalities all items > 0,5 Loading Factor P16, P21 < 0,5	70,553%
P6, P13, P7, P17, P25, P16, P21	Communalities all items > 0,5 Loading Factor all items > 0,5	72,012%

Table 8. Factors and Items Formed

Factors	Items
Factor 1 (24,856%)	Promotion gotten from friends, relatives, kin, family (mouth to mouth). (P3) School fees are proportional to the quality, service, school facilities and infrastructure, etc. (P4) School fees do not exceed the family's planned education budget (P5) Student's progress report (P8) Paying attention to individual potential, interests and talents. (P9) Student development counselling. (P10) Handling student delinquency. (P23) Understanding the diversity of students' abilities. (P24) The readiness of a good distance learning system. (P26)
Factor 2 (19,416%)	Classroom circumstances (P11) Conditions of school facilities (P12)

Factors	Items
	The canteen sells healthy (clean) food and refreshment (P14)
	Learning media (P15)
	There are health workers (P27)
	The optimization of the School Health Unit and its equipment (P28)
	Hygiene facilities (P29)
Factor 3 (11,665%)	Varied Extracurricular (P19)
	Wider ranges of additional activities (P20)
Factor 4 (8,272%)	Through *offline* media *offline* (P1)
	Through *online* media (P2)
Factor 5 (7,802%)	International curriculum or international standard lessons (P18)
	The availability of foreign teacher (P22)

CONCLUSION

Exploratory Factor Analysis (EFA) had been done on the response of 29 item statements regarding the factors which affect parents' decision in choosing schools. The result gained was that the instrument was able to explain 65.711% of the variables studied. However, to further improve the test result, 7 items were reduced. The reduction resulted in an increase in variance up to 6.301%, to 72.012%. The higher the Total Variance, the better the instrument can measure the variables being measured.

There were 5 factors formed based on the Eigenvalues> 1. From the analysis using 29 items to the reduction to 22 points, the number of factors formed was still 5 factors. What changes were the items which were inclined towards these factors. Nevertheless, the 5 factors that are formed from 22 items can be categorized as (1) School Services, (2) Facilities, (3) Additional Activities, (4) Promotion, and (5) International Curriculum.

The Total Variance result obtained indicated that there were still 27.988% that could not be measured from this instrument. For this reason, further research is needed considering the condition during the pandemic still causes a lot of anxiety from parents in choosing a good and safe school for their children.

REFERENCES

[1] Taher, A.P. 2020. "New Normal: Pemerintah Susun Protokol Pendidikan & Transportasi". Tirto News. Terbit 27 Mei 2020. Diunduh dari https://tirto.id/fDaj.

[2] Handoko, Hana. 2020. "Bagaimana Nasib Anak Sekolah ditengah Pandemik Covid-19". *Petisi Online: Change.org*. Diunduh dari https://www.change.org/p/joko-widodo-tunda-untuk-tahun-ajaran-baru-sekolah-selama-pandemik-corona?recruited_by_id=cffb04b0-a025-11ea-869f-5963e688d366&utm_source=share_petition&utm_medium=copylink&utm_campaign=psf_combo_share_initial&utm_term=psf_combo_share_abi

[3] Kotler, Philip. 2003. *Manajemen Pemasaran. Edisi Kesebelas. Jilid 1 dan 2*. Jakarta : PT Erlangga.

[4] Yaacob, N. A., Osman, M. M., Bachok, S. 2015. "An Assessment of Factors Influencing Parents' Decision Making When Choosing A Private School for Their Children: A Case Study of Selangor". *Elsevier: Procedia Environmental Sciences* 28 (2015) 406 – 417.

[5] Murdopo, L. 2013. "Analisis Preferensi Siswa Dalam Memilih Sekolah Madrasah Aliyah di Pulang Pisau". *Jurnal Sains Manajemen.* ISSN, 2302-1411.

[6] Bokings, Agnes J., dkk. 2013. "Faktor-faktor yang Memengaruhi Orangtua dalam Memilih Sekolah TK Bagi Anak". *Jurnal Matematika* Vol. 146 No. 2. ISSN: 1693-1394.

[7] Kristiani, N. 2016. "Faktor-Faktor Yang Mempengaruhi Keputusan Orang Tua Siswa Memilih SD Kasatriyan Surakarta". *Jurnal Manajemen Maranatha*, Vol.16, No.1, November 2016.

[8] Tangkilisan, G., Oroh, S. G., &Soegoto, A. S. 2014. "Bauran Pemasaran Jasa Pendidikan Pengaruhnya Terhadap Keputusan Siswa Dalam Memilih Sekolah Di Smk N 1 Manado". *Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, 2(4).

[9] Rakhmanita, A. 2012. "Pengaruh Harga, Promosi, Lokasi dan Sarana Terhadap Proses Keputusan Memilih Sekolah Pada Sekolah Alam Tangerang". *Widya Cipta,*Vol. VII, No.2 September 2012.

[10] Hair, J. F., Black, W. C., & Babin, B. J. 2010. *RE Anderson Multivariate data analysis: A global perspective*. New Jersey: Pearson Prentice Hall.
[11] Pallant, J. F. 2007. "Development and validation of a scale to measure perceived control of internal states". *Journal of Personality Assessment*, 75(2), 308–337.
[12] Tabachnick, B. G. & Fidell, L. S. 2007. *Using Multivariate Statistics. 5th edition*. Boston, MA: Pearson Education. Inc.
[13] Field, A. 2009. *Discovering Statistics Using SPSS, 3rd Edition*. London: Sage.
[14] *Osborne,* J. W., *Costello, A. B., & Kellow, J.T. 2008. Best Practice in Exploratory Factor Analysis*. London: Sage.
[15] Gaskin, J. 2012. "Exploratory Factor Analysis". *Gaskination's StatWiki*. Diunduh dari http://statwiki.kolobkreations.com
[16] Truong, Y., McColl, R. 2011. "Intrinsic motivations, self-esteem, and luxury. goods consumption". *Journal of Retailing and Consumer Services*, vol. 18, issue 6, 555-561.
[17] Chen, C. F., & Tsai, D. C. 2007. "How Destination Image and Evaluative Factors Affect Behavioral Intentions. *Tourism Management*, 28(4), 1115-1122.
[18] Hulland, J. 1999. "Use of Partial Least Square (PLS) in Strategic Management Research: A Review of Four Recent Studies". *Strategic Management Journal*, vol. 20, no. 2, pp. 195-204.
[19] BASRA (Berita Anak Surabaya). 2020. "Hadapi 'New Normal', Dispendik Jatim Siapkan Skenario Masuk Sekolah". *Kumparan News*: terbit 1 Juni 2020 5:28. (Diunduh dari https://kumparan.com/beritaanaksurabaya/laps us-hadapi-new-normal-dispendik-jatim-siapkan-skenario-masuk-sekolah-1tWQWwWdCOO/full).

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PREDICTING OF READING DIFFICULTIES: COULD IT BE FROM TEACHER KNOWLEDGE OF READING?

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Abstract

Difficulty reading at the beginning is a phenomenon that occurs in almost every school year in elementary schools. One of the allegations of this phenomenon is developing early reading skills carried out by teaching reading. This research was conducted to obtain a description of the teacher's knowledge of the concept of early reading and its teaching procedures. The researcher can 33 schools be accessed of this research, and all teacher teaching reading was being respondent. It is 33 teachers being respondent. All the teachers gave an online questionnaire validated with an expert before. The result is that all the teachers have scored under 60. All the teachers had minimum knowledge regarding reading skills

Keywords: reading difficulties, teacher knowledge

INTRODUCTION

Taboer et al. (2019) found that 15 students from 31 students who indicated by teachers have problems in early reading didn't have difficulties in phonological awareness and visual perceptions. In contrast, Stanovich (2005) (Lyytinen & Erskine, 2016) argues that reading problems became because of phonological awareness. Reading questions became visual perception events. It didn't have a strong correlation (Rochyadi, 2010). On another side, Baylis and Snowling (2011) found that phonological awareness practice, the student with down syndrome, can be read. In reality, we can discover that students with intellectual disabilities can read. It means that IQ doesn't have a strong predictor to be read. The question is, why they can't read?

One's of the reading problems predictor is teaching and curricula (Westwood, 2001). McGuiness (1998) argues that" children fail to learn to read in school because they aren't being taught correctly." Nbina (2012), Nor, Yunus, and Embong (2019) prove that teachers' knowledge contributes to student achievement. It could be a rationale because difficulties in learning could be happening from internal or external factors or both of them. This research aim is to finding teacher knowledge information regarding early reading in elementary school.

Early Reading

Reading is the process of finding information from the text. Before known a message which comes from the text, the reader has to "crack the code." Early reading is converting graphonics symbol to be sound of the language (Lyster, 1999) (Beck & Juel, 2002). Reading is not natural (Lyon, 1997). It is not like the language, which develops naturally. Children can read because of design.

Reading skills has development stages (Chall, 1983). Languages are the first stage to develop in reading development. Awareness of the sound of language to be phoneme is development after that. It develops in conjunction with visual perception. The decoding stage is developed after phonetical awareness and visual perception. In the development of reading, phonological awareness is a critical stage (Lyster, 1999) (Stanovich, 2005). Graphonics symbol is a representative phoneme in visual shapes. Without awareness regarding the segmentation of the word in speech, it will be a struggle for the student.

Reading and Bahasa

Reading is one aspect of language. The visual symbol represented phoneme in the local language. Bahasa, Indonesia, is different from English. Phoneme /x/ and /v/ is not natural in the Bahasa Indonesia event. There is an alphabet in Indonesian letters. It means that there are different principles in the alphabet between English and Indonesian.

Word in Bahasa Indonesia is formed by syllable. It differs from English is formed by phoneme (Soewargana, 1971). Laubach (2013) report that before use alphabets, the Malayan script is used in Malayan-Arabic. Malayan script base on Arabic letters but there is some modification to represent Malayan. According to Laubach (2013) reported that people in Malaya could not read Romans because it is separated.

Teaching Reading

The teaching reading method in Indonesia has many various ways. As an explanation that reading is a partial aspect of language skills. Therefore, a suitable method of teaching reading should be the

imminent characteristic of language itself. Word in Bahasa Indonesia is formed by syllable (Soewargana, 1971). The method of teaching contained language, and the letter is a syllable method. In practically, SAS (Analytic Structure Synthesis) as a method can be combined with the syllable method. Teaching starts from the sentence, split up to be the word, and split up into syllable. The student will be learned of a sequence of the letter which representative of syllable will learn by the student.

METHOD

The research aims are to finding information about teacher knowledge regarding early reading, according to 32 teachers who responded. It means that the result of this research is not to generalization. The instrument for collecting the data is a non-formal instrument. The researcher constructs the instrument from the theory of early reading. The instrument's validity with construct validity consulted with three experts, Bahasa Indonesia, evaluation, and special education.

RESULTS

According to data found, the score of teacher knowledge about early reading is shown in figure 1. The ideal score should be achieved above 50, according to the table.1 there is 25 teacher who has a score below of it. It is mean that 78% teacher has a problem in early reading knowledge.

class	Score	F
1	28 – 33	3
2	34-39	6
3	40-45	9
4	46-51	7
5	52-57	5
6	58-63	3

Figure 1. Score of teacher answer regarding early-reading

Figure 1 shown that 12% or 8 persons who passed the test. But with the maximum score which should achieve in the test is 100, table.1 shows that no one teacher has a score above 2/3 of the test score. It means that no one respondent mastery in early reading. Propitious, All the respondent has a score above 25, and it means that no one teacher hasn't knowledge about early reading. Table title.

DISCUSSION

Teachers' knowledge about the substance of the material and learning methods are important things to have before the teaching and learning process is carried out. These two things are one of the predictors of student learning success. Nor, Yunus, and Embong (2019) found that teacher knowledge of the subject being taught is closely related to the acquisition of student abilities. This was also found by Nbina (2012) that teachers who have knowledge of what is being taught are closely related to the achievement of student abilities.

This condition is directly proportional to reading skills. Teachers who have knowledge of reading skills will essentially affect the success of reading for their students to develop reading skills. However, Westwood (2001) suggests that one of the predictors of students having difficulty reading is the learning process. Although on the other hand, the predictor factor can be caused by the underdeveloped condition of phonological awareness (Stanovich, 2005) and visual perception (Rochyadi, 2010).

Bahasa Indonesia script has a long story. All script that exists in Indonesia in the past was different from letters which use today (Raffles, 2014) (Roza, 2017). Laubach (2013) reports that Malayan people can't if the messages are Romans. This information explains that naturally, Indonesian script is the letters with auxiliary characters (Raffles, 2014) because the word in Bahasa Indonesia formed base on the syllable. From history, we learn that should be differentiation teaching reading in Bahasa Indonesia and English. All the teacher who teaches reading should be known.

Westwood (2001) argue that one predictor is the curriculum. The curriculum is driving teachers to teach what they should have to teach. There is a method in teaching reading in Bahasa Indonesia, which calls the syllable method. But unfortunately, it is not covered in the curriculum of Bahasa Indonesia in elementary school (Kementerian Pendidikan dan Kebudayaan, 2016). It made guidance for the teacher to teach reading, and the teacher will be developing the curriculum if there is something that doesn't cover in the curriculum before.

The question is, why other students can read? Stanovich (2005) argues, is phonological awareness. Children have different developmental times. Development of human being it depends on the social environment on one side (Vygotsky, 1978) (Bronfenbrenner, 1994). According to Stanovich argue, phonological awareness develops in the children depend on the social environment gave learning experiences. Finally, phonological awareness conditions in the children will be different when they enter the school for the first time. The student can read the student who developed their phonological awareness, but the student who has a problem in reading is the student who didn't develop their phonological awareness yet. The teacher must know about it.

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REFERENCES

[1] Taboer, M. A., Kartadinata, S., Rochyadi, E., & Sunardi. (2019). Assessing Students with Reading Problem in Elementary School: A Case Study in 7 elementary Schools. *1st International Conference on Education, Social Sciences and Humanities (ICESSHum 2019)* (hal. 596-600). Padang: Atlantis Press.

[2] Stanovich, K. A. (2005). THE FUTURE OF A MISTAKE: WILL DISCREPANCYMEASUREMENT CONTINUE TO MAKE THE LEARNING DISABILITIES FIELD A PSEUDOSCIENCE? . *Learning Disability Quarterly*, 103-106.

[3] Lyytinen, H., & Erskine, J. (2016). *Early Identification and Prevention of Reading Problems.* University of Jyväskylä, Child Research Centre & Department of Psychology. Quebec: Encyclopedia on Early Childhood Development.

[4] Rochyadi, E. (2010). *Model Pembelajaran Berbasis Kesadaran Linguistik dan Kesadaran Persepsi Visual untuk Meningkatkan Kemampuan Membaca (penelitian pengembangan pada anak tunagrahita di sekolah luar biasa.* Bandung: -.

[5] Baylis, Pamela; Snowling, Margaret J;. (2011). Evaluation of a Phonological Reading Problem for Children with Down Syndrome. *Child Language Teaching and Therapy*, 39 -56.

[6] Westwood, P. (2001). *Reading and Learning Difficulties approach to teaching and assessment.* Victoria: The Australian Council for Education Research Ltd.

[7] McGuiness, D. (1998). *Why children can't read and what we can do about it.* Harmondsworth: Penguin Books.

[8] Nbina, J. B. (2012). TEACHERS COMPETENCE AND STUDENTS ACADEMIC PERFORMANCE IN SENIOR SECONDARY SCHOOLS CHEMISTRY: IS THERE ANY RELATIONSHIP?. *GLOBAL JOURNAL OF EDUCATIONAL RESEARCH*, 15-18.

[9] Nor, N. M., Embong, R., & Yunus, K. (2019). Effects of Teachers' Teaching Competencies on Students' Academic Performance Mediated by Holistic Centered Learning Style Based on SUMUR Program at Secondary Religious Schools. *IJARPED*, 25-38.

[10] Lyster, S.-A. H. (1999). *Learning to Read and Write.* Oslo: University of Oslo.

[11] Beck, I. L., & Juel, C. (2002). *http://citeseerx.ist.psu.edu.* Dipetik September 18, 2017, dari http://citeseerx.ist.psu.edu/viewdoc/: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.463.6197&rep=rep1&type=pdf

[12] Lyon, R. (1997 йил 10-July). Why Reading Is Not Natural Process.

[13] Chall, J. (1983). *Stages of Reading Development.* New York: McGraw-Hill Book Company.

[14] Soewargana, O. (1971). *Pendidikan prasarana dari semua prasarana pembengunan.* Bandung: GANACO N.V.

[15] Laubach, F. C. (2013). *Teaching the World to Read.* New York: Martino Publishing.

[16] Raffles, T. S. (2014). *The History of Java.* (H. Simanjuntak, & R. B. Santosa, Penyunt.) Jakarta: Penerbit Narasi.

[17] Roza, E. (2017). Aksara Arab-Melayu di Nusantara dan Sumbangsihnya dalam Pengembangan Khazanah Intelektual. *Tsaqafah*, 177-204.

[18] Kementerian Pendidikan dan Kebudayaan. (2016). PERATURAN MENTERI PENDIDIKAN DAN KEBUDAYAAN NOMOR 24 TAHUN 2016 TENTANG KOMPETENSI INTI DAN KOMPETENSI DASAR PELAJARAN PADA KURIKULUM 2013 PADA PENDIDIKAN DASAR DAN PENDIDIKAN MENENGAH. Dalam K. P. Kebudayaan. Jakarta: Kemdikbud.

[19] Vygotsky, L. (1978). *Mind In Society the development of higher pschological processes.* Massachusetts: Harvard University Press.

[20] Bronfenbrenner, U. (1994). Ecological Model of Human Development. *International Encyclopedia of Education.*

E-CALCULUS: DEVELOPMENT OF ONLINE-BASED CALCULUS TEACHING MATERIAL

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Abstract

At the time of the Covid-19 pandemic, online learning became the only alternative learning model that was relevant and safe to implement. Previously, the Indonesian government has also start to direct learning towards an online model. However, one of the problems in the online learning process is the lack of teaching materials availability that can be accessed online, especially quality teaching materials. The shortage of teaching materials is one of the reasons for not optimal online learning in Indonesia at this time. The purpose of this paper is to develop calculus teaching materials based on online learning (e-calculus) to optimize online mathematics learning in calculus material. The e-calculus process of developing uses research and development (R&D) method with stages: 1). data collection; 2). teaching material design; 3). development of teaching materials; 4). tests, evaluations, and revisions; 5). implementation. The results indicate that e-calculus teaching materials are valid, effective and practical so that it can be used as an alternative to online learning teaching materials in Calculus courses.

Keywords: Calculus- Online learning, Teaching material

INTRODUCTION

Online learning in Indonesia begin with the Indonesia open and integrated online learning program (PDITT) in 2014 by Budiono, the vice president of the Republic of Indonesia at that time. After that, on September 18 2018 the program changed its name to the online learning system (SPADA) with the aim of improving the quality of online learning and as a means of equitable quality education throughout Indonesia [1].

SPADA is a program of the Indonesian government through the ministry of education and culture (Kemendikbud) to face the era of the industrial revolution 4.0 in the field of higher education. One of the factors that can optimize the program is by providing teaching materials that can be accessed and used online. Teaching materials are a collection of learning resources that support the learning process in the form of printed or audio-visual materials. Teaching materials include modules, student worksheets, brochures, videos, pictures, interactive CD, or internet-based teaching materials [2].

Technology-based teaching materials reflect the progress of education and bring benefits to the learning process. The use of teaching materials also has a direct effect on the realization of educational goals in the learning process, including making students more interested in the material, more active, can do a lot of exercises according to the quality of individual students, improve learning outcomes, experience contextual learning, provide opportunities to collaborate, critical thinking, and improve problem-solving abilities [3]. Furthermore, internet-based teaching materials can improve students' additional skills including analysis, technology, presentation, and communication [4]. Based on Lestari [5], one of the positive effects of the use of teaching materials is that teachers will have more time to be able to guide students during the learning process and help students to improve their independent learning skills by acquiring new knowledge from various sources or references on the teaching materials used. As a result, learning will focus on students not only on teachers.

The development of an era that develops internet-based and robotic information technology with the theme of industrial revolution 4.0, the learning process should be carried out anywhere and anytime via the internet [6]. Internet users at the youth level currently reach 98 percent, meaning that almost all teenagers in Indonesia can use the internet [7]. The development of electronic-based teaching materials has been carried out before by several researchers, one of which is the development of GeoGebra-based electronic teaching materials by Amri [8] with test results showing that the teaching material can effectively improve student learning outcomes on integer material compared to conventional models with comparisons mean 70 and 61.43. In addition, teaching materials with the help of flipbooks can also improve problem solving skills with an increase of up to 92.9%. Teaching materials with the help of flipbooks also get good responses based on students' perceptions with a percentage of 74.05% for very good and good statements using

the Likert Scale [9]. In addition, electronic teaching materials can also help students with disabilities to learn numbers as is done by Saputra and Febriyanto [10] by developing multimedia-based teaching materials through an Android application for mentally retarded people about recognizing numbers from 1 to 100 and calculating 1 to 20. The test results showed that students with mental retardation became more enthusiastic and active in learning numbers.

In this paper, the author tries to explain the development of calculus teaching materials that can be accessed online. The teaching material is made using blog media via www.math-tekno.blogger.com page. The advantages of this teaching material apart from being accessible online can also be integrated with other relevant media such as links that link material with other relevant sources, videos that can be accessed directly while reading material, simulations on interactive functions using GeoGebra's help, and evaluation interactive online.

METHOD

The method in this study uses a type of research and development (R&D). The R&D research method is used to produce a product by testing the validity, practicality, and effectiveness of the product [11]. The development of teaching materials in this study was carried out by adopting the development of the Plomp model in Ahmar and Rahman [12] as follows:

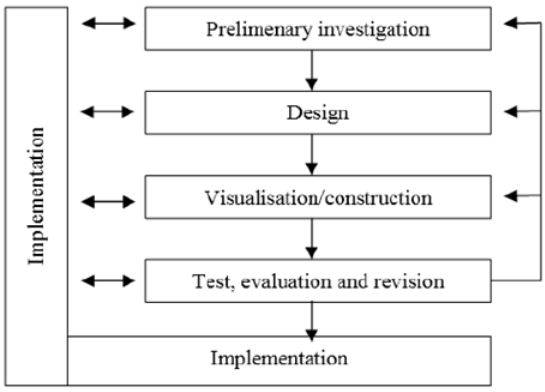

Figure 1. Plomp R&D Research Design

The following is an explanation of the Plomp R&D research design:

a. Data collection (case study)
   The first step in developing online teaching materials starts from collecting data about problems in online learning and choosing relevant solutions to overcome these problems so that online learning can run optimally.
b. Design of Teaching Materials
   The next step is designing teaching materials.. The product standards used to ensure that this teaching material is suitable for use refer to Nieveen's standards in Rusnilawati & Gustiana [9] which are valid, practical, and effective.
c. Development of Teaching Materials
   This online calculus teaching material is equipped with interactive media to make it easier for users to simulate calculus material. The material will also be complemented by GeoGebra software, a video linked to YouTube, and online evaluations via online quizzes.
d. Test, Evaluation, and Revision
   The last stage is content testing. Content testing was carried out by several expert validators including content experts and experts in the field of online learning medi. Decisions on the feasibility of teaching materials can be implemented according to Widoyoko's standards in Rusnilawati & Gustiana [9] as follows:

Table 1. Criteria for Feasibility Testing of Teaching Materials

Score	Score Interval	Category
A	$X > \bar{X}_i + 1.8\ sb_i$	Very Good
B	$\bar{X}_i + 0.6\ sb_i < X \leq \bar{X}_i + 1.8\ sb_i$	Good
C	$\bar{X}_i - 0.6\ sb_i < X \leq \bar{X}_i + 0.6\ sb_i$	Enough
D	$\bar{X}_i - 1.8\ sb_i < X \leq \bar{X}_i - 0.6\ sb_i$	Less
E	$X \leq \bar{X}_i - 1.8\ sb_i$	Very Less

Information: $\bar{X}_i$ = average ideal score = $\frac{1}{2}$ (maximum score + minimum score), sb_i= ideal standard deviation = $\frac{1}{6}$ (maximum score – minimum score), X = actual score. Teaching materials are categorized as feasible if they meet the valid criteria with a minimum category of good quality score.

RESULTS

There are two research results in this paper including: 1) an overview of e-calculus as an online-based calculus teaching material with the help of GeoGebra; 2) the results of the validity test were carried out by two experts, material experts and online learning media experts.

Overview of E-Calculus

The beginning of E-Calculus. This teaching material is developed with online learning standards and contains material descriptions, general objectives (graduate learning outcomes), and specific goals (course learning outcomes). In addition, e-calculus teaching materials also contain a list of references that can be used by students to study Calculus material in depth. The initial view of e-calculus teaching materials contained on figure 2.

The purpose of having learning outcomes and learning indicators is so that users can find out what competencies can be achieved after learning calculus material using e-calculus and can also measure their learning achievement.

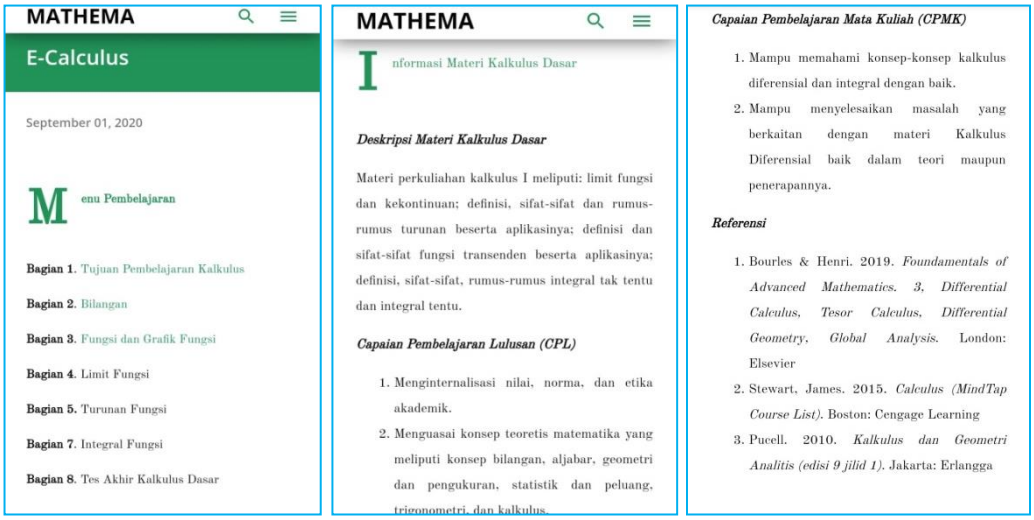

Figure 2. Initial view of E-Calculus

E-Calculus Content Section. The content on e-calculus consists of basic calculus materials including; numbers, functions and their graphs, function limits, function derivatives, and function integrals. The delivery of this material on e-calculus, apart from being explained in a descriptive narrative, is also assisted by several interactive media including GeoGebra software in order to describe functions in real time, besides that there are also videos embedded from YouTube so that they can be accessed directly on teaching materials. The video serves to help the narrative explanation so that it is easier for users to understand. Figure 3 is an overview of how content or content displays on e-calculus.

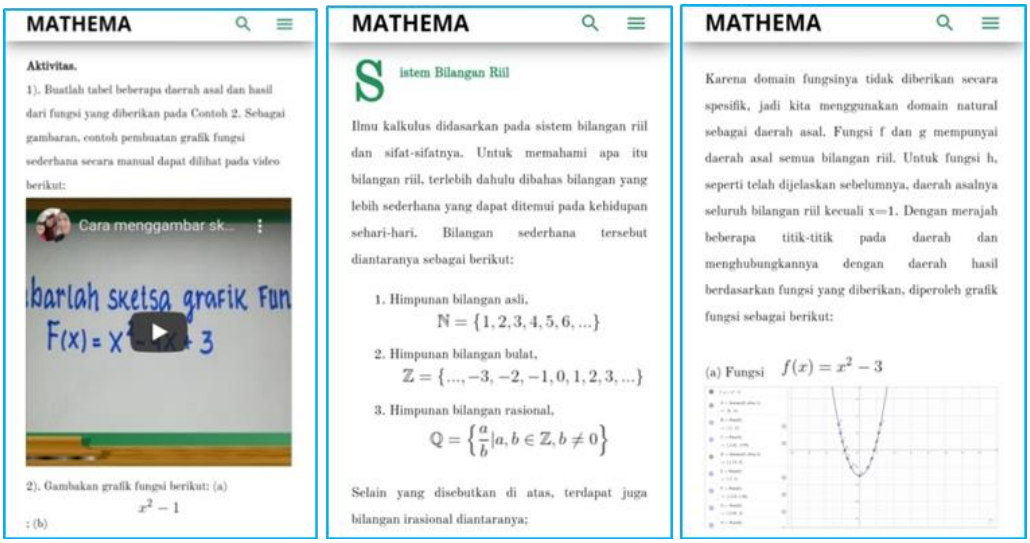

Figure 3. Display of E-Calculus Content

E-Calculus Evaluation Section. The last part of this calculus online teaching material is evaluation with the aim of increasing students' understanding and adding experience in solving basic calculus problems. In general, evaluation on e-calculus consists of activities contained in the sub-material to provide experience to students, and exercises per material to test and improve readers' understanding. The following is an overview of the evaluation section on the e-calculus material containded on figuer 4.

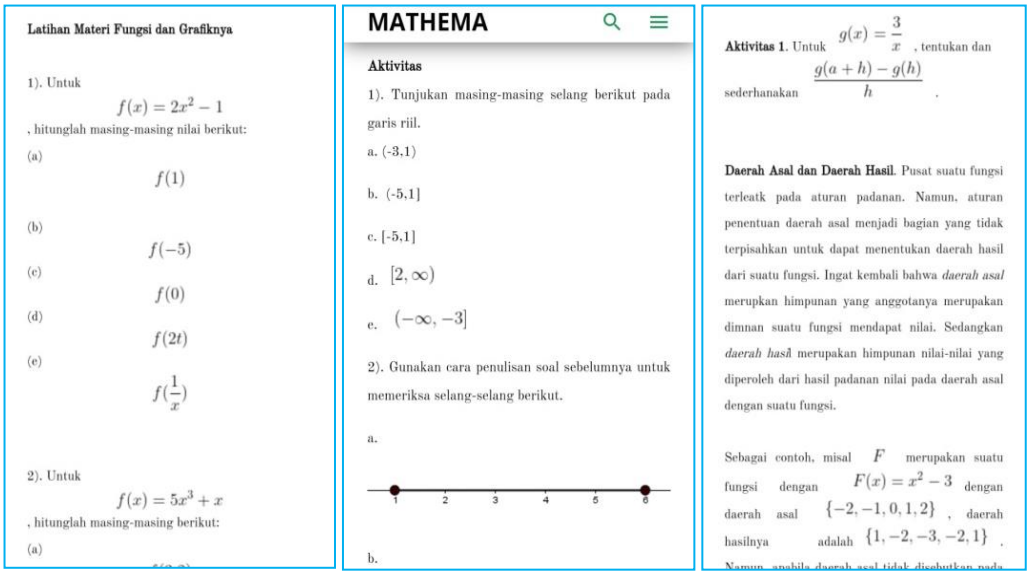

Figure 4. Display of E-Calculus Evaluation

Validity of E-Calculus

E-Calculus has been tested on material experts and online learning media experts. The test aims to check the validity of e-calculus as a teaching material before it can be implemented in practitioners or students as online-based calculus teaching materials. The validity questionnaire instrument consisted of 18 statements with four assessment indicators among them; material substance, learning design, visual communication display, and media utilization. In addition, there are also two open questions regarding strengths and weaknesses as well as suggestions for improvement or development of e-calculus in the future.

The following is a table of criteria for testing the validity test based on an assessment make by two experts regarding online-based calculus teaching materials:

Table 2. Criteria for Feasibility Testing of E-Calculus Teaching Materials

Score	Scor Interval	Category
A	$X > 4.6$	Very Good
B	$4.2 < X \leq 4.6$	Good
C	$3.8 < X \leq 4.2$	Enough
D	$3.4 < X \leq \bar{X}_i - 0.6\ sb_i$	Less
E	$X \leq 3.4$	Very Less

The results of the e-caculus validity test based on the results of the two packets test got the actual value = X = 4.7. This means that based on table 2, the validity of the online-based calculus teaching materials has a very good quality result value. Based on Widoyoko's assessment standards in Rusnilwati & Gustiana [9], e-calculus teaching materials or online-based calculus teaching materials are considered feasible to be implemented in students to measure their practicality and effectiveness.

Table 3 shows the distribution of e-calculus validity assessments per indicator:

Table 3. Distribution of E-Calculus Validity Scores per Indicator

No	Idicator	Average Score
1	Learning Subtance	4.63
2	Learning Design	4.90
3	Visual Communication Display	4.67
4	Media Utilization	4.50
Average		4.70

Based on table 3, the highest mean lies in the learning design indicator with a mean score of 4.90 and the lowest is on the media utilization indicator with an average score of 4.50. This is the author's attention to make improvements to e-calculus in order to produce a significant effect on improving students' understanding and learning outcomes of calculus. In addition, this revision is also expected to increase the mean score of e-calculus validity.

DISCUSSION

Based on the results of the validity test, it shows that e-calculus is valid and feasible to be implemented and further testing its practicality and effectiveness. But before that, there are several things that need to be improved in e-calculus based on the assessment of the validation questionnaire that has been filled in by material experts and

online learning media. The assessment on the questionnaire with closed statements on the four indicators resulted in several notes, including: 1). e-calculus gets the lowest score on the media utilization indicator. Therefore, it is necessary to improve the use of media by optimizing some parts of the teaching material so that the media can be inserted as a tool to explain the material so that students understand the material more easily. One of the tools that can be optimized is GeoGebra, with the GeoGebra program, abstract geometric objects can be visualized and manipulated quickly, accurately, and efficiently [13]. In addition, according to Machromah et al. [14] stated in the results of their research that learning calculus with GeoGebra can make students focus on material, namely integral; 2). an assessment of the material substance indicators also needs to be considered, so there needs to be a deepening of the material on e-calculus. The depth of the material becomes an important element so that the benefits of the material can be felt by students and can be applied in real life. Even though the learning process is carried out online or with blended learning, learning outcomes can still be optimized. Based on research by Ulfa & Puspaningtyas [15] that the online learning process using the blended learning method is effective in improving concept understanding and can improve student learning outcomes.

Furthermore, based on the results of open-ended questions given by experts who assess e-calculus regarding the strengths, weaknesses, and suggestions of this online-based calulus teaching material, it produces some important notes. Based on calculus material experts, e-calculus teaching materials need improvement in adding content regarding the application of calculus material in everyday life and its benefits. This is considered very important, considering that the content on e-calculus is a basic calculus that can be used by practitioners of all majors, so it is hoped that this e-calculus can be of great use to practitioners or students in engineering and economics majors. In addition, based on the assessment of online learning media experts, e-calculus needs to experience improvements in terms of online learning design. Media experts suggest that e-calculus can improve the layout of teaching materials to make them simpler and more attractive to practitioners. Considering that e-calculus is an online-based teaching material, media experts suggest giving more media space to the teaching material.

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REFERENCES

[1] _____. *Sistem Pembelajaran Daring (SPADA)*. https://spada.kemendikbud.go.id/sistem-pembelajaran-daring/. Las accesded on 26 November 2019.

[2] Maulydia, S.S. dkk. The Develpoment of Mathematics Teaching Material Through Realistic Mathematics Education to Increase Mathematical Problem Solving of Juniro High School Students. *International Journal of Advance Research and Innovative Ideas in Education*, 3(2): 2965-2971, February 2017 .

[3] Koparan, T. Analysis of Teaching Materials Developed by Prospective Mathematics Teachers and Their Views on Material Development.. *Malaysian Online Journla of Educational* Technology, 5(4): 8-28, October 2017.

[4] Busljeta, R. Effective Use of Teaching and Learning Resources. *Czech-Polish Historical and Pedagogical Journal*, 5(2): 55-69, November 2013.

[5] Lestari, I. Pengembangan Bahan Ajar Berbasis Kompetensi. Akademi Pertama: Padang, 2012.

[6] Maskar, S. & Anderha, R.R. Pembelajaran Transformasi Geometri dengan Pendekatan Motif Kain Tapis Lampung. *Mathema: Jurnal Pendidikan Matematika*, (1): 40-47, July 2019.

[7] Dewi, P.S. & Sintaro, S. Mathematics Edutainment dalam Bentuk Aplikasi Android. *Triple S (Journals of Mathematics Education)*, 2(1), 1-11, October 2019

[8] Amri, M. 2018. Pengembangan Bahan Ajar Elektronik Berbasis Geogebra dengan Model Penemuan Terbimbing pada Materi Bilangan Bulat. *Prosiding Seminar Nasional Matematika, PRISMA*: 792-795. Universitas Negeri Semarang. Ocotber 21, 2017:

[9] Rusnilawati & Gustiana, E. Pengembangan Bahan Ajar Elektronik (BAE) Berbantuan Flipbook berbasis Keterampilan Pemecahan Masalah dengan Pendekatan CTL pada Pembelajaran Matematika Kelas V Sekolah Dasar. *Jurnal Profesi Pendidikan*, 4(2): 190-201, December 2017

[10] Saputra, V. H. & Febriyanto, E. Media Pembelajaran Berbasis Multimedia untuk Anak Tuna Grahita. *Mathema: Jurnal Pendidikan Matematika*, 1(1): 15-23, July 2019.

[11] Hikmah, Y.P. & Maskar, S. Pemanfatan Aplikasi Microsoft Powerpoint pada Siswa SMP Kelas VII dalam Pembelajaran Koorditat Kartesius. *Jurnal Ilmiah Matematika Realistik*, 1(1): 15-19, June 2020.

[12] Ahmar, A.S. & Rahman, A. Development of Teaching Material using an Android. Global *Journal of Engineering Education*, 19(1): 72-76, February 2017

[13] Japa, N. et al. Media GeoGebra dalam Pembelajaran Matematika. International *Journal of Natural Science and Engineering*, 1(2): 40-47, 2017.

[14] Machromah, I.U. dkk. Learning Calculus with GeoGebra at College. *Proceeding International Conference on Mathematical Analysis, its Applications and Learning*: 1-11. : Universitas Sanata Dharma Yogyakarta. November 27, 2018

[15] Ulfa, M. & Puspaningtyas, N. D. (2020). The Effectiveness of Blended Learning using Learning System in Network (SPADA) in Understanding of *Mathematical Concept. Matematika dan Pembelajaran*, 8(1): 47-60, June 2020.

DEVELOPMENT OF OCEAN THEMED STEM LEARNING MATERIALS FOR MIDDLE SCHOOL SCIENCE LEARNING

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Abstract

STEM as a science learning innovation is still relatively new for teachers. Hence, it is necessary to develop learning materials as teaching guidelines. This research aims to develop a learning material on environmental pollution, stated as feasible and practical by expert and teacher judgment. This product is used to enhance the student's critical thinking and ocean literacy. It is a Research and Development (R & D) that adapts eight stages of the Borg & Gall development model. Product consist of the syllabus, lesson plans, student worksheets, and assessment instruments. The feasibility and practicality data obtained from the questionnaire filling by experts and science teachers. This study showed that 1) products are feasible and practical; 2) the readability of student worksheets are in the category of Very Good (3.2); 3) the average percentage of the learning implementation is 90%, and 4) there are 9 items from a total of 14 items of critical thinking test items that are declared valid and reliable (0.82) based on empirical tests on 250 students.

Keywords: *learning materials, STEM, critical thinking, ocean literacy, environmental pollution*

INTRODUCTION

The vast advancement of technology has resulted in the emergence of a need for new skills that must be possessed by workers. The demand for new skills urges changes in education, including changes in the science teaching process (Bybee, 2013, pp. 34–40). In the past, science's learning goals are to emphasize the knowledge aspect by giving modified class setting problems to students; on the contrary, now the learning goals of science emphasize the process aspect by giving real-world problems in class to be solved to students (Bybee, 2014, p. 217). Besides that, the science learning process also changes to be integrated not only between science-related disciplines but also other fields. The teaching process science like this is known as STEM learning (Kelley & Knowles, 2016, p. 2) which aims to form a STEM literate. There are four characteristics of a STEM literate:

1. Gaining STEM knowledge and using it to identify the related issues,
2. Having good understanding about characteristic, features and processes each STEM disciplines
3. Recognizing the role of STEM disciplines for society.
4. Captivating about STEM-related issues and with the ideas of STEM which reflect as concerned, affective, and constructive citizens (Bybee, 2010, p. 31)

STEM learning has characteristics, including the material provided related to problems in the real world, doing many hands-on activities, and emphasizing process engineering design. By giving real-world issues, students are taught to think critically and creatively. Hands-on STEM activity facilitates students to work together and improve their communication skills. Therefore, STEM is seen as an innovation in science learning to train 21st-century skills to students (Stehle & Peters-Burton, 2019, p. 12).

Critical thinking as part of the 21st-century skills (Franco et al.,2014, p. 2) is still relatively low (Nuryanti et al., 2018, p. 158). STEM learning is an innovative way to instill student's critical thinking (Soros et al., 2018, p. 7). Ardianti et al. (2020: 29) conducted a study with students in rural area. The study results indicated the treatment group who received instructional STEM activities performed in critical thinking compared to control group. STEM combined with learning model 5E learning cycle give positive impact to students critical thinking (Duran & Şendağ, 2012, p. 247). A recent study of Mutakinati et al. (2018: 61) stated that by designing a wastewater could improve critical thinking of middle school students.

In the context of educational literature, critical thinking is a cognitive ability that can be trained (Franco et al., 2014, p. 6; Halpern, 2014, p. 14) and is closely related to science learning (Osborne, 2014, p. 57). Critical thinking is needed by a scientific literate to make decisions in their daily life (Vieira & Tenreiro-vieira, 2014, p. 667). The ability to make decisions is one of the important factors influencing environmental conservation.

One of the real-world problems that students must know from an early age through STEM is environmental damage that threatens human existence. The sea is one of Earth's largest ecosystems, which has various problems, including marine debris, microplastics, and ocean acidification. Ocean literacy is an essential aspect that must be possesed by students in order to conserve the sea (Ghilardi-Lopes, Kremer, & Barradas, 2019, p. 5). Someone who is ocean-literate will always intend to make wise decisions regarding his/her daily activities by considering its impact to ocean (Uyarra & Borja, 2016, p. 1). Recent studies found that STEM can improve student's ocean literacy (Brill et al.2019, p. 241; Weiss & Chi, 2019, p. 27).

The national curriculum of Indonesia supported STEM education (Suwarma & Kumano, 2019, p. 5). Teachers also have a positive perception of STEM (Nugroho et al., 2019, p. 420). However, this does not mean that the implementation of STEM in Indonesia is without obstacles. Teachers were still constrained by the learning facilities in school and STEM teaching guidelines. Therefore, it is necessary to developed learning materials in STEM for science learning. The learning materials can be as guidelines for a teacher to achieve learning goals. There are various ways of applying STEM to science learning. STEM can be used as a learning approach and then combined with different learning model.

The purposes of this research is to develop science learning materials, especially for the topic of marine pollution. learning materials developed are based on STEM which are combined with different learning models such as discovery learning (Hapizoh, 2019), learning cycle 5E (Ahmad et al.,2018; Dass, 2015), and project-based learning (Capraro & Slough, 2013).

METHOD

It is a Research and Development (R&D) that adapted the development model by Borg & Gall. The procedure of this research can be seen in Figure 1.

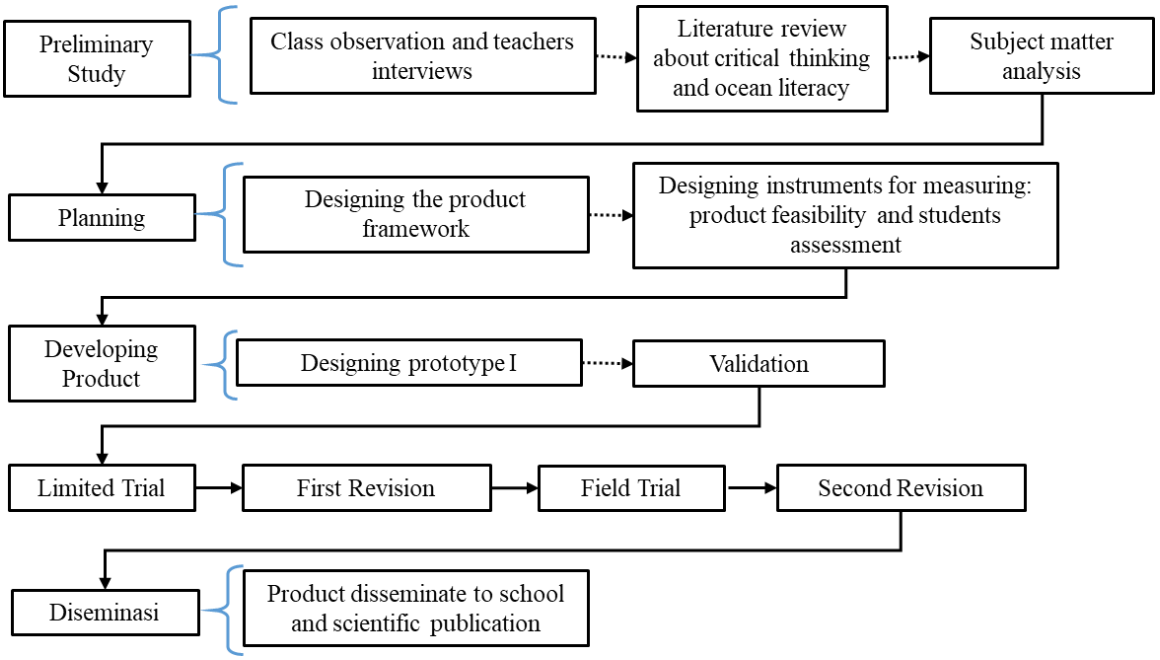

Figure 1. The research procedure

The learning instruments developed in this study consist of: the syllabus, lesson plans, student worksheet, and assessment instrument. There are three data obtained in this study: 1) data on the feasibility by expert judgement and practicality by teacher judgement; 2) data of worksheet readability; and 3) the percentage of learning implementation, and 4) data assessment empirical validation

The product feasibility data (syllabus, lesson plan, and student worksheet) is measured by giving a questionnaire to two expertise. The practicality data obtained from three science teachers. The questionnaire is in the form of a dichotomous statement. Each product has a number of different aspects and items (see Table 1). The product rating score is determined by the number of ticks in *Yes* column for each item. Futhermore, the product is declared valid based on the calculated percentage value referring to Arikunto (2011: 235).

Table 1. Feasibility criteria of products

Product	Aspect (n)	Item (n)
Syllaby	1. Syllaby identity 2. Conformity with KI (Core Competency) 3. Conformity with KD (Basic Competency) 4. Subject matter 5. Learning activities 6. Conformity with IPK (Achievement Competency Indicator) 7. Assessment aspect 8. Time allocation 9. Learning Sources	16
Lesson plan	1. Lesson plan features 2. Conformity with KI (Core Competency) 3. Conformity with KD (Basic Competency) 4. Conformity with IPK (Achievemen Competency Indicator) 5. Learning objectives 6. Subject matter 7. Time allocation 8. Pedagogical aspect 9. Learning media 10. Learning activities 11. Assessment aspect 12. Learning Sources	30
Student worksheet	1. Didactic 2. Technical 3. Construction	20

The worksheet readability data is obtained from the results of the readability questionnaire by the students. The questionnaire consist of 18 item which given to 18 students. They were chosen purposively by their ability category (low-middle-high). The completeness of learning process was measured based on two observer judgement for each meeting. The assessment empirical validity from test results of 250 students, and data was analyzed using Anates v.4. The students responses about the products was measured by calculating the score of questionnaire which given to students after the study. The questionnaire consist of 18 items which has positive and negative statement.

RESULTS AND DISCUSSION

The learning materials developed to drill ocean literacy and students' critical thinking skills in 7th grade when studying environmental pollution. The learning objective of these products are to achieve KD (basic competency) 3.8 and KD 4.8 of the national curriculum. There are five critical thinking indicators and seven ocean literacy aspects of these learning materials, as shown in Table 2.

Table 2. Indicator/aspects of critical thinking and ocean literacy

Component	Aspect/Indicator
Critical Thinking	1. Analyzing 2. Inferring 3. Evaluating 4. Explaining 5. Interpreting
Ocean Literacy	P1 Marine characteristics and its components P2 The sea is the constituent of the Earth. P3 Oceans and climate change P4 The role of the sea for humans P5 Biodiversity in ocean P6 Ocean and human are interconnected P7 Ocean in largely unexplored

Product feasibility and practicality

The feasibility and practicality of the learning instruments, i.e., lesson plan, syllabus, and worksheet, are assessed by experts and science teachers, respectively. The detailed information about it can be seen on this table below.

Table 3. Feasibility and practicality of products

Product	Expert and Practitioner Judgement (%)					Average	Category
	1	2	3	4	5		
Syllaby	100	98	98	98	100	98,8	Feasible
Lesson Plan	98	96	98	98	96	97,2	Feasible
Student Worksheet	100	96	98	96	94	96,8	Feasible

Learning implementation

The learning implementation percentage data using the STEM-based marine theme science learning instruments can, as shown in Figure 2., which stated that the learning process using the STEM-based marine theme science learning instruments has been successfully implemented.

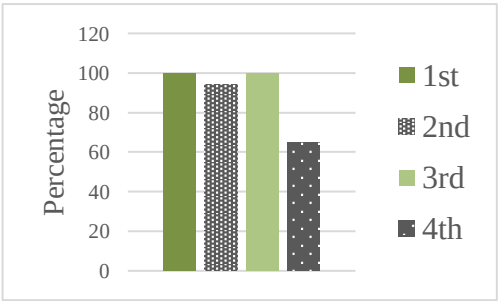

Figure 2. Percentage of learning implementation

Worksheet readibility

Table 4. Worksheet readability

	Aspects	Mean
1.	STEM Content	3.3
2.	Ocean Literacy Content	3.7
3.	Additional component	3.0
4.	Language aspects	3.1
5.	Font type and size	2.9
6.	Size and quality of the picture	3.1
7.	Layouting	3.0
Total		3.2
Category		**Very Good**

Table 4 showed that students' average score of the worksheet readability is in a Good category, with a score of 3.2 of 4.0 as maximum score.

Assessment validation

The ocean literacy test is not given empirical validation because the items used were adapted from previous research. This tes was conducted for measuring critical thinking, which forms an essay test. The test is given to 250 grade eight students from SMPN 1 Kretek, SMPN 2 Kretek, and SMPN 1 Sanden Yogyakarta. The data was analyzed using Anates v.4. Of 14 question items, nine items were declared valid, as shown in Table 5.

Table 5. Assessment Validity

No	R	Difficulty	Correlation
1		Low	0.515
2		Moderate	0.672
3		Moderate	0.521
4		Moderate	0.624
5	0.82	Moderate	0.512
6		Moderate	0.504
7		High	0.489
8		Low	0.561
9		Moderate	0.577

DISCUSSION

The product feasibility test stated that the learning materials consisting of the syllabus, lesson plan, and worksheet are categorized as feasible (see Table 3) to be used for the learning process on environmental pollution topics based on expert judgment and teachers as practitioners. The assessment instrument products for measuring critical thinking are also declared valid by empirical test (see Table 4). The syllabi and lesson plan in this learning materials are developed according to the Ministry of Education and Culture Regulation No. 22 of 2016, while the student worksheet is developed by taking into account the three worksheet quality requirements, i.e., didactic, constructive, and technical. The learning activities consist of four meetings with different STEM activities and different learning models are used at each meeting. Discovery Learning (Hapizoh, 2019), learning cycle 5E (Ahmad et al.,2018; Dass, 2015), and project-based learning (Capraro & Slough, 2013) models can be integrated with STEM as other studies have done so. The learning process is complemented by the practicum worksheet, which

serves as a guide for student activities. The learning process takes three weeks. The details of the STEM activities and a description of the STEM frameworks are explained in Table 6.

This learning materials used ocean-themed and focus on its polution. Previous study stated that learning materials using specific themes can improve student learning outcomes (Ningsih et al.,2013; Saleha et al.,2014). The marine theme used is objects that are near or around the students from the coast. The study object that can be found in students' daily lives makes learning more meaningful because it is taught contextually (King & Henderson, 2018).

Table 6. Learning activity

Meeting	Activity	Ocean Literacy Principles	Critical Thinking Indicators	STEM Framework	
1st Discovery	Making the ocean in a bottle	P1, P5, P6	Analyzing Explaining Inferring	S	▪ Ocean features, marine debris ▪ Concept of pollution and pollutant
				T	Generating idea to reduce marine debris
				M	Calculating the velocity of plastic dispersion in the ocean and the extent of the closure of ocean areas by plastics
2st Learning Cycle 5E	Making a watershed	P2, P3, P4, P6	Analyzing Interpreting Evaluating Explaining	S	Ocean circulation or biogeochemical cycle (heat, carbon, water)
				E	Building a watershed
				M	Geometry – net of solid
3st Discovery	Investigating the ocean acidification	P4, P3, P5 P6	Analyzing Evaluating Explaining	S	▪ Ocean acidification ▪ Air pollution (global warming) ▪ ocean circulation biogeochemical cycle (heat, carbon, water)
				T	pH indicator
				E	Conduct an experiment
4st Project-based learning (PBL)	Making a water garbage truck	P3, P6, P7	Analyzing Interpreting Evaluating	S	Ocean pollution
				T	Garbage truck
				E	Building a garbage truck
				M	Calculate the design (measurement and geometry).

Ocean pollution is a real-world environmental problem that students will face in the future as part of the community. Ocean environment problems given in the form of STEM activities can increase students' environmental awareness. Activities that are directly observed and investigated by students make them aware of the role of the ocean for humans.

The first STEM activity that was conducted by students is made an ocean in bottle. Students make two bottle to compare sea condition that have not and been polluted. In the first bottle the students made healthy ocean while in the second made a polluted sea which given pollutans (plastics and oil waste). This activity encouraged students to get to know the concept of microplastics. Based on the pretest results, it is known that 76% students did not know yet that plastics can be degraded by light into small pieces. Anderson et al. (2016) and Henderson & Green (2020) found the same result of their study, which stated that people knowledge about microplastic is still low. In this activity, students also instill to think analytically by answering the worksheet assignment (see Figure 3). By this activity, Students were taught about the concept pollution and learn about ocean diversity.

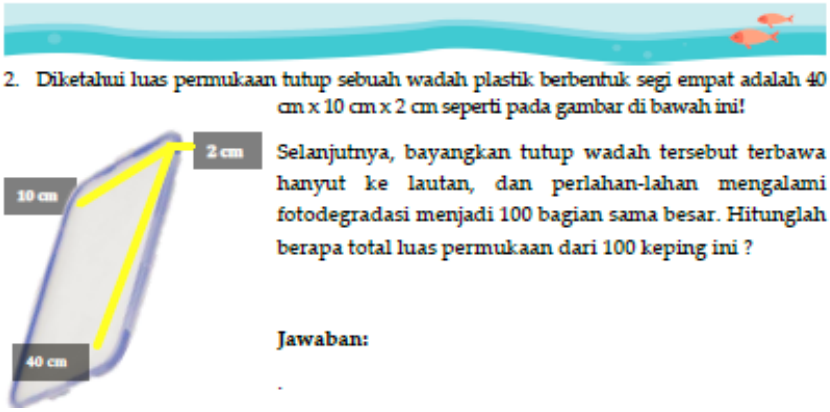

Figure 3. Sample question in student worksheet

The second meeting, students was made a watersheds. They learn about the concept of water cycle and taught about the fact that all objects or substances that are disposed carelessly from whatever origin will end up in the ocean. This certainly gives the students an understanding that wherever they come from (even though they are far from the coast) can have an impact on the marine ecosystem. It is expected that these activities build students' awareness not to litter. The third meeting, students conducted experiments related to ocean acidification. Students are invited to apply the acid-base concept that has been studied previously. At the fourth meeting, students were encouraged to design solutions by building a garbage collection machine that could operate on water. These four activities are carried out to encourage students to care for the sea. Anderson et al.(2016) stated that by giving people direct experience of polluted ocean could motivate them to take action. Uyara explained that our knowledge about environemtn related to our behavior to conserve it. By giving this all activity student instill to think critically toward their environment, drill to make a wise decision in all his/her daily activity, increase their awarness of ocean conservation, and having understanding about the ocean's vital role and vice versa which are indicated theirs as an ocean literate and critical thinker.

CONCLUSION

Based on the research and discussion, the following conclusions were obtained: *First*, there is an urgency to develop STEM learning tools needed by teachers as guidelines in teaching. *Second*, STEM learning can be provided through learning with specific themes and can be combined with different pedagogical learning models. *Third*, the research product of STEM-based marine science learning materials is declared valid and ease for use in learning environmental pollution topic for grade VII Junior High School students.

ACKNOWLEDGEMENT

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REFERENCES

[1] Ahmad, A. M., Yakob, N., & Ahmad, N. J. (2018). Science, technology, engineering and mathematic (STEM) education in Malaysia: Preparing the pre-service science teachers. *Journal of Natural Science and Integration*, *1*(2), 159. https://doi.org/10.24014/jnsi.v1i2.6595

[2] Anderson, A. G., Grose, J., Pahl, S., Thompson, R. C., & Wyles, K. J. (2016). Microplastics in personal care products : Exploring perceptions of environmentalists , beauticians and students. *MPB*. https://doi.org/10.1016/j.marpolbul.2016.10.048

[3] Ardianti, S., Sulisworo, D., Pramudya, Y., & Raharjo, W. (2020). The impact of the use of STEM education approach on the blended learning to improve student's critical thinking skills. *Universal Journal of Educational Research*, *8*(3 B), 24–32. https://doi.org/10.13189/ujer.2020.081503

[4] Arikunto, S. (2011). *Prosedur penelitian : suatu pendekatan praktik* (6th ed.). Jakarta: Rineka Cipta.

[5] Brill, C. H., Lawrence, L., Nuss, S. M., Cackowski, C., & Sharpe, K. (2019). Out of the Tower and into the Classroom: Marine Science Graduate Students as K-12 Classroom Contributors. In G. Fauville, D. L. Payne, M. E. Marrero, A. Lantz-Andersson, & F. Crouch (Eds.), *Exemplary Practices in Marine Science Education: A Resources for Practitioners and Researchers* (1st ed., pp. 241–256). Switzerland: Springer International Publishing.

[6] Bybee, R. W. (2010). Advancing STEM Education: A 2020 Vision. *Technology and Engineering Teacher*, *70*(1), 30.

[7] Bybee, R. W. (2013). *The case for STEM education: Challenges and opportunities*. Arlington: NSTA Press.

[8] Bybee, R. W. (2014). NGSS and the next generation of science teachers. *Journal of Science Teacher Education*, *25*(2), 211–221. https://doi.org/10.1007/s10972-014-9381-4

[9] Capraro, R. M., & Slough, S. W. (2013). Why PBL? why STEM? why now? an introduction to STEM project-based learning: An integrated science, technology, engineering, and mathematics approach. In R. M. Capraro, M. M. Capraro, & J. R. Morgan (Eds.), *STEM Project-Based Learning an Integrated Science, Technology, Engineering, and Mathematics (STEM) Approach* (2nd ed., pp. 1–6). Rotterdam: Sense Publisher. https://doi.org/10.1007/978-94-6209-143-6

[10] Dass, P. M. (2015). K-12 STEM Education. *K-12 STEM Education*, *1*(1), 5–12. https://doi.org/10.4018/978-1-5225-3832-5

[11] Duran, M., & Şendağ, S. (2012). A preliminary investigation into critical thinking skills of urban high school students: Role of an IT/STEM program. *Creative Education*, *3*(2), 241–250. https://doi.org/http://dx.doi.org/10.4236/ce.2012.32038

[12] Franco, A. H. R., Butler, H. A., & Halpern, D. F. (2014). *Teaching Critical Thinking to Promote Learning*. (D. S. Dunn, Ed.), *The Oxford Handbook of Undergraduate Psychology Education*. Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199933815.013.007

[13] Ghilardi-Lopes, N. P., Kremer, L. P., & Barradas, J. I. (2019). The Importance of "Ocean Literacy" in the Anthropocene and How Environmental Education Can Help in Its Promotion. In N. P. Ghilardi-Lopes & F. A. de S. Berchez (Eds.), *Coastal and Marine Environmental Education* (1st ed., pp. 3–17). Switzerland: Springer, Cham. https://doi.org/10.1007/978-3-030-05138-9_1

[14] Halpern, D. F. (2014). *Thought and knowledge: An introduction to critical thinking* (5th ed.). New York: Psychology Press.

[15] Hapizoh. (2019). Penerapan discovery learning terintegrasi STEM untuk meningkatkan hasil belajar peserta didik SMP negeri 26 palembang. In *Prosıdıng Semınar Nasıonal Pendıdıkan Program Pascasarjana Unıversıtas PGRI Palembang* (pp. 293–304). Palembang: Universitas PGRI Palembang.

[16] Henderson, L., & Green, C. (2020). Making sense of microplastics ? Public understandings of plastic pollution. *Marine Pollution Bulletin*, *152*(January), 110908. https://doi.org/10.1016/j.marpolbul.2020.110908

[17] Kelley, T. R., & Knowles, J. G. (2016). A conceptual framework for integrated STEM education. *International Journal of STEM Education*, *3*(1). https://doi.org/10.1186/s40594-016-0046-z

[18] King, D., & Henderson, S. (2018). Context-based learning in the middle years: achieving resonance between the real-world field and environmental science concepts. *International Journal of Science Education*, *40*(10), 1221–1238. https://doi.org/10.1080/09500693.2018.1470352

[19] Mutakinati, L., Anwari, I., & Yoshisuke, K. (2018). Analysis of students' critical thinking skill of middle school through stem education project-based learning. *Jurnal Pendidikan IPA Indonesia*, *7*(1), 54–65. https://doi.org/10.15294/jpii.v7i1.10495

[20] Ningsih, N. W., Kustijono, R., & Ismono. (2013). Pengembangan perangkat pembelajaran IPA terpadu tipe webbed tema tercemarkah airku di kelas VII SMP. *Jurnal Pendidikan Sains*, *01*(01), 54–59. Retrieved from http://journal.unnes.ac.id/sju/index.php/jise

[21] Nugroho, O. F., Permanasari, A., & Firman, H. (2019). The movement of stem education in Indonesia: Science teachers' perspectives. *Jurnal Pendidikan IPA Indonesia*, *8*(3), 417–425. https://doi.org/10.15294/jpii.v8i3.19252

[22] Nuryanti, L., Zubaidah, S., & Diantoro, M. (2018). Analisis kemampuan berpikir kritis siswa SMP. *Jurnal Pendidikan: Teori, Penelitian Dan Pengembangan*, *3*(2), 155–158. https://doi.org/10.17977/jptpp.v3i2.10490

[23] Osborne, J. (2014). Teaching critical thinking ? New directions in science education. *SSR*, *95*(352), 53–62.

[24] Saleha, Sunarno, W., & Suparmi. (2014). Pengembangan perangkat pembelajaran IPA terpadu tema es loli rasa durian kelas vii di SMP negeri 2 Wonogiri. *Inkuiri*, *3*(I), 28–36. https://doi.org/10.20961/inkuiri.v3i01.9654

[25] Soros, P., Ponkham, K., & Ekkapim, S. (2018). The results of STEM education methods for enhancing critical thinking and problem solving skill in physics the 10th grade level. In C. Yuenyong, T. Sangpradit, & Siriwan (Eds.), *AIP Conference Proceedings* (Vol. 1923, pp. 1–11). Phuket: AIP Publishing. https://doi.org/10.1063/1.5019536

[26] Stehle, S. M., & Peters-Burton, E. E. (2019). Developing student 21st Century skills in selected exemplary inclusive STEM high schools. *International Journal of STEM Education*, *6*(1), 1–15. https://doi.org/10.1186/s40594-019-0192-1

[27] Suwarma, I. R., & Kumano, Y. (2019). Implementation of STEM education in Indonesia: Teachers' perception of STEM integration into curriculum. In *Journal of Physics: Conference Series* (Vol. 1280). Bandung: IOP Publishing. https://doi.org/10.1088/1742-6596/1280/5/052052

[28] Uyarra, M. C., & Borja, Á. (2016). Ocean literacy : a ' new ' socio-ecological concept for a sustainable use of the seas. *Marine Pollution Buletin*, *104*(1–2), 1–2. https://doi.org/10.1016/j.marpolbul.2016.02.060

[29] Vieira, R. M., & Tenreiro-vieira, C. (2014). Fostering scientific literacy and critical thinking in elementary science education. *International Journal of Science and Mathematics Education*, *14*, 659–680. https://doi.org/10.1007/s10763-014-9605-2

[30] Weiss, E., & Chi, B. (2019). ¡youth & the ocean! (¡yo!): partnering high school and graduate students for youth-driven research experiences. In G. Fauville, D. L. Payne, M. E. Marrero, A. Lantz-Andersson, & F. Crouch (Eds.), *Exemplary Practices in Marine Science Education: A Resources for Practitioners and Researchers* (1st ed., pp. 27–58). Switzerland: Springer International Publishing. https://doi.org/10.1007/978-3-319-90778-9

A FEASIBILITY STUDY SCRAPBOOK OF CHILD STORIES AS WRITING AND STORYTELLING TEACHING MEDIA

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Abstract

This study aims to determine the feasibility of children stories scrapbook media on writing and storytelling learning activities. This study is a Research and Development (R&D) study using the Borg & Gall model. Data collection is done by questionnaires addressed to media expert and material expert. Data obtained is in the form of score and is concluded to determine the product feasibility. The results of study show that scrapbook of child stories obtains the validation score of 119 from the material expert and is then categorized "Feasible". In addition, it is scored 149 by the media expert and is categorized "Most Feasible". Based on these two results, it is concluded that scrapbook of child stories is feasible to use as writing and storytelling teaching media designated for students.

Keywords: teaching media, scrapbook of child stories, writing skill, storytelling skill

INTRODUCTION

Teaching media is an inseparable item in the teaching-learning activity. In order to attain the learning objectives, a teacher frequently uses various media. Media choosing and application becomes essential considering the components desired to be achieved. If applied properly, a teaching media can create an effective and enjoyable environment. Also, a teaching media can be a helpful device for the students in gaining better knowledge during the learning process (1).

A teacher, at the very least, should understand how to apply the media to convey the message as well as to support in achieving the optimal learning objectives. The messages mentioned earlier are the material contents for each subject. (2) which stated that "learning media is a tool that can be used to convey the message to the students for the purpose of learning can be achieved." It means that a teaching media is a tool which is purposely arranged to deliver the material in teaching-learning activity.

Teachers can apply the teaching media in the activities they arrange. It is necessary to note that the success rate of learning activities is determined by two main components in which teaching methods and teaching media (3). That is why an appropriate media is needed to support the students in effectively comprehending the learning material.

A teaching media is often associated with a physical tool (4). Media are usually used to facilitate the teaching-learning activity so generally they can be physically seen and used by the students to help them study the material. A teaching media offers various methods to make learning environment more exciting. This, however, still needs the teachers' initiative to willingly teach valuable knowledge to their students.

The application of teaching media can be varied, depending on teacher's creativity and the purpose to be achieved. As a tool, teaching media has a particular function. (5) stated that the media has four functions: 1) attention function; 2) affection function; 3) cognitive function; and 4) function compensatory.

Basically, the application of teaching media is originated from teacher's initiative in dealing with the learning problems occurred in class. It is in line with the opinion (6) stating that if a teacher has a pedagogic quality, they will encourage their students to learn effectively by using various teaching media. That is why pedagogic character should be implanted in all teaching sectors—specifically teachers, so that they have initiative and intuition in developing learning activities.

Various teaching media can be chosen to be developed and used in various learning activities. (6) stated that there are three kinds of media product which have been customized to be fitted the recent technology, in which: 1) audio-visual (cinema, television, radio, music videos, animation); 2) printed (newspaper, magazine, and comics); 3) digital media/e-media (internet, mobile phones, computer games, and video games). Those media can be developed and applied to support the students in comprehending the materials during learning activities.

Those various media can be chosen based on the learning activities that will be implemented in class. Besides its types, media can also be seen from its content. A media which still uses text, for example, still needs a help in its delivery. They should use proper language and corresponds with the students' ability so it will help them to understand the material. Several feasibility in terms of the contents seen from the use of language for lower grade of primary school students, as stated by

(7), include: 1) simplicity; 2) sentence effectiveness; 3) word accuracy; 4) standard terms; 5) communicative; 6) dialogic; 7) motivational ability; 8) conformance to Indonesian Spelling System General Manual (PUEBI); and 9) the use of terms, symbols, and icons.

The printed teaching media is easy to use for students which can be used everywhere and anytime. Scrapbook is one of the printed teaching media. It is a collection of pictures which are cut and arranged in such a way into one whole book, with some additional interesting designs. This is supported (8) who stated that scrapbook is a book containing some precious moments' pictures which are arranged neatly and beautifully. Each picture has its own caption describing the feelings or emotions which interpret the picture itself. The pieces of the pictures are deliberately and neatly arranged so they create a storyline. That is why a scrapbook can be developed as one of teaching media which contains story addressed for children.

However, in using a story as a teaching media, it should be noted that the story given must be suitable for children. Children stories are story that will be loved by children. (9) stated that children stories are the story which positions children as the main character with childhood as its focus. In this kind of stories, there is a children's world depicted by words and pictures. That is why a children story should contain all needed aspects which is suitable for child's characteristics and provides moral values.

Learning through story is often associated with the activities addressed to lower grade students. Besides using interesting pictures, a story uses a practical language that, when verbally-spoken, will give specific emotions to the listeners. Based on the findings on the field, storytelling activity can be advantageous in supporting the teaching-learning activity (10).

Scrapbook is then developed as a teaching media for enhancing writing and storytelling skills designated for the second graders of primary school, assuming that the arranged pictures with chronological storyline could encourage the students' creativity in those two skills. This is also supported by the story cards (11). As well as the story cards, scrapbook is also a development of a story path. Story path is a media used in the writing activity by describing something scene-by-scene (12). According to the mentioned description, a development scrapbook of child stories as a teaching-learning media to enhance the writing and storytelling skills of the second graders of primary school should be well-conducted.

METHOD

This study applies Research and Development (R&D) model. The developmental study is a research aimed to develop new products or to improve the existed products. This research model applies (13). There are ten stages of this research model, including 1) research and information collecting, 2) planning, 3) developing primary form of product, 4) preliminary field testing, 5) main product revision, 6) main field testing, 7) operational product revision, 8) operational field testing, 9) final product revision, 10) dissemination and implementation.

This study has its limitation in developing primary form of product. This stage includes the material arrangement and preparing the designs for the scrapbook as well as doing the validation based on media and material experts. The validation score is needed to determine whether or not a product is feasible to use in learning activities.

The analysis of product feasibility is done by data tabulation using the experts' validation instruments. In this study, data collection is done by questionnaire with response scale of 1-4. The determination of score range and conclusion drawing use score counting (14) which can be seen below:

Table 1. Score intervals

Score	Score Intervals	Category
A	$X > Xi + 1{,}8\ SBi$	Excellent
B	$Xi + 0{,}6\ SBi < X \leq Xi + 1{,}8\ SBi$	Very Good
C	$Xi - 0{,}6\ SBi < X \leq Xi + 0{,}6\ SBi$	Good
D	$Xi - 1{,}8\ SBi < X \leq Xi - 0{,}6\ SBi$	Fair
E	$X \leq Xi - 1{,}8\ SBi$	Poor

This study only uses the minimum score of "B" or "Very Good". Therefore, if the media and material experts' validation obtain the minimum score of "B" or "Very Good", Scrapbook of Child Stories is considered feasible to use as a media in teaching-learning activities

RESULT

The development of product design is arranged based on the introductory and planning studies. The product contains the subject of Bahasa Indonesia, particularly writing and storytelling skills, which is specifically addressed to the second graders of primary schools. The development scrapbook of child stories is referred to the objectives of study, curriculum 2013, Competency Standards, Core Competencies, Basic Competencies, study indicators, and learning material.

The product is developed in accordance with the arranged material and lesson plan. After that, the product is designed by Corel Draw X15 and

several supporting programs to make the illustrations. The product outlines three main sections, in which introduction, body, and closing. Introductory page consists of the identity, description, introduction, instructions, table of content, core competencies mind map, basic competencies, learning indicators, and introduction to characters' in the book. In the body part, there is a material presentation and worksheet that is set according to the subject content and self-assessment sheet. The last, in the closing part, there is a glossary, references, author's biography, and illustrator's biography.

Material expert's validation

The validation done by material expert aims to determine the feasibility scrapbook of child stories as teaching media in terms of its contents. The media feasibility is scored from scoring instruments consisting of several aspects, including material substance, linguistic aspects, and presentation. The scoring occurs in the scale of 1 to 4, which is then measured and converted into the feasibility score scrapbook of child stories by material expert. Below is the converted score done by material expert, presented in the table:

Table 2. Converted score (material expert)

No.	Interval	Score	Category
1.	X > 119	A	Most Feasible
2.	98 < X ≤ 119	B	Feasible
3.	77 < X ≤ 98	C	Less Feasible
4.	56 < X ≤ 77	D	Least Feasible
5.	X ≤ 56	E	Not Feasible

According to the table above, scrapbook of child stories as a teaching media can be categorized feasible when it reaches more than 98 with the score of B. If the score obtained is lesser than or is equal to 98, it is categorized less feasible and thus needs revision. After the analysis, the data obtained can be seen below:

Table 3. Material expert's questionnaire analysis

No.	Aspects	Scores
1.	Material Sub-stances	65
2.	Linguistic	31
3.	Presentation	23
Total		119

According to the material expert's questionnaire analysis, the score obtained is 119. It can be concluded that the scrapbook of child stories as a teaching media has been fulfilled the feasibility standard in terms of material content with the score of "B" and is categorized feasible.

Media expert's validation

The product validation based on media expert aims to determine whether or not the scrapbook of child stories is feasible to use as a teaching media to enhance writing and storytelling skills for the second graders of primary school. The feasibility in terms of media is scored using questionnaire scoring consisting of several aspects, including introduction (title page, introduction, competencies mind mapping, instructions, table of contents), body (material content, worksheet, reflection, summary, evaluation), closing (glossary, references, developer's profile), and graphic (layout and format, illustration, design, legibility, paper quality, and physical endurance). The score occurs in the scale of 1 to 4, which is then measured and converted into the feasibility score scrapbook of child stories media done by media expert. The table below shows the converted score done by media expert:

Table 4. Converted score (media expert)

No	Interval	Score	Category
1.	x > 139,4	A	Most Feasible
2.	114,8 < x ≤ 139,4	B	Feasible
3.	90,2 < x ≤ 114,8	C	Less Feasible
4.	65,6 <x ≤ 90,2	D	Least Feasible
5.	x ≤ 65,6	E	Not Feasible

The scrapbook of child stories media is categorized feasible according to media experts when reaches more than 114,8 and is scored "B". If the validation number of media expert does not reach or not exceeding the stated number, the scrapbook media cannot be categorized feasible and thus needs to be revised. The validation score of media experts is presented in the table below:

Table 5. Media expert's questionnaire analysis

No.	Aspects	Score
1.	Introduction	39
2.	Body	28
3.	Closing	11
4.	Graphic	71
Total		149

According to the table, the total score of the media expert's validation is as much as 149. This number has exceeded the score of 139,4; hence, the scrapbook of child stories media can be scored "A" and is categorized 'Most Feasible'.

DISCUSSION

Scrapbook of child stories media is developed as a teaching media, particularly for writing and storytelling, designated for the second graders of primary school. Scrapbook media has been tested

using feasibility test done by both media and material experts. Media is categorized feasible if the validation score from both experts reach the minimum score of "B" with the category of "feasible".

The product validation from material expert shows that the total value in terms of material contents reaches 119. This score has fulfilled the feasibility standard in terms of material with the score of "B" and is categorized "feasible". Although the number shows a feasible result, the material expert suggests that the sentences used in the book should not be too long and are made as simple as possible so the students can comprehend the material better.

The development scrapbook of child stories as a teaching media is deliberately arranged to support teaching-learning activities. Innovation of teaching media can provide more information for students and can improve learning outcomes (15). In the arrangement process, the scrapbook should contain learning material, story application samples, student's worksheet, and systematic evaluation. It aims to facilitate the students to easily use the media which will also affect their learning comprehension. It is in line with (2) who stated that the development of teaching media should be neatly arranged hence it can be properly used to deliver the material in the teaching-learning activity.

On the other hand, seen from its body, a scrapbook should provide some pictures which support the story of the students' daily life. Pictures have advantages that can explain concepts to facilitate students in learning (16). Some of the stories are used to help delivering the materials to the students in a simple, understandable way. It means that media should contain children stories. Depdiknas (9) stated that children stories are the story positioning children as the main character. From the stories scrapbook, the students will learn about the story elements with an exciting, understandable presentation.

Scrapbook of child stories presents learning activities by using stories. It aims that students can understand the materis easily. Writing a story with picture and keywords before, can help students learning storytelling (17).

In the scoring process, scrapbook of child stories has met the feasibility requirements in linguistic aspects. Material expert states that the scrapbook is linguistically arranged in accordance with Indonesian Spelling System General Manual (PUEBI), simplicity, coherence, and communicative and interactive aspects. It is in line with (7) who stated that a teaching media should be arranged in accordance to material contents, including 1) simplicity, 2) sentence effectiveness, 3) word accuracy, 4) standard terms, 5) communicative, 6) dialogic, 7) motivational ability, 8) conformance to Indonesian Spelling System General Manual (PUEBI), and 9) the use of terms, symbols, and icons.

According to media expert's validation, total score scrapbook of child stories reaches the amount of 149. It means that the scrapbook media is scored "A" and is categorized "Most Feasible". Besides scoring the scrapbook media in terms of media, the experts also give several suggestions for future improvement. They suggest several things, in which: the logo of UNY is better to be included and printed on the cover page, the word 'absence' is mistyped, the background color for the fonts should complement the theme of the page, the fonts used should be even, the characters should be introduced sequentially from the older to the younger, and the illustrator's biography should be included. Based on the given suggestion, the revision is done and a better result is obtained.

Scrapbook of child stories is a printed teaching media. In its process, printed media should pay attention to the visual presentation so it will attract students' interest. According to the media expert's analysis, the scrapbook has met the requirements for attractive display which is seen from layout, illustration, design, legibility, paper quality, and graphic. These aspects are in line with the essential points of developing printed media stated by (18), which includes: 1) format and layout, 2) script text, 3) arts and photography, and 4) colors.

In its arrangement process, the scrapbook of child stories also pays attention to the systematic storyline. It starts with introduction section consisting of title page, introduction, competencies mind mapping, instruction, and table of contents. In body section, there are material contents, worksheet, reflection, summary, and evaluation; whereas in closing section, there are glossary, references, and developer's profile. All of the media development sections are systematically arranged and thus gaining the excellent validation from the media experts. This supports (19) who stated that media development should involve several criteria, including: 1) clear learning objectives, 2) relevance between learning objectives and the Competency Standard /Basic Competencies of curriculum, 3) learning motivation, 4) accuracy of learning strategy application, 5) interactive, 6) learning motivation encouragement, 7) contextual, 8) conformance of materials and the learning objectives, 9) material depth, 10) understandability, 11) systematic; clear logical plot, 12) clear description, discussion, sampling, and exercise, 13) evaluation consistency toward learning objectives, 14) evaluation accuracy, and 15) feedback towards the evaluation.

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REFERENCES

[1] Z.-G Ge, "Does mismatch between learning media preference and received learning media bring a negative impact on academic performance? An experiment with e-learners," Interactive Learning Environments, pp. 1– 17, 2019

[2] S. A. Widodo, and Wahyudin, "Selection of learning media mathematics for junior school students," The Turkish Online Journal of Educational Technology, vol.17, pp.159, 2018.

[3] A. Mustadi, "Pengembangan pengajaran writing melalui metode beyond centers and circles time mata kuliah bahasa inggris di PGSD," unpublished.

[4] D. Indriana, Ragam alat bantu media pengajaran, Yogyakarta: Diva Press , 2011

[5] A. Arsyad, "Media pembelajaran," Jakarta: PT Raja Grafindo Persada, 2011

[6] E. Scarratt, and J. Davison, The media teachers's handbook, New York: Routledeg Taylor & Francis Group, 2012

[7] A. W. Purnanto, and A. Mustadi, "Analisis kelayakan bahasa dalam buku teks tema 1 Kelas I sekolah dasar kurikulum 2013. Profesi Pendidikan Dasar," vol. 3(2), pp. 102 – 111, 2016

[8] T. L. Live, and T. L. Live, Digital scrapbooking technology, Washington, D.C: Thomson Course Technology, 2005

[9] Departemen Pendidikan Nasional, Pedoman pembuatan cerita untuk taman kanak-kanak, Jakarta: Depdiknas, 2006

[10] N. Hidayati, Manfaat cerita bagi anak, Jakarta: Prenada Media Group, 2009

[11] L. Mayawati, N. N. Garminah, and N. Kusmariyatni, "Penerapan media kartu cerita untuk meningkatkan kemampuan menulis karangan narasi pada siswa kelas v Madrasah Ibtidaiyah (MI) Nurun Najah Sumberkima," Mimbar PGSD Universitas Pendidikan Ganesha, vol. 2, 2014

[12] S. Bowket, Countdown to creative writing: Step by step approach to writing techniques for 7-12 years, New York: Routledge, 2009

[13] W. R. Borg, and M. D. Gall, Educational research: An introduction, 5th ed. New York: Longman, 1983

[14] E. P. Widiyoko, Evaluasi program pembelajaran: Panduan praktis bagi pendidik dan calon pendidik, Yogyakarta: Pustaka Pelajar, 2009

[15] A. Lutfi, "Motivating Students to learn science by applying bilingual comic learning media (in bahasa)," Jurnal Pendidikan dan Pembelajaran, vol.20, pp.152-159, 2013

[16] M. I. J. Nazir etc, "Skill development in multimedia based learning environment in higher education: An operational model," International Journal of Information and Communication Technology Research, vol.2, pp. 820-828, 2012

[17] Fikriah, "Using the Storytelling Technique to Improve English Speaking Skills of Primary School Students", English Education Journal (EEJ), vol. 7(1), pp. 87-10, 2016

[18] J. E. Kemp, and D. K. Dayton, " Planning and producing instructional media, 5th ed, New York: Harper & Row Publisher, Inc, 1985

[19] R. S. Wahono, Aspek dan kriteria penilaian media pembelajaran, 2006, unpublished.

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E-LKPD (ELECTRONIC-WORK SHEET FOR STUDENTS) TO GROW HIGH ORDER THINKING SKILLS STUDENTS ON SOLUTION EQUILIBRIUM MATERIALS

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Abstract

21st century learning as technology-based learning requires students to have life skills that are in accordance with the demands of the times, one of which is the ability to critical thinking. Critical thinking is the ability to think at a high level (High Order Thinking Skills) because it includes the ability to analyze and evaluate. During a pandemic, Distance Learning (PJJ) is enforced. The success of learning is determined by several factors, one of which is the teaching material. Electronic-Student Worksheet (E-LKPD) is the right solution in optimizing the Distance Learning (PJJ) program in Chemistry lessons, namely on solution equilibrium material. The use of E-LKPD is expected to be able to grow the HOTS of students. This research uses literature study method or literature review. Journal identification using the ProQuest search engine, Research Gate, and Schoolar, which is then analyzed and continued using Mendeley. Based on the inclusion criteria, there were 41 journals that matched the criteria from the 2010 - 2020 publications. From the results of the study, it was found that E-LKPD was one of the effective teaching materials in learning, especially in solution equilibrium material which required students to be able to solve HOTS-based questions. The research design with the Plomp model is considered suitable in developing a teaching material. E-LKPD is designed using the Adobe Acrobat 11 Pro Extended application to provide students with opportunities to practice technology skills and the ability to solve HOTS problems in chemistry.

Keywords: E-LKPD, 21st Century Learning, HOTS, Solution Equilibrium

INTRODUCTION

Technological advances in the era of the industrial revolution 4.0 presented a significant challenge for the Indonesian people. The development of telecommunication technology, including computer networks, is happening very rapidly. Various technologies and scientific support applications are developing in various fields including education and teaching (Azhar et al., 2020). If you want to compete in this digital era, Indonesia needs to immediately improve the capabilities and skills of its human resources through education that can form a creative, innovative and competitive generation (Syamsuar & Reflianto, 2019).

Partnership for 21st Century Skills emphasizes that 21st century learning must teach 4 competencies, namely communication, collaboration, critical thinking, and creativity (Hidayah et al., 2017). Therefore, students not only have the ability to memorize, but also critical thinking skills, creative thinking skills, and the ability to solve problems in everyday life. 21st century humans in the age of information are very fast, not only enough to master the three basic abilities (reading, writing, and arithmetic) but more abilities are needed, one of which is critical thinking. Critical thinking is the ability to think at a high level (high order thinking skill) because it includes the ability to analyze, evaluate. By mastering these abilities, it is hoped that they will be able to provide students with the ability to continue their life after studying at school (Utami & Aznam, 2020).

Based on PISA research conducted in 2018, out of 80 countries evaluated, the average achievement scores of Indonesian students for science, reading, and mathematics were ranked 70, 75, and 74. Of course these results are very concerning (Schleicher, 2019). These results indicate that Indonesia has quite a tough job if PISA is still used as a standard for the government for education development. To overcome this problem, Indonesia needs to prepare the younger generation through education who can master 21st century skills.

Chemistry has a high level of urgency in science learning. Chemistry subjects are a group of specialization subjects in the 2013 curriculum that must be taken in the Mathematics and Natural Sciences major (Rahmasari et al., 2020). Chemistry subjects need to be taught for a more specific purpose, namely to equip students with the knowledge, understanding and a number of abilities required to enter higher education levels and develop science and technology. Chemistry learning can be carried out well if there are interesting learning interactions between teachers and students. Success in achieving learning objectives is strongly influenced by teaching and learning strategies, learning methods and approaches, and learning resources used.

In addition, recently, the world has been shocked by a pandemic, namely the novel coronavirus (CoVid-19), including Indonesia. This pandemic also has an impact on the world of education. The learning system in schools is now being transferred through an online or online system known as Distance Learning (PJJ). This of course provides a big enough challenge for educators in providing learning that is conducive, interesting and easily understood by students. The challenges that must be resolved by educators in providing conducive learning in this pandemic period is to present a PJJ concept that is in accordance with the policy of independent learning based on what was declared by the Minister of Education and Culture of the Republic of Indonesia, Nadiem Makarim to present learning that more characterizes students. Concept independent learning is an effort to change the score oriented student paradigm, so as to create a conducive learning atmosphere without being burdened with achieving a certain score.

The challenges that must be resolved by educators in providing conducive learning during this pandemic are presenting a PJJ concept in accordance with the policy of independent learning based on what was declared by the Minister of Education and Culture of the Republic of Indonesia, Nadiem Makarim to present learning that more shapes the character of students. The concept of independent learning is an effort to change the score oriented student paradigm, so as to create a conducive learning atmosphere without being burdened with achieving a certain score.

The success of education during this pandemic, especially in chemistry, is largely determined by several factors. One of them is by selecting teaching materials in accordance with the conditions of the PJJ. Electronic-Student Worksheet (E-LKPD) is an interactive IT-based teaching material that not only presents material, but is also equipped with videos and animations that can strengthen students' understanding in learning the material presented. E-LKPD is also expected to be able to grow the HOTS of students. E-LKPD can be developed using various applications, one of which is the Adobe Acrobat 11 Pro Extended application.

(Linda et al., 2018) stated that two of the toughest discussions based on the difficulties of students in learning chemistry, namely about ionic equilibrium and pH of buffer solutions, and the other is solution equilibrium. Thus, the subject matter is considered as the right material for E-LKPD content. Based on the problems that have been described, it is deemed necessary to research the development of interactive IT-based teaching materials used in chemistry learning on ionic equilibrium and the pH of salt solutions. The proposed development is in the form of E-LKPD to foster high order thinking skills by using the Adobe Acrobat 11 Pro Extended application.

METHOD

This research uses literature study method or literature review. Literature review is a form of literature search and research by reading books, journals and other publications related to research topics to produce writing on one specific topic (Marzali, 2017).

In preparing a literature review, it is necessary to pay attention to systematic procedures. (Suhartono, 2017) explains that systematic procedures for conducting literature reviews include (a) formulating problems, (b) collecting data, (c) evaluating the appropriateness of data, (d) analyzing and interpreting relevant data and (e) organizing and presenting the result. (Yuliana & Kusumawati, 2019) compile steps in carrying out a literature review starting with collecting data relevant to the topic under study, noting important points and their relevance to research problems, making notes and quotations arranged systematically, and make conclusions that describe the topic of discussion.

The data used in this study were obtained from the results of research that have been conducted and published in national and international online journals. In conducting this research, researchers conducted a search for research journals published on the internet using the ProQuest, Research Gate, and Schoolar seach engines with keywords: student worksheets, critical thinking, e-learning in chemistry. Articles and journals are understood by reading them, especially in the abstract section and all articles and journals. Key concepts obtained from articles and journals about "e-learning in chemistry learning", "HOTS-based E-LKPD development" and "Misconceptions on ion equilibrium and pH of salt solution" are recorded and formulated into an "E-LKPD to grow HOTS in solution equilibrium material ".

Each journal that has been selected must be based on certain criteria, namely inclusion criteria. Inclusion criteria are general characteristics of research subjects from a target and affordable target population to be studied (Setiyadi, 2013). Meanwhile, according to Notoadmojo, S, (2010), inclusion criteria are criteria that must be met by each member of the population who will be sampled. The inclusion criteria in this paper are:

Table 1. Journal Inclusion Criteria

Criteria	Inclusion
Period of time	The maximum period of time for publication of the journal is 10 years (2010-2020)
Language	Indonesian and English
Subject	Student, Teacher
Type of article	Original articles that have been published and indexed and available in full text
Theme of journal	E-LKPD for growing HOTS in the solution equilibrium material

Journals that match the inclusion criteria are then collected and summarized to make it easier to analyze the content contained in the research objectives. The analytical method made using journal content analysis and continued writing using Mendeley.

RESULTS AND DISCUSSIONS

Development of E-LKPD (Electronic Student Worksheets)

One of the efforts to make learning activities more optimal is to provide LKPD for student activities (Mutia & Prasetyo, 2018). LKPD is a learning process activity sheet to train thinking skills and science process skills in completing tasks according to the learning indicators to be achieved (Firdaus & Wilujeng, 2018). LKPD can make it easier for teachers to direct students to discover science concepts through experiments or investigations either individually or in groups (Hermanto & Prastiwi, 2013). LKPD is deemed necessary to be developed because LKPD is a complete teaching material with a concise form and rich in questions to practice (Diani et al., 2019).

Teachers using LKPD aim to support students in learning, carry out active learning, increase students' interest in learning science (Lee, 2014); alternatives for teachers to direct teaching or introduce activities as learning activities; provoke students to be active (Andriyani et al., 2018); and serves as an assessment (Utami & Aznam, 2020). The LKPD category that should be developed is E-LKPD because it allows students to access digitally by pressing a button on an available application (Herawati et al., 2017).

The use of Electronic Student Worksheets is closely related to the application of E-Learning. E-Learning refers to the use of the internet to increase knowledge and skills. The advantage of E-Learning is that it can force students to show an active role in learning (Farkhati & Sumarti, 2019). E-LKPD in general must meet the requirements, namely didactic requirements, construction requirements, and technical requirements (Lestari et al., 2019). Didactic requirements regulate the use of universal LKPD that can be used properly by all students and are expected to prioritize the development of social, emotional, moral, and aesthetic communication skills, and invite students to be active in the learning process. The construction requirements relate to the use of language, sentence structure, vocabulary, level of difficulty, and clarity of the E-LKPD so that it is easily understood by students. The technical requirements emphasize the presentati on of the E-LKPD which includes writing, pictures and appearance.

Table 2. E-LKPD Development Stages

No	Research Sources	Procedures
1	LKPD development Interactive Hydrolysis Material Salt (Indriani & Lavulza, 2020)	Chemistry teacher interviews and deployment questionnaire; KD adjustment, GPA based on 2013 curriculum; media selection; draft early; media visualization; arrangement of instruments research; validation of questionnaires and instruments research
2	Worksheet Development Electronic Learners Project Based On Material Thermochemistry in Class XI SMA (Andriyani et al., 2018)	The defining stage (curriculum analysis, student analysis, task analysis and objective specifications); designing test questions; media selection; create storyboards; validation; small group trials; testing large group
3	Development of E-LKPD with Scientific Approach to Electrolyte and Non-electrolyte Solutions (Apriyanto et al., 2019)	Initial-final analysis (curriculum, students, assignments and goal specifications); media selection, format, initial design; compilation of material into the media; validation; expert assessment; product trial

Based on the sources analyzed, the LKPD development stages were taken as an effective step, namely: preliminary interview techniques and questionnaires to see the problems and target needs; curriculum review in the form of KD analysis, GPA based on the 2013 revised 2017 curriculum; early product development; initial product trials; revision of initial product trial results; second product trial; second product revision; and implementation.

Validation carried out in the development of e-LKPD products includes validation of media experts and material experts. The sources used as a comparison were three journals for chemistry learning E-LKPD development, namely; IPA Learning Cycle based LKPD 7E (Utami & Aznam, 2020), Entrepreneurship Oriented Small Chemical Industry LKPD (Diniaty & Atun, 2014), Interactive LKPD with Scaffolding Approach on Salt Hydrolysis Material (Indriani & Lavulza, 2020).

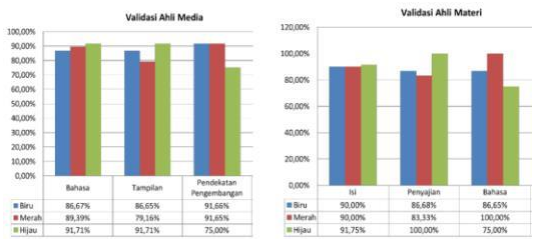

Figure 1. Validation Diagram for Media Experts and Validation of Material Experts

Table 3. The valid criteria used are:

No	Interval	Criteria
1	81%-100%	Very valid
2	61%-80%	Valid
3	41%-60%	Quite valid
4	21%-40%	Less valid
5	0%-20%	Invalid

The following figure 1.2 display of the LKPD that has been developed by Indriani & Lazulva. Based on the average results of the media expert's assessment for the three categories, the Interactive LKPD with the Scaffolding Approach has a higher overall assessment of 88.33%. If this value is converted based on the guidelines for the conversion of quantitative data to qualitative data, the interactive LKPD learning media products are included in the very valid criteria. This LKPD consists of a front page, an identity page, study instructions, basic competencies, GPA, and a core page. Revisions given by media experts include the use of icons for each command, animated videos must be in accordance with the material presented and the choice of words.

Figure 1.2 Front Page (Indriani & Lavulza, 2020)

According to (Indriani & Lavulza, 2020) for material expert validation, after the entire revision process was carried out and corrected again, the validity of the material from the interactive E-LKPD was being researched and developed. Furthermore, a further assessment is carried out in the form of a second stage assessment of the E-LKPD which is developed through a validity test questionnaire. E-LKPD that has been valid is then conducted a limited trial at schools until finally an E-LKPD is obtained that fits the valid criteria.

The trials conducted on the E-LKPD results include one-on-one trials and limited trials. One-on-one trials were carried out to see the practicality of the teaching materials developed including the suitability of E-LKPD with learning objectives, the material presented was easy to understand and the assignment given could be done. Limited trials were carried out to find out the criteria for the questions given were in accordance with the learning objectives, E-LKPD had sufficient information regarding the material provided and the order of the material was appropriate (Diani et al., 2019).

An E-LKPD product will enter the next trial phase if it meets the good category, including; The composition and content are relevant to each competency standard, are in accordance with basic competencies, relevant for second semester class XI students, the substance of the teaching materials is correct and according to chemical references, already contains HOTS indicators, physical appearance and illustrations are interesting to look at and the constituent components of the E-LKPD are complete (Prasetya et al., 2019).

High Order Thinking Skills (HOTS)

Higher order thinking skills are considered necessary to increase the creativity and motivation of students in implementing learning. Critical thinking is related to reflective thinking that decides what to do (Schulz & FitzPatrick, 2016). has been described as complex skills without simple algorithms for problem solving (Sasson et al., 2018). This thinking is based on research conducted by (Heong et al., 2012). that critical thinking skills will support students to find ideas in completing their assignments. This is a demand for educators to present a learning that is able to foster students' critical thinking skills through media, teaching materials or learning models.

The ability to think critically is an important requirement to be responsible for one's activities so that it allows students to think rationally over problems (Sumarni & Kadarwati, 2020). HOTS is needed to make the objective of careful, reflective and fair-minded judgments about what to believe or practical problems in the future (Putra et al., 2018). According to (Suryawati et al., 2020) critical thinking and empathy when applied simultaneously will help a person adapt to an unsafe environment. Critical thinking skills relate to the cognitive abilities of students in active learning in learning to select acceptable information and determine the truth in creating new ideas (Wijayanti et al., 2019).

Critical thinking skills are cognitive processes carried out as concepts, applications, synthesis and information obtained from observation, experience, reflection, thinking, or communication as a basis for believing and taking action and focusing on what must be done (Jatmiko et al., 2018). Critical thinking requires someone to be able to involve activities in analyzing more specific, different, renting, selecting, identifying, assessing, and developing ideas in a more perfect direction (Usmeldi et al., 2017). Critical thinking involves analysis and evaluation, not just accepting ideas or information. Advanced critical thinking skills require a person to analyze and reflect on the results of their thoughts (Sumarni & Kadarwati, 2020).

Indicators of critical thinking that have been carried out in several studies include research (Rahma, 2012), namely: (1) interpretation (classification and detection of information), (2) evaluation (assessing arguments), (3) analysis (analyzing arguments, experimental data and considering the credibility of the information evidence), (4) explanation (stating the results and justifying proce-

dures), (5) inference (analyzing conclusions, determining hypotheses and drawing conclusions) and (6) self-regulation (reviewing results, self-control). The ability of critical analysis in this learning is the ability of students to decipher information so that the intended meaning can be obtained through several indicators, namely: organizing, connecting parts, interpreting data, evaluating information, reflecting processes and making decisions related to relevant concepts (Fitriani et al., 2020).

E-LKPD to help HOTS

One of the things behind the importance of growing student HOTS is the fact that teachers still provide C_1-C_3 level questions for students so that students are less trained to work on questions that require critical thinking (Utami & Aznam, 2020). Learning activities will be more optimal if worksheets are used that are adjusted to the requested targets (Sudarmin et al., 2019). Therefore, to present a learning that is able to improvw the thinking skills of students, HOTS-based worksheets need to be developed.

Adobe Acrobat 11 Pro Extended as an Electronic Worksheet Application for Students

E-LKPD is a learning tool designed electronically, containing material in a systematic and interesting manner to achieve the expected competencies. E-LKPD is presented in an electronic format which includes animation, images, videos, more interactive navigation (Pursitasari et al., 2020). The applications used include Ispring Suite 8 Software (Indriani & Lavulza, 2020); 3D Pageflip Professional (Apriyanto et al., 2019).

The Adobe Acrobat application has never been researched and developed for E-LKPD in chemistry learning, therefore researchers are interested in using this application based on several advantages that have been analyzed. The advantages of Adobe Acrobat 11 Pro Extended have an online and offline platform usage format, can create files that can be typed directly, documents can look the same on any computer and PDF files can include interactive multimedia to help create an attractive appearance (Adobe Systems Team, 2014).

Plomps's R&D Development Model

The development model is one of the elements that must be determined before carrying out a product development research. The author conducts journal analysis in selecting a suitable model to be applied in this study by paying attention to journals that match the established inclusion criteria.

Table 4. Relevant Product Development Research

No	Research	Specied	Model
1	Linda, et al., 2017	Learning model	Plomp
2	Irfandi, et al., 2018	Teaching materials	ADDIE
3	Saraswati, et al., 2019	Teaching materials	Plomp
4	Sa'adah, et al., 2019	Asesmen	Plomp
5	Fitriani, et al., 2020	Learning media	Plomp

Based on the journal analysis for the last 3 years on several chemical subjects of SMA / MA through the Research Gate, it can be concluded that the Plomp model development method is the model most often used in research. The Plomp model is considered effective as a model for developing learning media and teaching materials. The author determines that in developing e-LKPD to grow HOTS in solution equilibrium material, the Plomp development model will be used.

The Plomp development model is a development model consisting of 6 phases (Saraswati et al., 2019), namely: the preliminary investigation phase, the design phase, the realization / construction phase, the validation phase. phase), the trial and revision and the implementation phase.

From the discussion of literature studies, the development of E-LKPD to grow students' HOTS can help implement learning in the form of E-Learning. However, from several related studies, it was found that the E-LKPD developed was less attractive with the least animation used. According to (Pralisaputri et al., 2016) students prefer learning media or interesting teaching materials, namely little descriptions, explanations in the form of images that are easy to understand because in essence, images can increase students' interest in learning.

E-LKPD based on HOTS student must include analysis, evaluation and synthesis skills. By developing E-LKPD HOTS, it will help students' thinking skills. HOTS is not only about ability to remember and memorize but also relates to critical thinking skills, creative thinking skills and problem-solving abilities in everyday in life (Sa'adah, et al., 2019).

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Education in the 21st century is learning through the use of technology where students are required to master learning using computers or the internet. E-LKPD is one of the effective teaching materials in the Distance learning program (PJJ). E-LKPD has many benefits and uses.

The authors hope that E-LKPD in the future will be more effective along with the development of technology and learning methods used. This article can be a reference for future researchers in developing E-LKPD, especially in chemistry learning and other subjects in general.

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REFERENCES

[1] Andriyani, E. Y., Ernawati, M. D. W., & Malik, A. (2018). Development of Project-Based Electronic Student Worksheets on Thermochemical Materials in Class XI SMA. Journal of The Indonesian Society of Integrated Chemistry. 10 (1), 6–11.

[2] Apriyanto, C., Yusnelti, Y., & Asrial, A. (2019). Development of E-Lkpd with Scientific Approach to Electrolyte and Non-Electrolyte Solutions. Journal of The Indonesian Society of Integrated Chemistry, 11: (1), 38–42.

[3] Azhar, M., Alizar, Khair, M., Ranny, Dewara, N., Adriani, D., & Zulhendra. (2020). A Competence of Teacher in Making e-LKPD Using Flip Book Maker with Emphasis on Macro, Submicro, and Symbolic Level Representation of Chemistry. Pelita Eksakta, 3 (1), 1. https://doi.org/10.24036/pelitaeksakta/vol3-iss1/80

[4] Diani, D. R., Nurhayati, & Didi, S. (2019). Development of Student Worksheets (LKPD) for Writing Short Stories based on Android Applications. Journal of Languages, Literature and Its Teaching, 7, 1–13.

[5] Diniaty, A., & Atun, S. (2014). Development of Entrepreneurship-Oriented Student Worksheet (LKPD) for Small Chemical Industry for SMK. Review of Scientific Instruments, 85 (2), 46–56. https://doi.org/10.1063/1.4830215

[6] Farkhati, A., & Sumarti, Sri Susilogati. (2019). Implementation of Chemistry Learning Management Assisted by Integrated E-LKPD Chemoenterpreneurship to Analyze Student Soft Skills. Journal of Chemistry in Education, 8 (2), 2–5.

[7] Firdaus, M., & Wilujeng, I. (2018). Development of guided inquiry LKPD to improve critical thinking skills and learning outcomes of students Developing students worksheet on guided inquiry to improve critical thinking skills and learning outcomes of students. Journal of Science Education Innovation, 4 (1), 26– 40. https://doi.org/10.21831/jipi.v4i1.5574

[8] Fitriani, O., Susilawati, & Linda, R. (2020). Development of Interactive Learning Media using Autoplay Studio 8 for Hydrocarbon Material of Class XI Senior High School. 4 (2), 368–379. https://doi.org/https://doi.org/10.31258/jes.4.2.p.296-30

[9] Heong, Y. M., Yunos, J. M., Othman, W., Hassan, R., Kiong, T. T., & Mohamad, M.. (2012). The Needs Analysis of Learning Higher Order Thinking Skills for Generating Ideas. Procedia - Social and Behavioral Sciences, 59, 197–203. https://doi.org/10.1016/j.sbspro.2012.09.265

[10] Herawati, E., Gulo, F., & Hartono. (2017). Development of Interactive Student Worksheet (Lkpd) for Learning Mol Concept in Class X Senior High School. Journal of Chemical Education Research, 3 (2), 168–178.

[11] Hermanto, F., & Prastiwi, M. S. (2013). Development of Science Discovery Worksheets Based on the 2013 Curriculum for Disaster Mitigation Materials for Class VIII Junior High School Students. Journal of Science Education, 2 (2), 369–377.

[12] Hidayah, R., Salimi, M., & Susiani, tri saptuti. (2017). Critical Thinking Skill: Assessment Concepts and Indicators. Garden Scholar Journal, 4 (2), 1–11.

[13] Indriani, N., & Lavulza. (2020). Design and Trial of Interactive LKPD with Scaffolding Approach on Salt Hydrolysis Material. Journal of Natural Science and Integration, 3 (1), 87–105.

[14] Irfandi, I., Linda, R., & Erviyenni, E. (2018). Development of a Learning Cycle-5E-Based Chemistry Learning Module on Chemical Bonds. EduChemia (Journal of Chemistry and Education), 3 (2), 184. https://doi.org/10.30870/educhemia.v3i2.3348

[15] Jatmiko, B., Prahani, B. K., Munasir, Supardi, Z. A. I., Wicaksono, I., Erlina, N., Pandiangan, P., Althaf, R., & Zainuddin. (2018). The comparison of oripa teaching model and problem based learning model effectiveness to improve critical thinking skills of pre-service physics teachers. Journal of Baltic Science Education, 17 (2), 300–319.

[16] Lee, C.-D. (2014). Worksheet Usage, Reading Achievement, Classes' Lack of Readiness, and Science Achievement: A Cross-Country Comparison. International Journal of Education in Mathematics, Science and Technology, 2 (2), 96– https://doi.org/10.18404/ijemst.38331

[17] Lestari, L. T., Kurniawan, E. S., & Fatmaryanti, S. D. (2019). Development of Thinking Actively in Social Context (TASC) based student activity sheets to improve the ability to create in high school students. Journal of Physics Education Research and Studies, 6 (1), 10. https://doi.org/10.12928/jrkpf.v6i1.11364

[18] Linda, R., Herdini, H., S, I. S., & Putra, T. P. (2018). Interactive E-Module Development through Chemistry Magazine on Kvisoft Flipbook Maker Application for Chemistry Learning in Second Semester at Second Grade Senior High School. Journal of Science Learning, 2 (1), 21. https://doi.org/10.17509/jsl.v2i1.12933

[19] Linda, R., Herdini, & Rahmaputri, Z. (2017). Interactive multimedia based on autoplay media studio 8 for chemistry subjects, the subject of reaction rates for classes XI SMA / MA. 9 (3), 347–351. https://doi.org/https://doi.org/10.24114/jpkim.v9i3.8382

[20] Marzali, A.-. (2017). Writing Literature Review. ETNOSIA: Journal of Indonesian Ethnography, 1 (2), 27. https://doi.org/10.31947/etnosia.v1i2.1613

[21] Mutia, N. B., & Prasetyo, Z. K. (2018). The Effectiveness of Students' Worksheet Based on Multiple Representations to Increase Creative Thinking Skills. Journal of Education and Learning (EduLearn), 12 (4), 631. https://doi.org/10.11591/edulearn.v12i4.8487

[22] Notoadmojo, S. 2010. Health Research Methodology. Rineka Cipta. Jakarta Pralisaputri, kurnia ratnadewi, Soeiyanto, H., & Muryani, C. (2016). Development SETS-Based Booklet Media on the Main Material of Natural Disaster Mitigation and Adaptation for Class X SMA. GeoEco Journal, (2), 147–154.

[23] Prasetya, C., Gani, A., & Sulastri, S. (2019). Development of Guided Inquiry-Based Student Worksheets on Salt Hydrolysis Material to Improve Science Literacy. Indonesian Journal of Science Education, 7 (1), 34–41. https://doi.org/10.24815/jpsi.v7i1.13556

[24] Pursitasari, I. D., Suhardi, E., Putra, A. P., & Rachman, I. (2020). Enhancement of student's critical thinking skills through science context-based inquiry learning. Journal of Indonesian Science Education, 9 (1), 97–105. https://doi.org/10.15294/jpii.v9i1.21884.

[25] Putra, B. K. B., Prayitno, B. A., & Maridi. (2018). The effectiveness of guided inquiry and instad towards students' critical thinking skills on circulatory system materials. Journal of Indonesian Science Education, 7 (4), 476–482. https://doi.org/10.15294/jpii.v7i4.14302

[26] Rahma, A. N. (2012). Matter Solubility and Product Approach. Journal of Education Research and Evaluation, 1 (2), 133–138.

[27] Rahmasari, T. P., Kurnia, L. D., Juwani, G. M., Murti, A. D., & Putra, K. A. P. (2020). SOCIALIZATION AND TRAINING OF MAKING E-MAGAZINE IN CHEMISTRY LEARNING @ SMAN PINTAR, RIAU PROVINCE. 4 (2), 177–185

[28] Reflianto, & Syamsuar. (2019). Education and learning challenges based on information technology in the era of the industrial revolution 4.0. Scientific Journal of Educational Technology, 6 (2), 1–13. https://doi.org/https://doi.org/10.24036/et.v2i2.101343

[29] Sa'adah, S. I., Putri, M. A., Nurhasanah, & Linda, R. (2019). Printed and IT THOTSIC as a Benchmark of Students' Ability in Facing the National Examination. Journal of Educational Sciences, 3 (1), 96–105. https://doi.org/https://doi.org/10.31258/jes.3.1.p.96-105

[30] Sa'adah, S. I., Rasmiwetti, R., & Linda, R. (2019). Development of Hots Questions with Wondershare Quiz Creator as a Display Media for Class Stoichiometry Materials X. Journal of Tadris Kimiya, 4 (2), 177–188. https://doi.org/10.15575/jtk.v4i2.5469

[31] Saraswati, S., Linda, R., & Herdini, H. (2019). Development of Interactive E-Module Chemistry Magazine Based on Kvisoft Flipbook Maker for Thermochemistry Materials at Second Grade Senior High School. Journal of Science Learning, 3 (1), 1–6. https://doi.org/10.17509/jsl.v3i1.18166

[32] Sasson, I., Yehuda, I., & Malkinson, N. (2018). Fostering the skills of critical thinking and question-posing in a project-based learning environment. Thinking Skills and Creativity, 29 (September), 203–212. https://doi.org/10.1016/j.tsc.2018.08.001

[33] Schleicher, A. (2019). PISA 2018: insights and interpretations. OECD Publishing, 64. https://www.oecd.org/pisa/PISA 2018 Insights and Interpretations FINAL PDF.pdf Schulz, H., & Fitz-Patrick, B. (2016). Teachers' understandings of critical and higher order thinking and what this means for their teaching and assessments. Alberta Journal of Educational Research, 62 (1), 61–86.

[34] Setiyadi. (2013). Concepts and Practices of Nursing Research Writing, 2nd Edition (2nd ed.). Graha Ilmu.

[35] Sudarmin, Zahro, L., Pujiastuti, s e, Asyhar, R., Zaenuri, & Rosita. (2019). The Development of PBL-Based Worksheets Integrated with Green Chemistry and Ethnoscience to Improve Students; Thinking Skills. Journal of Indonesian Science Education, 8 (4), 492–499. https://doi.org/10.15294/jpii.v8i4.17546.

[36] Suhartono, E. (2017). Systematic Literature Review (SLR): Methods, Benefits, and Challenges of Learning Analytics with Data Mining Methods in Higher Education. INFOKAM Scientific Journal, 13 (1), 73–86.

[37] Sumarni, W., & Kadarwati, S. (2020). Ethno-stem project-based learning: Its impact on critical and creative thinking skills. Journal of Indonesian Science Education, 9 (1), 11–21. https://doi.org/10.15294/jpii.v9i1.21754

[38] Suryawati, E., Suzanti, F., Zulfarina, Putriana, A. R., & Febrianti, L. (2020). The implementation of local environmental problem-based learning student worksheets to strengthen environmental literacy. Journal of Indonesian Science Education, 9 (2), 169–178. https://doi.org/10.15294/jpii.v9i2.22892

[39] Adobe Systems Team. 2014. Adobe Acrobat 11 Pro. Adobe System. California

[40] Usmeldi, Amini, R., & Trisna, S. (2017). The development of research-based learning models with science, environment, technology, and society approaches to improve critical thinking of students. Journal of Indonesian Science Education, 6 (2), 318–325. https://doi.org/10.15294/jpii.v6i2.10680

[41] Utami, D. N., & Aznam, N. (2020). IPA based learning cycle 7E integrated LKPD Parangtritis coastal local potential to improve critical thinking of students. Journal of Science Education Innovation, 6 (1), 11–25.

[42] Wijayanti, M. D., Rahardjo, S. B., Saputro, S., & Mulyani, S. (2019). Item analysis of critical thinking skills, instrument to measure the effectiveness of the scientific group inquiry learning (SGIL) model. Journal of Indonesian Science Education, 8 (4), 538–546. https://doi.org/10.15294/jpii.v8i4.20794

[43] Yuliana, N., & Kusumawati, W. (2019). Self-Directed Learning Methods in Nursing Education: A Literature Review Self-Directed Learning Methods on Nursing Education: A Literature Review. Indonesian Journal on Medical Science, 6 (1), 6–13.

TOXICOLOGY BOOK AS A TOOL TO IMPROVE INTERNAL TRY OUT SCORES FOR STUDENT COMPETENCY TEST IN CLINICAL TOXICOLOGY CORE

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Abstract

The globalization era is increasingly challenging because competition between nations is increasingly fierce. To be ready and survive this condition, Indonesia must have human resources that qualified to international standards. At 2018 Medical Laboratory Technologist Graduates required a competency test by Ristek Dikti, AIPTLMI and PATELKI. Unfortunately the passing competency test rate in national level is still relatively low, reaching only 43%. Clinical toxicology is one of the areas tested during the competency test. This research aims to generate Clinical toxicology Book to improve internal try out scores. The application of this approach gave positive influence to students score. Internal try out scores increased so that it can be said that developed Clinical toxicology book is effective and feasible.

Keyword: Book, Clinical toxicology, competency test Try out

INTRODUCTION

Free market and globalization give rise to fierce competition between nations. To fight this condition, every country mustly have human resources according international standards and are able to generate products / services towards international standards[1].

Effort to shield this effect of globalization PATELKI dan AIPTLMI organizing a competency test (Ujikom) for graduates of the Health Analyst Diploma Three Study Program. A national competency test is needed to answer the challenges of globalization that are currently being faced in the effort to standardize and guarantee the quality of higher education graduates in the health workers. The competency test is carried out so that graduates can be registered as health analysts and are allowed to carry out their practice / professional work in the territory of Indonesia as health workers in carrying out their duties. The level of passing the 2018 Ujikom has not been satisfactory, it has only reached 43%.

The results of student competency tests are obtained by external factors, include: Try Out, curriculum / learning methods, lecturer factors, other influencing factors[2]. In accordance with what was reported by previous researchers, learning material during college is a factor that affects to passing competency tests. Students' difficulties in understanding the material are probably caused by the existing textbooks were is too contextual and the explanations of content are too complicated[3]. More students easier to understand textbooks than other learning resources because they can be read, checked and discussed repeatedly. Books must be of high quality and be able to convey a complete message so that books need to be written, designed, and presented in a more attractive visually, easy to understand and can help students improve competency test scores.

Clinical toxicology is a field of study that is tested on competency test questions. It is necessary to compile Clinical toxicology book because the competency test questions refer to the mastery of knowledge and skills, the ability to think (high level) and refers to character building (attitudes).

This research aim to produce a Toxicology Textbook as a Tool to Improve the internal try out score of Student Competency Test in the field of Clinical Toxicology at Rajawali Health Institute.

METHODS

Research methodology

This research used Research and Development (R&D) study which is a type of research used to produce a product[4] The subjects of this research are 3 Toxicology lecturers. It applies non-randomized system of selecting the subject and is based on certain characteristics; those are (1) Toxicology lecturer; (2) permanent and active staffs in Technology Laboratorium Medic higher school; (3)Lecturer having three year period of work or more; and (4) male or female. Beside that the research subject to try utilization toxicology textbook is 80 health analyst students who will do competency test agenda of this 2020. The sampling technique was simple random which found 80 students as the samples.

Materials

There are three laptop (Acer, Lenovo, and MacBook Air) was used to write text book. Papper and Printer (EPSON L380) was used to printing draft of book, reference, and all hard documents. Office stationery to research support tools. Laboratory materials, substance and equipment to try practicum procedure. The 'IM3 ooredoo' data

pulse. Cellphone or Leptop to fill out a questionnaire. Computer instalation at Computer Based Test (CBT) room eas used to try out internal. Camera phone (Oppo Reno 2F) to capture all picture during research. Google form online facilities to field try out competency test questions.

Prosedure

This research first begin with the Literature review for Clinical Toxicology reference according to the blue print Competency test (Ujikom). Based on first step then continue to analysis all of literature have been carried out at the beginning of the compilation of various textbooks were used at this stage. 'Wacana' Analysis (writing paragraphs based on literature) to produce text. Try the practice prosedures entered in the book is important step before book validation step. Next step is validation of macro proportions (text), discourse reconstruction of text and layouting the design. The feasibility test on textbooks is carried out by giving questionnaires to lecturers who teach clinical toxicology courses on several campuses. Last step is Internal Exam Tryout Pretest, the use of textbooks in the strengthening of Ujikom, Ujikom's internal posttest tryout uses the same questions as the questions during the pretest. Then analysis data on the increase in the internal tryout score by Wilcoxon Signed Ranks Test using SPSS.

RESULTS

This section explained the results of research and at the same time is given the comprehensive discussion. The data and discussion can be made in several sub-chapters.

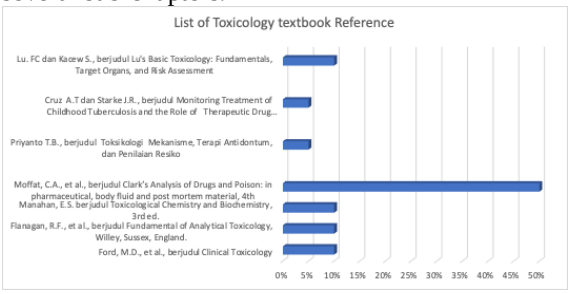

Figure 1. List of Toxicology textbook reference and percentage

The instrument used is a validation form. Validation form has been tested for validity and reliability Validation is conducted to know the feasibility of learning outcome and textbook content. From three validator all of textbook is valid. From this step got the suggestion and recommendation from all validators. Almost all them applied to the textbook to be best textbook ever. Practicum procedure also treat the feasibility test have form tested the procedures in the laboratory.

This step produce score pretest and posttest information. Pretest and posttest question has been valid and reliable. Treatment was given to students as utilization of Clinical toxicology book. Almost all of students was an increase in score after treatment. The data analysis result by Wilcoxon Signed Ranks Test using SPSS software shown at Table 1.

Table 1 Influence of utilization of Clinical toxicology book treatment by Wilcoxon Signed Ranks Test analysis

Ranks

		N	Mean Rank	Sum of Ranks
Value after treatment - Value before treatment	Negative Ranks	6[a]	8,33	50,00
	Positive Ranks	74[b]	43,11	3190,00
	Ties	0[c]		
	Total	80		

a. Value after treatment <Value before treatment

b. Value after treatment > Value before treatment

c. Value after treatment = Value before treatment

DISCUSSION

On learning study proccess has many component necessary to prepare. One of them is teaching materials**.** Teaching materials are all forms of material used to assist lecturers / instructors in carrying out teaching and learning activities in class**[5].** Teaching materials in the form of printed teaching materials such as Textbooks. The good books are arranged in the right rules in order to produce good quality books. A good quality book is able to convey messages precisely and according to purpose. According to the textbook functions as follows [6]:

1. Reflects a clear perspective on teaching and learning to demonstrates its application in the teaching materials presented.
2. Reflecting a rich knowledge, easy-to-read and varied source of subject matter according to the interests and needs of students, as a basis for learning activity programs.
3. Provide an organized and sequential resource for skills.
4. Presenting methods / materials of teaching to motivate students.
5. Presents the necessary initial fixations (deep roles) as well as support for practical exercises and assignments, dan
6. Presenting the evaluation and remedial materials / tools.

The process of producing textbook combine various references. Literature review do for this step. One reference and another completed each other. Discourse analysis usually call 'Analisis Wacana' did to produce beautiful text. Critical discourse analysis is necessary developed and used

as a tool to dismantle interests, ideologies, perceptions and practice in language and discourse activities.[7] Step to got textbook is discourses analysis that are in accordance with the needs of lectures and ukom question tutoring, namely adjusted to the learning objectives and the character of the discourse for clinical toxicology learning..

Producing textbook step have designing and decorating book process. This way to produce well-designed textbooks. Well-designed textbooks have the potential to make learning more lasting, fun and meaningful and may actively engage learners' and lecturer in many ways, through such mechanisms as posing questions, visual processing, testing hypotheses, analytical thinking, and verbal reasoning[8].

On the validity test of textbooks against three toxicology lecturers, the valid results were obtained from three lecturers. Testing the validity of the instrument can be done by asking judgment experts**[4]**. Therefore, the lecturer was chosen expert who acts as the instrument validator. The validity / eligibility includes: display aspects, language aspects, and material aspects. The results of the questionnaire state the dimensions, material and display dimensions get very high categories, meanwhile the language dimension gets a high category. The validity / feasibility of books has been declared successful in this research because it has exceeded the target, namely more than enough category.

The result of utilization of clinical toxicology book show succesfuly treatment. 76 Students score is increase (95%) and only 4 students score was decrease (5%). The study concluded that the development of a science textbook based on Science Technology Society is appropriate to use for learning[9].

CONCLUSION

Clinical toxicology textbook has been produced from this research. Influence of utilization of Clinical toxicology book treatment show positive ranks to competency test try out internal scores effect

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REFERENCES

[1] OECD. PISA 2019 Assessment Framework Key competencies in reading, mathematics and science. OECD; 2019 [online]. URL : http*://www.oecd.org/dataoecd/11/40/44455820.pdf [10 September 2010]*

[2] A. Abdillah. Analisis faktor-faktor yang mempengaruhi kelulusan uji kompetensi NERS Indonesia. JPAP; 2(2); pp. 373-380, Oct 2016

[3] S.N. Andriaty, A Findyartini, R.A. Werdhani. Studi eksplorasi kemungkinan penyebab kegagalan mahasiswa dalam uji kompetensi dokter indonesia, studi kasus di fakultas kedokteran universitas abulyatama. Jurnal Serambi PTK 2016; 3(2); pp.1-12

[4] Sugiyono, Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif dan R&D). Penerbit CV. Alfabeta: Bandung, 2015, pp.530

[5] Minarni. Pengembangan bahan ajar dalam bentuk media komik dengan adobe photoshop CS6 pada materi laju reaksi. Jurnal Inovasi Pendidikan Kimia, 14(2), pp. 2595 – 2607,2020

[6] A. Rustaman, Membangun Literasi Sains Peserta Didik. Bandung: Humaniora Penerbit Buku Pendidkan; 2011

[7] U. Fauzan, analisis wacana kritis dari model Faiclough hingga Mills. Jurnal Pendidik,6(1); pp:-, 2014

[8] Morgan in Y Behnke, The Palgrave Handbook of Textbook Studies. Publisher: Palgrave Macmillan:US;2018 pp.385

[9] A. Kartikasari, Roemintoyo, S. Yamtinah. The Effectiveness of Science Textbook Based on Science Technology Society for Elementary School Level. International Journal of Evaluation and Research in Education (IJERE) 7(2), pp. 127-131, June 2018.

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THE KNOWLEDGE SHARING BEHAVIOR AMONG FACULTY MEMBERS BASED ON DIFFERENT ACADEMIC DISCIPLINES IN HIGHER EDUCATION

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Abstract

This study aimed to compare the knowledge sharing behavior from faculty members of science department and social counterparts as well as the impact of leadership and normative beliefs on the knowledge sharing behavior of both academic disciplines in higher education. The data collection method in this study was a closed questionnaire with a scale of 1-5 intervals distributed to 130 Indonesian lecturers and was analyzed by using Independent T-Test and WARP-PLS statistics. The study indicated a high intention in knowledge sharing behavior among both groups, however there were some difference results in details. Leadership in both disciplines affected the knowledge sharing behavior. The normative beliefs on knowledge sharing of science lecturers were higher than their social sciences counterparts. However, the normative beliefs on knowledge sharing of science lecturers failed in influencing the knowledge behavior among them. This research has implication that the knowledge sharing behavior can be controlled more by organization leaders than by normative beliefs. It means the leader plays an important role in shaping knowledge sharing as a part of the culture in higher education.

Keywords: knowledge sharing, knowledge sharing behavior, normative beliefs, leadership, higher education

INTRODUCTION

Knowledge as intellectual capital is the main resource of an organization. This makes knowledge a strategic resource in achieving competitive advantage and organizational success. The use of knowledge resources can be done more effectively and efficiently through a knowledge management system [1]. Knowledge management includes the process of creating, using and sharing knowledge and information within an organization. Knowledge sharing is one of the main processes in knowledge management [1], [2].

Knowledge sharing is the process of providing or receiving information about tasks or knowledge and feedback about certain products or procedures [3]. Knowledge sharing allows individual knowledge to be converted into organizational knowledge. In the process, knowledge sharing provides benefits to the organization, namely (1) knowledge can be disseminated effectively and efficiently in the organization; (2) enhancing the ability of individual knowledge to recognize the value of knowledge, assimilate, and apply it to commercial purposes. It is supported by research [4] which also reveals that knowledge sharing is very important in the process of knowledge creation, organizational learning, and performance achievement.

There are several things that make knowledge sharing behavior important in an organization, including: (1) the distribution of knowledge from sender to receiver; (2) expanding employees' ability to organize; (3) better respond to environmental changes; (4) utilizing new knowledge; and (5) making effective decisions in business [5]. Knowledge management is beneficial for all sectors, both in manufacturing, banking, telecommunications, education and the public sector [6].

Previous studies on knowledge sharing are still dominated by knowledge sharing activities in business organizations [7], there is little empirical research that examines the intention of sharing knowledge of academic staff in universities, especially in Indonesia [8], [9]. Even so, the issue of knowledge sharing is equally important for knowledge-based institutions, such as universities, in which knowledge is created, distributed and applied. In higher education, the intention and attitude of academic staff (lecturers) in conducting knowledge sharing is a major component of successful knowledge management. Good knowledge sharing practices will help develop quality education and improve organizational performance.

Leaders certainly play an important role in controlling organizational performance. Therefore, the role of leadership is one of the factors that can influence the creation of a culture of knowledge sharing in an institution, including universities. However, the results of research [10] revealed that leadership had no effect on satisfaction and was less effective in building individual commitment to knowledge-sharing activities. On the other hand, there are contradictory studies that have found a positive relationship between empowering leadership and knowledge sharing [11]. Based on this research gap, the first hypothesis is compiled in this

study, namely *leadership affects knowledge sharing behavior.*

Knowledge sharing activities are influenced by several factors. Perceived self-efficacy and anticipated reciprocal relationship have a positive and significant effect on the intention to share knowledge while expected extrinsic awards have no effect [2]. The results of the study [12] explained that three of the Big Five Personality aspects affected individual knowledge sharing behavior, namely neuroticism, extroversion, and agreeable. Meanwhile, conscientiousness and openness had no effect.

Furthermore, subjective norm is a variable that influences knowledge sharing behavior. This is also supported by the results of research [13] and [14] where subjective norms and attitudes positively and significantly affected knowledge sharing behavior. [15] Adding normative belief as one of the factors influencing knowledge sharing behavior after attitudes and intentions towards knowledge sharing. However, the results differ in [16] that normative belief had no effect on intention and behavior in knowledge-sharing activities. Based on the research gap, the second hypothesis is compiled in this study, namely *normative beliefs affect knowledge sharing behavior.*

Attitudes towards knowledge sharing have a strong effect on one's research productivity [17]. This is because they value the role of research and knowledge-sharing activities with colleagues. In addition, the normative structure embedded in the environment is indirectly able to encourage someone to communicate and create new knowledge through knowledge sharing activities [18].

In higher education, the intention and attitude of academic staff in conducting knowledge sharing is a major component of successful knowledge management. Good knowledge sharing practices will help develop quality education and improve organizational performance. Research [6] stated that knowledge sharing among academic staff is important to improve the quality and quantity of knowledge possessed by individuals, resulting in knowledge creation and improving the overall performance of the institution.

There is a significant positive relationship between knowledge sharing and the productivity of scientific publications [19]. This reveals that knowledge sharing can help academic staff increase the number and quality of publications so as to improve research performance in universities.

Knowledge Sharing is the practice of exchanging and disseminating ideas, experiences and knowledge with others to ensure the sustainability of knowledge in organizations. In principle, knowledge sharing is a process intended to gain experience from other people [5]. As social behavior, knowledge sharing is vulnerable to social influences that arise from other people. Therefore it is important for organizations to understand the knowledge sharing behavior of their employees [20].

Knowledge sharing behavior in the academic profession can be identified by applying the theory of planned behavior [1]. Theory of planned behavior is a psychological model that examines individual behavior and states that the best predictor of a person's behavior in certain situations is their intention to perform the behavior. In this theory, a person's behavioral intention is based on attitude toward the behavior, subjective norms, and perceived behavioral control. Attitude toward the behavior refers to the evaluation of the intended behavior that leads to certain favorable or unfavorable outcomes or consequences. Normative beliefs are individual beliefs about the extent to which other people who are considered important to them think that they should or should not do certain behaviors [21]. In this case it means that the feelings of the lecturers towards their leaders and colleagues to do the same thing as what they do, in this case is knowledge sharing. This variable is a variable derived from subjective norms in Theory of Planned Behavior. Indicators in normative belief in knowledge sharing are (a) support from superiors (b) support from colleagues

A person's attitude toward knowledge sharing is influenced by empowering leaderships, where team members tend to see themselves as an important part of the decision-making process so that they are more motivated to share their knowledge [20]. Empowering leadership is able to stimulate and maintain knowledge sharing behavior in the work environment. Empowering leadership is a way for leaders to share power with subordinates and be involved in every action to increase intrinsic motivation to foster better performance [22]. Empowering leadership emphasizes the importance of the work of their subordinates; in this case, lecturers are related to their important role in the formulation of solutions and decisions with the aim of minimizing the boundaries between leaders and members so as to improve knowledge sharing behavior [23].

Several previous studies examining knowledge sharing behavior, especially in the academic environment, only focused on members in general without identifying differences in each field. This research describes the role of empowering leadership and normative belief as a component of Theory of planned behavior in influencing the knowledge sharing behavior of exact science and social science lecturers.

METHOD

This research was a quantitative research. This research was conducted by using a cross-sectional design. The reason for using this design was be-

cause the application of the cross-sectional model focused on variation. The variations consisted of gender, age, length of work, and group of fields of study.

The study population included all active lecturers at UNNES by determining the sample rate using the Slovin formula with an error of 5%. Information from both the field and respondents required techniques to collect information which was then converted into data. This study used primary data and secondary data. Primary data were obtained from questionnaires filled out by lecturers. Meanwhile, secondary data were obtained from literature studies related to research problems. Data collection techniques in this study used among others: literature study and questionnaires. The research questionnaire was presented with a Likert scale. In this study, researchers used a type of questionnaire instrument with a score of 1-5. The research data analysis was carried out by descriptive analysis and path analysis, besides that it was also equipped with a different test to compare the patterns of academic culture at Universitas Negeri Semarang, Indonesia.

RESULTS

This study further examined the Theory of Planned Behavior model to assess the extent to which leadership and normative belief variables affected the knowledge-sharing behavior of lecturers with a background in exact science and social science.

The new system of higher education in a post-industrial environment is characterized by volatile changes, overload information, competitiveness, uncertainty and, sometimes, organizational decline [23]. For higher education institutions, this means higher levels of competition, scarce resources and new fees, and unexpected fluctuations in student enrollment and institutional earnings. For academics, this sometimes means the need to seek new positive identities and new roles to find refuge from the storms of change [24].

The widespread diversification of the system causes higher education institutions to become more diverse internally. The academic culture among faculty members in women's studies, business studies, fashion design and medical-related professions has a very different nature and origin [25]. The multicultural configurations found in universities are much more complex and diverse today than 15 years ago.

Therefore, this study sought to reveal differences in academic life between two different disciplines to determine their motivation for knowledge sharing. Descriptive analysis was conducted by comparing leadership variables, normative beliefs and knowledge sharing from 65 faculty members from the Engineering and Mathematics and Natural Sciences faculties as representatives of the exact "group" and 65 faculty members from the Faculty of Economics and the Faculty of Social Sciences as representatives of the Social science "group" from Universitas Negeri Semarang. Apart from being analyzed descriptively, the data were also analyzed by using WarpPLS to test the effect of leadership and normative beliefs on knowledge sharing among faculty members of higher education.

Table 1. Results of Homogeneity Test and Independent T Test

Variable	Levene's Test		T-Test						
	Sig.	Homogeneity	Sig.	Mean		Criteria		Std. Error	Result
				Science	Social	Science	Social		
Leadership	0.465	Homogeneous	0.000	29.08	34.62	Medium	Medium	1.02709	Different
Normative beliefs	0.527	Homogeneous	0.379	18.06	17.55	High	High	0.57509	Not different
Knowledge Sharing Behavior	0.366	Homogeneous	0.187	13.21	12.92	High	High	0.22014	Not different

Table 2. *Model Fit* and *Quality Indices* for Social Science Lecturers

No	*Model Fit* and *Quality Indices*	Criteria Fit	Analysis Results	Information
1	Average Path Coefficient (APC)	$p < 0,05$	0,325 $p = 0,001$	Accepted
2	Average R-Squared (ARS)	$p < 0,05$	0,241 P= 0,010	Rejected
3	Average Adjusted R-Squared (AARS)	$p < 0,05$	0,217 P=0,016	Accepted
4	Average Block Variance Inflation Factor (AVIF)	*Acceptable if* <= 5, *ideally* <= 3,3	1,020	Ideal

No	*Model Fit* and *Quality Indices*	Criteria Fit	Analysis Results	Information
5	Afvif	*Acceptable if* <= 5, *ideally* <= 3,3	1,061	Ideal
6	Tenenhaus Gof (Gof)	*Small* >= 0,1, *medium* >= 0,25, *large* >= 0,36	0,384	Large
7	Sympson's Paradox Ratio (SPR)	*Acceptable if* >= 0,7, *ideally* =1	1,000	Ideal
8	R-Squared Contribution Ratio (RSCR)	*Acceptable if* >= 0,9, *ideally* = 1	1,000	Ideal
9	Statistical Suppression Ratio (SSR)	*Acceptable if* >= 0,7	1,000	Accepted
10	Nonlinear Bivariate Causaly Direction Ratio (NLBCDR)	*Acceptable if* >= 0,7	1,000	Accepted

Source: Data processed, 2020

Table 2 shows that the overall fit and quality indices of the sample of social science lecturers had not met the criteria. The research model must have a fit model that is all included in the category (accepted), especially for APC, ARS and AARS values. The inner model of research in social science lecturers can be continued because the accepted APC and AARS scores are added with the ideal value of other factors. While testing the quality of the model for exact science lecturers can be seen in the following table.

Table 3. *Model Fit* and *Quality Indices* for Exact Science Lecturers

No	*Model Fit* and *Quality Indices*	Criteria Fit	Analysis Results	Information
1	Average Path Coefficient (APC)	p < 0,05	0,153 p = 0,050	Accepted
2	Average R-Squared (ARS)	p < 0,05	0,060 P= 0,156	Rejected
3	Average Adjusted R-Squared (AARS)	p < 0,05	0,217 P=0,016	Good
4	Average Block Variance Inflation Factor (AVIF)	*Acceptable if* <= 5, *ideally* <= 3,3	1,459	Ideal
5	Afvif	*Acceptable if* <= 5, *ideally* <= 3,3	1,363	Ideal
6	Tenenhaus Gof (Gof)	*Small* >= 0,1, *medium* >= 0,25, *large* >= 0,36	0,193	Small
7	Sympson's Paradox Ratio (SPR)	*Acceptable if* >= 0,7, *ideally* =1	1,000	Ideal
8	R-Squared Contribution Ratio (RSCR)	*Acceptable if* >= 0,9, *ideally* = 1	1,000	Ideal
9	Statistical Suppression Ratio (SSR)	*Acceptable if* >= 0,7	1,000	Accepted
10	Nonlinear Bivariate Causaly Direction Ratio (NLBCDR)	*Acceptable if* >= 0,7	0,500	Rejected

Source: Data processed, 2020

Table 3 shows that the overall results of the fit model and quality indices of the exact science lecturer sample had not met the criteria. The research model must have a fit model that is all included in the category (accepted), especially for APC, ARS and AARS values. The inner model of research in exact science lecturers can still be continued because the APC value is accepted plus the value of other ideal factors. There are several factors that are not accepted, namely the ARS, AARS and NLBCDR values which indicate that the inner model is acceptable but not significant.

The relationship between variables for social science lecturers in this study can be seen in Figure 1.

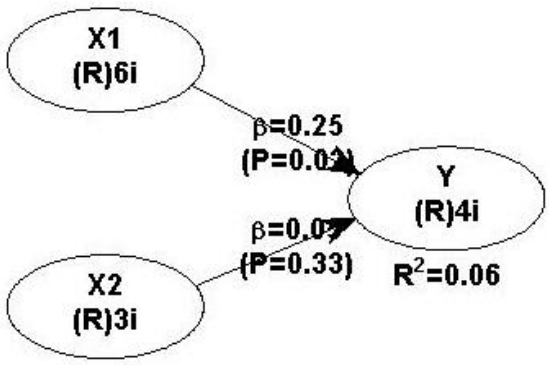

Figure 1. Research Data Analysis for Social Science Lecturers

Based on the test results in the image above, it can be seen that the leadership variable had a positive direction on the behavior regarding knowledge sharing with a coefficient of 0.241 and a value requirement of 0.001 where the leadership variable had a strong effect on behavior regarding knowledge sharing, meanwhile, the normative belief variable about knowledge sharing on knowledge sharing behavior showed a coefficient of 0.309 and a p value of 0.004, which means that normative beliefs about sharing knowledge had a moderate effect on behavior regarding knowledge sharing.

The direction of the relationship and the magnitude of the coefficient between variables for exact science lecturers can be seen in Figure 2.

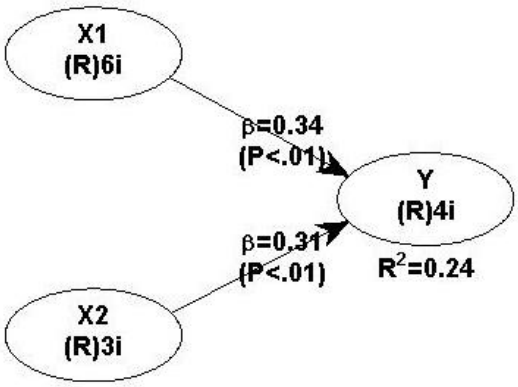

Figure 2. Research Data Analysis for Exact Science Lecturers

The test results showed that the leadership variable had a positive direction on behavior regarding knowledge sharing with a coefficient of 0.222 and a requirement of p value 0.029 where the leadership variable had a moderate effect on behavior regarding knowledge sharing, meanwhile the normative belief variable about sharing knowledge had no effect on behavior regarding knowledge sharing. This is because the p value of the normative belief variable is > 0.05 that exceeds the understanding limit of the p value, namely 0.10 or 10%.

DISCUSSION

Descriptively, Table 1 showed that in general there were no significant differences in normative beliefs and knowledge sharing behaviors of lecturers in the exact sciences and social sciences. Both were in the high category. On the other hand, there were significant differences between the two in the leadership variable, even though they were in the same category, namely medium. The role of leadership was seen more prominently in the academic community who were engaged in social science.

In general [25] classifies knowledge and discipline groupings into four categories, which include: (a) hard-pure in the form of pure exact sciences such as physics and mathematics; (b) soft-pure, namely pure social sciences such as history, sociology and anthropology; (c) hard-applied covering mechanical and medical engineering and the like; and (d) soft-applied covering education, law, administration and the like. Each of these categories has different characteristics, including in terms of leadership.

Orientation and work systems in each of the disciplines are such as teams in sports [26]. The exact field is like a sprinter. Researchers work in a team and compete intensely against other teams. Maybe for the field of Biology and Ecology it will tend to be gentler because some of the objectives are to observe natural phenomena, but time and budget constraints in the end still force them to increase their speed.

On the other hand, social science (both pure and applied) is like a person doing jogging, where work can be done alone or in a small team. They are not tied to one big team and do not have to have the same goal. Each individual is free to choose the preferred path, there will even be individuals who choose not to enter any competition, but only become a commentator.

The positions and duties of the 'coach' and 'captain' (in this context are academic leaders) are responsible for the performance of the teams that differ these characteristics. The output of each team also differs according to the "competition" they are participating in. This is in accordance with the results of research in this study that the role of the leader is more dominant for lecturers with a social science background because the work culture is more dynamic and varied so that it requires a greater role and control of the leader. In contrast, faculty members in the faculty of exact sciences already have large teams with clearer projects and work targets so that the role of the leader tends to be simpler.

H1: Leadership affected knowledge sharing behavior

Although the role of leaders in the faculties of exact and social sciences is different, leadership still plays an important role in influencing individual knowledge sharing behavior. Individuals who feel that they are an important part of decision making will be more motivated to share knowledge. The existence of high leadership abilities can increase loyalty not only to individuals but also to colleagues in an organization which in turn affects the behavior in sharing knowledge [27].

The results showed that leadership affected knowledge sharing behavior for both lecturers with backgrounds in exact science and social science. This result contradicted the results of research [28] and strengthens previous studies [29], [22], [28] and [29] that leadership is a key role in maintaining

knowledge-sharing behavior, both individuals and groups. The results of this study are also in line with the results of research [30] which stated that leadership is a very important factor in increasing the knowledge sharing behavior of stakeholders in hospitals in Jordan.

Leadership increases individual commitment and motivation which impacts on the desire to improve the quality of performance, especially in the field of knowledge sharing [27]. In addition, [31] stated that leadership is necessary in providing appropriate knowledge and networking in that environment and has an impact on opportunities for knowledge sharing. The importance of leadership in influencing the culture of sharing knowledge in organizations is also supported by [32].

H2: Normative belief affected knowledge sharing behavior

Normative belief is defined as the lecturers' feelings towards their leaders and colleagues to do the same thing as what they do, in this case knowledge sharing behavior. Thus, the higher the normative belief a lecturer has, the higher the intention of knowledge sharing that is carried out.

The results showed that normative beliefs affected knowledge sharing behavior for lecturers with a social science background. [33], [15] and [34] support this finding by revealing that there was a positive relationship between normative beliefs and knowledge sharing. Their research implies that someone who feels knowledgeable will consider sharing his knowledge. There is a significant relationship between subjective norms, which in this case is the normative belief in knowledge sharing behavior affected by a professional and positive environment [35]. This environment creates a sense of caring which then encourages academics to share knowledge on an ongoing basis. Therefore, someone who has high normative beliefs is more likely to share their knowledge when they feel that the group they are joining is supportive and hopes to share knowledge with each other.

In accordance with the previous explanation regarding the characteristics of faculty members in the faculty based on social sciences, each individual has different interests in their professional fields and it is very possible that this interest varies from time to time. Knowledge sharing can be a forum for faculty members who have the same passion or are exploring to try new things outside of their expertise.

Different results were shown for lecturers with an exact science background, namely normative beliefs had no effect on knowledge sharing behavior. This supports research [10] and [16]. The results of the research that do not show the effect of normative beliefs on knowledge sharing behavior are in accordance with the previous explanation that the salient characteristics in exact science are the intense competition between teams to achieve the same goals so that it affects knowledge sharing behavior which is only limited to teammates.

Based on the discussion above, it can be concluded that leadership had a significant effect on knowledge sharing behavior both to lecturers with social and exact science backgrounds, but with different levels of influence. Leadership has a greater effect on the knowledge sharing behavior of social science lecturers than exact science lecturers. The normative belief variable affected the knowledge sharing behavior of social science lecturers, but it did not affect the exact science lecturers. Therefore, in order to revive the spirit of knowledge sharing among faculty members in different scientific backgrounds, a leadership role is needed who is able to flexibly direct faculty members regardless of their normative beliefs.

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REFERENCES

[1] A. Srivastava, K. M. Bartol, and E. A. Locke, Nordin, N. A., Daud, N., Ummi, W., & Meor, K. Knowledge Sharing Behaviour among Academic Staff at a Public Higher Education Institution in Malaysia. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, *6*(12), 3415–3420. 2012

[2] Tohidinia, Z., & Mosakhani, M. Knowledge sharing behaviour and its predictors. *Industrial Management & Data Systems*, *110*(4), 611–631. 2010.https://doi.org/10.1108/02635571011039052

[3] Foss, N. J., Husted, K., & Michailova, S. Governing Knowledge Sharing in Organizations : Levels of Analysis , Governance Mechanisms , and Nicolai J . Foss , Kenneth Husted and Snejina Michailova. *Journal OfManagement Studies*, *47*(3), 455–482. 2010 https://doi.org/10.1111/j.1467-6486.2009.00870.x

[4] Ipe, M. Knowledge Sharing in Organizations: A Conceptual Framework. *Human Resource Development Review*, *2*(4), 337–359. 2013. https://doi.org/10.1177/1534484303257985

[5] Razak, N. A., Pangil, F., Zin, L., & Azlina, N. Theories of Knowledge Sharing Behavior in Business Strategy. *Procedia Economics and Finance*, *37*(16), 545–553. 2016. https://doi.org/10.1016/S2212-5671(16)30163-0

[6] Akosile, A., & Olatokun, W. Factors influencing knowledge sharing among academics in. *Journal of*

Librarianship and Information Science, *6*, 1–8. 2019 https://doi.org/10.1177/0961000618820926

[7] Cheng, M., Ho, J. S., & Lau, P. M. Knowledge Sharing in Academic Institutions : a Study of Multimedia University Malaysia. *Electronic Journal of Knowledge Management*, *7*(3), 313–324. 2009

[8] Saide, R. Trialih, Hsiao-Lan Wei, Okfalisa, & Wirdah. Knowledge Sharing Behavior and Quality Among Workers of Academic Institutions in Indonesia. *International Journal of Business and Society*. 18(2). 353-368. 2017.

[9] Jolaee, A., Nor, K. M., Khani, N., & Yusoff, R. M. Factors affecting knowledge sharing intention among academic staff. *International Journal of Educational Management*, *28*(4), 413–431. 2014. https://doi.org/10.1108/IJEM-03-2013-0041

[10] Elkordy, Manal. Transformational Leadership and Organizational Culture as Predictors of Employees Attitudinal Outcomes. Business Management Dynamics. Vol.3 No.5. Pp. 1526, 2013

[11] Wei-Li Wu, Yi-Chih Lee,Empowering group leaders encourages knowledge sharing: integrating the social exchangetheory and positive organizational behavior perspective, Journal of Knowledge Management, Vol. 21 Issue: 2, pp.474-491, 2017. https://doi.org/10.1108/JKM-08-2016-0318

[12] Teh, Pei-Lee, Chen-Chen Young, Chin Wei Chong, & Siew Yong Yew. Do the Big Personality Factors Affect Knowledge Sharing Behavior? A Study of Malaysian Univresities. *Malaysian Journal of Library and Information Science.* 16(1): 47-62. 2011

[13] Rahman, Muhammad Sabbir., Aahad M. Osmagani, Nuraihan Mat Daud., & Fafi A.M.A. Fattah. Knowledge Sharing Behaviors Among non Academic Staff on Higher Learning Institutions Attitude, Subjective Norms and Behavioral Intention Embedded Model. *Library Review.* Vol. 65. No. 1/2. Hal 65-83. 2016.

[14] Abdillah, Muhammad R., Ching-Torng Lin, R. Anita, B.Suroto, & Hadiyati. Knowledge-sharing Behavior Among Banking Officers in Indonesia. *Journal of International Studies*. 11(2), 136-153. 2018. http://doi.org/10.14254/2071-8330.2018/11-2/10

[15] Cheng, Xu. *Applying the Theory of Planned Behavior to Influence Auditors' Knowledge—Sharing Behavior*. Graduate Theses and Dissertations University of South Florida.2017. http://scolarcommons.usf.edu/etd/6691

[16] Fauzi, Muhammad Ashraf., Christine Nya-Ling Tan., &T. Ramayah. Knowledge Sharing Intention at Malaysian Higher Learning Institutions: The Academic's Viewpoint. *Knowledge Management & E-Learning*. Vol. 10, No.2. Page 163-176, 2018.

[17] Shim, Soyeon., Gwedolyn O'Neal., dan Nancy Rabolt. Research Attitude and Productivity Among Faculty at Four-Year U.S. Institutions: A Socialization Perspective. *Clothing and Textiles Research Journal*. 16 (3). Page 134-144. 1998

[18] Lerputtarak, Sarunya. *An Investigation of Factors Related to Research Productivity in a Public University in Thailand: A Case Study*. Dissertation. Degree of Doctor of Education, School of Education, Faculty of Arts, Education and Human Development, Victoria University, Melbourne, Australia. 2008.

[19] Ghabban, F., Selamat, A., & Ibrahim, R. (2018). New model for encouraging academic staff in Saudi universities to use IT for knowledge sharing to improve scholarly publication performance. *Technology in Society*. 2018. https://doi.org/10.1016/j.techsoc.2018.07.001

[20] Xue, Y., Bradley, J., Liang, H., Xue, Y., Bradley, J., & Liang, H. *Team climate , empowering leadership , and knowledge sharing*. 2011 https://doi.org/10.1108/13673271111119709

[21] Cialdini RB, Reno RR, Kallgren CA. "A Focus Theory of Nor-mative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places". .*Journal of Personality and Social Psychology* 58(6): 1015–1026. 1990.

[22] A. Srivastava, K. M. Bartol, and E. A. Locke, "Empowering leadership in management teams: Effects on knowledge sharing, efficacy, and performance," *Academic. Management. J.*, vol. 49, no. 6, pp. 1239–1251, 2006.

[23] Cameron, K. S., & Tschirhart, M. (1992). Postindustrial environments and organizational effectiveness in colleges and universities. *The Journal of Higher Education*, *63*(1), 87-108

[24] Henkel, M. (2000). *Academic identities and policy change in higher education* (Vol. 46). Jessica Kingsley Publishers.

[25] Becher, T., & Trowler, P. (2001). Academic tribes and territories. Buckingham: SRHE.

[26] Kekäle, J. (1999). 'Preferred'patterns of academic leadership in different disciplinary (sub) cultures. *Higher Education*, *37*(3), 217-238.

[27] Cakir, Fatma Sonmez, & Zafer Adiguzel. Analysis of Leader Effectiveness in Organization and Knowledge Sharing Behavior on Employees and Organization. *Journal SAGE.* 1-14. 2020. https://doi.org/10.1177/2158244020914634

[28] Lin, H. F. Knowledge sharing and firm innovation capability: An empirical study. *International Journal of Manpower*, *28*(3/4), 315-332, 2007.

[29] Zahidul, I. M., Hasan, I., Ahmed, S., & Ahmed, S. M. Organizational culture and knowledge sharing: Empirical evidence from service organizations. *African Journal of Business Management*, *5*(14), 5900-5909, 2011.

[30] Alhalhouli, Zaid. T., Z. B. Hj. Hassan, & C. S. Der. Factors Affecting Knowledge Sharing Behavior Among Stakeholders in Jordanian Hospitals Using Social Networks. *International Journal of Computer and Information Technology.* 03(05), 919-928. 2014.

[31] Kerr M, Clegg C. Sharing knowledge: contextualizing socio – technical thinking and practice. Learn. Organ., 14(5): 423-435. 2007.

[32] Oliver S, Kandadi KR. How to develop knowledge culture in organizations? A multiple case study of

large distributed organizations. J. Knowl. Manage., 10(4): 6-24. 2006.

[33] Ranasinghe, S.B., P. Dharmadasa. Intention to Knowledge Sharing: From Planned Behavior and Psychological Needs Perspectives. *International Journal of Knowledge Management*. 9 (4). Page 33-50. 2013. DOI: 10.4018/ijkm.2013100103

[34] Chennamaneni, Anitha. *Determinants of Knowledge Sharing Behaviors: Developing And Testing An Integrated Theoretical Model*. Dessertation. Faculty of the Graduate School of The University of Texas at Arlington. 2006.

[35] Abbas, Khalid. *Knowledge-Sharing Behaviour Intentions of Academics an Their Determinants.* Thesis. Liverpool John Moores University for Degree of Doctor of Philosophy. 2017. https://pdfs.semanticscholar.org/b109/5c616f42a9f1cd7debb5b1a4733b9e0f3878.pdf

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FEASIBILITY OF LEARNING INSTRUMENTS INNOVATION BASED ON PATROL MUSIC TO IMPROVE STUDENTS' LOVE THE HOMELAND ATTITUDE

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Abstract

The aim of this research is to (1) determine the feasibility of physics learning instruments based on patrol music, and (2) measure students' responses to the readability of local knowledge-based physics learning instruments. This study uses a 4D research and development model but it is specifically reviewed at the development stage only. The technique of data collection in this study uses feasibility assessment sheets and questionnaire items. These assessment sheets are given to three lecturers and questionnaire items are given to 15 students from class XI as research sample subjects. The research places were conducted in Public High School 1 Turen, Malang. This learning instruments consisted of the syllabus, lesson plans, student worksheets, handout and questionnaire of love the homeland attitude. The results of this study were analyzed with analysis quantitative descriptive. Based on the analysis result, the physics learning instruments based on patrol music have the feasibility in the excellent category to be implemented in the classroom for improving students' love the homeland attitude. Meanwhile, based on students' response analysis results, for the readability students' worksheets has students' response with the value of 78.75% while the readability handout has students' response with the value of 87.41%.

Keywords: feasibility, learning instruments, local knowledge, patrol music, love the homeland

INTRODUCTION

Since the beginning of the 21st century era, globalization gives a mixed effect that affects society from the younger generation until the older generation. Globalization can challenge the application of self-identity element [4]. One of the affects self-identity elements is caused by the heterogeneity information. The development of heterogeneity in the information flow can come from an increasingly competitive national civilization. It has an impact on easier some foreign cultures to entry and develop in a country [2],[8]. This impact can destroy slowly the noble values of the Indonesian people that have been develop since a long time ago [1].

The growing heterogeneity of society in Indonesia because pluralism generally provides many perspectives on solving problems, even it can lead to conflicts between people [5]. Cultural diversity with globalization influence can causes Indonesian culture to become increasingly complex. This complexity can also make noble values of Pancasila increasingly faded [2],[3],[9]. The cause is the comparison between modern culture and local culture that makes the modern culture has more attractive point than local culture [7]. So, students also need an attitude that is in accordance with the increasingly rapid distribution of data information in globalization era. This attitude can be applied through character education [6].

Character education can determine the progress of the nation [2]. It because character education can sharpen the various characters possessed by individuals, especially positive characters [12]. The first president, Ir. Soekarno once stated that character building for every citizen can make the country more character and dignified. Character building is very important for citizen to obtain and learn character education to build better character for themselves and their environment.

One of positive characters that can be developed by students is love the homeland. The love the homeland character is very needed to get generation that can know, understand, and appreciate the local culture around them [2],[12]. But many students as well as the community prefer to modernize their life without appreciating the local culture belonging to the local region. Based on the results of student observations in Public High School 1 Turen before implementation activities, there is also evidence that many students prefer foreign cultures and they do not know their unique regional culture; they often violate school regulations, and speak disrespectfully to teachers. So, the loving the homeland attitude must be instilled in students from an early age [11].

Therefore, an integration of learning instruments can be carried out with one of the typical cultures. In Malang, there is one of the music cultures that often known as patrol music. Patrol music activities are generally carried out once a year during the month of Ramadan. It is because the activity comes from the habit of the village community to wake up the sahoor meal for Muslims who are fasting in the

month of Ramadan [13]. However, along with the modernization carried out, the patrol music activity developed into a celebration until it was contested [10]. Music patrol uses "kentongan" made of bamboo which makes sounds with various rhythm. The sound produced from "kentongan" becomes an image of the sound wave application in physics subject. So, the integration of local culture (art of patrol music) with physics material (sound waves) can be carried out easier to improve the students' character of love for the homeland.

METHOD

This study has purpose to determine the feasibility of physics learning instruments based on patrol music and measure students' responses to the readability of the learning instruments product. The learning instruments' feasibility is very important for this learning instrument before it can be implemented for improving students' love the homeland attitude.

This research has specifically focus on the developing stage from 4D research and development by Thiagarajan. The technique for data collection in this study uses feasibility assessment sheets and questionnaire items for students' responses. This data collection used 3 expert judgments (lecturers) and 15 students of XI grade in school year 2019/2020. This study was conducted in Public High School 1 Turen, Malang, East Java.

This physics learning instrument based on patrol music has consist of the syllabus, lesson plans, student worksheets, handout and questionnaire of love the homeland. All of the product has many information that integrated with music patrol art. The design of learning instrument uses discovery learning that have been integrated with patrol music activity.

The data analysis for data collection uses quantitative and qualitative descriptive. For assessment sheets has been form to range value of one to four (4-Likert Scale), meanwhile and questionnaire result were form in percentages. All the result was analyzed with Ms. Excell 2013 application. The mean score (Z) for each aspect following equation (1).

$$\boldsymbol{Z} = \frac{\sum \boldsymbol{x}}{\boldsymbol{n}} \quad (1)$$

with n is the number of expert judgments that have been determined. Equation (1) can obtain the mean value (Z) for each aspect in the feasibility assessment and it was converted to qualitative descriptive as category according to Table 1 [14].

Table 1. Converting a Score to 4 Categories

Range Value	Category
$3.25 < x \leq 4.0$	Very Feasible
$2.50 < x \leq 3.25$	Feasible
$1.75 < x \leq 2.50$	Moderate
$1.0 < x \leq 1.75$	Less Feasible

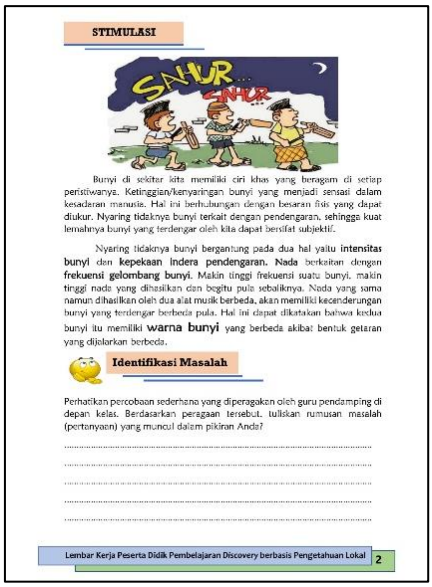
For students' response result to readability product, the questionnaire score result was changed into percentage form and converted into category as qualitative analysis descriptive according to Table 2 [15].

Table 2. Converting Percentage Results into Five Categories

Percentages	Category
$80 \leq x \leq 100$	Very Good
$60 \leq x < 80$	Good
$40 \leq x < 60$	Moderate
$20 \leq x < 40$	Low
$0 \leq x < 20$	Lowest

RESULTS

This developing stage of the learning instrument product need to be observed by expert judgments as a validation stage. This validation activity is very important due to physics learning instrument must have credibility and feasibility to be used in the classroom. This research was integrated with patrol music as local knowledge that have been known well in Malang, East Java; especially in Turen. This music patrol present application of sound wave subject because of students know about this music in their life society. This physics learning instruments consists of the syllabus, lesson plan, students' worksheet, handout and questionnaire of students' love the homeland attitude. All of the product was integrated with patrol music as local knowledge. Fig. 1 presents the information on patrol music that integrates into one of the students' worksheets pages.


STIMULASI

Bunyi di sekitar kita memiliki ciri khas yang beragam di setiap peristiwanya. Ketinggian/kenyaringan bunyi yang menjadi sensasi dalam kesadaran manusia. Hal ini berhubungan dengan besaran fisis yang dapat diukur. Nyaring tidaknya bunyi terkait dengan pendengaran, sehingga kuat lemahnya bunyi yang terdengar oleh kita dapat bersifat subjektif.

Nyaring tidaknya bunyi bergantung pada dua hal yaitu **intensitas bunyi** dan **kepekaan indera pendengaran. Nada** berkaitan dengan **frekuensi gelombang bunyi**. Makin tinggi frekuensi suatu bunyi, makin tinggi nada yang dihasilkan dan begitu pula sebaliknya. Nada yang sama namun dihasilkan oleh dua alat musik berbeda, akan memiliki kecenderungan bunyi yang terdengar berbeda pula. Hal ini dapat dikatakan bahwa kedua bunyi itu memiliki **warna bunyi** yang berbeda akibat bentuk getaran yang dijalarkan berbeda.

Identifikasi Masalah

Perhatikan percobaan sederhana yang diperagakan oleh guru pendamping di depan kelas. Berdasarkan peragaan tersebut, tuliskan rumusan masalah (pertanyaan) yang muncul dalam pikiran Anda?

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Lembar Kerja Peserta Didik Pembelajaran Discovery berbasis Pengetahuan Lokal 2

Figure 1. Information on patrol music in student students' worksheets at the stimulation stage

Before the learning instrument can be implemented into a classroom for improving students' love the homeland attitude, the product must be checked about its feasibility. This study has been analyzed the feasibility result of the learning instrument product. In Fig. 2 and Table 3, it presents analysis mean value and its category for each product.

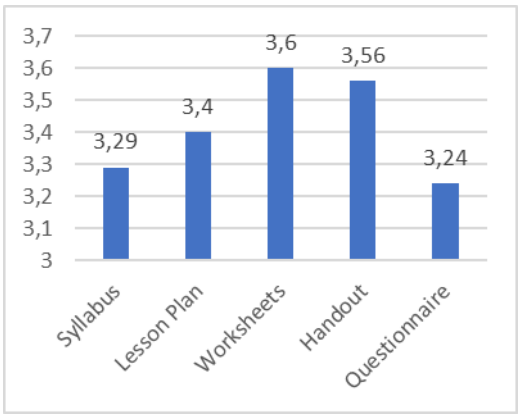

Figure 2. Feasibility Graph of Physics Learning Instrument based on Patrol Music

Table 3. Feasibility Category of Physics Learning Instrument based on Patrol Music

Learning Instrument Product	Mean Value	Category
Syllabus	3.29	Very Feasible
Lesson Plan	3.40	Very Feasible
Students Worksheet	3.60	Very Feasible
Handout	3.56	Very Feasible
Questionnaire of Love the Homeland	3.24	Feasible

Meanwhile, the students' responses result for readability product was presented in Table 4 and 5.

Table 4. Result of the Local Knowledge-based Student Worksheets Readability Questionnaire

No.	Statements	Percentage (%)	
		Yes	No
1.	The appearance of the students' worksheets is attractive and makes me interested in reading it	76.67	23.33
2.	The size of the text and images is clear and comfortable to read	100	0
3	The layout of images/graphics in the students' worksheet looks proportional (appropriate) so that I can easily read the sequence of activities in the students' worksheet	96.67	3.33
4	By reading the students' worksheet at a glance, I can immediately distinguish the parts of the students' worksheet, such as stimulation stage, data collection stage, etc.	76.67	23.33
5	The instructions/questions in the students' worksheet are easy to understand	90	10
6	The material description/questions in students' worksheet use language that is easy to understand	100	0
7	The questions in the students' worksheet are easy to understand	90	10
8	After reading the students' worksheet, I was interested in taking part in discovery learning activities	76.67	23.33
	Mean Value	78.75	8.75

Table 5. Results of the Local Knowledge-based Handout Readability Questionnaire

No.	Statements	Percentage (%)	
		Yes	No
1.	The appearance of the handout attracted me to read it	83.33	16.67
2.	The size of the text and images is clear and comfortable to read	96.67	3.33
3	The layout of the images/graphics in the handout looks proportional (appropriate) so that I can easily read the sequence of activities in the handout	86.67	13.33
4	The purpose of the learning material in the handout is clear and easy to understand	76.67	23.33
5	The material described in the handout is easy to understand because it uses daily activities	83.33	16.67
6	The concept of the handout material is presented systematically	90	10
7	The description of the language used is easy for me to understand	90	10
8	The use of symbols in handouts certainly don't confuse me	83.33	16.67
9	Text and image size are clear and easy to read for me	96.67	3.33
	Mean Value	87.41	12.59

DISCUSSION

From Fig. 2 and Table 3, all the product has mean value greater than 3. First, expert assessment of the syllabus includes 11 assessment indicators. The feasibility aspect of the contents of the syllabus is guided by 4 indicators, i.e. the suitability of indicators against basic competencies; development of learning activities based on basic competencies and the students' potential; the description suitability of learning activities with discovery learning models; and the suitability of the sound wave sub-material to the integration of local knowledge. From the overall assessment based on Table 3, the syllabus developed has a mean value feasibility of 3.29. This value is in the very feasible category.

The lesson plan's feasibility assessment consists of 15 assessment indicators. The lesson plan can present the integration of local knowledge (music patrol art) with learning activities at each meeting through the steps of learning activities, media, tools, and learning resources. Based on Table 3, the mean value in the lesson plan's feasibility assessment according to experts is 3.40. This value is included in a very feasible category.

The feasibility assessment of the students' worksheets has many aspects including the feasibility of content, didactic, presentation (appearance), language, and local knowledge. Students' worksheets include several sections (columns) that are adapted to the discovery learning model and the integration of patrol music art knowledge. The students' worksheets assessment consists of 15 assessment indicators. Based on Table 3, the students' worksheets feasibility assessment has a value of 3.60 which is included in the very feasible category.

The handout assessment has 12 assessment indicators. The assessment of handout content based on local knowledge is guided by the concept analysis that has been carried out in a defined stage. In addition to integrating with local knowledge in the content of the material, handouts require the display (presentation) of illustrations and images that are attractive and easy to understand by students. So, in the handout, there are some information and illustration of patrol music to attract student and give them more knowledge about their local knowledge. In this research, the feasibility value of the handout developed has a value of 3.56 which is in the very feasible category.

The questionnaire of students' loving the homeland attitude in this study consists of 24 statements. These statements are divided into 12 positive statements and 12 negative statements. Based on expert judgment, from 24 questions there are some revisions to correct the statements. So, the statement in the questionnaire can deliver the meaning of love the homeland attitude directly to the students. Based on Table 3, the feasibility value of the questionnaire developed has a value of 3.24 which is in the feasible category.

From the readability product of physics learning instruments based on patrol music, 15 students give mixed responses. Their responses were divided into two answers, i.e. "yes" for agreement and "no" for disagreement about the statements that be given. These responses were changed into percentage value so it more easily to be read about how they give advice about students' worksheets and handouts based on patrol music art.

Based on Table 4, students' responses about the readability of students' worksheets has mixed responses. For the display of student worksheets, it is known that only 76.67% of students' interest in reviewing this worksheet has an interest in learning it. It is because they can distinguish parts of the worksheet and understand it at first glance. However, from all statements, this student worksheet has a mean percentage value of 78.75% which is in the good category. It presents the student worksheets based on patrol music has a good readability level.

From students' responses about readability of handout based on music patrol has mixed responses

too. From all the statements that has been given, students still cannot clear and easy to understand the handout at first glance. It can be present in Table 4 with mean percentage value of 76.67%. It is because students need more time to understand and practice sound wave lessons while using handouts based on music patrols that have been developed. But, from all statements, this handout has a mean percentage value of 87.41% which is in the very good category. It presents the handout based on patrol music actually has a very good readability level to be implemented in the classroom for improving students' love the homeland attitude.

CONCLUSION

Based on the analysis of quantitative descriptive results, physics learning instruments based on patrol music as local knowledge has a feasible category to be implemented in a classroom for improving students' love the homeland attitude. It is because all the learning instrument product has greater value than 3.0 in feasibility assessment sheets results.

Based on the result of the readability questionnaire for students in the XI grade school year 2019/2020, it can be known that the learning instrument product has a good readability level for the student. So, it can make the teacher easier to teaching on sound wave subjects with integrated patrol music as local knowledge.

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REFERENCES

[1] E.N.C. Asih, N. Zuriah, and B. Budiono. "Peranan guru PKn dalam meningkatkan wawasan Kebangsaan dan Cinta Tanah Air (Wangsa Cita) di Era Globalisasi pada Siswa SMA Muhammadiyah 1 Malang". Jurnal Civic Hukum. 2018. 3(1):9-17.

[2] S.D. Ardianti, and S. Wanabuliandari. "Implementasi Pembelajaran Berbasis Ethno-Edutainment untuk meningkatkan Karakter Cinta Tanah Air Siswa Sekolah Dasar". Refleksi Edukatika: Jurnal Ilmiah Kependidikan. 2019. 9(2).

[3] N.T. Atika, H. Wakhuyudin, and K. Fajriyah. "Pelaksanaan Penguatan Pendidikan Karakter Membentuk Karakter Cinta Tanah Air". Mimbar Ilmu. 2019. 24(1):105-13.

[4] D. Budimansyah. "Tantangan Globalisasi Terhadap Pembinaan Wawasan Kebangsaan dan Cinta Tanah Air di Sekolah". Jurnal Penelitian Pendidikan. 2010. 11(1):8-16.

[5] L. Fatmawati, R.D. Pratiwi, and V.Y. Erviana. "Pengembangan Modul Pendidikan Multikultural Berbasis Karakter Cinta Tanah Air dan Nasionalis pada Pembelajaran Tematik". Scholaria: Jurnal Pendidikan dan Kebudayaan. 2018. 8(1):80-92.

[6] Y.T. Ismawati, and T. Suyanto. "Peran Guru PKn dalam Membentuk Sikap Cinta Tanah Air Siswa di SMA Negeri 1 Mojosari Kabupaten Mojokerto". Jurnal Kajian Moral dan Kewarganegaraan. 2015. 2:887–91.

[7] M. Kamisi, and R. Hasyim. "Peranan Guru dalam Membangun Kesadaran Cinta Tanah Air Pada Siswa Sekolah Dasar (Telaah Teoritik)". Pedagogik. 2016. 4(1):29–39.

[8] A. J. Mahardhani AJ. "Pemberdayaan Masyarakat Melalui Pendidikan Nonformal Berkarakter Cinta Tanah Air". Jurnal Pancasila dan Kewarganegaraan. 2018. 3(2):56-63.

[9] I. Mardhiah, and R.N. Aulia. "Menumbuhkan Rasa Cinta Tanah Air Melalui Pengembangan Ekopesantren". In Seminar Nasional Tahunan Pendidikan Ilmu-Ilmu Sosial 2017 Oct 20.

[10] A.S. Maftuchin, and A. Budiyanto. "Tradisi Seni Patrol dan Identitas Budaya Kampung Bandulan di Kota Malang". Studi Budaya Nusantara. 2017. 1(1):46-54.

[11] I.A. Nugroho, and H.D. Surjono. "Pengembangan Multimedia Pembelajaran Interaktif Berbasis Video Materi Sikap Cinta Tanah Air dan Peduli Lingkungan". Jurnal Inovasi Teknologi Pendidikan. 2019. 6(1):29-41.

[12] B. Subali, Sopyan, and A. Ellianawati. "Developing Local Wisdom Based Science Learning Design to Establish Positive Character in Elementary School". Jurnal Pendidikan Fisika Indonesia. 2015. 11(1).

[13] A.T. Wulandari, and N. Mariana. "Eksplorasi Konsep Matematika Sekolah Dasar pada Seni Tradisi di Desa Trowulan Mojokerto". Jurnal Penelitian Pendidikan Guru Sekolah Dasar. 2018. 6(7).

[14] E.P. Widoyoko. Teknik Penyusunan Instrumen Penelitian. Yogyakarta: Pustaka Pelajar. 2012. pp. 15:22.

[15] E.P. Widayoko. Evaluasi Pembelajaran Panduan Praktis Bagi Pendidik dan Calon Pendidik. Yogyakarta: Pustaka Pelajar. 2009.

THE EFFECT OF BLENDED LEARNING ON HIGHER ORDER THINKING SKILLS AND SELF-REGULATED LEARNING STUDENTS

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Abstract

Advances in information technology provide challenges to the world of education, especially in the learning process in schools. The implementation of education is not only in closed spaces with books and educators, the information technology revolution has changed the way people work, from how to communicate, how to coordinate, how to think, to how to learn and teach. The research method applied in this research is quantitative. The design used by the authors in this study is Quasi Experimental Design. The population in this study were students of class VIII at SMP Negeri 57 Bandung, while the sample in this study were class VIII A 32 person and VIII B 32 people so that all of them became 64 person. Based on the results of processing data calculations and data analysis, the authors can draw the conclusion that the effect of using blended learning at SMP Negeri 57 Bandung does not have a significant effect. The conclusion is that there is no significant difference between students who are treated with blended learning and students who are not given treatment. Although the application of blended learning does not have a significant effect on the ability of Higher Order Thinking Skils (HOTS), at least this learning trains students to learn independently and find their own learning resources. This means that the use of blended learning in the learning process can improve students' self-regulated learning.

Keywords: *Blended Learning, High Order Thinking Skills (HOTS), Self Regulated Learning*

INTRODUCTION

Today we have entered an era of disruption. Disruption is an innovation that will replace the entire old system with new ways. Disruption has the potential to replace old players with new ones. Disruption replaces the old, all-physical technology with digital technology that produces something completely new and more efficient and more useful.

There are six causes of disruption including, first, the rapid development of technology. Second, the emergence of a new generation (millennials). Third, the microprocessor speed which requires humans to move faster. Fourth, the symptoms of disrupted society that give rise to a disruptive mindset. Fifth, new ways of exploring victory through technology. Sixth, technology has entered the third wave (Internet of Things).[1]

World changes that are entering the era of the industrial revolution 4.0 or the fourth world industrial revolution in which information technology has become the basis of human life. The fourth industrial revolution has emerged as a new era in the development of civilization. The fourth industrial revolution is marked by the development of Artificial Intelligence (AI) which has the impact of digitalization and automation in various sectors of life such as in trade, industry, mining, tourism, education, to the use of digital money in commerce. [2].

Learning must prioritize literacy and in-depth understanding of how various systems in the world work compared to only learning through robotic tutors.[3] Based on this opinion, the major implications of the fourth industrial revolution for education will require changes in educational governance starting from facilities and infrastructure, teacher quality, curriculum, and learning systems so that outcomes are in accordance with the needs of the world of work.

A student's success depends on 21st century skills, so students must learn to have them. The Partnership for 21st Century Skills identifies 21st century skills including: critical thinking, problem solving, communication and collaboration. [4]

Apart from the educational revolution, an in-depth understanding of the special characteristics of students as input in education also determines the quality of educational outcomes. Generation z students tend to be free, individualistic, and highly dependent on technology and the speed of obtaining information through digital media and the internet. [5]. Of course, this character must be facilitated in the educational process so that students get the education that suits their needs.

The level of human resource development (Human Development Index-HDI) Indonesia ranks 102nd (1996), 99th (1997), 105th (1998), 109th (UNESCO, 1999), 108th (UNDP, 2007), and the 121st of 187 (2012) countries in the world. Then the level of competitiveness of Indonesian human resources ranks 50 in the competitiveness of the 144 countries surveyed by the World Economic Forum through the Global Growth Competitiveness

Index (2012). This position is below the position of other ASEAN countries such as Singapore which is in 2nd place, Malaysia at 25th, Brunei at 28th, and Thailand which is at 38th. The downgrade is a cause for concern because it reflects the technological capability of a country so that it must be encouraged so that our technological capabilities are capable. parallel to other countries.[6]

Constructivism theory [7] "the way learners construct knowledge, think, reason, and reflect on is uniquely shaped by their relationship with other. He argued that the guidance given by more capable other, allows the learner to engage is levels of activity that could not be managed alone.".

Advances in information technology provide challenges to the world of education, especially in the learning process in schools. In the National Education System Law No. 20 of 2003, it turns out that the acceptance of recognition is not the time to rely on conventional approaches in the administration of the national education system. The implementation of education is not only in closed spaces with books and educators, the information technology revolution has changed the way people work, from how to communicate, how to coordinate, how to think, to how to learn and teach. The role of information technology in human activities today is very large. Information technology has become the main facilitator of various activities, including the world of education.

Students can obtain a wide range of information from various sources through cyber space or virtual space that uses computers or the internet.[8]. Taking into account the trends that are developing in the world and the condition of education in Indonesia, the reasons for online learning are needed as follows educational capacity in Indonesia, distribution not justice for education most education units do not yet have adequate and quality educational resources, has not been able to realize quality education and training services, not yet able to guarantee the fulfillment of the needs and demands for quality education and training. [9]

So far, Citizenship Education learning tends to only emphasize aspects of cognitive development, ignoring affective and psychomotor aspects, so it seems that citizenship education is used as an indoctrination tool and learning targets that focus on rote learning and only limited to strengthening material so that students are fast. feeling bored and bored [10]. intellectual skills which are essential for a knowledgeable, effective, and responsible citizen are known as critical thinking skills [11]

Based on this, the teacher should use learning that can lead students to higher order thinking skills and fun learning for students so that students become active in the learning process. One of the learning models that teachers can use is the Blended Learning model. Semler [12] Blended Learning is a learning model that combines the best aspects of online learning, structured face-to-face activities, and real-world practice. Online learning systems, classroom exercises, and on the job experiences will provide valuable experiences for them. Blended learning consists of a combination of e-learning and traditional educational approaches, and is very suitable for the transition process towards e-learning from traditional forms of learning and teaching. [13]. Blended learning is a must so that learning can be fun as well as a satisfying experience for students and instructors [14]

To develop Blended Learning, mentions five keys; (1). Live-Event, (2). Self-Paced Learning, (3). Collaboration, (4). Assessment, (5). Performance Support Materials [15]. Furthermore, one of the learning objectives expected in the current era is higher order thinking skills.[16]. Higher order thinking skills include problem-solving skills, creative thinking skills, critical thinking, argumentation skills, and decision-making abilities.

In addition to this learning model, it can be used to take students to higher order thinking but [17] Blended Learning learning model is also very suitable for increasing student learning activeness and independence in the learning process. That is because the Blended Learning learning model utilizes technology in its learning, where technology in the world is currently developing very rapidly.

Character development in schools must be carried out systematically and continuously.[18] says "character building must be carried out systematically and continuously involving aspects of knowledge, felling, loving, and action." And then [19] explained that "the character is developed through the knowing stage, acting, towards habit*).*"

Character education is a mission in education supported by the government through Presidential Regulation of the Republic of Indonesia Number 87 of 2017 concerning Strengthening Character Education Article 1 paragraph 1 states that: Strengthening Character Education, hereinafter abbreviated as PPK, is an educational movement under the responsibility of the education unit to strengthen the character of students through the harmonization of sports, feelings, sports and involvement and cooperation between educational units, families and communities as part of the Gerakan Nasional Revolusi Mental (GNRM)"

Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 20 of 2018 concerning Strengthening Character Education in Formal Education Units Article 2 paragraph (1): "PPK is implemented by applying Pancasila values in character education, especially including religious values, honesty, tolerance, discipline, hard work, creative, independent, democratic, curiosity, national spirit, love for the country, respect for achievement, communicative, love. peaceful, fond of reading, caring for the environment, caring socially, and being responsible".

Furthermore, the character that will be focused in this research is the independent character. The character of independence is a process that involves normative elements, meaning that independence is a directed process because the development of independence is in line with the existential nature of humans, independent students must have their own creativity and initiative, and be able to work alone by referring to the guidance they receive.[20] argued that the character of independent learning is self-awareness, driven by oneself, the ability to learn to achieve its goals.

Based on the understanding of the character of learning independence above, it can be concluded that independent learning is a condition of independent learning activities that does not depend on others, has the will and is responsible for itself in solving learning problems. Learning independence will be realized if students actively control everything they do, evaluate and then plan something deeper in the learning that is passed and students also want to be active in the learning process

Based on the results of preliminary observations made by the author at SMP Negeri 57 Kota Bandung which has implemented blended learning, the results show that conventional learning is considered less attractive, boring, and does not improve students' independent character in learning, besides that it also does not improve thinking. Higher Order Thinking Skills (HOTS) students.

Looking at the data that has been described above, the writer is interested in conducting research with the title The Effect of Blended Learning on Higher Order Thinking Skills (HOTS) and Students' Independent Character (Quasi Experiments on Class VIII Students at SMP Negeri 57 Kota Bandung). This research is considered important to see the extent of the success of learning using this method and as a solution in facing challenges in the industrial revolution era with the increasingly rapid development of science and technology.

METHODS

The research method applied in this research is an experimental method with a quantitative approach. "Experimental research can be defined as a research method used to find the effect of certain treatments on others under controlled conditions".[21] This method tries to find something new that can be a solution to various existing problems.

The design used by the authors in this study is Quasi Experimental Design,[21] In this design, neither the experimental group nor the control group were chosen randomly. This design uses two sample classes. The first sample is used as an experimental class where teaching using Blended Learning will be applied. Meanwhile, the second sample will be used as a control class, where conventional teaching will be applied.

The population in this study were students of class VIII at SMP Negeri 57 Bandung, while the sample in this study were class VIII A 32 person and VIII B 32 person, so that all of them became 64 people. Data collection techniques in this study include, observation, documentation study, literature study, quesionaire in the form of tests. The instrument in this study was carried out by testing the validity and reliability testing. Statistical analysis is needed to test the significance of the difference in the average gain between the experimental group and the control group through the normality and homogeneity test of varians.

RESULTS

Data recapitulation of the pre-test and post-test results for the control class and experimental class

Based on the data on the pretest and posttest scores of student learning outcomes, a data frequency distribution table can be made. Data frequency distribution is the grouping of data into several classes. The pretest frequency distribution table for student learning outcomes in the experimental and control groups can be read in the table:

Tabel 1. Instrument Test Results

No	Item question	r XY	t count	t table	Ket	Different test		level of difficulty	
						DP	Criteria	TK	Kriteria
1	1	0.493	3.001	2.048	valid	0.375	Enought	0.700	Hard
2	2	0.425	2.486	2.048	valid	0.500	Good	0.700	Medium
3	4	0.373	2.127	2.048	valid	0.250	Enough	0.467	Medium
4	5	0.407	2.361	2.048	valid	0.375	Enough	0.767	Easy
5	6	0.561	3.584	2.048	valid	0.750	very good	0.467	Medium
6	7	0.487	2.951	2.048	valid	0.250	Enough	0.900	Easy
7	8	0.469	2.811	2.048	valid	0.375	Enough	0.833	Easy
8	9	0.385	2.210	2.048	valid	0.375	Enough	0.833	Easy
9	14	0.665	4.712	2.048	valid	0.500	Good	0.867	Easy
10	15	0.464	2.769	2.048	valid	0.500	Good	0.667	Medium
11	19	0.362	2.056	2.048	valid	0.250	Enough	0.500	Medium
12	20	0.437	2.572	2.048	valid	0.375	Enough	0.667	Medium
13	23	0.403	2.329	2.048	valid	0.500	Good	0.800	Easy

No	Item question	r XY	t count	t table	Ket	Different test		level of difficulty	
						DP	Criteria	TK	Kriteria
14	24	0.589	3.853	2.048	valid	0.625	Good	0.700	Medium
15	28	0.384	2.203	2.048	valid	0.500	Good	0.700	Medium
16	29	0.426	2.493	2.048	valid	0.375	Enough	0.867	Easy
17	30	0.452	2.684	2.048	valid	0.375	Enough	0.700	Medium
18	32	0.536	3.363	2.048	valid	0.375	Enough	0.867	Easy
19	33	0.407	2.361	2.048	valid	0.375	Enough	0.767	Easy
20	35	0.573	3.701	2.048	valid	0.500	Good	0.867	Easy

Source: Processed by Researchers 2020

Table 2 Frequency Distribution of Pretest and Posttest Values

Pretest				*Posttest*			
Eksperiment Group		Control Group		Eksperiment Group		Control Group	
Interval value	f (frequency)	Interval value	f (frequency)	Interval value	f (frequency)	Interval value	f (frequency)
40 - 46	4	45 - 52	3	50 - 56	3	60 - 65	7
47 - 53	3	53 - 60	6	57 - 63	3	66 - 71	6
54 - 60	9	61 - 68	6	64 - 70	8	72 - 77	5
61 - 67	5	69 - 76	7	71 - 77	6	78 - 83	4
68 - 74	7	77 - 84	2	78 - 84	5	84 - 89	2
75 - 81	4	85 - 92	1	85 - 91	7	90 - 95	1
Total	32	Total	25	Total	32	Total	25
Average	61.41	Average	66	Average	73.13	Average	72.8

Source: Processed by Researchers 2020

Based on the table above, it can be seen that the pretest interval value in the experimental group starts from the range 40 - 46 while in the control group, it starts from the range 45 - 52. The highest value in the experimental group is 80 while the control group is 90. Meanwhile, the second lowest value is the group is the same, namely 40 for the experimental group and 45 for the control group. The average value in the experimental group was 61.41 and in the control group 66. The posttest interval values in the experimental group started from a range of 50 - 56, while in the control group the interval values started from the range of 60 - 65. The highest and lowest values for the two groups the same, namely 90. The lowest score in the experimental group was 50, while the control group was 60. The average value in the experimental group was 73.13 and 72.8 in the control group.

Normality Test

Experiment Class

To find out whether the data is normally distributed or not, it can be done by looking at the significance value (Sig.) In the Kolmogorov-Smirnova column. As a testing criterion, if the significance value is greater than 0.05, then the student learning outcome variable data is declared to be normally distributed. Conversely, if the significance value is less than 0.05, then the student learning outcome variable data is declared to be not normally distributed.

Based on the test results, it is known that the variable significance value of the experimental class pre-test value is 0.107 while the variable significance value of the experimental class post-test value is 0.163. The significance value is greater than 0.05, so it can be stated that the data in the experimental class is normally distributed.

Control Class

Based on the test results, it is known that the variable significance value of the pre-test value for the experimental class is 0.200 * while the variable significance value of the post-test value for the control class is 0.107 *. The significance value is greater than 0.05, so it can be stated that the data in the control class is normally distributed.

Homogenity Test

Based on the test, it is known that the significance value of the F test from the pre-test and post-test results of the experimental class is 0.957 and the data from the pre-test and post-test results of the control class is 0.342. It is clear that the significance value is greater than 0.05. So, it can be stated that the data on student learning outcomes in this study are homogeneous.

Hipotesis Test

Based on the tcount = -4,476 and a significance value of 0,000. Based on these calculations, it can be seen that tcount <ttable (-4.476 <2,000). In addition, it is known that the significance value obtained is 0.000, so that 0.000 <0.05. Based on the provisions in hypothesis testing, then the conclusion is $\mu 1 = \mu 2$ in the sense that there is no significant difference between students who are treated with blended learning and students who are not given treatment.

DISCUSSION

In essence, the learning model can help teachers communicate information, knowledge, skills and experiences of students in a more attractive way to achieve learning goals with a well-prepared plan or pattern. The learning model is a way for teachers to accelerate the process of transcribing learning material. This is based on the understanding that the teacher's ability to deliver learning material has certain limitations. The learning model chosen in this study is a learning model that combines face-to-face and online learning called blended learning.

This research is an experimental research in the form of a Quasi Experimental Design type Non-equivalent Control Group Design which uses two groups, namely the experimental group and the control group. The determination of the experimental group and the control group was carried out by dividing the superior and non-superior classes in class VIII of SMP Negeri 57 Bandung.

In this study, both the experimental group and the control group were previously given a pre-test in order to determine the high-order thinking skills (HOTS) and independence of students before the treatment was given. The pre-test was carried out by conducting HOTS test questions and observations using the student independence observation sheet guidelines in the experimental and control group classes.

After the pre-test was carried out, the experimental group was given treatment. The experimental group was given treatment using the Blended Learning model while the control group was not given any treatment, meaning that they continued to use learning that is usually used by teachers in teaching, namely lectures, questions and answers or class discussions. The different treatment between the two groups was intended to determine the effect on HOTS thinking ability.

After being given treatment, both the experimental and control groups were given a post-test by looking at HOTS thinking abilities and students' independence in Civics subjects.

The steps that are prepared in applying this blended learning media include:

Material Selection

The selection of material in Civics learning is a stage that needs to be prepared. The material prepared is taken from student books used in SMP Negeri 57 Bandung. The content of the material is adjusted to the syllabus and lesson plans that have been made previously. Apart from student books, material can be taken from several other references as teachers' references in material preparation.

Making Learning Media

In making this learning media, researchers collected learning materials, illustrations, audio and online teaching techniques as the implementation of this blended learning

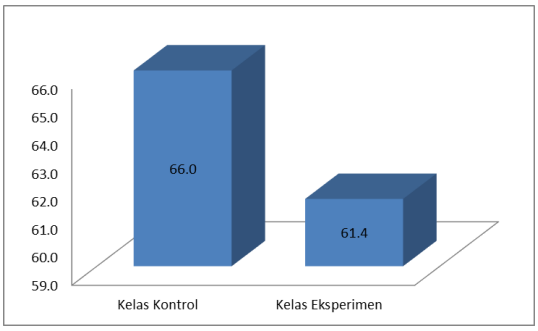
Making syllabus and lesson plans

The learning media that is made will be more optimal if the results are previously based on the syllabus and lesson plans.

Application of Blended Learning

The mission carried by the school that supports the development of global information systems and technology is in line with what the researchers will develop. The sample that the researcher chose was two classes divided into the control class and the experimental class.

From the results of the calculation of the pretest and posttest values, there are differences in the thinking skills of the experimental class and the control class. In more depth, it can be described as follows: first, the average initial pretest scores in the experimental class were 61.4 and 66 in the control class. The average initial test score between the experimental class and the control class can be described by:

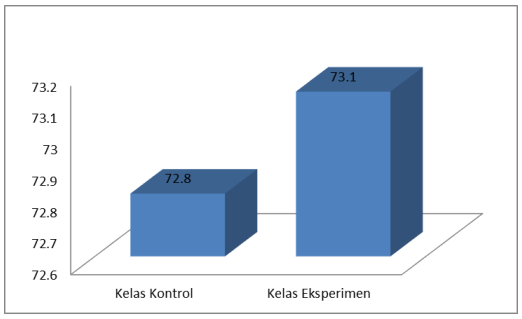


Source: Processed by Researchers 2020

Image 1. The mean of the initial test of the experimental and control classes

The two values have a significant difference in which the control class has a higher score than the experimental class score. This shows that the thinking ability of the control class is higher than the experimental class.

Then after the experimental class and control class were given different treatment, namely in the form of teaching in the experimental class using blended learning while the control class used conventional methods or lectures, the average of the two classes had increased. The average posttest final test score obtained an average score of 73.1 for the experimental class and 72.8 for the control class. The average final test score between the experimental class and the control class can be described by:



Source: Processed by Researchers 2020

Image 2 The mean post test eksperimental class and control class

Based on the picture above, it shows that the final test scores of the two classes have a not too significant difference, but the experimental class has a higher average score than the control class which was previously superior to the experimental class.

If we look at the theory that has been discussed previously, based on this the teacher should use learning that can lead students to higher-order thinking skills and fun learning for students so that students become active in the learning process. One of the learning models that teachers can use is the Blended Learning model.

Semler [11] Blended Learning is a learning model that combines the best aspects of online learning, structured face-to-face activities, and real-world practice. Online learning systems, classroom exercises, and on the job experiences will provide valuable experiences for them. Blended learning consists of a combination of e-learning and traditional educational approaches, and is very suitable for the transition process towards e-learning from traditional forms of learning and teaching. [12]. Blended learning is a must so that learning can be fun as well as a satisfying experience for students and instructors [13].

However, in practice, blended learning conducted at SMP Negeri 57 Bandung has no significant effect on increasing students' higher order thinking skills (HOTS). This is presumably because students still need guidance from the teacher when trying the stages in higher-order thinking. Higher order thinking skills need continuous practice so that students are trained in analysis so they can think innovatively.

Furthermore, independent learning is a condition of independent learning activities that does not depend on others, has a willingness and is responsible for itself in solving learning problems. Learning independence will be realized if students actively control everything they do, evaluate and then plan something deeper in the learning that is passed and students also want to be active in the learning process

CONCLUSION

Based on the results of processing data calculations and data analysis, the authors can draw the conclusion that the effect of using blended learning at SMP Negeri 57 Bandung does not have a significant effect. Although the application of blended in learning does not have a significant effect on the thinking ability of Higher Order Thinking Skils (HOTS), at least this learning trains students to learn independently and find their own learning resources. This means that the use of blended learning in the learning process can improve students' self-regulated learning.

REFERENCE

[1] D. Budimansyah, N. Suharto, and I. Nurulpaik, *Proyek Belajar Karakter Untuk Mengembangkan Literasi Baru Abad 21*. 2019.

[2] A. J. Butler, "The Fourth Industrial Revolution and education," *South African Journal of Science*. 2018.

[3] Y. Liao, E. R. Loures, F. Deschamps, G. Brezinski, and A. Venâncio, "The impact of the fourth industrial revolution: A cross-country/region comparison," *Producao*, 2018.

[4] A. J. Rotherham and D. Willingham, "21st century skills: The challenges ahead," *Educ. Leadersh.*, 2009.

[5] S. B. Berkup, "2_BERKUP_2014_Working With Generations X And Y.pdf," *Mediterr. J. Soc. Sci.*, 2014.

[6] Muhammad Rifki Adam and D. Setiawati, "The Relation Between School Facilities, Interest in Learning, and Habits in Learning Class XI SMK Sub District Mojosari," *J. BK UNESA*, vol. 03, pp. 64–71, 2013.

[7] L. S. Vygotsky, *Mind and Society: The Development of Higher Psychological Processes*. 1978.

[8] Hasrah, "Pemanfaatan Teknologi Komunikasi Dan Informasi Dalam Pembelajaran PKN," *Phinisi Integr. Rev.*, vol. 2, no. 2, 2019.

[9] Y. Bilfaqih, "Esensi Penyusunan Materi Pembelajaran," p. 10, 2009.

[10] L. Anggraeni, "Pentingnya Model Pembelajaran Pendidikan Kewarganegaraan Berbasis E Learning di Era Globalisasi," *ejournal UM*, vol. 24 (2), pp. 93–101, 2011.

[11] Z. Zurgobban and D. Budimansyah, "PENDIDIKAN DAMAI SEBAGAI PEMBINAAN KEADABAAN KEWARGANEGARAAN DI BIDANG

SOSIAL," *Model. J. Progr. Stud. PGMI*, 2016.

[12] H. Husamah, "Blended Project Based Learning: Metacognitive Awareness of Biology Education New Students," *J. Educ. Learn.*, 2015.

[13] G. Jones, "Experiences of applying a 'blended' learning approach to client-based student projects," *Proc. Int. Conf. e-Learning, ICEL*, vol. 49, no. 2, pp. 170–176, 2012.

[14] S. Yusoff, R. Yusoff, and N. H. Md Noh, "Blended Learning Approach for Less Proficient Students," *SAGE Open*, vol. 7, no. 3, pp. 1–8, 2017.

[15] J. A. Pereira, E. Pleguezuelos, A. Merí, A. Molina-Ros, M. C. Molina-Tomás, and C. Masdeu, "Effectiveness of using blended learning strategies for teaching and learning human anatomy," *Med. Educ.*, 2007.

[16] R. Cahyani and S. Saputra, "Validation and analysis of mathematics learning materials based on HOTS," in *AIP Conference Proceedings*, 2019.

[17] B. I. Shibley *et al.*, "Designing a blended course: Using ADDIE to guide instructional design," *J. Coll. Sci. Teach.*, 2011.

[18] M. Muslich, "KTSP Pembelajaran Berbasis Kompetensi Dan Kontekstual," *Jakarta PT. Bumi Aksara*, 2008.

[19] A. Zainal, "Bimbingan Dan Konseling Di Sekolah," *Bandung: Yrama Widya*. 2012.

[20] S. D. Brookfield, "Foundations of Critical Theory," *Adv. Dev. Hum. Resour.*, 2014.

[21] Sugiyono, "Metode Penelitian Kuantitatif, Kualitatif dan R & D.Bandung:Alfabeta.," *Metod. Penelit. Kuantitatif, Kualitatif dan R D.BandungAlfabeta.*, 2012.

Others:

Ministerial Regulation of Education and Culture of the Republic of Indonesia Number 20 of 2018 concerning Strengthening Character Education in Formal Education Units

Presidential Regulation of the Republic of Indonesia Number 87 of 2017 concerning Strengthening Character Education

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ADIWIYATA SCHOOL: AN IMPLEMENTATION OF ENVIRONMENTAL CARE IN CHARACTER EDUCATION

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Abstract

This study aims to examine the implementation of the *Adiwiyata* (environmentally cultured) School as a program to develop environmental care in character education and investigate the issues in implementing the program. This study was conducted at one of *Adiwiyata* school, namely State Elementary School Gedongkiwo, Yogyakarta. This is a qualitative study in which the data were collected through observations, interviews, and documentation. The subjects of this study were the principal, teachers, and students. The object of research is the implementation of enviromental care in character educationo in *Adiwiyata* School. The obtained data were analyzed through data reduction, data display, and data verification. The instruments used in this study were validated using the triangulation technique and source triangulation. The findings show that the *Adiwiyata* school program is carried out through school policies, curriculum implementation, participative environmental care programs, and environmentally friendly facility management. Then, in general, the issues in implementing the program are related to student awareness to care for the environment, the absence of solid teamwork to implement the program, and damaged supporting facilities.

Keywords: implementation, *Adiwiyata* school, character education, environmental care

INTRODUCTION

Environment is a place where someone lives and interacts every day. Mundiatun & Daryanto (2015) define an environment as a settlement in which an organism lives and all conditions that directly or indirectly affect its standard of living. The environment that can support the lives of an organism including human is a healthy environment. However, the physical environment or natural conditions in Indonesia are now in a serious condition as many phenomena of environmental damages eventually affect people's lives.

Environmental damage is the result of people's exploitation. The waste issue is one of the environmental problems that need a specific concern. Waste is constantly generated by humans, so, unquestionably, the amount of waste is increasing every single day. According to Geotimes (2015), In Indonesia, a total of 175,000 tonnes of waste are generated every day. It means that a person generates 0.7 kilograms of waste every day. The total population of people in Yogyakarta in 2015 according to BPS DIY (2017) or Yogyakarta Statistics Indonesia was 7,358,352, therefore the amount of waste generated was around 5,150,846.4 kilograms per day. Based on these data, it was estimated that the amount of waste in Indonesia in 2019 was 67.1 million tons of waste per year.

This waste-related estimation was made by Statistics Indonesia in 2018. It was stated that in 2016 the amount of waste generated in Indonesia reached 65,200,000 tons per year with a population of 261,115,456. It is predicted that the Indonesia population will continue to increase, and thus the amount of waste will increase. Apart from being related to waste, Statistics Indonesia also presented the results of the 2014 and 2018 Village Potential Surveys showing that an increase in water pollution and a decrease in air quality resulted from pollution in Indonesia make the environmental issues more complex.

Physical environment problems do not only occur in the national scope but also in a smaller scope, especially in the field of education, especially elementary schools. Based on research conducted by Amirudin (2010), one of the elementary student behaviors showing delinquency is littering. This delinquency is a form of an undisciplined attitude and ignorance of environmental issues.

The environmental damages occurring both in the national and school contexts show people lack awareness of protecting the environment. Moreover, Muslich (2011) argues that the number of damages to nature shows the low awareness of students and even educated people to protect the environment. Therefore, it is necessary to instill the character values, especially the character of caring for the environment in teaching-learning processes.

Indonesian law No. 20/2003 on National Education System regulates that the functions or goals of national education are building the generation's character. Several character values should be developed at the early ages, one of which is caring for the environment.

Iskandar (2012) states that knowledge about the environment is needed to shape attitudes related to the environment. Thus, through the education system, knowledge and characters of environmental care may be provided and then instilled.

The process of developing environmental care in education should start from the early education level, namely elementary school. Syafi'i (Wiyani, 2013) states that concepts of protecting the environment in character education should be delivered in early childhood education. Educational institutions need to provide direct instructions to shape students' mindsets in order to protect the environment.

One of the government's efforts to protect the environment done by the Ministry of the Environment is the *Adiwiyata* program. According to the Ministry of Environment and the Ministry of Education and Culture (2011), *Adiwiyata* is a good and ideal place to obtain knowledge, various norms, and ethics that serve as the basis of a prosperous life and the ideals of sustainable development.

SD Negeri Gedongkiwo is one of the *Adiwiyata* schools in Yogyakarta City. Based on observations and interviews conducted with the school principal and teachers, SD Negeri Gedongkiwo is an *Adiwiyata* school assisted by SD Negeri Ungaran since 2012. Thus, there is proof that the school has a strong commitment to provide character education of environmental care for students, teachers, and educational personnel until recently.

Based on the interview with the principal, the school's commitment to implement character education of environmental care is stated in one of the school visions "Excellence in the aspect of environment insight " which is achieved through the mission "Creating a clean, green, and fun school environment". Apart from that, the goal of SD Negeri Gedongkiwo is "Living in a clean and neat condition in order to create a clean and pleasant work environment".

The schools receiving the *Adiwiyata* award are considered to have succeeded in developing the environmental care character. Research conducted by Manurung (Al-Anwari, 2014) shows that *the Adiwiyata* program implemented in SD Negeri 04 Jepara has successfully developed the student character of environmental care. This is shown by some activities, for example, planting and caring for plants, sorting and taking out the trash, saving water, as well as reducing electricity and paper consumption.

Based on pre-research observations, the activities done as the consequence of being an *Adiwiyata* school were carried out optimally. However, there were still problems regarding the lack of environmental care.

The student behavior showing the lack of environment care is littering. Some of the students put trash in the plant pot. During an interview done, the school principal stated that littering was one of the obstacles in implementing environmental care in the character education at SD Negeri Gedongkiwo.

Teachers at SD Negeri Gedongkiwo were trying to fix the student behavior by giving punishment. They asked the students to pick up the trash and put it in the trash can. However, their awareness of disposing garbage properly was lacking, and it was hard to change behavior.

At SD Negeri Gedongkiwo, a regular student activity, student picket, was held every morning, before and after school. This activity was conducted to keep the class clean and tidy. All students knew that it was their responsibility to do the picket, but some students just needed to be reminded to do the picket.

SD Negeri Gedongkiwo also tried to provide the student with sufficient facilities to support the implementation of character education of caring for the environment. One of the supporting facilities was a bathroom for each class. The bathrooms were located in the corners of the schools. It was the student's responsibility to maintain the bathroom cleanliness, but some of the bathrooms were dirty and smelled bad.

Another facility provided by the school was hand basins. There were some hand basins in the schoolyard and classrooms. The students were accustomed to wash their hands, but during the observation, it was found that some hand washing basins were broken and the faucets leaked.

The school canteens were neat and the food was kept clean and healthy. Based on the results of interviews with one of the canteen owners, she was urged by the school to sell foods with no food additive and artificial coloring. Moreover, she was asked to not sell plastic-packed foods and drinks to reduce the amount of plastic waste generated. The canteen owners tried to obey the school regulation as the consequence of being *Adiwiyata* school. However, the canteen owners said that it was hard to not use any plastic as they need to wrap the food. Besides, banana leaves, the alternative of plastic wrap, were expensive.

Based on the facts and problems found in the school, the researcher tries to examine the implementation of character education of environmental care at an *Adiwiyata* school, SD Negeri Gedongkiwo. This research is considered important as Manase (2016) states that in order to have meaningful and sustainable conservation and environmental

change for the community, environmental education values obtained from environmental programs and education should be implemented. One of the implementations of character education is done in *Adiwiyata* school.

METHOD

This study employed the descriptive qualitative approach. This was conducted at SD Negeri Gedongkiwo which is located at Jalan Bantul Gang Tawangsari, Mantrijeron District, Yogyakarta City. This research was conducted on 11 August 2015 - 15 March 2016. The participants of this study were the school principal, three teachers, and twelve students at SD Negeri Gedongkiwo. The object of this research was the social situation at SD Negeri Gedongkiwo including the implementation of character education values of caring for the environment. The data in this study were collected through observations, interviews, and documentation. The instruments used in this study were observation sheets and interview guidelines. The obtained data were analyzed using data reduction techniques, data presentation, and data conclusion or verification. The data were validated using the triangulation technique and source triangulation.

RESULT AND DISCUSSION

Adiwiyata school program to develop character education of environmental care at SD Negeri Gedongkiwo was implemented in the following ways.

a. Environment-based Policy

1) School Vision, Mission, and Goal

SD Negeri Gedongkiwo has a vision, mission, and goal that include the efforts to preserve the environment. The school publishes its vision, mission, and goal to all students, teachers, educational personnel, and the student parents in several activities, namely ceremonies, teaching-learning activities, and meetings with the school committee. Some students are aware that their school is an *Adiwiyata* school although they do not know the meaning of their school vision, mission, and goal.

2) School Budget Action Plan

The School Budget Action Plan contains the budget allocated for programs related to the environment. Funds come from school operation costs, namely BOSDA, BOSProp, and BOSN. These three sources of funding cover 20% of the school budget plan. Then, the budget is used to fund some programs related to character education of environmental care.

3) Exemplary Behaviour

The exemplary behaviors done by the principal and teachers include dressing neatly and cleanly, disposing trash properly, mingling and working together with the students during SEMUTLIS to clean the school, avoid buying food and drink outside the canteens, and asking the students to take care of the plants in the garden in front of the classrooms.

4) Routine Activity

A regular activity carried out by teachers, educational personnel, and students to improve the quality of the school environment is Class Picket (SEMUTLIS) which is conducted every day before and after school hour. *Jumat Bersih* is done on Fridays of the end of every month, Friday morning exercise is done by all school members, class competition is held annually, and washing hands and disposing trash properly are done regularly.

5) Spontaneous Behaviour

Spontaneous behaviors are done by the principal and the teachers when they see students ignoring the environment care regulations. Based on the result of the interview, the school principal and teachers advise the students and impose fine to those ignoring the regulations.

6) Making a Condition

Certain conditions are made in order to educate students to care for the environment. This activity is done to make sure that the school environment including the schoolyard, classrooms, and bathrooms are clean. Moreover, this activity is done by conducting an environment-based teaching-learning process, providing sufficient trash cans, putting board containing the school visions and mottos, through announcements in break time asking students to always dispose garbage properly, and giving socializations related to the environment.

7) Problem Faced during the Program Implementation

The problems in implementing environmental policies at SD Negeri Gedongkiwo are as follows.

a) The school vision, mission, and goal regarding environment perseverance have not been fully understood especially by students.
b) Students' awareness of caring for the environment is still lacking as some of them are still littering.
c) The students, especially those of the first grade have little knowledge about sorting the trash.

b. Implementation of Environment-based Curriculum

1) Lesson Planning

In environment-based lessons, teachers should develop the lesson plans and other teaching instruments, such as learning indicators and syllabus containing the environmental care characters and materials with environmental themes.

2) Teaching-Learning Process

SD Negeri Gedongkiwo implements environment-based learning by integrating into all subjects. The teaching-learning processes are focused on student active participation. The teaching method used is lecture with question and answer activity, discussion, assignments, demonstration, direct practice, direct observation, and field trips. The learning media used to deliver the material are PowerPoint slides, pictures, realia, and other tools available in schools, for example, composter.

3) Problems Faced during the Program Implementation

The problems faced in implementing an environment-based curriculum are as follows.

a) Teachers do little preparation in conducting environment-based teaching-learning processes.
b) The environment-based curriculum does not stand alone, as it should be integrated into subjects.
c) Some students find it difficult to understand materials about the environment.

c. Participation-based Environmental Activities

1) Maintenance and Environment Perseverance

Maintenance of the building and school environment is funded by a certain budget. In picket activity, students clean the classroom by sweeping and mopping the floors, cleaning the blackboard, watering plants in front of the class, and disposing trash properly. Meanwhile, the gardeners always sweep and mop the porch floors. In addition, there are workers cleaning the upstairs rooms. *Jumat Bersih* is held on Fridays in the end of each month, while class competition is held annually.

2) Extracurricular Activity

Extracurricular activities carried out at SD Negeri Gedongkiwo help improve student awareness of the environment. The activities are Scouts, Little Doctors, and Community of Animal Lovers.

3) Creativity and Innovation

There are creativity and innovation activities carried out by the students, teachers, and educational personnel in an effort to preserve the environment. They recycle the waste, reduce the use of energy, and create artworks. Those activities are carried out in teaching-learning processes. Student artworks are displayed in the principal's room.

4) Partnership with Several Parties

School partners and the forms of support provided in the implementation of character education of caring for the environment are as follows.

a) Yogyakarta City and Province Environmental Agency (BLH) provides counseling, plants, cleaning tools, trash cans, composter, and environmental education competitions.
b) Department of Industry and Cooperatives provides counseling to increase fish and poultry consumption.
c) Yogyakarta Health Office provides socialization of healthy food and canteen.
d) Yogyakarta Education Office provides disaster response posters and food testing kits.
e) Balai POM tests the food sold in the canteens and provides socialization.
f) Pertamina Foundation provides counseling and assistance for making mini botanical gardens.
g) Yogyakarta Community Health Center provides counseling.
h) Gedongkiwo Urban Village Community Empowerment Institution (LPMK) gives plants and socialization.
i) Gedongkiwo Family Welfare Movement provides counseling.
j) The school committee (student parents) establishes a canteen managed by student parents and helps maintain the first-grade classrooms and gardens.

5) Problems Faced during the Program Implementation

The issues in conducting participation-based environmental programs are presented below.

a) The building and environment maintenance is considered not optimum since there are students, teachers, and educational personnel who are not aware of their main duties to participate in maintaining the environment.
b) The number of students participating in Scout extracurricular activities is low.
c) There is no regular schedule for teacher creativity development programs.
d) The services and facilities provided by some parties are sometimes not in accordance with the school's needs.

d. Management of Environmentally Friendly Facilities

1) Facilities and Infrastructure

Environmentally friendly facilities and infrastructure at SD Negeri Gedongkiwo are complete, with sufficient clean water, trash cans, composter, feces disposal, and green open spaces. The facilities and infrastructure are considered complete, as the school gets a perfect score of 100 in school accreditation.

2) Facility and Infrastructure Maintenance

The maintenance of facilities and infrastructure is the responsibility of all students, teachers, and educational personnel. The members of *the Adiwiyata* team-people in charge of conducting *Adiwiyata* programs-are of teachers and educational personnel although students are involved in maintaining the facilities and infrastructure.

3) Electricity, Water, and Office Stationery Utilization

Principals and teachers ask the students to efficiently use electricity, water, and stationery in the following ways.

a) Save electricity. There are pamphlets, posters, or stickers promoting to save energy. These may help the students remember to always turn on the lamps and fans only when it is necessary.
b) Save the water. There is an inscription on the wall to save water. This urges the students to use water efficiently and remind them to turn on the bathroom faucet and then turn it off after use. Besides, they are asked to not to forget flushing the toilet.
c) Save the stationery. The students are prohibited to make scribble on their books and fold and tear their books. Refill markers are used in consideration of cost-efficiency. Moreover, teachers make use of scrap papers to print assignments.

4) Environmentally Friendly Canteen with Healthy Food

The school's policy of improving the quality of a healthy and environmentally friendly canteen is to establish a canteen with the school committee. The canteen owners and teachers join training on healthy food, health checks for canteen owners and food vendors outside of school, food test, healthy food with no artificial coloring, sweeteners, and preservatives, and limiting plastic wrap for food. The canteen owners pay Rp. 5,000.00 every day to the school for canteen maintenance. The money is used to build a gate before the main gate to stop the students from buying food from outside of the school.

5) Problems Faced during the Program Implementation

The problems faced by SD Negeri Gedongkiwo in managing environmentally friendly supporting facilities are as follows.

a) The canteen established by the school committee is not consistently available.
b) There are still students who buy food and drinks outside the school through the inside gate.
c) Some supporting facilities at SD Negeri Gedongkwio are damaged and not functioning, for example, a sink, trash can, basketball hoop, and bathroom.
d) Students do not always use their stationery efficiently.

In general, the implementation of character education of environmental care at SD Negeri Gedongkiwo is in accordance with the components and standards made by the Ministry of Environment and Forestry and the Ministry of Education and Culture (2011). The standards include the School Environment Policies, Implementation of Environmental-Based Curriculum, Participatory-Based Environmental Activities, and Management of Environmentally Friendly Supporting Facilities. This is shown by the clear vision and missions regarding the environment, environment-based lesson plans, extracurricular activities, and supporting facilities for the implementation of the character education values. The stages of instilling character education through teaching-learning processes include moral knowledge, moral feelings, and moral actions (Lickona, 2014). However, moral actions have not turned into behaviors since there are students who do not consistently care about the environment. Therefore, exemplary behaviors should be optimally provided to students to stimulate environment care. According to the Ministry of Education (2010), exemplary behaviors are teachers or educational personnel attitudes that serve as an example for students. Teachers have the main role in providing exemplary behaviors for the students.

One of the issues found during the research is that the environment-based curriculum is not yet independent and is still integrated into subjects, and as a result, environment-based learning are not optimally conducted. Maryono (2015) states that environmental education and environmental education policies should be integrated into character education and should be positioned as a separate subject or conducted with a specific comprehensive teaching approach. This is considered more effective in achieving the goals. Besides, one of the issues in implementing character education of envi-

ronmental care is students lack activeness in participating in extracurricular activities related to environmental care character, for example, scouts. Risnani, Sumarmi, & Astina (2017) state that students have a lack of environmental awareness because they are not actively involved in school programs in which the purpose is to promote environmental conservation. When students are not involved in environmental preservation programs, they will not feel responsible for their environment. Thus, student activeness in environment-based activities is a must to foster student care for the environment.

Lack of teamwork within an institution has been an issue that needs to be resolved. Gal & Gan (2018) argue that in promoting a pro-environmental action, institutional goals need to strengthen and develop entrepreneurship, leadership, teamwork, and collaboration among students, staff, and communities. In addition, leadership and school vision play an important role in student management and education. Thus, solid cooperation is one of the keys to the successful implementation of character education of environmental care.

CONCLUSION

Based on the research findings, character education of environmental care may be implemented through several programs related to school policy components, implementation of environment-based curriculum, participation-based environmental activities, and facilities and infrastructure management. The findings may serve as the guidelines for educational institutions to implement similar programs to develop student environmental awareness. The issues found in this research should be noticed, so they can be anticipated. Therefore, character education of environmental care can build the students' characters that are manifested in daily activities.

REFERENCES

[1] Al-Anwari, A. M. (2014). Strategi Pembentukan Karakter Peduli Lingkungan Di Sekolah Adiwiyata Mandiri. Retrieved from http://www.academia.edu/121621160/STRATEGI_PEMBENTUKAN_KARAKTER_PEDULI_LINGKUNGAN_DI_SEKOLAH_ADIWIYATA_MANDIRI

[2] Amirudin, N. (2010). *Upaya Guru Pendidikan Agama Islam Dalam Menangani Kenakalan Siswa Pada Siswa Kelas III SD Muhammadiyah Program Khusus Kottabarat Surakarta* (Universitas Muhammadiyah Surakarta). Retrieved from http://eprints.ums.ac.id/9107/2/G000080161.pdf.

[3] BPS DIY. (2017). Jumlah Penduduk menurut Kabupaten/Kota di D.I Yogyakarta (Jiwa), 2010-2019. Retrieved from https://yogyakarta.bps.go.id/dynamictable/2017/08/02/32/jumlah-penduduk-menurut-kabupaten-kota-di-d-i-yogyakarta-jiwa-.html

[4] Gal, A., & Gan, D. (2018). What Went Well? Understanding the Culture of a Long-Term Israeli Environmental Education Primary School Program. *Australian Journal of Environmental Education*, *34*(3), 262–289. https://doi.org/10.1017/aee.2018.33

[5] Geotimes. (2015). *2019, Produksi Sampah di Indonesia 67,1 Juta Ton sampah Per Tahun*. Retrieved from http://geotimes.co.id/2019-produksi-sampah-di-indonesia-671-juta-ton-sampah-per-tahun/

[6] Iskandar, Z. (2012). *Psikologi Lingkungan: Teori dan Konsep*. Bandung: PT Refika Aditama.

[7] Kebudayaan, K. L. H. & K. P. dan. (2011). *Panduan Adiwiyata: Sekolah Peduli dan Berbudaya Lingkungan*. Jakarta: Kementerian Lingkungan Hidup.

[8] Lickona, T. (2014). *Pendidikan Karakter: Panduan Lengkap Mendidik Siswa Menjadi Pintar dan Baik*. Bandung: Nusa Media.

[9] Manase, J. (2016). Factors Conditioning Community Utilization of Environmental Education in Tanzania: The Case of Uluguru Mountains, Morogoro Municipality. *International Journal of Education and Literacy Studies*, *4*(2). https://doi.org/10.7575/aiac.ijels.v.4n.2p.22

[10] Maryono. (2015). The Implementation of the Environmental Education at "Adiwiyata" Schools in Pacitan Regency (An Analysis of the Implementation of Grindle Model Policy). *Journal of Education and Practice*, *6*(17), 31–42. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1079888&site=ehost-live

[11] Mundiatun, & Daryanto. (2015). *Pengelolaan Kesehatan Lingkungan*. Yogyakarta: Gava Media.

[12] Muslich, M. (2011). *Pendidikan Karakter Menjawab Tantangan Krisis Multidimensional*. Jakarta: Bumi Aksara.

[13] Nasional, K. P. (2010). *Pengembangan Budaya dan Karakter Bangsa: Pedoman Sekolah*. Jakarta: Pusat Kurikulum.

[14] Risnani, R., Sumarmi, S., & Astina, I. K. (2017). Implementation of Project-Based Learning (PjBL) through One Man One Tree to Improve Students' Attitude and Behavior to Support. *International Education Studies*, *10*(3), 134. https://doi.org/10.5539/ies.v10n3p134

[15] Wiyani, N. A. (2013). *Konsep, Praktik, & Strategi Membumikan Pendidikan Karakter di SD*. Yogyakarta: Ar-Ruzz Media.

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IMPLEMENTATION OF EVALUATION VOCATIONAL EDUCATION IN APPLYING LEARNING FROM HOME IN COVID-19 ERA

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Abstract

This study aims to determine the form of assessment of theoretical and practical learning online and offline, and to find out the competencies developed by mechanical engineering vocations in the Covid-19 pandemic era. The 3 domains of assessment and competency forms are cognitive, psychomotor, and affective. The research method used is quantitative, descriptive short using a questionnaire. The questionnaire statement is equipped with answer choices and open answers to competencies in order to provide freedom according to the actual situation. Respondents in this study were 41 mechanical engineering vocational educators. The results obtained is: first, the form of assessment of theoretical learning in the cognitive realm using quizzes (online learning) and assignments (offline learning), the psychomotor domain of assessment through assignments, the affective domain by observation. Meanwhile, the form of assessment of practical learning in the cognitive realm through assignments, psychomotor assessment using assignments (online learning), and the form of assessment reports (offline learning), for the affective realm through observation. Second, competencies that tend to be developed by educators: (1) cognitive competence, understanding of students, (2) psychomotor competencies developed by machining practicum, and (3) affective competence, prioritizing cooperation between students.

Keywords: Learning from Home, Forms Assessment, Competence

INTRODUCTION

The covid-19 pandemic affected the political, economic, social, and psychological dimensions (Michael B. Cangkapay). The Covid-19 pandemic has a crisis impacting education in various parts of the world. 33.1% of the world's student population is affected by school closures which resulted in 579 million students dropping out of school and 35 countries affected by school closures [1]. The Indonesian government still has the same policy in the field of education, namely learning is still carried out from home. This is considered because it is still difficult to implement health protocols. Therefore, learning activities are carried out from home [2]. However, areas that are already in the green zone can apply face-to-face learning. This paradigm shift provides an opportunity to reevaluate various approaches, such as a student-centered educational approach, an independent learning approach, a lifelong learning approach [3].

There are 2 methods of implementing learning from home, namely online distance learning using cellphones/computers and offline learning using television, radio, self-study modules and worksheets, printed teaching materials, props and learning media from objects in the environment ([4]. Online learning is increasingly a part of education systems around the world. The implementation of learning becomes comfortable because it is easily accessible anytime and anywhere.

However, the face-to-face classroom approach was always the most desirable and perceived to be more affective. Face-to-face learning builds intimacy between educators and students and makes the application of offline learning easier (Deepika Nambiar). Online learning provides evidence of inequality between students who have internet access and can adapt to the implementation of learning, but not students who are blocked by network access [5]. The implementation of vocational education learning also applies online and offline systems to theoretical and practical learning.

Vocational education is closely related to education and training, hard skills and soft skills. In improving the quality of training and student satisfaction, three factors are needed, namely human resources, training equipment and technological capabilities [6]. The purpose of vocational education is to prepare students for the world of work [7]. However, excessive graduates cause the quality of vocational education in Indonesia to decline. Meanwhile, other countries have succeeded in providing vocational education in accordance with their goals, and are constrained by a shortage of labor [8]. Therefore the need for the role of education in creating holistic education for students by integrating all learning domains, such as affective, cognitive and psychomotor.

Learning in the 21st century requires students to have skills, knowledge and abilities in the fields of technology, media and information, learning and innovation skills as well as life and career skills [9]. Competencies that students in the 21st century must

have are called 4C, namely Critical Thinking and Problems Solving, Creativity, Communication Skills, and Ability to Work Collaboratively [10]. Abdulloh Hamid & Putu Sudira (2013, p.39), stated that "character education can instill habits (habituation) about which things are good so that students understand (cognitive) about what is right and wrong, able to feel (affective) values. good and used to do it (psychomotor)" [11]. The decline in student achievement scores in the cognitive and psychomotor domains, the lower the affective value, and vice versa [12]. Therefore, the authors intend to examine the forms of assessment used by educators and the competencies developed from the cognitive, psychomotor, and affective domains in implementing learning from home in the Covid-19 pandemic.

METHOD

This research uses quantitative methods with a descriptive approach. The descriptive approach is carried out by the steps of collecting data, classifying, processing data, and making conclusions about an objective state in a descriptive one. Respondents in this study were 41 mechanical engineering vocational educators.

Table 1. Respondens Data

No	Indicator	Frequency (f)	Percentage (%)
1	Province		
	Central Java	18	44
	Special Region of Yogyakarta	8	20
	East Java	5	12
	West Java	4	9
	North Sumatra	2	5
	South Sumatra	1	2
	South Borneo	1	2
2	Background Education		
	Bachelor	33	80
	Magister	7	17
	Doctor	1	2
3	Teaching Experience		
	1 - 5 Years	26	63
	6 - 10 Years	4	10
	11 - 15 Years	5	12
	>15 Years	6	15
4	Institution		
	Public School	22	54
	Private School	19	46
5	Subjects		
	Basic Mechanical Engineering Expertise Program (C2)	8	20
	Mechanical Engineering Competency (C3)	25	61
	Others	8	20

The data collection technique uses a questionnaire by giving a set of questions to respondents [13] which is designed to obtain information about a subject [14]. The questionnaire questions, namely: first, related to the form of assessment used when learning from home by implementing online and offline learning in the implementation of theoretical and practical teaching and learning. Second, discussing the competencies developed by educators in the Covid-19 pandemic era. its domains include cognitive, psychomotor, and affective. The questionnaire questions are equipped with answer choices and open answers to questions related to competence in order to provide freedom according to the actual situation. Questionnaire data collection via Google form. The data obtained were processed and categorized according to the topic of discussion. data are interpreted, dialogued and supported by relevant studies. Furthermore, the conclusions obtained from the results of research data.

RESULTS

Era of the Covid-19 pandemic requires learning to be carried out from home by expecting online and offline learning. The learning system provides an opportunity to re-evaluate the appropriate forms of assessment. and competencies that can be developed by educators in the subject of basic mechanical engineering expertise program (C2) and mechanical engineering expertise (C3) in the implementation of learning from home.

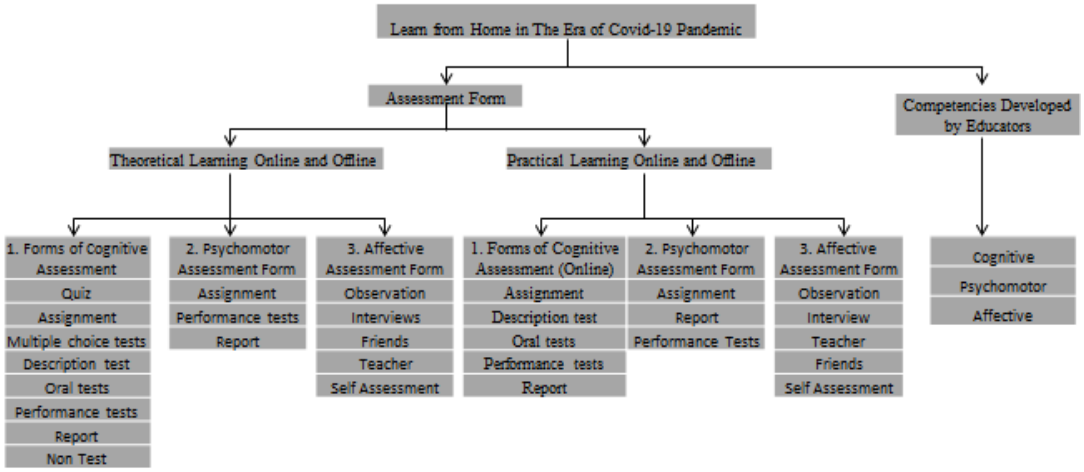

Figure 1. Research Findings

Based on data obtained from 41 vocational educator respondents. 8 respondents from basic programs include: (1) 2 respondents on mechanical engineering drawings, (2) 4 respondents from mechanical engineering jobs, and (3) 2 respondents from the field of basic mechanical engineering design. 25 respondents from the expertise program consisting of: (1) 6 respondents of NC, CNC and CAM machining techniques, (2) 3 respondents from milling machine engineering, (3) 12 respondents of lathe machining engineering, and (4) 4 manufacturing engineering respondents . Furthermore, 8 respondents from other subjects contributed in mechanical engineering. There is an important finding that not all educators apply both online and offline systems to theoretical and practical learning.

Table 2. Implementation of Mechanical Engineering Vocational Learning

No.	Implementasi of Learning	Frequency	Persentage
1.	Online theory learning	39	95
2.	Offline theory learning	11	22
3.	Online practice learning	15	37
4.	Offline practice learning	14	29

DISCUSSION

Forms of Theoretical Learning Assessment

Forms of assessment that tend to be used by educators in theory learning, based on the results of the questionnaire obtained from the cognitive realm, namely quizzes in learning online and offline learning assignments, the psychomotor domain uses assignments, while the affective is with observation. Improved learning outcomes in the affective domain through observational and psychomotor assessment forms are obtained according to skills, and products produced by students during practical learning activitie [15]. Another form of assessment on psychomotor is making Work Preparation (WP) and products. Another affectic assessment is discipline.

Table 3. Forms of Theoretical Learning Assessment Learned from Home

	Online Learning		Offline Learning	
Theoretical Learning	Frequency (f)	Persentage (%)	Frequency (f)	Persentase (%)
1. Forms of Cognitive Assessment				
Quiz	30	77	4	36
Assignment	24	62	8	73
Multiple choice tests	29	74	5	45
Description test	16	41	6	55
Oral tests	2	5	2	18
Performance tests	3	8	2	18
Report	6	15	5	45
Non Test	2	5	1	9
2. Psychomotor Assessment Form				
Assignment	35	90	8	73
Performance tests	7	18	6	55
Report	12	31	4	36
Others	2	5		
3. Affective Assessment Form				
Observation	30	77	10	91
Interviews	4	10	2	18
Friends	4	10	1	9
Teacher	11	28	4	36
Self Assessment	8	21	1	9
Others	3	8		

Forms of Practical Learning Assessment

Assessment of the cognitive domain involves knowledge, understanding, theory application, and analytical skills to solve the given problem. Assessment of the psychomotor domain is measured by conducting laboratory tests, and assessment of the affective domain is carried out through observation [16]. The results obtained from the form of practical learning assessment that tend to be used by educators to support learning in the Covid-19 pandemic era, namely: (1) cognitive by using assignments, (2) psychomotor using assignments in online learning, while offline with report assessment forms, (3) affective by observation.

Table 4. Forms of Practical Learning Assessment Learned from Home

	Online Learning		Offline Learning	
Practical Learning	Frequency (f)	Persentage (%)	Frequency (f)	Persentase (%)
1. Forms of Cognitive Assessment				
Assignment	13	87		
Description test	7	47		
Oral tests	1	7		
Performance tests	2	13		
Report	3	20		
2. Psychomotor Assessment Form				
Assignment	14	93	4	29
Report	5	33	9	64

	Online Learning		Offline Learning	
Practical Learning	Frequency (f)	Persentage (%)	Frequency (f)	Persentase (%)
Performance Tests	1	7	7	50
3. Affective Assessment Form				
Observation	13	87	12	86
Interview	1	7	3	21
Teacher	6	40	6	43
Friends	1	7	2	14
Self Assessment	3	20	4	29

Competencies Developed by Educators

Competence is found if the ability is really successful in relation to socio-moral [17]. Competence includes theoretical knowledge, practical and applied knowledge and knowledge, personal attributes, and social dispositions [18]. Theoretical knowledge competencies also support democratic participation in society, social inclusion, and social mobility as a basis for advancement of work and education [19]. Based on the results ofdata competencythat tend to be developed by educators: (1) Cognitive domains, students' understanding, (2) psychomotor competences developed by machining practicum. Psychomotor competence will increase if educators design learning strategies, compile lesson plans based on syllabus and taxonomy levels to achieve teaching goals [20], and (3) the affective domain, prioritizing cooperation between students.

Table 5. Cognitive, Psychomotor, and Affective Competencies

Cognitive	f	%	Psychomotor	f	%	Affective	f	%
Understand	12	29	Machining practicum	5	12	Cooperation	24	59
Analyze	11	27	Write a simple program	3	7	Responsibility	18	44
Know	8	20	Set the cutting tool	3	7	leadership	18	44
Apply	8	20	Test the program	3	7	Mandiri	13	32
Evaluate	7	17	Using software	3	7	Discipline	12	29
Synthesis	6	15	Demontation	3	7	Creativity	11	27
Assessment	6	15	Drawing skills	2	5	Accuracy	8	20
Thorough	6	15	Designing assembly work objects	1	2	Honesty	8	20
Creating	5	12	Activities (ability to act/skilled)	1	2	Optimistic	7	17
Compose	5	12				Sure	7	17
Think	5	12				Responsive	7	17
Conceptualization	5	12				Perseverance	6	15
Application	3	7				Innovative	6	15
Rational	3	7				Active	6	15
						Empathy	5	12
						Communication	5	12
						Never give up	2	5
						Insirative	1	2
						Solutive	1	2
						Collaborative	1	2
						Respect for others	1	2

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REFERENCES

[1] UNESCO, *COVID1-19 Impact on Education*. 2020.

[2] L. V. Hignasari, "Impact Analysis of Online Learning Toward Character Education of Elementary School Students In The New Normal Era," *New Norm. Idealism Implement. Indones. Philipp.*, pp. 225–244, 2020.

[3] G. Kolcu, S. Demir, K. Gülle, T. Atay, M. İ. B. Kolcu, and A. Koşar, "Evaluation of Transition to Distance Education in COVİD-19 Pandemic," pp. 1–9, 2020, doi: 10.21203/rs.3.rs-35396/v1.

[4] Kemendikbud, *Pedoman Pelaksanaan Belajar Dari Rumah Selama Darurat Bencana COVID-19 di Indonesia*, no. 15. 2020.

[5] B. Quito, "The Digital Divide : Online Learning for Students in the time of Pandemic A Research Essay for COMP 607 by :," 2020, doi: 2.2.17745.15204.

[6] N. Phan, T. Hang, L. T. Thuy, and P. T. Tam, "Impacting the Industry 4 . 0 on the Training Quality and Student ' S Satisfaction At Lac," vol. 21, no. 1, pp. 1–18, 2018.

[7] Suharno, N. A. Pambudi, and B. Harjanto, "Vocational education in Indonesia: History, development, opportunities, and challenges," *Child. Youth Serv. Rev.*, vol. 115, no. August, p. 105092, 2020, doi: 10.1016/j.childyouth.2020.105092.

[8] J. Reys-Nickel, L., & Lasonen, "Graduates of 2-year Engineering and Engineering Technician Programmes in the U.S. and the U.K," *Tech. Educ. Train.*, 2018, doi: 10(1), 30–44.

[9] K. Peppler, *21st-Century Skills*. 2017.

[10] Kemendikbud, *Kompetensi siswa abad 21*. https://www.kemdikbud.go.id/main/blog/2017/06/pendidikan-karakter-dorong-tumbuhnya-kompetensi-siswa-abad-21, 2020.

[11] A. Hamid and P. Sudira, "Penanaman nilai-nilai karakter siswa SMK Salafiyah Prodi TKJ Kajen Margoyoso Pati Jawa Tengah," *J. Pendidik. Vokasi*, vol. 3, no. 2, pp. 138–152, 2013, doi: 10.21831/jpv.v3i2.1592.

[12] V. Sönmez, "Association of Cognitive, Affective, Psychomotor and Intuitive Domains in Education, Sönmez Model," *Univers. J. Educ. Res.*, vol. 5, no. 3, pp. 347–356, 2017, doi: 10.13189/ujer.2017.050307.

[13] Sugiyono, *Metode penelitian kuantitatif, kualitatif, fan R&D*. Bandung: Alfabeta, 2015.

[14] D. Bozonelos and S. Marcos, "Chapter 8 - Quantitative Research Methods and Means of Analysis," no. August, 2020.

[15] A. Yulastri, H. Hidayat, G. Ganefri, F. Edya, and S. Islami, "Learning outcomes with the application of product based entrepreneurship module in vocational higher education," *J. Pendidik. Vokasi*, vol. 8, no. 2, p. 120, 2018, doi: 10.21831/jpv.v8i2.15310.

[16] N. A. M. Noor, N. M. Saim, R. Alias, and S. H. Rosli, "Students' performance on cognitive, psychomotor and affective domain in the course outcome for embedded course," *Univers. J. Educ. Res.*, vol. 8, no. 8, pp. 3469–3474, 2020, doi: 10.13189/ujer.2020.080821.

[17] В. Стрюков and О. Громцева, "Аналіз ключових компетенції в професійній освіті," *Soc. Dev. Secur.*, vol. 9, no. 5, pp. 94–109, 2019, doi: 10.33445/sds.2019.9.5.6.

[18] M. (Ed. . Mulder, *Competence-base vocational and professional education*. Dordrecht, the Netherlands: Springer.

[19] L. Wheelahan, "Knowledge , Competence , and Vocational Education - Introduction - Bernstein ' s Theory of Knowledge," pp. 97–112, 2019, doi: 9781119098713.ch6.

[20] A. Ahmad, Y. Kamin, and A. N. Md Nasir, "Applying Psychomotor Domain for Competency Based Teaching in Vocational Education," *J. Phys. Conf. Ser.*, vol. 1049, no. 1, 2018, doi: 10.1088/1742-6596/1049/1/012049.

C-HERO (CULTURE HERITAGE BOARD): EDUCATIVE GAME MEDIA USING AUGMENTED REALITY FOR Z-GENERATION

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Abstract

This research aims to develop an educative media based on augmented reality for the Z generation. Method of the research was using Research and Development, from Borg and Gall, deal with ten steps that are research and information collecting, planning, develop preliminary of product, preliminary field testing, primary product revision, main field testing, operational product revision, operational field testing, final product revision, and dissemination and implementation. C-Hero developed to become an attractive education media that can be implemented into courses. An augmented reality-based media is suitable as teaching material for generation Z to study of social science in junior high school. The educative media of C-Hero developed using boards, unity app, and cards, which then will be validated. C-Hero can be used to learn about the history and culture of Indonesia in and out of the class. The development of C-Hero as an educative media can be an alternative method to teach the generation Z in the study of social science in junior high school.

Keywords: *C-Hero, Media Edukatif, Z Generasi*

INTRODUCTION

The development of technologies also carrying potencies to develop the education sector. The potencies of technology development nowadays can be utilized to simplify the teaching process. According to Smaldino, Lowther, Mims & Russell (2015, p.12), the current trends of teachers is to change the strategy and teaching method into digital swiftly. To be more specific, it will come in the form of the implementation of educative media. It believed to be the most feasible approach that meets the students' need in the 21st century, which also known as Generation Z (Gen Z).

The educative media that commonly used in the learning process is through games. According to some sources (Yonekura & Soares, 2010; Prensky, 2003), a game-based educative media can encourage a strong motivation, communication, and increasing the selective visual attention of the students. It can also prevent the students from being bored to the course itself, as opposed to the more conventional-passive learning class (Admiraal, Huizenga, Akkerman & Dam, 2011, p.1187).

The digital approach is the most suitable method to fulfil the students' needs in the 21st century, which also known as the Generation Z era. According to Tapscott (2008, p.5), Gen Z is the generation born between 1998 into 2009. This generation is widely known to be gravely attached to technologies in their daily lives. They tend to believe that technologies are there to assist them in their activities, despite the negative stereotypes about the technology itself. Though, it known that the immersive amount of dependency towards technology may harm Generation Z (Csobanka, 2016, p.66).

One of the negative impacts of this dependency is that Generation Z would become "the silent generation." It occurs because the Gen Z were preoccupied with the electronic devices for more than 8 hours per day. The frequent use of the electronic device may imply that the platforms on the smartphone play a significant role in the daily habit (Turner, 2015, p.106). While the fact is, in some decades ahead, Gen Z would make up to 18% of the world population. Along with that, in 2045, Gen Z would become the people who will lead the country. Therefore, there are precautions needed to guide this generation to utilize technology with true wisdom.

One of the methods is to harness the benefit of inseparable technology. The primary purpose is to improve the quality of human life, conducting the revolution of character, and maintain a strong bond with the culture, using something already available within reach of the Generation Z. They are supposed to lead into a more refined future by optimizing the utilization of smartphones, an integral part of their lives.

The utilization of a smartphone could be a wise solution to improve knowledge and strengthen the cultural bond. A smartphone wields considerable amounts of features, particularly in the learning process. According to Anshari, Almunawar, Shahrill, Wicaksono & Huda (2017), Yamamoto (2014), Arista & Kuswanto(2017), Rambitan (2015), Puspitasari & Ishii (2016), a smartphone could use to transfer a wide variety of media, sharing the knowledge and creates dynamic learning. It also simultaneously, can help students to look forward to some interactive courses which then could boost their learning motivation, self-learning, and critical thinking skill.

The previous research using smartphone and paper-based successfully carried out. According to Huang, Wu, & Chen (2012), the combination of smartphone and paper-based can provide benefits for the student. These benefits are students' group discourse levels, individual levels, individual learning outcomes, and group learning outcomes, initial responses to the given questions, experience a new approach to group problem solving and can help teachers monitor students' engagement in group discussions.

Observations at SMPN 1 Wonosari show potential and problems. There are potential exists in the use of smartphones by students. Many students use smartphones in school so that they have the potential for smartphone-based media development. Students have problems with knowledge of Indonesia's diversity. They are still not maximal in understanding the material on Indonesia's diversity in social studies subjects.

Many previous studies have done on utilizing smartphone-based media. Research from Wahyutama, Samopa, and Suryotrisongko (2013) uses Augmented Reality technology on an android smartphone. They conducted research using augmented reality with a smartphone via a barcode. Meanwhile, this study, it does not use barcodes but directly on the image so that the symbols in the image can represent each region in Indonesia.

Research from Oktaliva (2015) uses an Android smartphone as an educational medium in social studies learning in grade VII SMP. He developed an interactive mobile learning application for geography on social studies subjects. Application media in smartphones is promoting visualization in Geography material. The difference with this study is that the author uses an augmented reality-based application so as cultural videos can display on the application.

Research from Ashari, Kridalukmana, and Windasari (2016) examines the application of provincial recognition games in Indonesia. They researched learning media in the form of android-based games. The difference with this study is that the author uses educational media based on monopoly games with augmented reality.

A study from Pramono (2013) researched supporting media for learning traditional houses of Indonesia using augmented reality. This study using image media as a form of visualization of augmented reality. Meanwhile, the author's research uses video-based augmented reality as visualization.

The main focus of this research is to offer the scenes of Indonesian cultures, in the form of an interactive game that can be played on a combination game using smartphone and paper-based. The desired outcome is that it would arouse the curiosity of the players, which mainly consist of children and teenagers. This game could become an alternative way to introduce the Indonesian culture through the utilization of technology, which in this case is a smartphone. This game can also be used to reintroduce and revitalize the character and nation values, which seems to degrade in the present time. Along with that, Gen Z, who lives with their attachment to smartphones, could strengthen their identity and help them as the successor of the golden age of Indonesia in 2045, in a more appealing manner.

METHOD

This study carried in the form of Research and Development (R&D). According to Borg & Gall (1983, p.772; Effendi, & Hendriyani, 2018, p.64-66), Educational Research and Development is a process used to develop and validate educational products. There are ten (10) steps in Borg & Gall's (1983; Effendi, & Hendriyani, 2018, p.64-66) research, including research and information collecting, planning, develop a preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision and dissemination, and implementation.

The subjects of this study are 33 students at Wonosari 1st Junior High School. The first step is to conduct a field and literature study for research and information collecting. The field study carried out by analyzing the courses in the Junior High, interview with the teacher and the students, and school observation. The literature study aims to find theories related to Indonesian culture. The next step is planning to determine the software design and the mapping of the content, which refers to the vast diversity in Indonesian culture. The third step is to develop the preliminary form of the product by gathering video resources, audio recordings, photos, or articles. Then the data would be combined and processed to create a digital software that can be distributed. The fourth step is preliminary field testing which used to validate the liability of the software. The test will be done by the experts in the respective field with the questionnaire, while the parameter of liability is using the criteria from Sutimin, Joebagjio, Sariyatun, dan Abidin (2018).

Tabel 1. *Parameter of liability*

Range	Criteria
3.26-4.00	Very Feasible
2.51-3.25	Feasible
1.76-2.50	Quite Feasible
1.00-1.75	Infeasible

The fifth step is the main product revision, where the assessment and suggestions come from the

media experts. The next step is the main field testing, which done in a small group consisting of 5 people to examine the operational flaws. Following the previous step is the operational product version, in which the main focus is to revise the operational product's flaws. Furthermore, a final product revision carried out in the larger group of subjects, consisting of 28 people with the main focus is to find out the product legibility. After that, a final product revision carried out to validate the liability of the product. Furthermore, the last step is dissemination and implementation, where the finalized product is given out to the social science teacher to use it in his/her classes.

FINDINGS AND DISCUSSION

The data that gathered in Junior High School shows that the subject of cultural diversity in Indonesia poorly acknowledged in the classes. The subject of the cultural diversity of Indonesia can be found in the third grade of Junior High, in the first term. One of the factors that cause this misunderstanding is the conventional method of teaching that is implemented by the respective teacher. The teacher also tends to develop fewer interactive media for the classes. While in this advanced technology era, it is more common and easier to develop some interactive-playable media to help the students understanding more about the subject of a course. According to the survey, numerous students in Wonosari 1st Junior High School have a smartphone with them. It could be a potential factor for this matter to create a successful outcome.

Planning created according to the problems and issues that have been gathered from the research and information collecting. From the problems and issues, the given solution is to develop this educative game to assist the social science studies, especially for the subject of cultural diversity in Indonesia. The educative game created using a particular software which the desired outcome is to be able to play on various smartphone devices. The main reason for this solution is because of the familiarity of smartphone towards the Junior High students. This game will be called C-Hero (Culture Heritage Board), a game based on augmented reality. C-Hero (Culture Heritage Board) is a combination of conventional and digital games. The combination consists of a board game, a clue card, and audio-visual software to liven up the gameplay. C-Hero built using the software and hardware based on the observation results in the field. The game will be combined with other resources to enhance the experience of the learning process. Other resources that will add to the game is about the cultural diversity of Indonesia. Several videos regarding the various cultures in various regions of Indonesia, the software that will be used to develop the game (in this, the developers are using Unity ver. 5.0.2fl, fuvoria, and Java), video and image editing software (movie maker/photoshop), and the pictures of various landmarks of several regions of Indonesia as the game build data.

Picture 1. *Flow Chart C-Hero*

As an educative game, C-Hero is using not only software as its basis but also using hardware. This combination will include the application of the following software like Corel Draw X6, Unity, Fuvoria, Movie Maker, Java, Java Development Kit, as well as several additions in-game material like pictures and videos about the cultural diversity of Indonesia. The concept design of C-Hero then created using the Unity software as the software for augmented reality. Along with that, Fuvoria and Java will use as the source of the material. Its as well as decoding the game so it can be played on a smartphone. After the framework is done, the game data (the media related to the cultural diversity of Indonesia) will be introduced to the game.

As the following software is done, the hardware part (the game board) will be built.

C-Hero using a Monopoly-related board that contains the names of Provinces in Indonesia, including their local culture. It also equipped with a hint card, which is revealing a video about the cultural diversity of Indonesia when scanned using a smartphone. The hint card also integrated with audio-visual software, Metaio. This software act as a bridge to combine two different media. This software works by scanning the hint card that contains information about the cultural diversity of Indonesia, then processing the image and insert the related video. After its process is done, the software finished its process by converting the video and save it so that it could be used on the smartphone.

After all, the development process of the software is done created; the next steps is the test run. If the hint card containing the information about the cultural diversity of Indonesia is scanned through a smartphone, the screen should show the related video about the content of the card. It should work for every card with various information about cultural diversity in every region. Each card would possess their unique information about the province and the culture so that the information could depict each card correctly. The C-Hero game offers such advantages, as follow the combination of two media would be more efficient to introduce the cultural diversity of Indonesia, the overall media would be more interactive, in comparison to other kinds of media. C-Hero can also be played either inside or outside the school. It created by combining the Monopoly game which is already familiar for the children, which considered to be more captivating to play so that the introduction of the cultural diversity of Indonesia would be captivating as well.

The validation process is including content and media proofing. The content proofing is done by an expert who is a lecturer in Tradition and Local Wisdom subject from Social Sciences Study Program. The college teacher himself validate the consistency of the subject by the content and the subject related with the introduction of Indonesia's cultural diversity as well as the goals to conserve and optimize the cultural majesty of the archipelago through the inspection on the hint cards, the cultural Monopoly board game, and the video in the C-Hero. The suggestion on this first validation test is to focus more on the fading culture of the less renowned ones.

The content expert was giving the content validation total score three from the questionnaire, which means that this game is feasible, according to the mentioned figure beforehand. Therefore, it can be concluded that the quality of the content within the C-Hero Application is proper enough. It appropriates to be tested to the students as well as the public in general.

Tabel 2. *Validation Content.*

Formula	Total Skor Questionnaire	Criteria
(N : 56) x 4	(42/56) x 4 = 3	Feasible
Max Value = 56 N = Value Obtained		

The validation of the software and hardware is done by the teacher of Computer Application and the Learning Media of Social Sciences from the Social Sciences Study Program. The media validation count gives total score 3, as mentioned before. It means that according to the category, this game is included in the feasible category. According to the feasibility of the media, the C-Hero can be tested either on children or people in general.

Tabel 3. *Validation Media.*

Formula	Total Skor Questionnaire	Criteria
(N : 84) x 4	(63/84) x 4 = 3	Feasible
Max Value = 84 N = Value Obtained		

The researcher revises the flaws and suggestions about the software and hardware based on the results of the content and media validation test. After the bugs fixed, the C-Hero then can be brought to the field testing.

In the preliminary field testing, the C-Hero tested to five students at Wonosari 1st Junior High School. The developer team chose the students randomly and prompted them to try playing the game. At this phase, the five students were explained how the game works. It starts by introducing the parts of the C-Hero and the gameplay. Supposedly, the C-Hero game is already familiar to the students, because generally, this game is closely related to the Monopoly game. The part that differs the C-Hero from the Monopoly is just the names on the board, and C-Hero tends to be more interactive because of the involvement of visualization from the smartphone. Though, the preliminary field testing showed that the students were still unfamiliar with the gameplay.

The problem found during the preliminary field testing, where the students are getting confused with the gameplay of C-Hero. Therefore, the developer team then simplifies the gameplay by

classifying the hint cards according to the region so that it should put the player in more ease.

The operational field testing is the second phase of the whole field testing. The experiment runs on a bigger group of a class. In this phase, the experiment is run on 28 students of Wonosari 1st Junior High School. In this large group experiment phase, the students are divided into smaller groups. The goal is to create a more convenient game session. One group consists of five students. Each student was given an equal chance to play the C-Hero. The five students that were participating in the first field testing were scattered into the existing groups. The main purpose is to make sure that each group has the leader who already understands about the gameplay of C-Hero. In this phase, the game is already adjusted to be user-friendly. The students can understand the gameplay and enjoying the game as well as understanding the concept of introducing the charm of cultural potency of the archipelago. The course becomes more enjoyable and more convenient. At the end of the class, the researcher verbally asked some questions about the Indonesian culture, and the students were able to answer properly. The C-Hero can be used easily by the students in the operational field-testing phase. However, there are still some contents that were not able to be used yet. It includes the video sound that went missing and some glitch on the videos.

In the final production phase, the inoperative contents fixed until it can be properly operated. The developer fixes the glitch on the sound and the videos. There are also some improvements to the graphic and animation aspect. The C-Hero fixed until it came out as a final product.

After the operational product revision is done, the C-Hero then introduced publicly. The application itself already introduced towards the Social Science teachers in Wonosari 1st Junior High School by inviting them in a forum group discussion. There, the developer team explains the new media that can be used by Social Science teachers in their class. Many of the teachers were interested in using the C-Hero as their teaching instrument.

C-Hero is a product that combines manual and digital games. C-Hero can be played by five people using the board and the app. It contains certain information about the endangered cultures of Indonesia. It has acquired its feasibility through the validation from the content and media experts. From the experiments that have been carried out, the C-Hero game shows that it got several advantages.

First, C-Hero is a combination of two different media which is considered to be more effective and efficient in its effort to introduce the cultural diversity of Indonesia. C-Hero is using two media, which is the board and the app that offer some exciting advantages towards the students. The observation results from the operational field test shows that the students are quite happy about the C-Hero game. The board used in the game could provide a representative function towards the students, and they were able to obtain some information regarding the endangered cultures of Indonesia from the board. The researcher recognizes that the students were actively acquiring the information about the Indonesian cultures and understand them as when the class is over, they were able to answer the given questions. The C-Hero software strengthens the acquired information by using audio-visual stimulation. Along with Mathew & Alidmat (2013), the utilization of audio-visual media in class could stimulate the brain and improving the learning process in class.

The second is that C-Hero exists as an interactive learning media. As an interactive learning media, C-Hero meets the criteria like was stated by Dede (2009, p.66) as a tool to improve education by creating possibilities for various perspectives, learning conditions, and transfer. Various perspectives could conduct by using the image and video media where the students in the class could observe from multidimensional viewpoints. C-Hero could serve as a medium to control the behaviour of the students in a class. They could voluntarily be occupied with the class and happily cooperating with the learning process. As an interactive media, C-Hero could be exploited as a teaching material, especially for the subject of Social Sciences to transfer the information as a part of reality through the audio-visual features.

The third one is that C-Hero created by adapting the commonly known Monopoly game, so it could be more convenient to be used to introducing information about the cultural diversity of Indonesia. The Indonesian children were likely familiar with the game since the Monopoly is a worldwide game (Whitehill, 1999, p.133). Therefore, it can be assumed that they will be more likely to understand the innovative gameplay of the C-Hero. In the first main field test and the operational field test, the students seem to quickly understand the gameplay and the Social Science class could progress more interactively.

Fourth, the C-Hero could be implemented in either inside or outside the class. It could be played anywhere as long as the board and the app is accessible. Furthermore, the players could play casually with their friends, just like a regular board game would do. According to Bassiouni & Hackley (2014, p.125), Generation Z needs a face-to-face interaction to maintain their social capabilities, which is provided by the C-Hero game. The players will run the game in groups, and as they play, they

would interacting and socializing with the other players as well. Moreover, this game also provides cognitive aspects from the media and the content itself which makes this game is genuinely convenient to be used as the medium to transfer the knowledge about the Indonesian cultures everywhere, anywhere, as the more they play the game.

C-Hero uses in social studies in Indonesian cultural diversity materials. Students can use their smartphones as media learning. They can use smartphones to learn white media in class. They are actively using smartphones for social studies learning. Students and their friends play C-Hero using a smartphone as a learning medium. Students use smartphones as a positive impact because they can actively and comfortably use smartphones for learning to use C-Hero. C-Hero keeps them from boredom in studying. Interacting students do not discuss things outside of learning but are actively participating in learn using C-Hero by making better use of smartphones.

C-Hero has a positive impact by providing comfort in social studies learning. C-Hero also prevents students from using smartphones for bad things. Students can use smartphones to play online games and access social media in some cases. Students do not appear to be playing online games and accessing social media when learning to use C-Hero. C-Hero becomes a medium that makes them actively discuss, compete, and interact actively with fellow students. C-Hero makes it easier for teachers to transfer material to them. The teacher guides students not to cheat and supervises if there are students who ask questions.

The teacher uses C-Hero as an educational game media with a student center learning approach. The student center promotes students to be active in learning so that they can support inquiry and scientific learning. C-Hero supports inquiry, and scientific learning methods can actively provide students to find material independently. C-Hero supports scientific and inquiry methods because C-Hero prepares learning materials for the diversity of Indonesian cultures. Students can be active as in observations in large classes where students look for their learning material while playing C-Hero. The teacher guides and supervises when they are looking for information so that the teacher's task in the classroom becomes lighter.

Smartphones can harm the attitudes of students. They lack greetings and interact with other students. C-Hero can be used for them to interact as an educational game. C-Hero, used in learning based on observations in the large class stage, can provide them to discuss and interact actively. C-Hero played in groups can intensify students to discuss and interact with each other. C-Hero supports to hone them to be able to collaborate by interacting with each other among students.

C-Hero accommodates social studies learning that does not provide internet. C-Hero is designed in a monopoly game to accommodate schools that have poor internet access, do not use the internet, and when they are not powered, although further research needs to be done to determine its effectiveness in social studies learning. C-Hero supports various school conditions as educational game media. C-Hero has weaknesses besides the absence of the internet as a learning medium that combines traditional and digital games. These weaknesses include the use of boards and cards that are prone to damage because they are made from paper. C-Hero boards and cards are prone to water, and prolonged use will fade the colour and crease the paper. The solution to this weakness is the use of a board that is printed on paper that is strong enough and covered with plastic so that it is waterproof.

CONCLUSIONS

The development of the C-Hero, which based on the augmented reality is considered to be able to stimulate the players' interest in the cultures of Indonesia. The main concept of C-Hero is a Monopoly board with Indonesian province names printed on, as well as the local cultures and equipped with the hint card which can be scanned with a smartphone to reveal the audio-visual media about the cultural diversity of Indonesia. The implementation of the C-Hero game is to be utilized for Social Sciences class in the 3rd grade of Junior High School. The comprehension of fascinating cultures of the archipelago can be seen from the approval of the content and media experts. According to their examinations, C-Hero is eligible to be tested to the public. Testing delivered especially for the young generation in order to introduce the charms of the cultures in the archipelago. Therefore, it is hoped that the young generation could optimize their cultural charms even more and be ready to embrace the Golden Age of Indonesia in 2045, by creating a strong foundation of Indonesian culture through a small step in the C-Hero game.

REFERENCES

Online Jurnal

[1] Admiraal, Wilfried., Huizenga, Jantina., Akkerman, Sanne., & Dam, Geert ten. (2011). The Concept of Flow in Collaborative Game-Based Learning. *Computers in Human Behavior*, 27 (3), 1185-1194, from: https://doi.org/10.1016/j.chb.2010.12.013.

[2] Anshari, M., Almunawar, M. N., Shahrill, M., Wicaksono, D. K., & Huda, M. (2017). Smartphones usage in the classrooms: Learning aid or interference?. *Education and Information Technologies*, 22 (6), 3063-3079, from: https://doi.org/10.1007/s10639-017-9572-7.

[3] Arista, F. S., & Kuswanto, H. (2018). "Virtual Physics Laboratory Application Based on the Android Smartphone to Improve Learning Independence and Conceptual Understanding". *International Journal of Instruction, 11*(1), 1-16, from: https://doi.org/10.12973/iji.2018.1111a.

[4] Ashari, Yusuf., Kridalukmana, Rinta., & Windasari, Ike Pertiwi. (2016). Pembuatan Aplikasi Permainan Pengenalan Provinsi di Indonesia melalui Game "Adventure Indonesia" berbasis Android. *Jurnal Teknologi dan Sistem Komputer*, 4 (2), 389-96, from: https://doi.org/10.14710/jtsiskom.4.2.2016.389-397.

[5] Bassiouni, D. H., & Hackley, C. (2014). "Generation Z" Childern's Adaptation to Digital Consumer Culture: A Critical Literature Review. *Journal of Costumer Behaviour*, 13 (2), 113-133, from: https://doi.org/10.1362/147539214X14024779483591.

[6] Csobanka, Zsuzsa Emese. (2016). *The Z Generation. Acta Technologica Dubnicae*, 6 (2), 63-67, from: https://doi.org/10.1515/atd-2016-0012.

[7] Dede, C. (2009). Immersive interfaces for engagement and learning. S*cience*, *323* (5910), 66-69, from: https://doi.org/10.1126/science.1167311.

[8] Hendriyani, H., & Hendriyani, Yeka. (2016). Pengembangan Model Blended Learning Interaktif dengan Prosedur Borg and Gall. *International Seminar on Education (ISE) 2nd* (62-70). Bandung: Universitas Pendidikan Indonesia. Retrived from: https://osf.io/preprints/inarxiv/zfajx/.

[9] Huang, H. W., Wu, C. W., & Chen, N. S. (2012). The Effectiveness of Using Procedural Scaffoldings in a Paper-Plus-Smartphone Collaborative Learning Context. *Computers & Education*, 59 (2), 250-259, from: https://doi.org/10.1016/j.compedu.2012.01.015.

[10] Mathew, N. G., & Alidmat, A. O. H. (2013). A Study on the Usefulness of Audio-Visual Aids in EFL Classroom: Implications for Effective Instruction. *International Journal of Higher Education*, 2 (2), 86-92, from: http://dx.doi.org/10.5430/ijhe.v2n2p86.

[11] Pramono, Andy. (2013). Media Pendukung Pembelajaran Rumah Adat Indonesia Menggunakan Augmented Reality. *Jurnal Eltek*. 11 (1), 122-130, retrieved from: https://jmam.polinema.ac.id/index.php/eltek/article/view/10.

[12] Prensky, Marc. (2003). "Digital Game Based Learning". *ACM Computers in Entertainment*, 1 (11), 1-4, from: https://doi.org/10.1145/950566.950596.

[13] Puspitasari, L., & Ishii, K. (2016). "Digital divides and mobile Internet in Indonesia: Impact of smartphones". *Telematics and Informatics*, *33*(2), 472-483, from: https://doi.org/10.1016/j.tele.2015.11.001.

[14] Rambitan, V. M. (2015). The effect of smartphone on students' critical thinking skill in relation to the concept of biodiversity. *American Journal of Educational Research*, *3*(2), 243-249, from: https://doi.org/10.12691/education-3-2-18.

[15] Sutimin, L. A., Joebagio, H., Sariyatun, M., & Abidin, N. F. (2018). The Development of Deconstructive Learning History Model to Promote the Higher Order Thinking Skill of University Students. *The New Educational Review*, *51* (1), 19-29, from: https://doi.org/10.15804/tner.2018.51.1.01.

[16] Turner, A. (2015). "Generation Z: Technology and Soscial Interest". *The Journal of Individual Pycology*, 71 (2), 103-113, from: https://doi.org/10.1353/jip.2015.0021.

[17] Wahyutama, Febrian., Samopa, Febriliyan., & Suryotrisongko, Hatma. (2013). Penggunaan Teknologi Augmented Reality Berbasis Barcode sebagai Sarana Penyampaian Informasi Spesifikasi dan Harga Barang yang Interaktif berbasis Android, Studi Kasus pada Toko Elektronik ABC Surabaya. *Jurnal Teknik ITS*. 2 (3), from: http://dx.doi.org/10.12962/j23373539.v2i3.5225.

[18] Whitehill, B. (1999). American Games: a historical perspective. *Board Game Studies, 2* (1), 116-14. Retrieved from: http://bgsj.ludus-opuscula.org/PDF_Files/BGS2-complete.pdf#page=114.

[19] Yamamoto, N. (2014). "An Interactive Learning System Using Smartphone: Improving Students' Learning Motivation

and Self-Learning". *2014 Ninth International Conference on Broadband and Wireless Computing, Communication and Applications*, https://doi.org/10.1109/bwcca.2014.125.

[20] Yonekura, Tatiana., & Soares, Cassia Baldini. (2010). "The Educative Game as a Sensitization Strategy for The Collection of Data with Adolescents". *Revista Latino-Americana de Enfermagem*, 18 (5), 968-974, from: https://doi.org/10.1590/S0104-11692010000500018.

Books

Borg and Gall. (1983). *Educational Research An Introduction*. New York: Longman.

Smaldino, Sharon E., Lowther, Deborah L., Mims Clif., Russell, James D. (2015). *Instructional Technology and Media for Learning*. Pearson: Singapore.

Tapscott. (2008). *Grown Up Digital: How the Net Generation is Changing Your World*. Boston: McGraw-Hill.

Thesis/Disertation

Oktaliva, Sesky. (2015). Pembangunan Aplikasi Mobile Learning Interaktif Materi Geografi Pada Mata Pelajaran Ilmu Pengetahuan Sosial kelas VII Berbasis Android (Studi Kasus SMPN 14 Bandung). (Diploma Thesis, Unikom).

DEVELOPMENT OF LEARNING DEVICES BASED ON STUDENT COMPETENCE INDUSTRY REVOLUTION (IR) 4.0

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Abstract

This is a research and development, which aims to develop a Problem Based Learning (PBL) model based on Student Competence IR 4.0. Learning devices are developed by using the Four-D development model. Expert validation was carried out by 2 principle and 2 teachers. The results show that the development of learning devices is declared valid with an average rating above 90 percent. Therefore, the learning devices is ready for field trials.

Keywords: Learning Devices, Problem Based Learning, Student Competence IR 4.0

INTRODUCTION

Student competence in Industry Revolution (IR) 4.0 refers to the development of society and the economy which requires that the education system equip students with new competencies and skills [1]. The skills possessed by students are expected to contribute actively to economic development. Student competence at IR 4.0 puts forward skills to adapt to the environment.

Schools are educational institutions that significantly influence the development of children's behavior [2]. The change in the learning process from being originally teacher-centered is now being changed to being student-centered. On developing learning effectiveness students can take responsibility for their own learning with the required learning styles and skills [3]. The learning process developed aims to make students able to solve daily problems [4]. So that the context in learning refers to problems in the real world.

Adaptive learning systems can help individual students improve their learning performance by presenting educational materials according to student needs [5]. Students have a democratic voice to feel free and safe, to be able to discuss and form opinions about their and others' ideas. Students who are able and likely to participate in discussions are more likely to develop their views on social life. Students who have positive relationships with classmates and feel safe in class will have the ability and willingness to discuss [6].

In supporting the implementation of learning, the teacher must prepare learning devices. Ref. [7] states that the preparation of teachers as educators will greatly affect the success of learning. Before learning is carried out the teacher arranges good learning devices. Without good planning, learning will not run smoothly and learning objectives cannot be achieved. Learning tools need to be developed to produce learning innovations and adapt to the times.

The Ministry of Education and Culture emphasizes that learning strategies and techniques must focus on students, take advantage of digital technology, and use innovative approaches [8]. The 2013 Curriculum emphasizes student competencies to have Higher Order Thinking Skills (HOTS). This ability encourages students to be able to analyze problems and find solutions. This ability encourages students to be able to analyze problems and find solutions. Besides, students are effectively encouraged to have the values of Strengthening Character Education (Penguatan Pendidikan Karakter/PPK). PPK consists of the values of integrity, religious, nationalist, independent, and cooperation [9]. Adjusting to the conditions in the 21st century, students are required to be more skilled. Student characters must meet the Student Competencies IR 4.0 by developing the implementation of learning that supports the achievement of these competencies.

Integrated learning and assessment initiatives for Student Competence IR 4.0 have been initiated from OECD countries such as Australia, Austria, Belgium, etc. [1].

In this study, Student Competence IR 4.0 refers to Gleason [10]. Gleason developed the main competencies that students must have, namely Top Ten Skills, consisting of (1) complex problem solving; (2) critical thinking; (3) creativity; (4) people management; (5) coordinating with others; (6) emotional intelligence; (7) judgment and decision making; (8) service orientation; (9) negotiation; and (10) cognitive flexibility. In addition to the Top Ten Skills, Student Competence IR 4.0 also looks at the

aspect of student literacy skills which refers to the new literacy idea published by the Ministry of Research, Technology, and Higher Education (Kemenristek Dikti) on January 17, 2018. In welcoming the disruption era, Kemenristek Dikti raises literacy new, namely digital literacy, data literacy, and humanist literacy.

In [11], digital literacy is important so that students can be integrated with the world of education outside of school. Students are expected to make breakthroughs in innovation by increasing their ability to use the internet, expanding access, and increasing cyber security protection. Data literacy provides learning reinforcement for students in understanding both qualitative and quantitative data and understanding the information obtained. Humanist literacy emphasizes the communication skills of students both directly and through digital intermediaries.

The development of integrated learning devices with a Problem-Based Learning (PBL) model and integrated with Student Competencies IR 4.0 is expected that students can be actively involved in exploring information to improve cognitive understanding and have a personality that encourages students to compete globally. The implementation of PBL is based on theoretical principles that combine real-life problem-solving skills with basic knowledge for decision making [12]. PBL is formulated into a social constructivist where learning takes place through cooperative activities that promote deep cognitive, social, and emotional learning to real applications [13].

Ref. [14] emphasize that the PBL approach has main pedagogical principles consisting of three clusters, namely the learning approach, the social approach, and the content approach. Implementing learning by providing personalized learning content or being briefed is one of the most important features in the education system [5]. The teacher actively shapes students 'capacity to be independent and effectively integrate students' knowledge, emotions, and behavior [2].

Self-learning with group discussion refers to a social approach that symbolizes collective ownership of the learning process and problem identification [14]. In addition to achieving PBL competencies, it can overcome problems between individuals in the class. Ref. [15] revealed that the learning process is hampered and student achievement decreases if the climatic conditions of the class interfere, whether influenced by certain students or as a whole.

The PBL model supports the soft skills students must have when entering the world of work. This study integrates the PBL model with the Student Competencies IR 4.0. In designing a learning model considering the competency principles of Student Competencies IR 4.0. This can be seen in the implementation steps of learning. The design of learning steps is based on the PBL syntax with the content of Student Competencies IR 4.0.

The purpose of this study was to develop learning devices with the Problem Based Learning (PBL) model based on the Student Competencies IR 4.0. This development is the first step in preparing for a new future in education and assessment standards.

METHOD

This research is the development of learning devices. The development uses the Four-D model developed by Thiagarajan, S., Semmel, D., & Semmel, M. The development model uses four stages [16]: 1) define, 2) design, 3) develop, and 4) disseminate. In this study, the development stage of learning devices was carried out until the development stage. The learning devices developed are the subjects of the Practicum Accounting for Service, Trade and Manufacturing Companies, grade 11 Vocational High School. The focus of learning is Basic Competence 3.4 analyzing adjustment transactions for service companies. Learning devices consist of learning identities, steps for implementing learning, teaching materials and media, and assessments.

The learning device developed was tested for validity. Data were analyzed through an assessment by three experts (expert judgment) consisting of 2 principals and 2 accounting teachers. They assess the lesson plan (RPP) in terms of content, language and construction. The measurement results are calculated using the Aiken formula with the Delphi method. The content validity formula of Aiken V [17] as follows:

$$V = \sum S/[n(c-1)]$$

Formula description:

S = r - lo
r = the number given by the appraiser
lo = the lowest validity score
n = number of appraisers
c = the highest number of validity assessors

RESULTS

The results of the development of learning devices are described as follows.

Define Stage

This first stage aims to identify the problems that are the basis for developing learning devices in Vocational High Schools. The results of the analysis identified from the problems that exist in SMK, namely: most teachers do not understand in arranging learning devices according to the 2013 Curriculum, and the implementation of learning is still dominated by teachers so that students are not en-

couraged to be active, independent in seeking information and critical thinking.

Design Stage

The design of learning devices is based on the 2013 Curriculum. In learning devices, assessment instruments are arranged based on indicators of student competency achievement which are then translated into question indicators. The assessment includes cognitive, affective, and psychomotor aspects.

Develop Stage

The aim of the develop stage is to produce valid and practical devices. The validity test was conducted by subject teachers and school principals. To assess the readability of the learning devices developed, a readability test was carried out.

Validity test

The learning device model developed has fulfilled the content validity with the results of the assessment showing valid criteria. The validation results are presented in Table 1. The results of the validity if a percentage will show a score: the component of the subject's identity is 100%, core competency components is 93.75%, basic competency components is 93.75%, competency achievement indicator components is 93.75%, the component of learning model is 93.75%, the learning objectives component of 93.75%, the components of learning activities is 95.83%, the learning material component is 93.75%, the components of the media tools, materials and sources of 93.75%, the learning assessment component is 95.83%, the research instrument is 95,83% and the component of student competency IR 4.0 was 93.75%.

Table 1. Validation Results

No	Component	Expert Validity Score	Total (%)
1	Subject's identity	16	100
2	Core competency	15	93,75
3	Basic competency	15	93,75
4	Competency achievement indicator	15	93,75
5	Learning model	15	93,75
6	Learning objectives	15	93,75%
7	Learning activities	15,33	95,83
8	Learning material	15	93,75
9	Media tools, materials and sources	15	93,75
10	Learning assessment	15,33	95,83
11	Research instrument	15,33	95,83
12	Student Comepetency IR 4.0	15	93,75

DISCUSSION

This learning device development research uses the Four-D development procedure. The product developed is a learning devices containing a Learning Implementation Plan (*Rencana Pelaksanaan Pembelajaran*/RPP). RPP in outline contains basic competencies and learning objectives achieved by students, steps for implementing learning, and assessment instruments.

The development of learning devices is based on the characteristics and learning styles of students. The characters of adolescence tend to be more active so that the implementation of learning is adjusted by involving students actively both in seeking information, discussions, and presentations. The development of learning devices arranges student tasks and activities during the learning process to achieve the stated goals. During the learning process students are encouraged to be active in finding material sources, expressing opinions through group discussions, and presenting the results of the discussion.

Design stage is done by dividing into four parts. The first part is constructing the assessment with the criteria reference test. The preparation of test instruments is based on indicators of competency achievement. The assessment instrument is arranged based on the indicators of achieving student competence which are then translated into question indicators. Second, the selection of learning media that supports learning objectives. The learning media used in this learning tool is a learning video about service company adjustment journals. The video is shown at the beginning to bring out students' digital literacy competencies and provide material perceptions. Third, the selection of the learning device format which contains the material design, scientific approach, and the appropriate learning model. Fourth, do the initial design. This section aims to design learning tools based on the analysis carried out at the define stage and based on predetermined criteria in selecting the appropriate media and format.

The develop stage aims to produce valid, practical, and effective learning tools. This stage is carried out by testing the validity and legibility test. The validity test is carried out to validate the learning tools of the experts with expert judgment so that they get input in the development of learning devices. The validity test is used to determine the level of validity / feasibility of learning devices before testing. The validation sheet was developed from Anugraheni [18] which contains subject identity, formulation of objectives / indicators, material selection, learning models, learning activities, selection of media / learning resources, and development of RI 4.0 Student Competencies.

Basically, the development of learning tools is carried out in order to innovate in the implementation of learning. Preparation for teaching by the teacher by arranging learning devices makes it easy for teachers to achieve learning objectives. The development was carried out with the Problem Based Learning (PBL) model based on the Students Competence in the Industrial Revolution 4.0. The development results were validated by four experts through expert judgment with valid results. All components of learning equipment are at a percentage above 90%. Therefore, the learning devices that have been developed are ready for field trials.

This research was conducted using a Four-D development model but did not carry out all stages. The development stages carried out are define, design, and develop. Future research is expected to develop learning tools up to the disseminate stage.

REFERENCES

[1] Ananiadou, K. and M. Claro. (2009). 21st Century Skills and Competences for new millennium learners in OECD countries. *OECD Education Working Papers, No. 41*. OECD publishing.

[2] Baker, J. A., Grant, S., & Morlock, L. (2008). The teacher-student relationship as a developmental context for children with internalizing or externalizing behavior problems. *School Psychology Quarterly*, 23(1), 3–15.

[3] Kolb, A.Y. & Kolb, D.A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning & Education.*

[4] Agustina K., Kristiyanto, W.H., & Nobiandini D. (2017). Learning design of problem based learning model based on recommendations of sintax study and contents issues on physics impulse materials with experimental activities. *International Journal of Active Learning.*

[5] Hwang, G.J., Sung, H.Y., Hung, C.M., et al. (2012). Development of a personalized educational computer game based on students' learning styles. *Education Tech Research Development*.

[6] Wanders, F.H.K., Veen, I.V.D., Dijkstra, A.B., et al. (2019). The influence of teacher-student and studentstudent relationships on societal involvement in Dutch primary and secondary schools. *Theory & Research In Social Education*.

[7] Fitri, A. (2011). Pengembangan perangkat pembelajaran statistika dasar bermuatan pendidikan karakter dengan metode problem based learning. *Jurnal PP Volume 1, No.2*.

[8] The Ministry of Education and Culture (Kementerian Pendidikan dan Kebudayaan/Kemendikbud). (2018). Simposium Internasional Pendidikan 4.0 untuk Indonesia Hasilkan 20 Rekomendasi. *Gerakan Literasi Nasional*. https://gln.kemdikbud.go.id.

[9] The Ministry of Education and Culture (Kementerian Pendidikan dan Kebudayaan/Kemendikbud). (2018). *Panduan Penilaian Hasil Belajar dan Pengembangan Karakter pada Sekolah Menengah Kejuruan*. https://psmk.kemendikbud.go.id.

[10] Gleason, N.W. (Ed). (2018). *Higher Education in The Era of The Fourth Industrial Revolution*. Singapore: Springer Published.

[11] Muliastrini. (2019). Penguatan Literasi Baru (Literasi Data, Teknologi, dan SDM/Humanisme) pada Guru-guru Sekolah Dasar dalam Menjawab Tantangan Era Revolusi Industri 4.0. *Jurnal Ilmu Sosial dan Humaniora, 2(2-1), 88-102.*

[12] Wade, M. (2020). *Problem-Based Learning In Physician Assistant Education At A University In Eastern South Carolina: Improving An Active Learning Pedagogy*. Dissertation at Liberty University.

[13] Hang, N. V. T., Meijer, M. R., Bulte, A. M. W., Pilot, A. (2015). The implementation of a social constructivist approach in primary science education in Confucian heritage culture: the case of Vietnam. *Cultural Studies of Science Education, 10(3), 665-693*.

[14] Kolmos, Anette, and Erik de Graaff. (2014). Problem-based and project-based learning in engineering education–merging models. *In Cambridge Handbook of Engineering Education Research (CHEER), edited by A. Johri and B. M. Olds, 141–160*. New York: Cambridge University Press.

[15] Blank, C. & Shavit, Y. (2016). The association between student reports of classmates' disruptive behavior and student achievement. *American Education Research Association*.

[16] Thiagarajan, S., Semmel, D., & Semmel, M. (1974*). Instructional development for training teachers and exceptional children a sourcebook*. Indianapolis: Indiana University.

[17] Aiken, L.R. (1985). Three coeficients for analyzing the reliability and validity of ratings. *Educational and Psychological Measurement. 1985, 45., pp 131-142*.

[18] Anugraheni, I. (2018). Meta Analisis Model Pembelajaran Problem Based Learning dalam Meningkatkan Keterampilan Berpikir Kritis di Sekolah Dasar. *Polyglot: Jurnal Ilmiah.*

COMMUNICATIVE COMPETENCE ASSESSMENT FOR TEACHER PROFESSIONAL DEVELOPMENT

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Abstract

A comprehensive review on all aspects of education can improve the quality of education particularly in Indonesia. The Indonesian Ministry of Education and Culture has designed a roadmap which can be used as a guidance to achieve the qualified education. The Sustainable Development Goals (SDG) Document signed by 160 countries in the World Education Forum 2015 has set a strong foundation for Indonesia to determine its goal, including the strategic goals in education. One of the educational strategic goals is teacher professional development through international collaboration and trainings [3]. To realize the goal, teachers as one of the most determinant factors must continuously improve and develop themselves. This paper is particularly focused on teachers of bilingual or immersion programs whose tasks also include preparing students to be a part of global society. This study was designed as an environment and needs analysis which included knowing the existing assessment tools to measure the teachers' target language competence and the needs for communicative competence assessment. The results of the study reveal that in general the existing assessment tools found in the field have not yet accommodated those six aspects of communicative competence.

Keywords: teacher professional development, communicative competence assessment, environment and needs analysis

INTRODUCTION

A well-planned design of qualified education must be prepared to embrace the 2045 megatrend. A comprehensive review on all aspects of education can improve the quality of education particularly in Indonesia. The Indonesian Ministry of Education and Culture has designed a roadmap which can be used as a guidance to achieve the qualified education. The Sustainable Development Goals (SDG) Document signed by 160 countries in the World Education Forum 2015 has set a strong foundation for Indonesia to determine its goal, including the strategic goals in education. One of the educational strategic goals is teacher professional development through international collaboration and trainings [3].

In relation to teacher professional development, teacher trainings must be well designed and prepared. This paper is particularly focused on teachers of bilingual or immersion programs whose tasks also include preparing students to be a part of global society. In other words, those teachers are challenged to provide comprehensible input for students through the target language as well as transferring the knowledge of the subject matters to the students. Therefore, their communicative competence in the target language is crucial. Apparently, teachers have received some training but they hardly trained in communicative competence development. One among other reasons for the absence of such training is the fact that mostly, the language assessment is only focused on the language proficiency. In fact, to be a communicative speaker, teachers need to have communicative competence. Based on the issues outlined above, this paper presents the results of environment and needs analysis of communicative competence assessments for teachers who use English as the delivery language in the classroom. This research is aimed to find out the existing teacher assessments and the needs of communicative competence assessment tool. The results of this research are beneficial for teacher professional development in the future.

METHOD

This study was designed as an environment and needs analysis which included knowing the existing assessment tools to measure the teachers' target language competence and the needs for communicative competence assessment. Qualitative approach was applied in this phase. Creswell [2] defines qualitative research as a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. This method is meant to dig and gain data from natural setting.

The study involved bilingual or immersion programs school principals and teachers of eight primary schools. The total respondents were sixty participants. The data were collected through interviews and focus group discussions.

RESULTS

From the results of interview and focus group discussion, it was found out that there were several assessment tools used by schools to measure teachers' English proficiency especially during the teacher recruitment process. Those assessment tools included TOEFL, micro teaching, interview, and translation. Proficiency tests like TOEFL was useful to assess the linguistic competence of the teacher candidates. In fact, this proficiency test was recommended for those who planned to continue their study abroad and this kind of proficiency test was under the category of norm-referenced test (NR). The use of TOEFL to assess teacher's language competences could give a description of teachers' linguistic competence level. However, TOEFL could not precisely measure the other communicative competence aspects.

Another assessment which was used by the schools was micro teaching. Micro teaching is a form of performance-based assessment. This kind of assessment is potential to describe teachers' communicative competence. However, some factors such as the unnatural discourse and limited assessment time, micro teaching alone does not provide comprehensive report of teachers' communicative competence.

Interview is effective to measure teachers' aural productive skills. During the interview, teachers' communicative competence can be assessed. However, this kind of assessment requires either skillful trained assessor or experienced interviewer who can assess teachers' communicative competence aspects.

One of the schools under this study assigned teacher candidate to do translation work during the recruitment process. This form of assessment does not assess teachers' oral productive skills which were vital for teaching profession. Teachers' linguistics and written competence can be portrayed through this kind of assessment. However, other aspects of communicative competence cannot be captured. In 2014, Hartono's study produced a communicative competence assessment kits (CCA) which accommodate the six aspects of the communicative competence. The CCA is a paper-based assessment which requires a lot of paper work. In 2019, a digital CCA (DCCA) was developed by the writers but the DCCA has not been widely used and still under a try-out project.

From the results of the interview and focus group discussion above, it can be said that each kind of assessment tool used by the schools has its own strengths and weaknesses. Table 1 below summarizes the strengths and weaknesses of each assessment tool used by the schools under this study.

Table 1. The existing Assessment Tool

Assessment tool	*Strength*	*Weakness /limitation*
TOEFL	Its validity and reliability has been admitted internationally.	Only covers the linguistic competence aspect
Micro-teaching	It can give description of teachers' communicative competence	The discourse is not natural
Interview	It is effective enough to access teachers' communicative competence	Only experienced assessors who have enough knowledge background about communicative competence can do the assessment.
		Limited on the assessment of linguistic and written discourse competence
Translation	The materials are flexible	
Communicative Competence Assessment Kits	It covers the six aspects of Communicative Competence	Need a lot of paper work

The results of the needs analysis suggest the need of more practical Communicative Competence Assessment which is paperless, technology user friendly, and practical.

DISCUSSION

Competency is a highly valued qualification that accounts for the effective use of one's knowledge and skills in a specific, usually complex context [6]. The competence can be observed from the performance. Therefore, if someone is labelled as a competent person, his performances are supposed to come up to a standard [6]. This study tried to see teachers' competencies in teaching with English which can not be separated from teachers' performances. In relation to teaching competencies and professionalism, the government of Republic Indonesia, through the Ministry of National Education gives great concern on the teacher's competencies and professionalism. According to the Laws of the Republic Indonesia Number 14, 2005 Chapter 8 which is known as The Teacher Law, teachers are labeled as professional educators who are supposed to have academic qualification, competencies, teaching certificate, physically and spiritually healthy, and the ability to realize the national education goals. Further, the competencies mentioned in Chapter 8 of The Teacher Law are explained in chapter 10. Those competencies refer to four standard competencies which include the pedagogic competency, personal competency, social competency, and professional competency. These are the cores of Indonesian teacher's competencies.

In more detailed explanation, the pedagogic competencies in the Indonesian Teacher Law are understood as the ability to understand the learners. Based on the attachment of the rules of the national education ministry number 16, 2007, the components of pedagogic competencies include the ability to understand the characteristic of learners from physical, moral, sociocultural, emotional, and intellectual; the ability to understand the learning designs and practices, assessment, and the ability to facilitate leaners to develop and actualize all of their potentials.

Personal competencies are understood as competencies which reflect stable, mature, and wise personality who can be the role model for the learners. Social competencies are referred to the teachers' ability to communicate and socialize effectively with the learners, educational staff, parents, and society. Meanwhile, professional competencies are the wide and deep mastery of teaching materials, curriculum, knowledge within the field of the study, and the structure and methods of the knowledge.

Communicative competence is considered as the key component of teaching and learning foreign languages. It is not enough just to know the language or the rule of the foreign language. Learners must also know how to use the language in real communication. In the practice of teaching and learning the foreign language in Indonesia, in this case English, there are some challenges which have to be faced by both teachers and students.

One of the challenges faced by the educational institutions in Indonesia which offer immersion or bilingual program is the quality insurance of the teachers. Teachers are demanded to meet some expected qualities. Considering the position of English as a foreign language in Indonesia, the role of teachers as the target language role-model is very significant. Another consequence of having English as a foreign language is the limited exposure to the target language. Students are mostly exposed to English in the classroom. Although classroom discourse may not be able to create as natural discourse as the real discourse outside the classroom, teachers are demanded to provide 'natural' discourse through the classroom interaction. The ability of handling a discourse is the core of communicative competence as suggested by Celce Murcia, Dornyei and Thurrel [5]. The concept of communicative competence is comprising by five aspects what so called as linguistic competence, sociocultural competence, strategic competence, actional competence, and discourse competence. In 2007, Celce-Murcia renewed the concept with an emphasis on teacher's competence. The new concept of communicative competence has six aspects in it namely the linguistic competence, sociocultural competence, strategic competence, discourse competence, interactional competence, and formulaic competence. The communicative competence framework is described in the following figure.

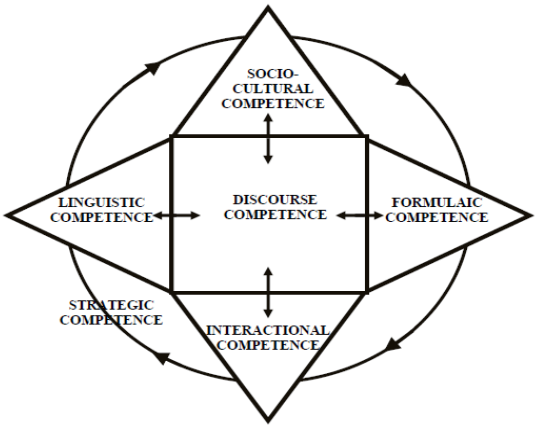

Figure 1. Communicative Competence aspects [4]

In relation to teachers' professional development, an appropriate English training which promotes communicative competence starts with a communicative competence assessment. The as-

sessment tool should accommodate the six aspects of communicative competence as proposed by Celce-Murcia [4].

Conclusion

Generally, the existing assessment tools found in the field have not yet accommodated those six aspects of communicative competence. To support teacher professional development, a communicative competence assessment is needed. The communicative competence assessment instrument is important to as the first step to prepare a professional training in communicative competence development for teachers. By knowing the level of teachers' competence, an effective and appropriate teacher training can be designed.

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REFERENCES

[1] H. Hartono, "Developing English training course for communicative competence enhancement of bilingual primary school teachers", unpublished dissertation, 2017.

[2] J.W. Cresswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 3rd Edition. California: SAGE publication, 2009.

[3] Kementrian Pendidikan dan Kebudayaan Republik Indonesia, Peta Jalan Generasi Emas Indonesia 2045, 2017.

[4] M. Celce-Murcia, "Rethinking the communicative competence in language teaching", in E. A. Soler, & M. P. Jorda, Intercultural Language Use and Language Leraning, Dordrecht: Springer, 2007, pp. 41-57.

[5] M. Celce-Murcia, Z. Dornyei, & S. Thurrell, "Communicative competence : a pedagogically motivated model with content specifications", Retrieved November 1, 2013, from http://www.zoltandonyei.co.uk/uploads/1995-celce-murcia-dornyei-thurrell-ial.pdf, 1995.

[6] W.Westera, "Competencies in education : a confusion of tongues" in Journal of Curricullum Studies Vol.33(1), 2001, pp.75-81

THE TRADITION OF PREGNANCY AND BIRTH IN BANJAR AND LAMAHOLOT TRIBES

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Abstract

Indonesia is one of the most densely populated countries in the world. It also has culture groups and diverse ethnicities of more than 1,340. Each has held cultural values and forms a belief persisted down throughout generations. These cultural values form a local wisdom that struggles to survive. This article aims to discuss the traditions and ritual ceremonies related to pregnancy and birth of Banjar tribe in Borneo and Lamaholot tribe in East Nusa Tenggara. This study used a literature review discussing life and traditions existing in Borneo and in East Nusa Tenggara. Furthermore, the writer examined the local wisdom and preservation of a natural environment in various regions in Indonesia. In addition to the data collection, the interviews with traditional leaders of Borneo and East Nusa Tenggara were carried out in a workshop. The main outcome of this paper is to highlight the need of better understanding on how the ritual stages of pregnancy and birth in those two regions are still preserved and carry deep meaning for their communities.

Keywords: Banjar Tribe, Lamaholot Tribe, Pregnancy Tradition, Ethno parenting

INTRODUCTION

A cultural system existing in a society is created with the values it adheres to. A culture can be interpreted as a unique information system believed to provide benefits, and become a life goal as well as a guideline for regulating and controlling a daily life in a particular group or community (Zahran, 2011; Bornstein 2012). The cultural values existed in an area tend to influence a parenting method (Bornstein, 2012). This results in differences of the parenting patterns in each region due to their diverse cultural value systems. Indonesia is one of Southeast Asia countries forming an archipelago with approximately 17,000 islands. According to the 2010 BPS census, Indonesia has its diversity of around 250 indigenous ethnic groups with 1,340 of them living side by side. The more ethnic groups in Indonesia, the more local wisdoms we would find.

Rahyono (2009) confirms the local wisdom is obtained through experiences from society in a certain ethnic group. The local wisdom takes place very strongly over a long interval. Even though this era is modern, several regions in Indonesia still adhere to their local wisdom, including East Nusa Tenggara and Borneo. The writer did not obtain much data regarding the existing parenting in Borneo and East Nusa Tenggara. Some of its information regarding the local wisdom obtained include the research related to natural management in the two areas such as a whaling in Lamalera (Kurniasari & Reswati, 2011), a management of protected forests in Kampung Wae Rebo (Uju, Bhuja, & Lete, 2019), a local culture in natural resource management in Lembata Regency (Firdaus, Djatmika, & Amirudi, 2017), an effort of natural environment preservation by paying attention to the local wisdom (Niman, 2019), and a forest management in Dayak Kanayatn community (Soni, 2012). This article is going to focus on description of the local wisdom with regard to the rituals and ceremonies of pregnancy and birth moments of Banjar tribe in Borneo and Lamaholot tribe in East Nusa Tenggara.

RESEARCH METHOD

This study used a qualitative approach through a literature review analyzing the data and information related to the rituals and ceremonies throughout the pregnancy of the Banjar tribe in Borneo and the Lamaholot tribe in East Nusa Tenggara. The data analysis process was started by describing traditions and rituals of pregnancy heldby the Banjar tribe in Borneo, followed by describing the traditions and rituals of pregnancy held by the Lamaholot tribe in East Nusa Tenggara. The next stage was a comparison between the two tribes and a discussion based on the perspective of ethno parenting theory. Apart from reviewing some literature, the writer carried out interviews with representatives from Borneo and East Nusa Tenggara regions in a workshop of Ethno parenting in 2019.

RESULT AND DISCUSSION

People and Culture of Borneo

Borneo is one of the five biggest islands in Indonesia. This island has an area of 743,330 km2, three state areas, and consists of five provinces. Based on the 2010 BPS census, there were two major ethnic groups in Borneo; the Dayak Tribe and the Banjar Tribe. Furthermore, there are many other tribes with a small population, such as the Kutai, Paser, Tidung, and Berau tribes.

Of all the tribes in Borneo, the Banjar Tribe or well known as *"Urang Banjar"* in Southern Borneo is discussed in this study. The majority of the people are Muslims, reaching more than 97%. They are quite devout in worship which can be seen from the active mosque constructions for praying, the number of useful activities during a very solemn fasting month. They always share *zakat* and try to be able to go on pilgrimage (Daud, 1997).

The Banjar people still hold various traditions including the ceremony performed when someone is married, pregnant, and giving birth. Those are commonly referred to "life cycle ceremony" (Hadi, 2015). This ceremony is held once in a lifetime called a tradition.

The life cycle ceremony is not only performed by the Banjar tribe which is dominant with its Islamic belief, but this ceremony is also performed by people in Bali whom hold Hindu belief (Suardana, 2019). The life cycle of Hindu went through several stages, starting from newborns, weaning, childhood, adolescence, puberty, post-marriage, pregnancy, ageing and death (Koentjaraningrat, 1976). In addition, the Sundanese and Javanese tribes hardly recognize the life cycle ceremony. The Sundanese life cycle ceremony is divided broadly into five stages, starting from pregnancy, birth, childhood, and death (Hadiati, 2016). The same as in the Banjar tribe, the Sundanese rituals are closely related to Islam. Meanwhile, the life cycle ceremony of Javanese is a definite sign of a person's maturity starting from birth, marriage, and death (Ekowati, 2008; Sedyawati, 2006).

Although the process of performing life cycle ceremonies in Banjar, Bali, Sunda and Java tribes shows considerable differences, its purpose in performing this ceremony remains the same such as an expression of gratitude towards God (Rachmawati, 2017), asking for prayers to run the birth well and avoiding the accidents and bad luck for family life.

The Pregnancy Tradition of Banjar Tribe

The pregnancy tradition of Banjar tribe is held when the pregnancy turns three months and seven months (Hairina, 2016). According to its belief, a pregnant woman smells good, so the evil spirits continue to harass the mother and the baby. Even the odd numbers such as three, seven, and nine are times considered sacred. This tradition is performed with the aim of protecting pregnant woman, her baby and family against calamities to be always safe (Syarifuddin, 1982).

> *"At three months of pregnancy, a Batapungtian tawar ceremony is performed, which is held on a day that has been determined as a good day for performing the ritual. It is on Friday at 07.00 AM. In this ceremony, the elder woman gives a prayer of salvation while sprinkling oil on the pregnant woman's head. The oil used is made from wanyi wax, coconut oil, fragrance wood, and blood from the crests of boiled chickens, known as baboreh likat oil" (Hairina, 2016).*

Furthermore, at the age of seven months of pregnancy, a *mandi tian mandaring* ceremony known as *bapagar mayang* is performed which is especially for pregnant woman for the first time.

> *"This ceremony requires several items such as a fence, mayang areca, sugarcane stalks and spears for fence posts, flower water, asai temu giring, mayang water, and a glass of water that has been recited a prayer. The water is splashed into the mother's body by the elder "(Hairina, 2016)*

The Birth Tradition of Banjar Tribe

A ritual of welcoming a baby is a manifestation of the prayers offered. This ritual is held in accordance with child development (Ideham, 2005). When the baby is born, the father immediately calls for prayer *(adzan)* and *iqamat* with the hope that his child always obey the religion. Meanwhile, a child's placenta is placed in banana leaf stem and saved in a basket made of salted clay. The basket is planted in the burial ground, and then a small piece of bamboo is attached to the top of the ground pile. The people hope that the child will be healthy, dignified, and respected (Hairina, 2016). The ritual was then continued to perform at night by inviting close relatives to recite Al-Qur'an together. If the baby is a male, the chapter recited is Surah Yusuf; while if the baby is female, the chapter recited is Surah Maryam. Calling for prayer *(adzan)* and *iqamat* as well as reciting Surah Yusuf or Surah Maryam in this tradition is the influence of Islam, because the majority of Banjar community are Muslims. Therefore, it is not surprising that Islam influences the traditions (Hiliadi, 2016).

After the previous ceremony is performed, it continues with a *bapalas bidan* ceremony. This ceremony is performed as a sign of gratitude to the *paraji* (child shaman) who has helped the birth process of the mother. Even though the birth delivery process is not assisted by the *paraji*, this ceremony must still be performed to avoid children getting sick (Daud, 1997).

The same is also held by the Baduy community after assisting the birth of a mother, the *paraji* or *indung beurang* will get some food such as *tumpeng* (Indonesian ceremonial dish of yellow rice served in a cone shape), chicken, and the others as gifts from families that they have been assissted of the childbirth process (Supriatna, 2012).

The next ritual is giving the name for the child known as *mangarani anak* ceremony (Hairina, 2016). The name is a very fundamental aspect due to a child's identity, a prayer and hope for a good and happy life. This causes parents often ask for help to the tribal leader or the elder to determine it. This *mangarani anak* ceremony is usually performed in the ceremony of *aqiqah* and *tepung tawar*. It is a process to wipe a child's forehead with *tutungkal* water. It is a form of water mixture, spices, and pulp oil as a symbol of giving blessings to the child (Shapiah, 2015). The instinct of parents is to protect their children against the harms. The parents in Banjar perform the activities believed to be able to drive away the evil spirits to avoid the disturbance for their children, including keeping several items placed near by the baby's head for 40 days such as *surah yasin*, onions, limes, mirrors, and *jeringau* leaves (Ideham , 2005).

The Community and Culture of East Nusa Tenggara

East Nusa Tenggara is one of 34 provinces in Indonesia. Located in the eastern part of Indonesia, it has about 550 islands with an area of approximately 48,718 km2. The majority of the people in this area are Christian, around 90.51% (Central Bureau of Statistics, 2019). Flores Island, West Timor Island and Sumba Island are the three main islands in East Nusa Tenggara. Several people hold the belief of supernatural spirits and their ancestors powers (Adonis & Djoko, 1997).

Of several ethnic groups in East Nusa Tenggara, one discussed in this paper is the Lamaholot tribe in East Flores. For the people in East Nusa Tenggara; "Children are a great hope and blessing from the ancestors" (TB PM interview, 04 December 2019). They see children are entrusted by God who are a source of fortune for the family. Thus, it is an obligatory for the family to celebrate the presence of children as the manifestation of immeasurable gratitude. Also, the birth of a child is courteously greeted with several rituals consisting of various stages with their own philosophies.

The Pregnancy Tradition of Lamaholot Tribe

In the regional cultural documentation regarding the traditional ceremony of East Nusa Tenggara (1984), the two ceremonies were held by the Lamaholot Tribe related to the pregnancy tradition. They are *maring hapeng* and *hoing teinodok* ceremonies. The *maring hapeng* ceremony is held to ask to the highest form name of community's belief called *Rera Wulan Tana Ekan* for protecting the pregnant woman in the pregnancy through the birth process with the hope to run well. This ceremony is held in the three months pregnancy.

> *"Several food preparations in this ceremony are tumpeng (Indonesian ceremonial dish of yellow rice served in a cone shape) and chicken, coins, brass bracelet, tobacco, arrack, betel nut, one or two days old chicks, and chicken eggs that are about to hatch". If the ceremonial time is agreed by the tribal leader, the husband of the pregnant wife goes to the roke or holy pillar in a traditional house called korke to put the coins or brass bracelet which has been prepared as a symbol of binding a promise with Rera Wulan Tana Ekan. Also, the husband prays to safe his wife and his child in the birth process (Ministry of Education and Culture, 1984).*

The prayer is a great deal of effort to prepare for welcoming and providing children's indirect educational provisions, since the true process of children's education begins in the womb (Abdullah, 2017). The parents are trying to provide various educational stimuli even though the children are still in the womb.

The next ceremony is *maring hapeng* requiring the blood of a rooster to be rinsed in several corners of the house. Then, the ceremony of *makan sirih pinang* and *boa* is held. It is delivering dishes served for the ancestors in the form of the chicks or chicken eggs kept in several sacred places such as forests and large rocks (Ministry of Education and Culture, 1984).

The next ceremony is *huke*. It is served with a wonderful meal for the spirits of the ancestors (Darnys, 1991) such as t*umpeng* (Indonesian ceremonial dish of yellow rice served in a cone shape), chicken meat, betel nut, and tobacco.

When the pregnancy turns nine months old, *hoing temodok* ceremony is held to admit all the past mistakes of family. This is a self-purification ceremony for pregnant woman from all her past mistakes, while the hope to not make the same mistakes when having children (Solot, 2018). The husband should be ready for a table full of specially prepared food for the next ceremony. It consists of cotton tied with red threads called *braha brika*, a rooster, betel nut, arack, candlenut, brown rice, the hatched chicken eggs or chicks, and tobacco. The tribal leader in this ceremony determines a good morning for the husband to beg for forgiveness for all his sins to the *Rera Wulan Tana Ekan* in the traditional house called *korke*. The next is *hoing teinodok* ceremony held by the *Marang* (ceremonial priest) taking place at the tribal leader's house. The *Marang* (ceremonial priest) takes the *braha brika* and sweeps it over the mother's body while reciting

a prayer. The *braha brika* then is thrown away outside the village. Meanwhile, The *Marang* brings the hatched eggs or chicks as offerings to the ancestors to the sacred places. After serving the dishes in several places, the place where the mother gave birth called *warada* is rinsed with the blood of the rooster. It continues with food preparation of the candlenuts to be chewed together with betel nut which will later be attached to the forehead and limbs of the pregnant woman. It keeps the mother to be strong and safe in delivery time (Ministry of Education and Culture, 1984).

A closer look at the aforementioned explanation, the process is remarkably similar to prenatal education, but in the local version. At this time, the amount of efforts are required to educate parents to encourage a growing awareness of starting life with the children. When the children are born, they look their parents as role models in the future, while the parents educate them properly to be useful and expected by the community (Abdullah, 2017).

The Welcoming Baby Tradition of Lamaholot Tribe

Coming from the same source in the regional cultural documentation regarding the traditional ceremony of East Nusa Tenggara (1984), there are six stages of the ceremony when the baby is born:

First, the ceremony of *tilu kebekek*

After the baby is born, the *paraji* cuts the baby's umbilical cord and then bathes and wraps the baby carefully in a cloth. The parents will prepare a place made of woven palm leaves to save the baby's placenta.

The food preparations needed for this ceremony are brown rice, a pot, and a shell spoon. In the morning, the eldest brother of the baby's father known as *opu weruin* cooks a porridge for four days every morning and evening to the new mother. In the first day, there is a little ritual called *toto dulat* held by giving the porridge to the mother, the forehead of the child, and the placenta in the pot. The porridge was made previously at the tribal leader's house. The mother and the baby must stay at home for these four days, while the family must still prepare pandanus leaves to *make doko*. It is used for the mother to provide shelter from an urgent situation that requires her to get out of the house (Ministry of Education and Culture, 1984).

Second, the ceremony of *agu-at*

This ceremony is held when the baby turns four days old. It is as an expression of gratitude for the mother giving birth to her baby safely. Also, it marks the appointment of *Rera Wulan Tana Ekan* made by the husband when he was in the *korke* during the mother's pregnancy. This ceremony requires a variety of food preparations such as betel nut, arrack, tobacco, t*umpeng* (Indonesian ceremonial dish of yellow rice served in a cone shape), eggs and chicks, a goat or pork (Darnys, 1991).

Third, the ceremony of *helet kebote*

This is a ceremonial form held to protect the placenta. It is hung at a tree in the forest near by the village usually engaged in the afternoon. The Lamaholot tribe does not bury the placenta, yet puts it in a high place, the higher the better (Ngebu, 2018). If the baby is a male, the family prepares the bow, arrow and man weaving sarong; however, if the baby is a female, what is needed is a weaving tool called a *menuhu* and a women's woven sarong. After the placenta is hung, the fourth ceremony is held, called *tali gelang* (bracelet) ceremony intended to give a gift for a newborn baby. This ceremony is performed in the afternoon and in a large scale since it involves all villagers. The important things for preparation are a lontar leaf mats basket to save *wajak nemu* (betel nut), tobacco, rice, arrack, goat and pork. In addition, the family prepared *keleka* (a woven palm leaves basket) as a place to save a gift set of bracelets, beads, or coins received from the villagers to baby families (Ministry of Education and Culture, 1984).

Fifth, the ceremony of *ohong*

This ceremony is performed by washing the hair of the baby's mother according to customary procedures. It aims for self-purifying and regaining the newly born mother's strength in order to produce a lot of breastmilk. It is usually performed in the morning. The food preparation needed are coconut fruit, medicinal ingredients, brown rice, dried fish, coconut shell, pot made of clay (Ministry of Education and Culture, 1984).

Sixth, the ceremony of *lodong a na*

This ceremony is held when the baby turns 40 days old to be inaugurated as a new member of the religion or belief. The food preparation needed are rice, fish, chicken, and fresh coconut (Ministry of Education and Culture, 1984).

The comparison between Pregnancy Tradition and Birth Tradition of the Banjar Tribe in Borneo and the Lamaholot Tribe in East Nusa Tenggara

Of the information relating to the rituals of pregnancy and birth in the Banjar and the Lamaholot Tribes, we can see that the local wisdom is still being preserved in several regions in Indonesia. They perform the rituals as a form of obedience and belief to the custom and belief they adhere to. Furthermore, the tradition preservation is held as a considerable effort to save the children and be protected by God.

The expression of Gratitude

It is fairly easy to find forms of birth ceremonies expressed in various cultural forms throughout the Indonesian archipelago (Soebadyo, 2002).

While the majority of people of the Banjar Tribe in Borneo are Muslims and the Lamaholot Trribe of East Nusa Tenggara are Christians, both show a sense of gratitude towards God Almighty. This is clearly seen from several kinds of ceremonies performed to be grateful for everything God gives. Interestingly, the tradition of thanksgiving, *Selametan* (the expression of gratitude to God) or pregnancy and birth ceremonies is found in several areas such as in Banda Aceh (Fajri, 2020), Lampung (Alimah, 2017), the Sunda area (Prawiro, 2015), Java area (Widyaningrum, 2017), South Sulawesi (Ramli, Getteng, Amin, & Susdiyanto, 2017), Bali (Swastika, 2012), Dayak (Kuenna, 2015) and the other areas in Indonesia.

The Education of Unborn Baby

The comparison between the pregnancy tradition held by the Banjar and the Lamaholot Tribes bears similarities and differences. They believe an odd gestational age is quite sacred. It is clearly seen by performing various kinds of existing rituals. The Banjar tribe holds the ceremony when the woman turns three months and seven months pregnant, while the Lamaholot tribe holds it when the woman turns three months and nine months pregnant. When the pregnancy reaches three months, they share the same food preparation-chicken blood. The Banjar tribe uses blood from a chicken crest to mix with *likat baboreh* oil which will be sprinkled on the pregnant woman. Meanwhile, the Lamaholot tribe uses the blood of a rooster used to rinse the sacred pillar in the *warada* (a place where the mother gives birth). This animal blood is generally used in traditional ceremonies as a symbol to neutralize the relationship between creatures and humans from bad things (Kuenna, 2015).

As the aforementioned explanation, at the age of seven months pregnancy, the Banjar tribe bathes the pregnant woman by using several prayer recited objects, such as flower water, *asai temu giring*, *mayang* water and a pot of water. Unlike what the Lamaholot Tribe perform, they merely wash the hair of a mother who has given birth by using coconuts and medicinal ingredients. Both are the symbols aimed to purify, refresh and regain the mother's strength. Apparently, the ceremony for bathing a mother who is seven months pregnant is also held in the Sundanese and Javanese Tribes (Suliyati, 2017; Hadiati, 2016). In the Sundanese tribe, the water is mixed with seven kinds of flowers. First, the mother is bathed by the *indung beurang* followed by the female elders in turns. The water was poured out seven times, and there were seven pieces of cloth provided. Each splash of the cloth are replaced with the dry one ”(Rusnandar, 2017). A quite same as the Sundanese people, Javanse performs this ritual bathing for pregnant women by using the water from seven sources added seven kinds of flowers. Seven women respected in the area take turns watering the mother's body (Hadiati, 2016). According to the beliefs of the Sundanese, Javanese and Banjar people, if the ceremony is held, the mother is predicted to give birth safely, and get a beautiful and kind child as expected. Interestingly, the involvement of the community and the elders is clearly seen in this ceremony. The tribal leaders, parents or elders generally lead this ceremony. The community involvement process takes place in it. Parenting is not only a concern for parents but also for the elders and the local community. It can easily be found in many cultures, including in the Sundanese tribe living in Kampung Naga, West Java, where the pregnancy ceremony process involves the elders (Rachmawati, 2017).

The Banjar and the Lamaholot tribes have prepared the education of unborn baby known as prenatal education. Prenatal period is also well known as the period before giving birth (Ministry of National Education, 2000). The tradition of praying for pregnant woman carried out by the local community, as well as the tradition of the pregnant woman encouraged to pray a lot, wishing the best for her children. The atmosphere of silence, acceptance, gratefulness and serenity in the moment of praying build positive emotions towards children. According to Bornstein (2012), it is needed for the parents to continue socializing positive values since the children are in the mother's womb up till growing into adulthood. It aims particularly for the children having social provisions to participate in life. In addition, the pregnant woman always tries to maintain their food. Therefore, her children can be healthy and strong. The maintenance, provision, and arrangement of these foods are generally controlled by the traditions in villages holding strongly the customs (Rachmawati, 2017).

The joy of Welcoming a Baby

The Banjar and the Lamaholot tribes welcome the baby with joy and happiness. The community also takes part in looking after children, as what the people of Kampung Naga perform in West Java (Rachmawati, 2018). The tradition held in the Banjar and the Lamaholot areas is a form of respect and gratitude towards God as well as the reception of humans who will be born. The parents hope their children are supposed to bring good fortune and benefit for many people. The tradition held is believed to be able to build children's lives good when they are born in the world.

Many people believe that the placenta of a born baby is its magical sibling. Hence, a ceremony should be performed to treat it equitably (Putra, 1988). The two tribes show quite striking differences in terms of how to save the placenta. The Banjar tribe keeps the placenta in the basket then plants it in the burial ground and sticks a small piece of bamboo over the pile of land. This is the same as what Javanese and Sundanese people usu-

ally carried (Widyaningrum, 2017; Isnendes, 2016). In contrast to the customs of the Banjar Tribe, the Lamaholot Tribe does not bury the placenta, instead saves it in a basket and places it in a high place, for example hanging on a tree such the tradtion of people in Bayung Gede Traditional Village in Bali (Arta, 2011). This puts in a considerable effort to keep the baby healthy and avoid a state of disorders.

The last but not least is giving the name,because it is a prayer,hope,and child's identity. The parents in the Banjar and the Lamaholot tribes often ask for help to the elders to give the name for their children to build a fairly good life quality for children.

The Belief of Islamic Religion

Islam influences the culture existing in the Banjar community, because as previously explained the majority of people are muslims. In line with Abbas and Muchtar (2013), *Urang* Banjar, Islam, and Indonesia are three quite strongly interrelated things. The number of religious activities in the community such *Baayun Mulud* (Hiliadi, 2016) has made them to be deeply religious persons. Further, the large number of mosque-building constructions are more creating the Banjar area to be known as *seribu langgar* (thousand mosques). Kuntowijoyo (in Jamalie, 2014) argues that the religion and the culture are related and seem to powerfuly influence one anoother. A value from the religion enables the culture to form. The local traditions existing in the Banjar community are not entirely disappeared by the development of Islam, but these religious values allow the existing culture to enter and merge (Hiliadi, 2016). If a tradition consists positive values, it deserves to maintain and preserve.

The Belief in Ancestral Traditions

In contrast to the traditions existing in the Lamaholot tribe that tends to be more influenced by the ancestral traditions (interview with TB PM, 04 December 2019). Based on BPS data for 2010, the people of East Nusa Tenggara have various beliefs in religion; Christianity (90.51%), Islam (9.28%), Hindu (0.20%), and Buddhism (0.01%), though the traditions of their ancestors are still maintained. The worship of ancestral spirits is a very prominent thing (Soh, et al., 1985). The megalithic tradition has barely survived in East Nusa Tenggara. It is highly seen by the existence of hundreds and even thousands years of old buildings considered sacred as places to honor and give thanks to their ancestors (Adonis & Djoko, 1997). The existence of buildings or places of megalithic traditions used for worship processions proves that the people are one with nature in living and understanding the meaning of life (Ministry of Education and Culture, 1984). Kinds of ceremonies from birth to death are closely related to the ancestral traditions. Another interesting aspect is the tradition of hunting, weaving, farming, gardening, opening land or harvest, even making weapons and any items from metal or clay (Uju, Bhuja, & Lete, 2019), the Lamaholot tribe has complex and magical rituals.

CONCLUSION

The findings of this paper reveal that in the current era of globalization, traditional culture is still preserved. This is indicated by the existence of areas holding traditions or traditional rituals related to parenting starting from pregnancy to the birth of baby. These traditions or traditional rituals are an obedience and belief hereditary. The rituals held certainly varied since the culture, environment, and history of each region is different. However, all parents basically always hope the best for their children in the future. The local wisdom maintained is a proof that the community still adheres to several matters relating to customs to have a good quality and blessed life.

REFERENCES

[1] Abdullah, M. (2017). Pendidikan pre-natal, telaah pemikiran Ibn Qayyim Al-Jauziyyah dalam Kitab Tuhfah Al-Maulud Bi Ahkam Al-Maulud dan relevansinya dengan pendidikan Islam. *Jurnal Pendidikan Agama Islam, 2*(2), 341-360.

[2] Adonis, T., & Djoko. (1997). *Sistem Pemerintahan Tradisional di Nusa Tenggara Timur.* Jakarta: Proyek Pengkajian dan Pembinaan Nilai-Nilai Budaya Direktorat Jenderal Kebudayaan Departemen Pendidikan dan Kebudayaan.

[3] Alimah, A. R. (2017). *Peran orang tua dalam penanaman nilai aqidah dan ibadah pada anak di masyarakat Kelurahan Korpri Raya Sukarame Bandar Lampung.* Lampung: Universitas Islam Negeri Raden Intan.

[4] Arta, K. S. (2011). Prosesi upacara ari-ari dengan sistem gantung. *Media Komunikasi FIS, 10*(1), 1-15.

[5] Badan Pusat Statistik. (2019). *Perkembangan Ekonomi Provinsi Maluku Triwulan IV-2019.* From maluku.bps.go.id: https://maluku.bps.go.id/pressrelease/2020/02/05/371/ekonomi-maluku-tahun-2019-tumbuh-5-57-persen.html

[6] Bornstein, M. H. (2012). Cultural approaches to parenting. *Parenting, 12,* 212–221.

[7] BPS. (2010). *Kependudukan [Population].* Jakarta: Badan Pusat Statistik.

[8] Darnys, R. (1991). *Makanan: Wujud, variasi, dan fungsinya serta cara penyajiannya daerah Nusa Tenggara Timur (Vol. 17).* Jakarta: Direktorat Jenderal Kebudayaan.

[9] Daud, A. (1997). *Islam dan Masyarakat Banjar; Diskripsi dan Analisa Kebudayaan Banjar.* Jakarta: PT.Raja Grafindo Persada.
[10] Departemen Pendidikan dan Kebudayaan. (1984). *Upacara Tradisional Daerah Nusa Tenggara Timur.* Jakarta: Departemen Pendidikan dan Kebudayaan.
[11] Departemen Pendidikan Nasional. (2000). *Kamus Besar Bahasa Indonesia (KBBI).* Jakarta: Balai Pustaka.
[12] Ekowati, V. I. (2008). Tata cara dan upaya seputar daur hidup masyarakat Jawa. *Journal.uny.ac.id*, 204-220.
[13] Fajri, Z. (2020). *Praktik pembacaan Surat Yusuf dan Maryam dalam masyarakat Gampong Landom Kecamatan Lueng Bata Kota Banda Aceh.* Banda Aceh: Universitas Islam Negeri Ar-Raniry Darussalam.
[14] Firdaus, R., Djatmika, E. T., & Amirudi, A. (2017). *Kearifan lokal kegiatan ekonomi dan pemanfaatan sumber daya alam Kabupaten Lembata.* Malang: Pascasarjana Universitas Negeri Malang .
[15] Hadi, S. (2015). Studi etika tentang ajaran-ajaran moral dalam masyarakat Banjar. *Dalam Jurnal Tashwir, 3*(6), 209-226.
[16] Hadiati, D. N. (2016). *Bentuk, Makna, dan Fungsi Upacara Ritual Daur Hidup Manusia pada masyarakat Sunda.* Surabaya: Universitas Airlangga.
[17] Hairina, Y. (2016). Dinamika perubahan pola pengasuhan anak dalam masyarakat Banjar . *Transpormasi Sosial Dan Intelektual Orang Banjar Kontemporer*, 1-24.
[18] Hiliadi, W. (2016). Nilai-nilai tradisi Baayun Mulud sebagai kearifan lokal di Banjarmasin Kalimantan Selatan. *Civic Edu Jurnal Pendidikan Kewarganegaraan, 1*(1), 19-26.
[19] Ideham, S. (2005). *Urang Banjar dan kebudayaannya.* Banjarmasin: Pemerintah Propinsi Kalimantan Selatan.
[20] Isnendes, C. R. (2016). *Ibu dan pola pengasuhan anak.* Bandung: UPI.
[21] Jamalie, Z. (2014). Akulturasi dan kearifan lokal dalam Tradisi Baayun Maulid pada Masyarakat Banjar. *El Harakah, 16*(2), 234-254.
[22] Koentjaraningrat. (1976). *Manusia dan Kebudayaan di Indonesia.* Jakarta: Jambatan.
[23] Kuenna, K. (2015). Simbol dalam Upacara Adat Dayak Ngaju (Symbols in Ritual Tribe of Dayak Ngaju). *Jurnal Bahasa, Sastra, dan Pembelajarannya, 5*(2), 179-187.
[24] Kurniasari, N., & Reswati, E. (2011). Kearifan lokal masyarakat Lamalera: Sebuah ekspresi hubungan manusia dengan laut. *Buletin Riset Sosek Kelautan dan Perikanan, 6*(2), 29-33.
[25] Ngebu, J. F. (2018). Pendidikan karakter dalam kosmologi masyarakat Suku Bajawa di Flores Nusa Tenggara Timur. *Prosiding Seminar Nasional Geotik* (pp. 62-69). Surakarta: Muhammadiyah University Press.
[26] Niman, E. M. (2019). Kearifan lokal dan upaya pelestarian lingkungan alam. *Jurnal Pendidikan dan Kebudayaan Missio, 11*(1), 1-16.
[27] Prawiro, A. (2015). Ritual daur hidup di Kampung Naga, Desa Neglasari, Kecamatan Salawu, Kabupaten Tasikmalaya Jawa Barat. *Journal of Local Culture, 2*(2), 121-140.
[28] Putra, N. (1988). *Upacara Manusa Yadnya.* Denpasar: IHD Denpasar.
[29] Rachmawati, Y. (2017). *An Ethnography Study on Parenting Tradition in Sundanese Culture in West Java-Indonesia.* Hualien-Taiwan, National Dong Hwa University: Unpublished.
[30] Rachmawati, Y. (2018). *Sundanese Parenting at Kampong Naga West Java Indonesia* . (draft naskah buku): Belum diterbitkan.
[31] Rahyono, F. X. (2009). *Kearifan Budaya dalam Kata.* Jakarta: Wedatama Widyasastra.
[32] Ramli, Getteng, A. R., Amin, M., & Susdiyanto. (2017). Perilaku nelayan dalam lingkungan keluarga terhadap pendidikan anak di Desa Tamalate Kecamatan Galesong Utara Kabupaten Talakar. *Jurnal Diskursus Islam, 5*(3), 1-30.
[33] Rusnandar, N. (2017). Pranata pendidikan pada upacara ngeuyeuk seureuh, upacara masa kehamilan, dan ngasuh budak. *Patanjala, 9*(1), 31-44.
[34] Sedyawati, E. (2006). *Budaya Indonesia: Kajian arkeologi, seni, dan sejarah.* Jakarta: Raja Grafindo Persada.
[35] Shapiah, S. (2015). Nilai-nilai pendidikan Islam dalam tradisi kelahiran pada Adat Banjar. *Mu'adalah; Jurnal Studi Gender dan Anak, 3*(1), 67-83.
[36] Soebadyo, H. (2002). *Indonesia Heritage.* Jakarta: Buku Antar Bangsa.
[37] Soh, A., Kotten, D., Batu, S., Koehuan, M., Hayon, Y., Ouw, M., & Kana, C. (1985). *Upacara tradisional yang berkaitan dengan peristiwa alam dan kepercayaan daerah Nusa Tenggara Timur.* Jakarta: Departemen Pendidikan dan Kebudayaan.
[38] Solot, M. K. (2018). Pengalaman wanita hamil Lamaholot sebelum masuk rumah sakit. *CHMK Health Journal, 2*(3), 20-30.
[39] Soni, C. P. (2012). *Kearifan lokal masyarakat adat Dayak Kanayatn dalam pengelolaan hutan adat (marang) di Kampung Sidas Daya Kecamatan Sengah Temila Kabupaten Landak Kalimantan Barat.* Yogyakarta: Universitas Negeri Yogyakarta.
[40] Suardana, I. K. (2019). Perkawinan sebagai ritus daur kehidupan masyarakat Hindu. *Prosiding Seminar Nasional Dharma Acarya*, (pp. 153-156). Almapura.

[41] Suliyati, T. (2017). Upacara tradisi masa kehamilan dalama Masyarakat Jawa. *Jurnal Kajian Kebudayaan, 7*(1), 1-12.
[42] Supriatna, E. (2012). Upacara Seba pada Masyarakat Baduy. *Patanjala, 4*(3), 481-496.
[43] Swastika. (2012). *Dharma Kahuripan, Grha Paramitha Santi Lan Jagadhita Satyam-Sivam-Sundaram.* Denpasar: Pustaka Bali Post.
[44] Syarifuddin, d. (1982). *Upacara tradisional (Sejak anak dalam kandungan lahir sampai dewasa) daerah Kalimantan Selatan.* Jakarta: Departemen Pendidikan dan Kebudayaan Direktorat Jendera Kebudayaan Direktorat.
[45] Uju, G. F., Bhuja, P., & Lete, T. (2019). Keraifan lokal masyarakat dalam pengelolaan hutan lindung di Kampung Wae Rebo, Desa Satar Lenda, Kabupaten Manggarai. *Jurnal Biotropikal Sains, 16*(1), 1 – 11 .
[46] Widyaningrum, L. (2017). Tradisi adat Jawa dalam menyambut kelahiran bayi. *JOM FISIP , 4*(2), 1-15.
[47] Zahran, S. K. (2011). Type of parental socialization across cultures a psychoanalysis. *Psychology, 2*, 526–534.

UTILIZING FLIPPED CLASSROOM LEARNING MODEL IN GRAMMAR CLASS VIEWED FROM STUDENTS' PERSPECTIVE

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Abstract

The aim of this study is to describe the students' perception on the use of Flipped classroom learning model in grammar class. The participants of this study were 48 students majoring English Education Study Program in one of private universities in Lampung province. Those students enrolled intermediate grammar class. The research design used in this study is qualitative. The instrument used is questionnaires in the form of Likert Scale in the level of Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD). The results of questionnaire then were analyzed qualitatively. Based on the analysis, it can be found that most students respond positively toward flipped classroom learning model. Flexibility, accessibility, easiness to conduct learning that results improvement on students' academic achievement and performance become the major strengths of utilizing flipped classroom in grammar class. It is recommended that flipped classroom is an alternative teaching model that supports the students' success in learning English.

Keywords: Flipped Classroom, Grammar class, Students' perception.

INTRODUCTION

In Indonesia, English as a foreign language is a compulsory subject in all schools and universities. Several studies have uncovered the fact that students have a weak tendency to master English in all skills, namely listening, speaking, reading and writing. In fact, they are also weak in vocabulary and grammar knowledge. Research conducted by Mandasari, B &Aminatun, D [1] found that students at universities have difficulty in speaking skill. This is due to a lack of exposure to English and a lack of variation in teaching English so that students feel not motivated to learn. Another study suggests that Indonesian students also experience difficulties in learning writing skill. This is due to a lack of time to practice writing (Al-Badawi,2011). Instead of mastering four skills of English, it is also notified that grammar knowledge is considered as important knowledge. It is the basic foundation when students are going to master a language (Wang, F) [3]. However, the preliminary study conducted at Universitas Teknokrat Indonesia, it is found that some students enrolled in Grammar class got problem in grammar knowledge. The lecturers and students have limited time to discuss and practice grammar materials in the classroom. Thus, it makes them having less exposure toward grammar practice. On the other hand, teaching method used by lecturers was static. The students coming to the class are given explanation about the materials. No teaching innovation is applied. This condition puts students having no motivation in learning grammar. Having lack of motivation makes students difficult to improve their grammarknowledge. Consequently, English communication practiced by the students leads them to the misunderstanding. Therefore, it is notified that mastering grammar knowledge is important.

In an effort to solve the problem above, innovation in English learning is needed. One of the efforts to improve students' abilities in grammar learning is by using technology. Applying technology in English language learning and having face-to-face meeting in the classroom are part of blended learning. It is confirmed that blended learning has successfully conducted. Some studies conducted by researchers toward the use of blended learning have been administered. A study conducted by Sari, F. M., & Wahyudin, A. Y. [4] found that blended learning using Instagram in English for business class results positive perception on the students in term of motivation, learning engagement, and attitudes. In addiiton, blended learning using Vlog successfully improve students' speaking ability (Mandasari, B & Aminatun, D) [5]. On the other hand, Powtoon helps students improve their international culture understanding (Oktaviani, L., Man-

dasari, B., &Maharani, R. A.) [6]. Lastly, blended learning using Memrise enhances students' vocabulary mastery as well as promote independent elarning (Aminatun, D., & Oktaviani, L) [7]. In short, blended learning brings success for students inside and outside classroom.

As we know that blended learning contributes for successful English learning, the researchers try to implement it as a solution to solve problem in learning grammar by using other technological tools. One of the technologies officially launched by the government is the Moodle Learning Management System or better known as the Online Learning System (SPADA). This online learning platform has been used by most universities in Indonesia, one of which is the Indonesian technocrat university where researchers conduct research. The learning model that can be used is the flipped classroom learning model.

Flipped classroom learning model is a learning model that supports pedagogical process involving technology. It is part of blended learning. This learning model provides two modes of learning; face-to-face (inside classroom activities) and online learning (outside classroom activities). It enables lecturers to provide video lectures that can be put in the online platform. The students play role as the main actor who are responsible in both inside and outside classroom activities. In inside classroom activities, the students have to learn independently by watching the video lectures, read the book, and browse other supporting references as an effort to understand the materials given. These materials are provided on the online learning platform. What they have found is better noted on their notebook. In outside classroom activities, the students discuss what they have learnt from the video lectures and other sources. In this case, lecturers play as a facilitator that creates an interactive learning activity in the form of pair works, group discussion and practices for students. In other words, it can be said that flipped classroom replaces what face-to-face activities done (Alsowat, H) [8]. Moreover, flipped classroom is considered as individual learning where the teacher/lecturers implement instruction, project-based learning, inquiry-based study, and other method that characterize this learning model as student-center learning (Bergmann &Sams) [9]. The successful flipped classroom learning model is characterized by some points, they are collaboration, student-centered learning, optimized learning space, a great deal with time, support from administrator (Alsowat, H) [10]. In other words, access toward the materials on the online learning and offline learning platform is the key point to enhance flipped classroom learning Bergmann &Sams) [11].

The researchers have implemented flipped classroom in teaching intermediate grammar classstarted on September-December 2019. Considering the previous reseach on blended learning, the reserchers are interested in uncovering the fact of conducting flipped classroom in langugae learning and identify the students' perception. This is wahat makes this present study different from others. Thus, this paper describes the students' perception toward flipped classroom learning model in Grammar class.

METHOD

The design of this research is a descriptive qualitative. This research involves 48 students as the participants majoring English Education study program of Universitas Teknokrat Indonesia. The students were selected as the participants in this research with some reasons. First, the students enrolled Intermediate Grammar class in which one of the researchers was the one who responsible for the lecture. She is in charge for Intermediate Grammar class. Second, the students have encountered Moodle Learning Management System (SPADA) as a mean to learn English Grammar. So, it eases the researchers to conduct the research. In addition, the university provide facilities that support the teaching and learning by using technology.

The instrument of this study is questionnaire. The questionnaire was used to dig information about the students' perception after using SPADA in learning intermediate grammar. The questionnaires were developed by using Likert Scale consisting 20 statements in the level of Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD). The results of the questionnaires were analyzed by finding the percentage on students' response in each statement. When the percentage of strongly agree and agree statement is more than 50%, it can be said that students have positive perception and attitude toward the learning model, and vise versa.

RESULT

The result of questionnaires about the students' perception toward flipped classroom learning model varies. It can be presented on the following table.

Table 1. The result of questionnaires about the students' perception toward flipped classroom learning model varies

No	Questionnaire	SA	A	N	D	SD
1	Flipped classroom learning model uses video lectures to replace face-to-face learning	45%	27%	17%	11%	-
2	The material is organized in a flexible way	67%	24%	-	9%	-
3	Flipped classroom enables me to discuss the materials with my friends and lecturers	44%	39%	-	12%	5%
4	Flipped classroom learning model enables me to share my knowledge	37%	43%	15%	5%	-
5	Flipped classroom enables me to gain access to other users'knowledge	56%	32%	8%	4%	-
6	The use of SPADA enables the discussions withother students	16%	65%	17%	2%	-
7	The system in SPADA is secured	27%	57%	14%	2%	-
8	I can easily comprehend the materials presented on the video	12%	57%	16%	15%	-
9	I seldom encounter problem during the online learning	65%	24%	8%	3%	-
10	Flipped classroom makes learning easier	69%	29%	-	2%	-
11	The quality of my task improved	56%	24%	10%	10%	-
12	Use of the flipped classroom learning model enhanced the effectiveness of my tasks	29%	54%	16%	1%	-
13	The use of SPADA enabled me to complete task quickly	56%	24%	15%	5%	-
14	I am satisfy with the learning model	26%	54%	14%	6%	-
15	Flipped classroom is recommended to implement	32%	49%	15%	4%	-
16	Flipped classroom provides successful for my study in grammar class	16%	61%	17%	6%	-
17	Flipped classroom enables me with up-to-date information	17%	53%	19%	11%	-
18	My academic achievement improved	43%	41%	16%	-	-
19	My learning performance improved	37%	38%	17%	8%	-
20	Flipped classroom learning model supports independent learning	27%	65%	8%	-	-

DISCUSSION

Based on the result of the questionnaire, there were various responses from the students. Each statement has difference percentage. From the table above, it can be seen that the students showing positive responded toward flipped classroom learning model. For the first statements there were 45% of students who strongly agreed and there were 27% of students who agreed that flipped classroom model it can be used in order to replace face-to-face learningusing video lectures. Video lectures, is one of the effective tool to support the learning process in flipped classroom which brings an innovative perspective (Basal) [13]. For the second statements, there were more than 90% of students give positive responded (67% strongly agree and 24% agree) that the material is organized in a flexible way. Teachers can deliver their material trough creating videos of teaching, recording and narrating screencast the material using their computers (Hamdan et al.) [14]. So, from this classroom model offers the students a great deal of flexibility in terms of when they study, how the study and how quickly they master and cover the material.

Furthermore, there were 44% of students who strongly agreed and 39% of students who agreed that flipped classroom enables students to discuss the materials with friends and lecturers. In the flipped classroom model, the roles of the teacher are guide, facilitator and organizing of the students (Basal) [15]. So, from this model encourage the students to be an active learner and make students easier to discuss the materials with friends and lecturer. Next, there were 37% of students who strongly agreed and 43% of students who agreed that flipped classroom learning model enables students to share their knowledge with other students. In flipped classroom model, students can share their knowledge or opinion trough discussion section in SPADA, and also students can use of online chat and newsgroup as method that allow students to interact and learn from others (Berger and Topol) [16]. For the next statements, there were more than 80% of students agreed that flipped classroom enables students to gain access to other users'knowledge it was 56% of students who strongly agreed and 32% of students who agreed. According to Zhang, Leon, Lina Zhou and Nunamaker [17], state that networking technologies are providing a diverse means to support learning in a more personalized, flexible, portable, and on-demand manner. In flipped classroom model, especially learning trough SPADA it enables the discussions withother

students. It means, this model not only makes for easier discussion with the lecturer, but also makes for easier discussion with other students, it showed that 16% of students strongly agreed and 65% students who agreed with that statement, it occurs because students as social learners usually prefer to learn in groups and interact with their peers (Weaver) [18].

Furthermore, there were more than 70% of students who trust the security system on LMS especially on SPADA. It means that SPADA can be a reliable online learning tool for students in learning process. Related to flipped classroom model, there were 12% of students who strongly agreed and 57% of students who agreed that students can easily comprehend the materials presented on the video, because to keep up with the changing times, the content and format of an online course is easily updated (Patricia C. and Keith) [19]. Next statements, there were 65% of students who strongly agreed and 24% of students who agreed that students seldom encounter problem during the online learning.

Furthermore, for the next statements there were 69% of students who strongly agreed and 29% of students who agreed that flipped classroom makes learning easier. It can be seen from the questionnaire, more than 90% of students agreed. In terms of accessibility, the students can access the video of online learning at any time whether they are at home or on the road. The students can access the internet or online learning trough the laptop and hand phone, and some fortunate people or students can access it without network connection (Kruse) [20]. Next, there were 56% of students who strongly agreed and 24% of students who agreed that

flipped classroom model can improve the quality of the student's task especially using SPADA, because lecturer gives clear explanation of the material and the task. So, the students can improve their quality of the task. There were 29% of students who strongly agreed and 54% of students who agreed that use of the flipped classroom learning model enhanced the effectiveness of student tasks it can be seen from the questionnaire that only 16% of students choose neutral. There were 56% of student who strongly agreed and 24% of students who agreed that the use of SPADA enabled students to complete task quickly, it is because in SPADA there is direct task with the limitation of the time. So, it can make students quickly to complete the task. Furthermore, 26% of the students who strongly agreed and 54% of students who agreed that using this learning model give students sense of satisfaction, it means that more than 70% of students are likely to use this learning model, because the student more control over their learning experience (Brown) [21]. Next statements, more than 80% of students agreed that flipped classroom is recommended to implement it is because this learning model is the good way in teaching and learning process beside traditional way. This flipped learning model may eliminate the ineffectiveness of face to face lessons and also support the lecturers and learners to use technology (Enfield) [22].

There were 16% of students who strongly agreed and 61% of students who agreed that flipped classroom model provides successful for the study in grammar class, it means that more than 70% of students are successful in learning the material especially in grammar class. It showed, 17% of students strongly agreed and 53% of students who agreed that flipped classroom enables students with up-to-date information for the student studies, it means that more than 70% of students agreed that e-learning provides a up-to-date or new information. Next, there were 43% of students who strongly agreed and 41% of students who agreed that students academic achievement improved, it means that this learning model improves students grade for grammar class, it is indicated that the students really serious in studying. There were 37% of students who strongly agreed and 38% of students who agreed that students learning performance improved, It is indicated that only 25% of students choose neutral and disagree. For the lastly, there were 27% of students who strongly agreed and 65% of students who agreed that flipped classroom learning model supports independent learning. From this statement only 8% of students choose neutral.

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REFERENCES

[1] Mandasari, B., & Aminatun, D. (2019). Uncovering Studentsâ€™ Attitude toward Vlogging Activities in Improving Studentsâ€™ Speaking Ability. *Premise: Journal of English Education*, *8*(2), 214-225.

[2] Al-Badwawi, H. S. Q. (2011). *The perceptions and practices of first year students' academic writing at the Colleges of Applied Sciences in Oman*. University of Leeds.

[3] Wang, F. (2010). The Necessity of Grammar Teaching. *English Language Teaching*, *3*(2), 78-81.

[4] Sari, F. M., & Wahyudin, A. Y. (2019). Undergraduate Students' Perceptions Toward Blended Learning through Instagram in English for Business Class. *International Journal of Language Education*, *3*(1), 64-73.

[5] Mandasari, B., & Aminatun, D. (2020, February). VLOG: A TOOL TO IMPROVE STUDENTS‟ ENGLISH SPEAKING ABILITY AT UNIVERSITY LEVEL. In *PROCEEDINGS* (Vol. 1, No. 1).

[6] Oktaviani, L., Mandasari, B., & Maharani, R. A. (2020). IMPLEMENTING POWTOON TO IMPROVE STUDENTS'INTERNATIONAL CULTURE UNDERSTANDING IN ENGLISH CLASS. *Journal of Research on Language Education*, *1*(1).

[7] Aminatun, D., & Oktaviani, L. (2019). Memrise: Promoting Students' Autonomous Learning Skill through Language Learning Application. *Metathesis: Journal of English Language, Literature, and Teaching*, *3*(2), 214-223.

[8] Alsowat, H. (2016). An EFL flipped classroom teaching model: Effects on English language higher-order thinking skills, student engagement and satisfaction. *Journal of Education and Practice*, *7*(9), 108-121.

[9] Bergman, J., &Sams, A. (2014). Flipped learning. *Flipped Learning Netwoks*.

[10] Alsowat, H. (2016). An EFL flipped classroom teaching model: Effects on English language higher-order thinking skills, student engagement and satisfaction. *Journal of Education and Practice*, *7*(9), 108-121.

[11] Bergman, J., &Sams, A. (2014). Flipped learning. *Flipped Learning Netwoks*.

[12] Borstorff, Patricia C. & Keith L. (2007).Students Perception and Opinions Toward E-Learning in The Collage Environment.*Academy of educational leadership journal.Vol 11, no 2.*

[13] Basal, A. (2015). The Implementation of aFlipped Classroom in Foreign Language-Teaching. *Turkish Education Online Journal of Distance -TOJDE, 16(4), 28-37.*

[14] Hamdan, N., McKnight, P., McKnight, K., Arfstrom, K. M.(2013). The flipped learningmodel: A white paper based on the literature review titled A review of flipped learning.*Flipped Learning Network.*

[15] Basal, A. (2015). The Implementation of aFlipped Classroom in Foreign Language-Teaching. *Turkish Education Online Journal of Distance -TOJDE, 16(4), 28-37.*

[16] Berger, K.A. &Topol, M.T. (2001).Technology to Enhance Learning: use of a web siteplatform in traditional classes and distance learning. *Marketing education review, 11(3), 15-26.*

[17] Zhang, D., Leon Z., Lina, Z., &Nunamaker Jr. (2004).Can E-Learning Replace ClassroomLearning?.*Communication of the acm.*

[18] Weaver, P. (2002). Preventing E-Learning Failure.*Training& development, 56(8), 45-51.*

[19] Borstorff, Patricia C. & Keith L. (2007).Students Perception and Opinions Toward E-Learning In The Collage Environment.*Academy of educational leadership journal.Vol11, no 2.*

[20] Kruse, K. (2006). Measuring e-learning's benefits.*Learning guru.*

[21] Brown, K.G.(2001). Using Computers to Deliver Training: Which Employees LearnandWhy?.*Personnel psychology, 54(2), 271-296.*

[22] Enfield, J. (2013). Looking at The Impact of The Flipped Classroom Model of Instruction onUndergraduate Multimedia Students at CSUN. *Techtrends, 57(6), 14-27.*

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WHAT STUDENT NEEDS IN ONLINE LEARNING AT HIGHER EDUCATION

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Abstract

The use of information and technology is inevitable in the world of higher education. Moreover, it is supported by the spread of the coronavirus, which forces educators and students to prepare and carry out online learning in Indonesia. The purpose of writing this article is to detect schedules, methods, and learning media that can increase student activeness in online learning, so that online learning can be carried out optimally. The data obtained from the first stage of the design development method, namely preliminary research. From these results, it is found that, the platform used in online learning is 98.2% using LMS and 96.4% using Whatsapp, the desired implementation time is scheduled within the appropriate credit limit, the learning method used was the guided discussion learning method, and the media used is a learning video equipped with a reference book.

Keywords: online learning, higher education, learning management system, guided discussion, distance education

INTRODUCTION

Prior to the spread of the Covid-19 virus, learning activities at universities in Indonesia were generally conducted face-to-face. Indeed, there have been several universities trying to use technology and the internet as an alternative medium of learning to enter the era of the 4.0 revolution. However, face-to-face learning is still favored by everyone. This is not without reason, face-to-face learning activities can be monitored in real terms and any misconception by learners can be detected quickly, so that even the delivery of feedback on concepts, especially mathematics materials, becomes even more precise and faster [1],[2],[3]. However, it was eventually forced to switch to virtual learning. Immediately, everyone is turning to online learning. The lesson plan that was made beforehand is no longer suitable for the situation. Learning strategies, methods, and media that have been planned for face-to-face learning, obviously, will not be applicable to virtual learning as a whole [1]. As a result, online learning is only a forced cosmetic change of face-to-face learning to virtual learning, in order to meet the course objectives [4].

The sudden changes in learning approach, from diect teaching to online learning, forces educators and learners to quickly adapt to the wonder of technology [4]. Online education does face several challenges in student satisfaction including issues such as quality of teaching, a clearly defined /well-written syllabus, faculty meetings with student needs, education that should be equal in value of tuition paid, and clear program requirements [5]. Advances in technology have made it even more complicated for novice users to reach and participate in online classes. Currently, online learning activities are not limited to modules and discussion forums. Long distance education now includes a wide range of programs such as multimedia technology, streaming video, graphics, voice communication, applets, and other advanced technologies that may have to be installed and configured to meet course objectives [4].

To support these online learning activities, it is necessary to analyze the needs of online learning activities for students. This is to design an online learning that can answer students' needs for learning success virtually. Students who take online learning are entitled and deserve a high-quality learning experience [6]. The intended needs analysis is limited to three important points, namely: 1) Platforms or applications that students are proficient in using; 2) Learning strategies that make students learn optimally; 3) supporting learning media so that online learning runs optimally.

METHOD

Research Subjects

The identification of online learning needs was carried out in two classes in the elementary school mathematics learning course at Padang State University, majoring in primary school teacher education. The subjects of this study had previously carried out online learning. So that they can assess their needs for future online learning. The number of respondents in assessing needs was 55 students. The results of the identification of these needs will be applied again to them. So in this study, respondents and research subjects were the same.

Data Collection Techniques

Questionnaire

The data was collected by distributing questionnaires to two classes in mathematics for elementary school courses. The questionnaire given aimed to: 1) evaluate ongoing online learning; and 2) to identify student needs for online learning for subsequent meetings in mathematics for elementary school courses.

Literature Study

Literature study is a data collection method that is directed at finding data and information through documents, written documents, photographs, images, and electronic documents that can support the writing process. Data in literature studies are secondary data. Secondary data is a source of research data obtained by researchers indirectly through intermediary media, namely obtained and recorded by other parties. This literature study is carried out by reading and studying books, journals, and newspapers related to the research topic.

Data Analysis Techniques

The data was analysed by using percentage analysis. This technique was used to see how much the frequency of respondents' answers and phenomena in the field tends to be. This step was also carried out to see the size of the proportion of each answer to each question so that the data that is processed is easy to analyze.

RESULTS

The survey that was conducted identified five things, namely: 1) The platform used; 2) Class schedule; 3) Learning Methods; 4) Learning Media; and 5) Availability of feedback. Padang State University (UNP) has developed their own e-learning platform via a learning management system (LMS), namely MOODLE From the survey results it was found that 98.2% of online lectures used the UNP e-learning portal and were equipped with the WhatsApp application as a medium for communication. In addition, the zoom application was also used by most of the online lectures, even though an LMS was already available as seen in Figure 1.

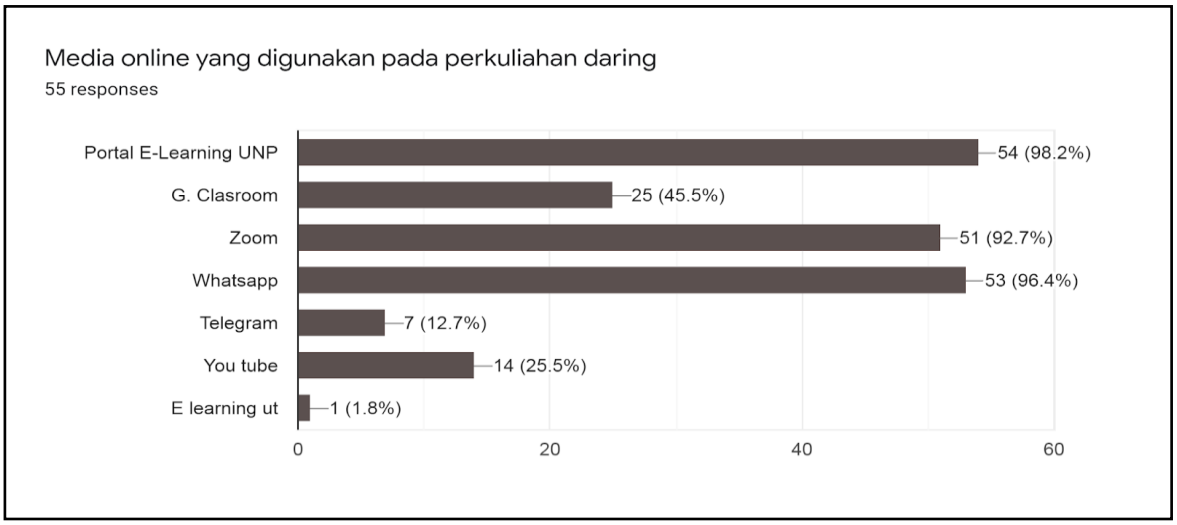

Figure 1. Online Platforms Used in Online Lectures

Respondents in this survey were students who studied in semester 2, so their credits in this semester were quite a lot, namely between 20 and 21 credits. Because of this, 81.8% of respondents prefer online learning activities to be carried out on a scheduled basis. This, based on the results of the evaluation of online learning that had taken place, showed that more than half of the courses did not follow the schedules that have been decided.

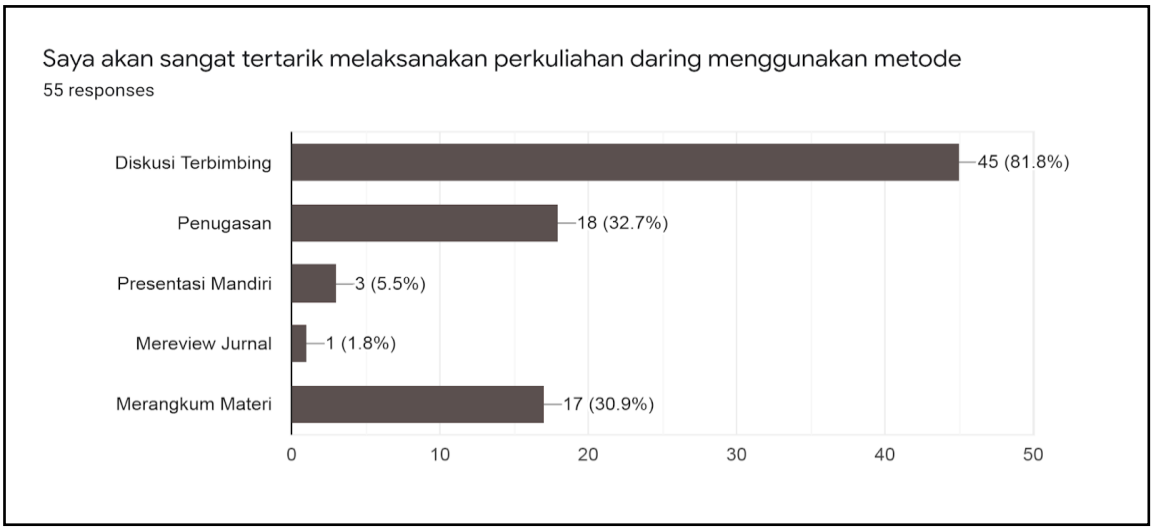

Figure 2. Result of Choosing a Learning Methods for Online Lectures

There were several methods used by lecturers in online learning, including online presentations, independent assignments, and discussions. The results, however, showed that students prefer guided discussion methods for their online classroom, which is as much as 81.8%, as in Figure 2. To complete this method, students picked learning videos, reference books, and power points as online learning media. As seen in Figure 3. As a complement to these learning methods and media, 98.2% of students wanted feedback for every online learning activity they do, see Figure 4.

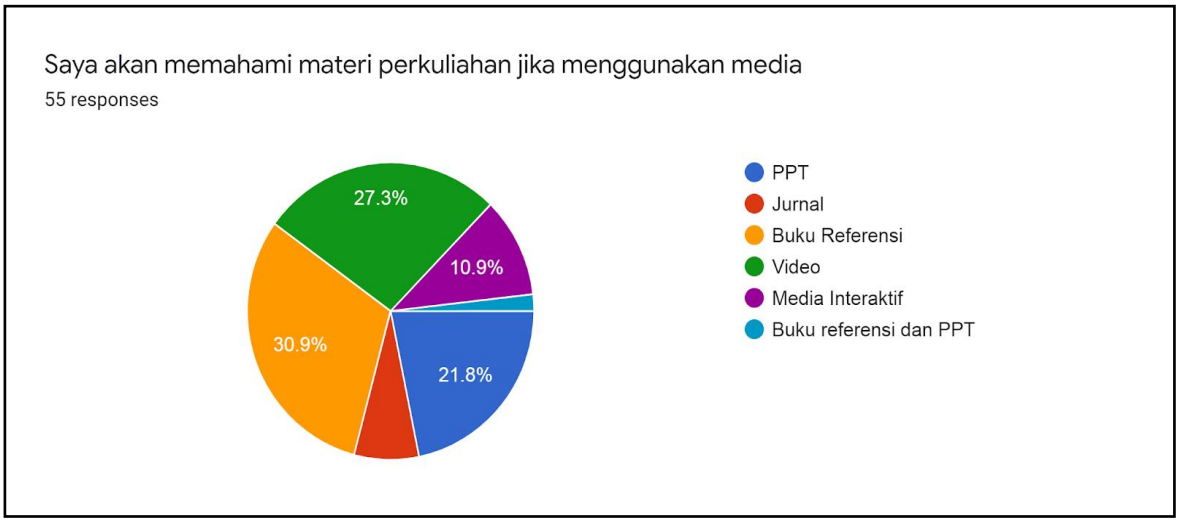

Figure 3. Result of Selection of Learning Media for Online Learning

DISCUSSION

The main task of the lecturer is to teach students, namely to condition them to learn actively, so that their potential (cognitive, affective, and conative) can develop optimally. From the research results of [7], found that teaching and learning in higher education is a joint process, with responsibility on students, and teachers contributing to their success. In this joint process, higher education must involve students in questioning their ideas before the main issues are discussed and their opinions about how the real world works, so that they can reach a higher level of understanding.

Guided discussion strategy is one of the strategies that can relate learning to classroom situations, where each student is a unique individual, who is endowed with the intellectual ability to think and act both as an individual and as a group member [8]. Students have the ability to meaningfully conform to each other and to their world. Their togetherness to solve social problems as a group

can give them stimulation to actively contribute to learning.

The best teaching helps students to question their preconceptions, and motivates them to learn by placing them in situations where existing models don't work and where they see themselves as the authors of answers, and serve as agents of responsibility for change [7]. That means, students need to be exposed to problems that they consider important. Also, they believe that most developed countries are trying to use new teaching methods, such as active student-centered methods.

Figure 4. Results of Selection of Online Lecture Activity Feedback

The literature shows that student participation in online discussions can be enhanced by mixing audio or video discussions with online text discussions [9]–[12]. The audio or video component improves communication and relationships with peers, encourages students to participate in discussions, and supports students to elaborate on their responses, because it facilitates communication that takes less time compared to texts discussion [9]–[10],[13].

Teachers must have a positive attitude towards technology and a good understanding of how to use technology, so that online learning becomes a positive learning experience for students [6]. In addition, the teachers must be able to answer basic questions about how to navigate the LMS and use the necessary technologies [6]. A good course design that includes tutorials on LMS and other necessary technologies will be of great help with technology issues.

Content can be developed based on strategies such as integrating multimedia to enhance the learning experience using constructivist theory principles [14]. Some examples of multimedia include games, videos, and simulations. It is important to note that simply incorporating multimedia into online course designs is not always the appropriate answer. Teachers need to ask themselves what technologies will add to the learning activity. Multimedia, if used in the wrong way, may implicate the learning process [15].

As a teacher who develops the most extraordinary online learning, it is not enough with qualified methods and media, but also provides useful feedback to students so that learning activities are truly executed [6]. When providing feedback, time management is important for teachers. Providing timely feedback to each student and group is essential in an online environment. The LMS will have a built-in feature to provide feedback such as exams, quizzes, or fields. This type of assessment is automatic and simple [6]. Complex assignments that require writing will take longer to assess and provide vital and time-consuming feedback. Providing immediate feedback on downloaded papers or into an LMS text box is a suitable method of providing direction to students. Videos can be made to provide feedback to students for any type of work, but they are a good idea when assessing group work.

The main purpose of feedback is to enable students to know if they are making sufficient progress towards achieving learning objectives [6]. It is very important in online learning to provide students with a varied and frequent type of formative assessment. Otherwise, students may not be able to correct problems encountered in the assignment prior to summative assessment.

Giving feedback to students occurs in a variety of ways including more authentic types of assessment such as problem-based learning which allows input to be given to dispositions, knowledge, and skills related to critical thinking, problem solving, and group work [6]. Another type of authentic assessment that is effective in online learning is collaborative learning which allows groups of stu-

dents to work together for shared learning outcomes.

Portfolios and self-assessments are useful in an online environment [6]. A portfolio can be used during the entire course of study or during an internship as the cornerstone of the degree program [6].. Portfolios allow students the opportunity to incorporate technology and add depth to assessment that would not be possible on paper. With online learning having a large focus on student-centered learning, there must be a heavy focus on self-reflection for students [6]. In an authentic learning experience, it is important for students to know where they are in the learning process. Self-reflection helps students focus on online learning outcomes.

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REFERENCES

[1] McAvinia, C. (2016). Online learning and its users: lessons for higher education. Kidlington, UK: Chandos Publishing/Elsevier.

[2] Kebritchi M, Lipschuetz A, Santiague L. Issues and challenges for teaching successful online courses in higher education: A literature review. Journal of Educational Technology Systems. 2017 Sep;46(1):4-29.

[3] Vallade JI, Kaufmann R. Investigating instructor misbehaviors in the online classroom. Communication Education. 2018 Jul 3;67(3):363-81.

[4] Dumford, A.D., Miller, A.L. Online learning in higher education: exploring advantages and disadvantages for engagement. J Comput High Educ 30, 452–465 (2018).

[5] Ruffalo Noel Levitz (2017). 2017 National student satisfaction and priorities report. Cedar Rapids, Iowa: Ruffalo Noel Levitz. Retrieved from RuffaloNL.com/Benchmark

[6] Dalton MH. Online Programs in Higher Education: Strategies for Developing Quality Courses. FOCUS on Colleges, Universities & Schools. 2018 Jan 1;12(1).

[7] Shirani Bidabadi N, Nasr Isfahani A, Rouhollahi A, Khalili R. Effective Teaching Methods in Higher Education: Requirements and Barriers. J Adv Med Educ Prof. 2016 Oct;4(4):170-178. PMID: 27795967; PMCID: PMC5065908.

[8] Olukayode OJ. Inquiry Method, Teacher Guided Discussion Method and Studentâ€™ s Attitude and Performance In Social Studies. Global Journal of Management and Business Research. 2012 Sep 4;12(15).

[9] An, Y.-J., & Frick, T. (2006). Student perceptions of asynchronous computer-mediated communication in face-to-face courses. Journal of Computer-Mediated Communication, 11, 485–499.

[10] Ching, Y., & Hsu, Y. (2015). Online graduate students' preferences of discussion modality: Does gender matter? Journal of Online Learning and Teaching, 11(1). Retrieved from http://ezp.waldenulibrary.org/login?url⁄4http://search.proquest.com/docview/1700641543?accountid⁄414872

[11] Ice, P., Curtis, R., Phillips, P., & Wells, J. (2007). Using asynchronous audio feedback to enhance teaching presence and students' sense of community. Journal of Asynchronous Learning Networks, 11(2). Retrieved from http://olc.onlinelearningconsortium.org/jaln/v11n2/using-asynchronous-audio-feedbackenhance-teaching-presence-and-students'-sense-community

[12] Olesova, L. A., Richardson, J. C., Weasenforth, D., & Meloni, C. (2011). Using asyn-chronous instructional audio feedback in online environments: A mixed methods study. Journal of Online Learning and Teaching, 7(1). Retrieved from http://jolt.merlot.org/vol7no1/olesova_0311.htm

[13] Hara, N., & Hew, K. F. (2007). Knowledge-sharing in an online community of health-care professionals. Information Technology & People, 20, 235–261.

[14] Almala, A. H. (2005). A constructivist conceptual framework for a quality e-learning environment. Distance Learning, 2, 9–12.

[15] Yue, C. L., Bjork, E. L., & Bjork, R. A. (2013). Reducing verbal redundancy in multi-media learning: An undesired desirable difficulty? Journal of Educational Psychology,105, 266–277.

THE TREND OF STEM PROJECT BASED LEARNING PUBLICATION: A BIBLIOMETRIC STUDY

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Abstract

This study analyzes trends in Science, Technology, Engineering, and Mathematics-Project Based Learning (STEM-PjBL) literature with a bibliometric study. This study was conducted using the Publish or Perish search software in the Scopus database. After the search results were obtained and sorted, the literature search results were aggregated, and the titles and abstracts analyzed using Microsoft Excel and VOSviewer. In this study, 22 articles were analyzed. The results of the analysis show that STEM-PjBL is starting to attract the attention of researchers, even though the numbers are still relatively small. Asian countries contributed the most to the STEM-PjBL literature on the databases investigated. Other results indicate that there is a potential to relate STEM-PjBL performance to 21st century skills other than creative thinking. In addition, this research also suggests the study of the relationship between the engineering design process, creative thinking, and metacognitive in STEM-PjBL learning, which has rarely been encountered so far.

Keywords: bibliometric, scientometric, STEM, project, STEM-PjBL

INTRODUCTION

Research related to STEM in the last decade got a lot of attention in a science education study. STEM believed can borderline pipeline students carrier since the beginning, STEM integrated with science activity based inquiry cab lead a larger participation STEM-related career in future(Knezek, 2019). The purpose of STEM education is for growing 21st-century skills (Shelley & Kiray, 2018). STEM can improve students' mastery of concepts, higher-order thinking skills, and project design activities (Fan & Yu, 2017). In the United Arab Emirates, STEM learning emphasizes education because science, technology, engineering, and mathematics reflect the economic development (Eltanahy, Forawi, & Mansour, 2020). The application of STEM in education impacts student learning, which can be seen as driving the country's progress in science, engineering, innovation, economics, and international competitiveness (Kuo, Tseng, & Yang, 2019).

Several review studies have been conducted to review STEM literature. Margot conducted a literature review on teacher perceptions of STEM integration(Margot, 2019), Schreffler synthesized empirical literature using universal designs for learning in STEM (Schreffler, Vasquez III, Chini, & James, 2019), Simpson and Bouhafa synthesized empirical identity studies in STEM (Simpson & Bouhafa, 2020), Lee identified trends in integrative approaches in technology education in South Korea (H. Lee, Ham, & Kwon, 2020), systematically analyzed articles related to STEM learning to see a picture of its development (Li, Wang, Xiao, & Froyd, 2020a).

During its development, STEM education develops and synergizes with learning that has long existed. STEM is combined with project-based learning (Chen, 2019; Han, Capraro, & Capraro, 2016a; Y. Lee, Capraro, & Bicer, 2019; S. J. Lou, Liu, Shih, & Tseng, 2011; Tseng, Chang, Lou, & Chen, 2013), STEM with inquiry(Birney & Cronin, 2019; Callaghan, 2020; Ibrahim, 2017; Psycharis, 2016; Schmidt, 2016), and STEM with problem-based learning (Estes, Liu, Zha, & Reedy, 2014; S.-J. Lou, Shih, Ray Diez, & Tseng, 2011; Newhouse, 2017).

Toma and Greca used inquiry-based STEM learning in integrated school students to see the effect of student attitudes towards science. The results of his research strengthen the excellence of inquiry-integrated STEM learning. In general, the learning carried out improves students' attitudes towards science and helps them develop science learning content(Toma & Greca, 2018).

The combination of STEM and Project Based Learning provides students with a contextual and authentic experience that strengthens students' concepts of science, technology, engineering, and mathematics. (Capraro, 2013). Projects in PjBL are usually complex and consist of seven components: identifying objectives and constraints, conducting research, finding ideas, analyzing ideas, building models, testing and improving, and communicating and reflecting (Han, Rosli, Capraro, & Capraro, 2016). The complex process provides teachers with opportunities and opportunities to incorporate STEM components into learning (Wan, So, & Zhan, 2020). PjBL learning usually requires a long duration and is carried out collaboratively so that students can work together with sufficient time to

solve challenges when integrating STEM components (Education Bureau, 2016). These variations provide an alternative for the teacher in choosing learning according to the topic or material being applied.

One of the variations of STEM learning, STEM-PjBL, has been explored by several researchers. Wilson researched by applying STEM-PjBL to secondary schools in Australia located in diverse and socially disadvantaged communities and found that schools were capable and dedicated to promoting sustainable STEM-PjBL programs (Wilson, 2020). Elsewhere, Morrison explored how teachers engage and support students in STEM-PjBL to identify five key elements that define student learning experiences in a project-based environment (Morrison et al., 2020).

Although it has been carried out in various contexts, investigations carried out to identify trends and possible fields of study in the PjBL STEM field are still rare. This study aims to describe the STEM-PjBL research trend in the credible literature. In addition, this study is to present opportunities for the PjBL STEM research field that can be carried out in the future

METHOD

By using a bibliometric study, we explored some peer-reviewed articles indexed by Scopus. Bibliometric studies are commonly used to investigate and to characterize some scientific literature in a particular field (Andrés, 2009). This study followed five steps of the bibliometric study, as shown in Figure 1.

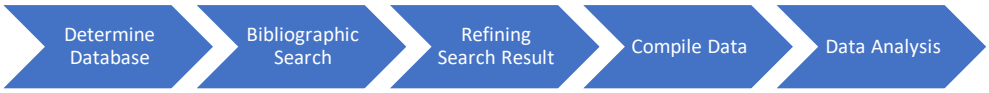

Figure 1. the step of a bibliometric study

The first step was conducted by determining the database. Scopus was used as a database in this study. The Scopus database is one of the peer-reviewed article databases with many journals covered (Neuhaus & Daniel, 2008). Therefore, this database will provide a lot of 'credible' articles. The second step is a bibliographic search. Publish or Perish (PoP) Program (https://harzing.com/) was used to search for some literature related to the topic investigated. According to Setyaningsih and Indarti (Setyaningsih & Indarti, 2018), Publish or Perish software can query some databases in a bibliometric study. In October 2020, we conducted a searching article with the title word "STEM-PjBL" OR "STEM PjBL" OR "STEM Project Based Learning" OR "science, technology, engineering, and mathematics project based learning." We used Boolean logic to improve the quality of the search. Boolean logic is used for systematic literature searches that cannot be carried out in the usual way (Gusenbauer & Haddaway, 2020). In this case, there are several ways of writing STEM-PjBL, which we try to accommodate the search with the operator 'OR.' After collecting the initial database, we refined the initial search result through some criteria. We exclude the duplicate article and chapter or book chapter. The next step is compiling the data; we compile the data by using Zotero software. We checked and added incomplete metadata then extracted it to RIS format by using this software. The last step is analyzing the data. We used Microsoft Excel to analyze the data. We counted and visualized the type of literature published using Microsoft Excel. After that, country contributions were counted based on author affiliations are also counted. The formula used is the formula introduced by Howard et al. (Howard, Cole, & Maxwell, 1987).

$$Score = \frac{\left(1.5^{n-i}\right)}{\sum_{i=1}^{n} 1.5^{n-i}}$$

While (n) is the number of authors in the article and (i) is the order of an author in the article. The results obtained are ranked and presented in tabular form.

To explore the topic of study in this field, we investigated the data network based on the co-occurrence network and co-occurrence of the author with the VOSviewer software (http://www.vosviewer.com/). The Vosviewer software is quite powerful in analyzing and visualizing bibliometric or scientometric analysis data (Hosseini et al., 2018; Karakus, Ersozlu, & Clark, 2019)

RESULTS AND DISCUSSION

The initial search results using the PoP program found 35 literature on the topic investigated from 2011 to 2021. The search result was refined by excluding chapters or book chapters (13 works of literature). Therefore, 22 articles were analyzed in this study. The general metric data present in Table 1.

Table 1. Comparison matrices

Matrices Data	Initial Search	Refinement Search
Publication years	2011-2021	2015-2021
Citation years	9(2011-2020)	5(2015-2020)
Papers	35	22
Citations	408	240
Cites/year	45.33	48.00
Cites/paper	11.66	10.91
h-index	10	7
g-index	20	15
hI,norm	10	7
hI,annual	1.11	1.40

From a database of 22 articles, we analyzed and visualized the data. According to the literature, there were two kinds of literature in this review, the original research article and the conference paper. The journal article is the most studied literature in this review. The percentage of literature based on the type of publication shown in Figure 2.

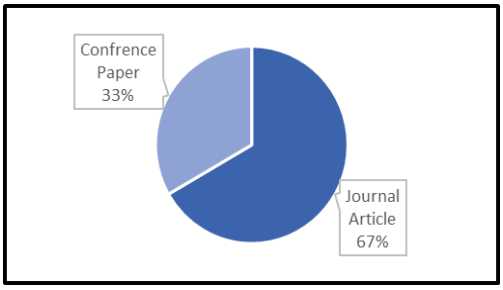

Figure 2. The distribution of database based on the type of literature

The publication trend in the STEM-PjBL topic could be seen by exploring the number of publications each year. The trend presents in Figure 3.

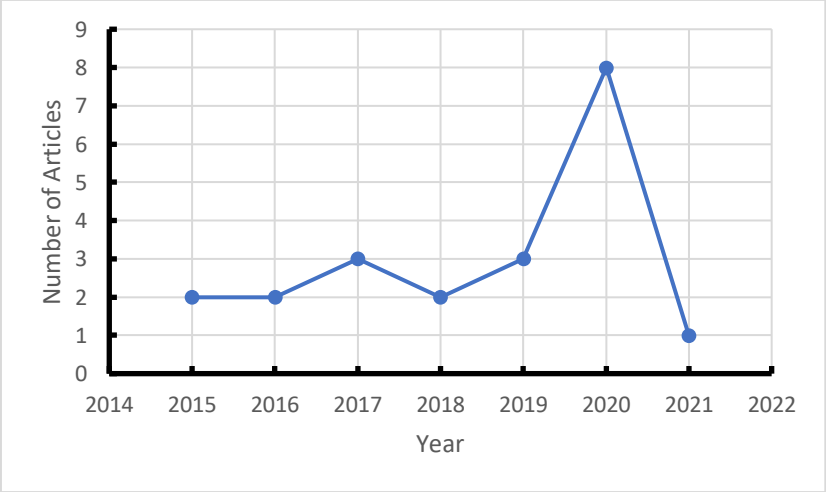

Figure 3. the number of STEM-PjBL publication from 2015 to 2021

Figure 3 indicates that the number of publications rose marginally from 2015 to 2019. However, from 2019 to 2020, the trend has risen significantly. Publications have already been published for the period released in 2021. These findings suggest that STEM-PjBL learning is

starting to attract interest among science education researchers. This can happen because STEM-PjBL is known to be able to boost student achievement (Han, Capraro, & Capraro, 2016b). The scope for further exploration is open to the STEM-PjBL study theme.

By using the equation from Howard et al. (Howard et al., 1987), the contribution of each country to the STEM-PjBL research study can be observed. The results of each country's contribution measurement are shown in Table 2.

Table 2. The country contribution to STEM-PjBL Research area

Country	Score
Indonesia	7,92
Taiwan	4
Republic of Korea	2,36
United State	1,94
Malaysia	0,96
Australia	1
South Africa	1
Spain	1
Turkey	0,41
Iran	0,4

Table 1 shows that Indonesia is the country that published the most STEM-PjBL study findings in the Scopus database. This showed that Indonesian researchers are concerned about STEM-PjBL. For the ASEAN region, Indonesian publications in the STEM field are generally ranked third under Malaysia and Thailand (Ha et al., 2020). The countries in second and third places are Taiwan and South Korea. Similar to Indonesia, both countries are located in the Asian zone. It is noteworthy that authors dominate publications in the Scopus database with affiliations from Asian countries. Li et al. (Li, Wang, Xiao, & Froyd, 2020b) carried out a systematic literature review and found that the United States and other western countries contributed the most to STEM studies and publications. This is very different from the results of this current study. The explanation for this condition is the probability that STEM-PjBL research will require research in learning, not conceptualization or policy.

To analyze the co-occurrence keywords of titles and abstracts, VOSviewer is used to analyze, explore, and visualize data. The results of the mapping are shown in Figure 4.

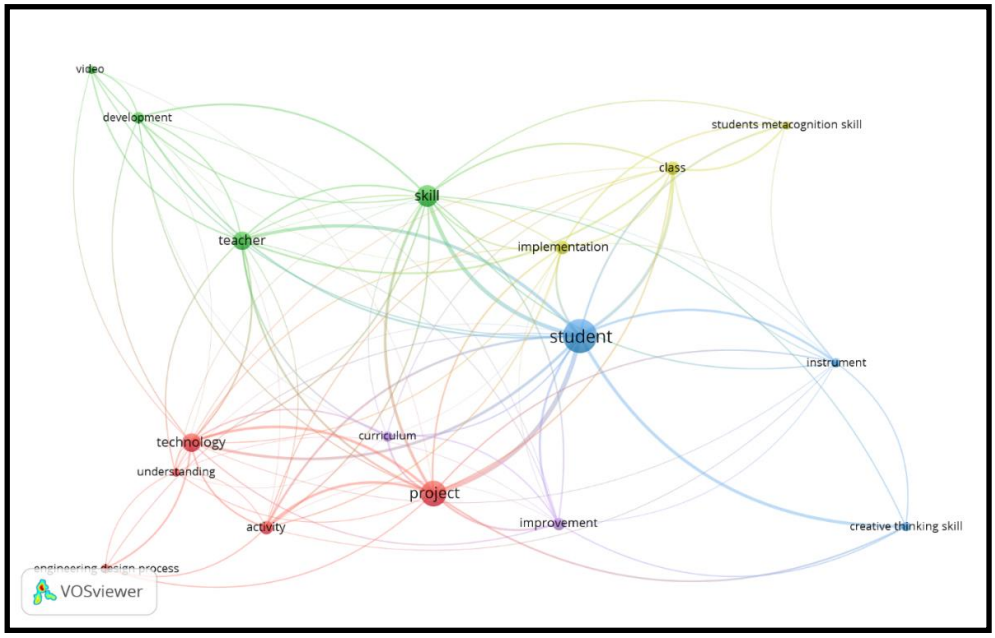

Figure 4. Title and abstract network visualization of STEM-PjBL literature

Figure 4 shows the ties between terms which often appear simultaneously in the literature being studied. The results of the quest indicate that there are five clusters. The first cluster in red consists of keyword operation (13), engineering design phase (6), project (45), technology (22), and comprehension (5). The second green cluster consists of four objects, namely creation (9), skills (31), instructor (23), and video (5). The blue color is the third cluster of creative thinking skills (6), methods (6), and students (75). The fourth yellow cluster consists of class (12), implementation (13), and student metacognition skills (5). The last cluster is purple, i.e., curriculum (7) and improvement (10). The value in the back indicates the co-occurrence value of the word. It is noteworthy that PjBL literature has been studied in combination with creative thinking skills, engineering design processes, and metacognitive skills. This is in line with several that STEM-PjBl

can be used to develop the creative thinking skills of students as one of the 21st-century skills (Land, 2013; Sumarni & Kadarwati, 2020); the findings of the exploration indicate that other 21st century skills, such as critical thinking, collaborative skills, or communication skills, have not been researched or researched in the STEM-PjBl area of study. This could be an incentive for more research in the implementation of STEM-PjBL. The STEM-PjBL is also associated with the engineering design process. Even though all three have been studied, the results of the VOSviewer exploration show that there is no connection between the engineering design process, metacognitive skills, and creative thinking. This will be an opportunity and a challenge to explore the relationship between these variables in STEM-PjBL learning.

As a preliminary study, this study at least has shown how the development of STEM-PjBL research. It is important for further research to expand the database, perhaps not only using one database but using several databases so that the results can provide a wider reach. However, this study actually shows how attention science education researchers pay to the development of STEM learning.

CONCLUSION

Based on the explanation that has been presented in the previous section, this study concludes that STEM-PjBL research is starting to get attention among research circles. The publication of STEM-PjBL topics in Scopus indexed journals and conferences has increased in recent years. However, the publication in this study is still dominated by authors with affiliations from Asian countries such as Indonesia, Taiwan, and Korea. The results of the co-occurrence keyword analysis show that several terms are often studied together with STEM-PjBL topics such as engineering design process, creative thinking skills, and metacognitive skills. 21st-century skill, previously known skills, such as critical thinking, communication skills, and collaborative skills, are still not found in this bibliometric analysis. This is an opportunity for further exploration in investigating and implementing STEM-PjBL learning in a nuance classroom context.

REFERENCES

[1] Andrés, A. (2009). *Measuring academic research: How to undertake a bibliometric study*. Oxford: Chandos Publishing.

[2] Birney, L., & Cronin, J. (2019). Environmental habitat restoration and inquiry-based learning with New York City public schools—An urban model in STEM education. *Journal of Environmental Studies and Sciences*, *9*(3), 322–326. https://doi.org/10.1007/s13412-018-0530-5

[3] Callaghan, N. I. (2020). *Discovery: Virtual Implementation of Inquiry-Based Remote Learning for Secondary STEM Students During the COVID-19 Pandemic*. 8.

[4] Capraro, R. M. (Ed.). (2013). *STEM project-based learning: An integrated science, technology, engineering, and mathematics (STEM) approach* (2. ed). Rotterdam [u.a]: Sense Publ.

[5] Chen, C.-S. (2019). *A Practical Action Research Study of the Impact of Maker-Centered STEM-PjBL on a Rural Middle School in Taiwan*. 24.

[6] Education Bureau. (2016). *Report on Promotion of STEM Education: Unleashing Potential in Innovation*. Education Bureau.

[7] Eltanahy, M., Forawi, S., & Mansour, N. (2020). Incorporating Entrepreneurial Practices into STEM Education: Development of Interdisciplinary E-STEM Model in High School in the United Arab Emirates. *Thinking Skills and Creativity*, *37*, 100697. https://doi.org/10.1016/j.tsc.2020.100697

[8] Estes, M. D., Liu, J., Zha, S., & Reedy, K. (2014). Designing for problem-based learning in a collaborative STEM lab: A case study. *TechTrends*, *58*(6), 90–98. https://doi.org/10.1007/s11528-014-0808-8

[9] Fan, S.-C., & Yu, K.-C. (2017). How an integrative STEM curriculum can benefit students in engineering design practices. *International Journal of Technology and Design Education*, *27*(1), 107–129. https://doi.org/10.1007/s10798-015-9328-x

[10] Gusenbauer, M., & Haddaway, N. R. (2020). Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources. *Research Synthesis Methods*, *11*(2), 181–217. https://doi.org/10.1002/jrsm.1378

[11] Ha, C. T., Thao, T. T. P., Trung, N. T., Huong, L. T. T., Dinh, N. V., & Trung, T. (2020). A Bibliometric Review of Research on STEM Education in ASEAN: Science Mapping the Literature in Scopus Database, 2000 to 2019. *Eurasia Journal of Mathematics, Science and Technology Education*, *16*(10), em1889. https://doi.org/10.29333/ejmste/8500

[12] Han, S., Capraro, R. M., & Capraro, M. M. (2016a). How science, technology, engineering, and mathematics project based learning affects high-need students in the U.S. *Learning and Individual Differences*, *51*, 157–166. https://doi.org/10.1016/j.lindif.2016.08.045

[13] Han, S., Capraro, R. M., & Capraro, M. M. (2016b). How science, technology, engineering, and mathematics project based learning affects high-need students in the U.S. *Learning and Individual Differences*, *51*, 157–166. https://doi.org/10.1016/j.lindif.2016.08.045

[14] Han, S., Rosli, R., Capraro, M. M., & Capraro, R. M. (2016). Journal of Turkish Science Education, 11(1),3-23. *Journal of Turkish Science Education.*, 28.

[15] Hosseini, M. R., Martek, I., Zavadskas, E. K., Aibinu, A. A., Arashpour, M., & Chileshe, N. (2018). Critical evaluation of off-site construction research: A Scientometric analysis. *Automation in Construction*, *87*, 235–247. https://doi.org/10.1016/j.autcon.2017.12.002

[16] Howard, G. S., Cole, D. A., & Maxwell, S. E. (1987). Research productivity in psychology based on publication in the journals of the American Psychological Association. *American Psychologist*, *42*(11), 975–986. https://doi.org/10.1037/0003-066X.42.11.975

[17] Ibrahim, A. (2017). *Teachers' Roles, Students' Personalities, Inquiry Learning Outcomes, and Practices of Science and Engineering:The Development and Validation of the McGill Attainment Value for Inquiry Engagement Survey in STEM Disciplines*. 21.

[18] Karakus, M., Ersozlu, A., & Clark, A. C. (2019). Augmented Reality Research in Education: A Bibliometric Study. *EURASIA Journal of Mathematics, Science and Technology Education*, *15*(10). https://doi.org/10.29333/ejmste/103904

[19] Knezek, G. (2019). *Project-based learning for middle school students monitoring standby power: Replication of impact on stem knowledge and dispositions*. 26.

[20] Kuo, H.-C., Tseng, Y.-C., & Yang, Y.-T. C. (2019). Promoting college student's learning motivation and creativity through a STEM interdisciplinary PBL human-computer interaction system design and development course. *Thinking Skills and Creativity*, *31*, 1–10. https://doi.org/10.1016/j.tsc.2018.09.001

[21] Land, M. H. (2013). Full STEAM Ahead: The Benefits of Integrating the Arts Into STEM. *Procedia Computer Science*, *20*, 547–552. https://doi.org/10.1016/j.procs.2013.09.317

[22] Lee, H., Ham, H., & Kwon, H. (2020). Research trends of integrative technology education in South Korea: A literature review of journal papers. *International Journal of Technology and Design Education*. https://doi.org/10.1007/s10798-020-09625-7

[23] Lee, Y., Capraro, R. M., & Bicer, A. (2019). Affective Mathematics Engagement: A Comparison of STEM PBL Versus Non-STEM PBL Instruction. *Canadian Journal of Science, Mathematics and Technology Education*, *19*(3), 270–289. https://doi.org/10.1007/s42330-019-00050-0

[24] Li, Y., Wang, K., Xiao, Y., & Froyd, J. E. (2020a). Research and trends in STEM education: A systematic review of journal publications. *International Journal of STEM Education*, *7*(1), 11, s40594-020-00207–6. https://doi.org/10.1186/s40594-020-00207-6

[25] Li, Y., Wang, K., Xiao, Y., & Froyd, J. E. (2020b). Research and trends in STEM education: A systematic review of journal publications. *International Journal of STEM Education*, *7*(1), 11, s40594-020-00207–6. https://doi.org/10.1186/s40594-020-00207-6

[26] Lou, S. J., Liu, Y. H., Shih, R. C., & Tseng, K. H. (2011). The senior high school students' learning behavioral model of STEM in PBL. *International Journal of Technology and Design Education*, *21*(2), 161–183. https://doi.org/10.1007/s10798-010-9112-x

[27] Lou, S.-J., Shih, R.-C., Ray Diez, C., & Tseng, K.-H. (2011). The impact of problem-based learning strategies on STEM knowledge integration and attitudes: An exploratory study among female Taiwanese senior high school students. *International Journal of Technology and Design Education*, *21*(2), 195–215. https://doi.org/10.1007/s10798-010-9114-8

[28] Margot, K. C. (2019). *Teachers' perception of STEM integration and education: A systematic literature review*. 16.

[29] Morrison, J., Frost, J., Gotch, C., McDuffie, A. R., Austin, B., & French, B. (2020). Teachers' Role in Students' Learning at a Project-Based STEM High School: Implications for Teacher Education. *International Journal of Science and Mathematics Education*. https://doi.org/10.1007/s10763-020-10108-3

[30] Neuhaus, C., & Daniel, H. (2008). Data sources for performing citation analysis: An overview. *Journal of Documentation*, *64*(2), 193–210. https://doi.org/10.1108/00220410810858010

[31] Newhouse, C. P. (2017). STEM the Boredom: Engage Students in the Australian Curriculum Using ICT with Problem-Based Learning and Assessment. *Journal of Science Education and Technology*, *26*(1), 44–57. https://doi.org/10.1007/s10956-016-9650-4

[32] Psycharis, S. (2016). The Impact of Computational Experiment and Formative Assessment in Inquiry-Based Teaching and Learning Approach in STEM Education. *J Sci Educ Technol*, 11.

[33] Schmidt, M. (2016). Transforming a Traditional Inquiry-Based Science Unit into a STEM Unit for Elementary Pre-service

Teachers: A View from the Trenches. *J Sci Educ Technol*, 14.
[34] Schreffler, J., Vasquez III, E., Chini, J., & James, W. (2019). Universal Design for Learning in postsecondary STEM education for students with disabilities: A systematic literature review. *International Journal of STEM Education*, *6*(1), 8. https://doi.org/10.1186/s40594-019-0161-8
[35] Setyaningsih, I., & Indarti, N. (2018). Bibliometric analysis of the term "green manufacturing." *International Journal of Management Concepts and Philosophy*, *11*(3), 315. https://doi.org/10.1504/IJMCP.2018.100142333
[36] Shelley, D. M., & Kiray, D. S. A. (2018). *RESEARCH HIGHLIGHTS IN STEM EDUCATION*. 209.
[37] Simpson, A., & Bouhafa, Y. (2020). Youths' and Adults' Identity in STEM: A Systematic Literature Review. *Journal for STEM Education Research*, *3*(2), 167–194. https://doi.org/10.1007/s41979-020-00034-y
[38] Sumarni, W., & Kadarwati, S. (2020). Ethno-Stem Project-Based Learning: Its Impact to Critical and Creative Thinking Skills. *Jurnal Pendidikan IPA Indonesia*, *9*(1), 11–21. https://doi.org/10.15294/jpii.v9i1.21754
[39] Toma, R. B., & Greca, I. M. (2018). The Effect of Integrative STEM Instruction on Elementary Students' Attitudes toward Science. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(4). https://doi.org/10.29333/ejmste/83676
[40] Tseng, K.-H., Chang, C.-C., Lou, S.-J., & Chen, W.-P. (2013). *Attitudes towards science, technology, engineering and mathematics (STEM) in a project-based learning (PjBL) environment*. 16.
[41] Wan, Z. H., So, W. M. W., & Zhan, Y. (2020). Developing and Validating a Scale of STEM Project-Based Learning Experience. *Research in Science Education*. https://doi.org/10.1007/s11165-020-09965-3
[42] Wilson, K. (2020). Exploring the Challenges and Enablers of Implementing a STEM Project-Based Learning Programme in a Diverse Junior Secondary Context. *International Journal of Science and Mathematics Education*. https://doi.org/10.1007/s10763-020-10103-8

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THE FEASIBILITY OF DEVELOPING INTERACTIVE MULTIMEDIA LEARNING WITH CONTEXTUAL APPROACH TO IMPROVE THE CONCEPTUAL UNDERSTANDING AND INTEREST IN LEARNING MATHEMATICS

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Abstract

This study aims to produce interactive learning multimedia with contextual approaches that are appropriate for fourth grade elementary school students in mathematics learning activities to improve understanding of concepts and interest in learning. The research method used is research and development which refers to the Borg and Gall development model. The subject of the trial was fourth-grade elementary school students in Kotagede district. Data collection uses interview guidelines, scales, and questionnaires. The data analysis technique used is descriptive analysis. The results showed that interactive learning multimedia with a contextual approach was declared appropriate to be used to improve the understanding of concepts and learning interests of fourth grade elementary school students in angular measurement material. Based on the results of the validation by the material and media experts stated that the product developed meets the eligibility criteria in the "feasible" category, and the questionnaire responses of students and teachers in the "very feasible" category.

Keywords: Interactive Learning Multimedia, Contextual Approach, Concept Understanding, Learning Interest.

INTRODUCTION

Mathematics is one of the sciences that is the basis of various scientific disciplines. In the field of education, mathematics is a compulsory subject that students must study from elementary to tertiary levels. The implementation of mathematics learning at the elementary school level is the initial foundation for being able to apply and develop further concepts at a higher level, so that it requires understanding and mastery of correct and strong mathematical concepts since elementary school (Booker, 2004).

According to Hudojo (2005: 13) that learning mathematics requires an understanding of concepts, where with understanding these concepts students will find it easier to interpret and remember the subject matter so that mathematics learning outcomes can increase. This statement was also expressed by Priyambodo (2016: 10), which states that the low learning outcomes of students are due to the low understanding of mathematics concepts. In research conducted by Novitasari & Leonard (2017: 765) it also proves that the ability to understand concepts can significantly influence student learning outcomes. Where the results of student mathematics learning get better when students can understand mathematical concepts well. Widyastuti & Pujiastuti (2014: 184) also reveal that students who have a good understanding of concepts can be better trained to be able to develop logical thinking skills and be able to solve daily problems.

In addition to the importance of the ability to understand concepts, one thing that is no less important for achieving learning objectives is student interest in learning. Gusniwati (2015: 28) reveals that interest in learning is one of the most important factors affecting students' conceptual understanding, where students who have an interest in learning will try harder and pay attention to the lesson than students who do not have interest in learning. This can enable students to have high learning achievement. However, the fact that occurs is that students' interest in learning in mathematics is still low. This was revealed by HØgheim (2017: 3)) that mathematics is one of the subjects most prone to decline in interest other than science.

In addition, the achievement of learning mathematics in Indonesia is still low. This is shown from the results of a survey from Trends in International Mathematics and Science Study (TIMSS). Based on the results of TIMSS Survey (2015), it was found that Indonesian students obtained a math score of 397, which is in the 45th rank of 50 countries, and is included in the lower rank. So it can be seen that the mathematics learning achievement of students in Indonesia is still low. There are many factors that influence the success of learning mathematics, one of which is the availability of learning media to support the teaching and learning process.

Shadiq (2014: 3) reveals that some students consider mathematics to be a difficult subject. This is also supported by the results of interviews with fourth grade elementary school teachers at SD Negeri Kotagede 1 stating that a difficult subject for students is mathematics. Based on the data from the questionnaire results of the fourth grade student needs analysis in 4 SD in Kotagede district, it was found that 68.10% of students stated that mathematics was a difficult subject. In addition, the results of the Mid-Semester Assessment (PTS) and Final Semester Assessment (PAS) obtained data that the scores for mathematics subjects were below other subjects. One of the maths material that is difficult for students is angle measurement. Based on the results of research conducted by Mariyana, Rosady, & Latifah (2018: 98) it was found that the material for measuring angles in fourth grade elementaru school was difficult because more than half of the students still had difficulty using the protractor and had not completed the KKM. Crompton (2015: 19) also states that the concept of angles is difficult for elementary school aged students to understand.

Based on the results of interviews with several fourth grade elementary school teachers in Kotagede District, it was found that most of the SD in Kotagede Yogyakarta sub-district already had learning support facilities such as LCDs, projectors, and computers. However, its utilization is not optimal because it is only used for learning Information and Communication Technology (ICT) and is rarely used to teach mathematics subjects. The same thing is also found in SD Negeri Gedongkuning, where the use of learning media to teach mathematics is also still limited. teachers rarely use learning media to support the implementation of mathematics learning.

Based on these problems, it is necessary to make improvements or improvements in learning to support student learning success. In accordance with current curriculum developments, Indonesia is implementing the 2013 curriculum in which the learning process is more student-centered (student centered learning). Given the development of science and technology that has progressed rapidly and affects all aspects of human life, the use of technological developments is also used in the learning process. This is in accordance with the learning principles contained in permendikbud nomor 22 tahun 2016, concerning Basic and Secondary Education Process Standards, which states that the learning process must utilize information and communication technology to increase the efficiency and effectiveness of learning. The government plans to implement creative and innovative learning by utilizing the application of advances in information and communication technology in an integrated, systematic and effective manner in accordance with the situation and conditions. In line with this, Widyastono (2015: 88) also reveals that information and communication technology is expected to be utilized in developing the quality of learning, one of which is using computer-based learning media.

There are several categories of skills that teachers must have in teaching in the 21st century, one of which is that teachers must be able to design and develop learning experiences and assessments in the digital era *(*Daryanto & Karim, 2017: 4). In this case, the teacher should be able to take advantage of technology in the implementation of the teaching and learning process that allows all students to actively participate in learning. With the use of this technology, it is hoped that it can encourage students to be more interested and serious in learning.

Therefore, learning media that utilize technology and contextual are needed to encourage students to actively participate and help students improve conceptual understanding according to student learning needs and interests to create an effective and fun learning process.

One of the learning media that can be used as an alternative is interactive learning multimedia. Surjono (2017: 2) states that multimedia is a combination of various media such as text, images, sound, animation, video, etc. which are integrated by utilizing computers or electronic equipment to achieve certain goals. In this case, the combination of various media refers to the use of computers or technology as information channels. She & Chen (2009: 1297) which states that multimedia offers great potential as a powerful learning technology to improve human learning. In addition, research conducted by Novitasari (2016: 8-18) also revealed that the use of interactive multimedia in learning mathematics can increase students' ability to understand mathematical concepts.

Interactive learning multimedia can be designed by linking subject matter with students' daily lives or contextual in nature. Through interactive multimedia learning with a contextual approach, students can build knowledge from their experiences so that the learning process takes place more meaningfully and students find it easier to remember the material. According to Lotulung, Ibrahim, & Tumurang (2018: 40) state that the learning process that links material with students' real-world situations will encourage students to make connections between the knowledge they have and the environment around them. In order to create meaningful learning, students need to be given the opportunity to do, try, and experience for themselves so that students are not only passive listeners who only accept all the information provided by the teacher. Therefore, the contextual approach can be an alternative approach to learning mathematics so that it can make it easier for

students to understand mathematics material. Selvianiresa & Prabawanto (2017: 2) also explained that in mathematics there are indirect concepts, so a process is needed to interpret these concepts. Students can learn these abstract mathematical concepts through various real activities, where learning is directly linked to students' daily lives. Therefore, it would be better if interactive learning multimedia contains learning steps with a contextual approach so that the learning process becomes more meaningful for students.

The purpose of this research is to produce product development in the form of interactive learning multimedia with a proper contextual approach to improve the conceptual understanding and learning interest of fourth grade elementary school students in mathematics, especially angle measurement material.

The development of interactive learning multimedia products is carried out based on references from several studies that have been carried out. Some of the relevant research includes research conducted by Shi (2017) in the International Journal of Emerging Technology in Learning with the title Application of Multimedia Technology in Vocabulary Learning for Engineering Students. The purpose of this study was to determine the effectiveness of using multimedia in improving learning outcomes and the ability to remember in English vocabulary lessons. The results of this study found that learning using multimedia assistance was more effective than traditional methods, where students accepted learning more quickly with a higher average score acquisition. In addition, students also take longer to remember the material. The similarity between this research and this research is to both test the effectiveness of multimedia learning. The difference is that in this study, the ability to understand concepts and student interest in learning will be improved.

Research by Li (2016) in the International journal of Information and Education Technology with the title Transforming Conventional Teaching Classroom to Learner-Centered Teaching Classroom Using Multimedia-Mediated Learning Module shows that learning that uses technology in the form of multimedia can increase student motivation and retention. In addition, students' understanding of learning using multimedia assistance in learning is higher than conventional learning. The similarity between this research and this research is that both develop multimedia to be used in the learning process to improve student understanding.

Research from Shah & Khan (2015) entitled "Impact of Multimedia-aided Teaching on Students' Academic Achievement and Attitude at Elementary Level", resulted in the finding that the experimental group, namely those who used multimedia in learning, showed more positive achievement and attitudes compared to the group. control, which is not using multimedia in learning. So that the conclusion is the use of multimedia in effective learning to improve student achievement and attitudes. The relevance of this study to this study is to both test the effectiveness of multimedia to improve students' cognitive abilities and attitudes. In this research, what you want to improve is the understanding of concepts and student interest in learning.

METHOD

The type of research applied to this research is development research which refers to the development model from Borg & Gall (1963: 772) as shown in Figure 1. This development research was conducted in March-April 2019 and was carried out until the seventh stage due to limitations time and cost.

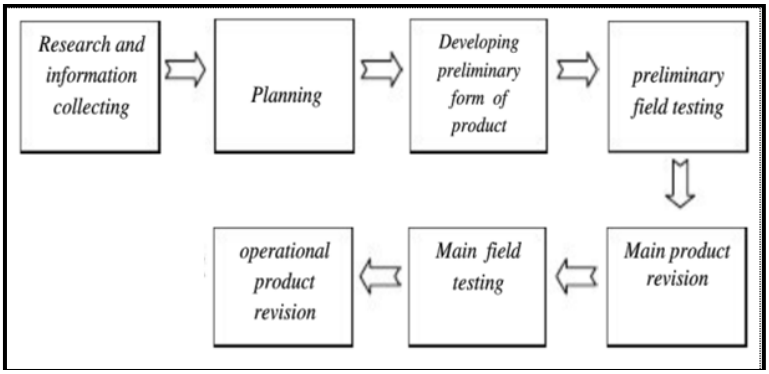


Figure 1. The Borg and Gall Development Procedure
(Source: adapted Borg & Gall, 1963: 772)

Borg and Gall's development model is as follows: (1) a preliminary study in the form of an analysis of the initial needs of fourth grade elementary school students and teachers related to mathematics learning; (2) planning, namely compiling product designs and research

instruments; (3) initial product development, namely making products in the form of interactive learning multimedia using Adobe Flash Professional CS6 and validating by material and media experts and making revisions according to expert input; (4) the initial field test was conducted to determine the responses of students and teachers to the product. In this study, the initial field test was conducted at SDN Gedongkuning involving fifteen fourth grade elementary shool students and one teacher; (5) major product revisions are developed based on teacher and student suggestions and input; (6) the main field test was carried out on a broader scale, namely at SDN Rejowinangun 1 and SDN Baluwarti as many as 30 students and 2 teachers; and (7) operational product revisions. The data collection techniques used in this study were interview, questionnaire, and assessment scales. Interviews and questionnaires were aimed at fourth grade elementary school teachers and students to obtain information regarding the needs of teachers and students in the learning process. The scale is used to validate the product based on the judgment of the experts to determine the feasibility of the product being developed.

The data obtained through interviews, questionnaire sheets and product appraisal sheets were analyzed statistically qualitatively and quantitatively. Qualitative data in the form of comments and suggestions obtained from media experts, material experts, teachers and students and in the form of interviews. While quantitative data is used to convert the results of student response scores, teacher responses and product rating scales by material experts and media experts.

Data to assess the feasibility of a product were analyzed by the following steps: (1) tabulating the data on the assessment items for each component contained in the instrument sheet; (2) calculate the total score for each component, calculated using the following formula:

$$X = \frac{\sum x}{n}$$

(Source: adapted from Sugiyono, 2012: 49)

Information :
X = average score
∑x = total score obtained
n = number of evaluators

(3) converting the total score in the form of a score with four scale criteria according to the categorization guidelines from Mansyur, Rasyid, & Suratno (2015: 409) as follows.

Table 1. Guidelines for Product Feasibility Assessment Scores Categorization

Interval Score	Value	Category
Ri + 1,5 Sdi < score ≤ maximum total score	A	Very Feasible
Ri < score ≤ Ri + 1,5 Sdi	B	Feasible
Ri – 1,5 Sdi < score ≤ Ri	C	Less Feasible
Total minimum score < score ≤ Ri – 1,5 Sdi	D	Not Feasible

(Source: adapted from Mansyur, Rasyid, & Suratno, 2015: 409)

Information:
Ri: ideal average = (maximum score + minimum score)
Sdi: ideal standard deviation = (maximum score - minimum score)

RESULTS AND DISCUSSION

The resulting product is in the form of interactive learning multimedia with a contextual approach that can be used for fourth grade elementary school students developed with the development procedure from Borg and Gall. The initial product development steps are as follows.

Needs Analysis Results

Based on the results of interviews with several fourth grade teachers related to mathematics learning, it was found that mathematics is a subject that is considered difficult by students. This is also in accordance with the results of the student questionnaire which showed 68.10% of students answered that mathematics was difficult. The average score for mathematics is lower than that of other subjects. Students' interest in learning mathematics is still low. This is due to the lack of understanding of students' concepts and the lack of availability of learning media that can be used to support the implementation of the teaching and learning process in mathematics, so that learning tends to be monotonous and boring for students. Students are more excited when the teacher delivers lessons using LCD. This is also in accordance with the results of the student needs analysis questionnaire which shows that 81.90% of students are more interested in learning by using LCD / computer / laptop.

In this case, teachers and students need learning media that utilize technology and are contextual so that interactive multimedia learning with a contextual approach is needed that can improve conceptual understanding and student

interest in mathematics. This is supported by research conducted by Shah & Khan (2015) which shows that groups of students who use multimedia in learning show more positive achievement and attitudes than those who do not use it. In addition, the results of research conducted by Li (2016) also show that the understanding and motivation of students in class who use multimedia in the implementation of the learning process is higher than conventional learning.

Preliminary Product Development

There are several steps taken in the initial product development, namely: 1) Analyzing Core Competencies, Basic Competencies, and formulating indicators; (2) Collecting material, images and videos related to angle measurement material in class IV curriculum 2013. (3) Designing the flow and design of interactive multimedia learning in the form of flowcharts and storyboards. Interactive learning multimedia with a contextual approach is designed and developed using Adobe Flash Professional CS6 with the storage of results in exe type files so that users do not depend on Adobe Flash software to run it. This multimedia can be run on a laptop or computer. The learning multimedia was developed with a tutorial and drill and practice model, with several parts including the competencies achieved, materials, simple games, practice questions, reference lists, and profiles. The language used is Indonesian. The colors used are bright and sharp colors and do not interfere with the readability of the writing. The images used in multimedia interactive learning are used to connect the material with students' daily lives so that the material becomes clearer and more meaningful. Animations in this interactive learning multimedia show the process of measuring angles to clarify the concept of angles. The sound used in multimedia interactive learning is in the form of a narrative voice to provide an introduction to learning, background music, and sound effects to provide feedback to students.

In addition, interactive multimedia learning is adapted to a contextual approach which includes several components, namely constructivism, inquiry, quetioning, learning community, modeling, reflection, and authentic. The following are some pictures of the development results of interactive learning multimedia with a contextual approach to angle measurement material for fourth grade elementary school students.

Figure 2. Front page view
(Source: author's document)

Figure 3. Example of Constructivism Display
(Source: author's document)

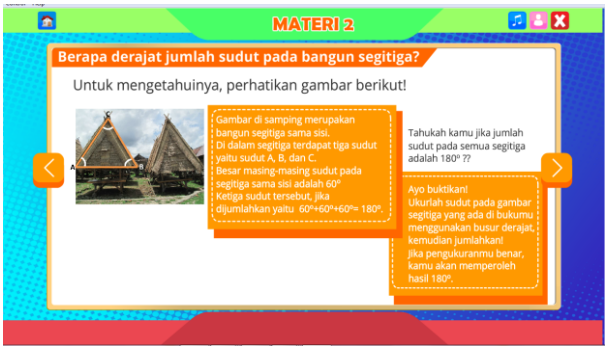


Figure 4. Example of Inquiry Views
(Source: author's document)

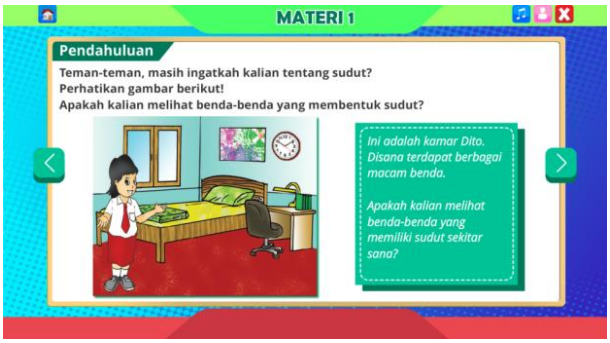


Figure 5. Example of Questioning Display
(Source: author's document)

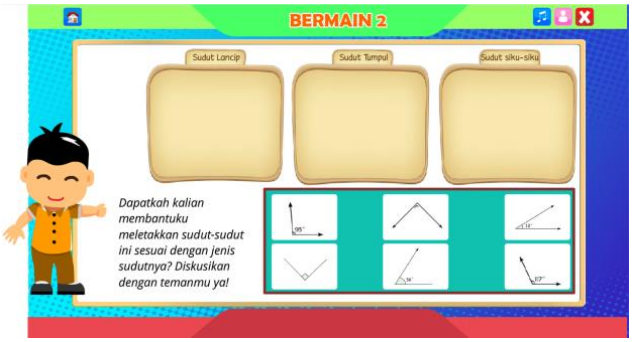
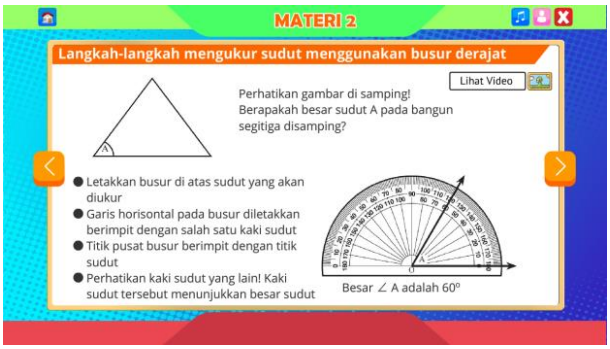


Figure 6. Example of Learning Community Display
(Source: author's document)



FFigure 7. Example of Modeling Display
(Source: author's document)

After making interactive multimedia learning is complete, then it is validated by material experts and media experts. Material experts provide an assessment of the content of the material and media experts provide an assessment of the appearance of the media. The input and suggestions provided by material experts and media experts are used as material for revising interactive learning

multimedia with a contextual approach so that the media can be declared worthy of being tested.

Product Feasibility Test Results

The results of the feasibility test consist of data from the validation results of material experts and media experts to state that the product developed is suitable for use for fourth grade elementary school students. Interactive learning multimedia products are declared feasible if all aspects of the assessment get a minimum score of B or the category "feasible".

Assessment of the feasibility of the material consisting of aspects of the quality of content and learning objectives as well as aspects of instructional / learning quality in interactive multimedia learning with a contextual approach is carried out by material experts. The following is a summary of the assessment results from material experts.

Table 2. Results of the Material Expert's Product Assessment

No.	Aspect	Score	Value	Category
1.	Quality of content and learning objectives	47	B	Feasible
2	Instructional / learning quality	56	B	Feasible
Jumlah		83	B	Feasible

Table 2 shows the results of material experts on aspects of the quality of content and learning objectives based on the value of B and is included in the feasible category. Furthermore, in the aspect of instructional / learning quality, it got a score of 56 with the predicate B value and was included in the feasible category. The total result of interactive learning multimedia research from material experts got a score of 83 with the predicate B value and the category "feasible".

Furthermore, the results of the feasibility of the media which consisted of several aspects, namely appearance, suitability of presentation, navigation, interactive, and media access were carried out by media experts.

Tabel 3. Hasil Penilaian Produk ahli Media

No	Aspect	Score	Value	Category
1.	Display	48	B	Feasible
2.	Serving suitability	15	B	Feasible
3.	Navigation	14	A	Very Feasible
4.	Interactive	13	B	Feasible
5.	Easy of media acces	10	A	Very Feasible
	Jumlah	100	B	Feasible

Table 3 shows the results of the assessment of media experts on the display aspect, getting a score of 48 with a value of B and is included in the feasible category. In the aspect of presentation suitability, it obtained a score of 15 with the predicate B value and was included in the feasible category. In the navigation aspect, it gets a score of 14 with the predicate A value in the very feasible category. In the interactive aspect, it got a score of 13 with a predicate of value B in the feasible category, and in the aspect of easy media access, it got a score of 10 with a predicate of value A which was included in the very feasible category. Overall the results of the interactive learning multimedia assessment from media experts got a score of 100 with the predicate B value and the category "feasible".

Based on the assessment given by material experts and media experts, mulimedia interactive learning with a contextual approach is declared feasible to be used at the next stage, namely at the initial trial stage according to the revised suggestions that have been given by the experts. The following is an example of displaying interactive multimedia learning before and after being revised.

Before Revision

After Revision

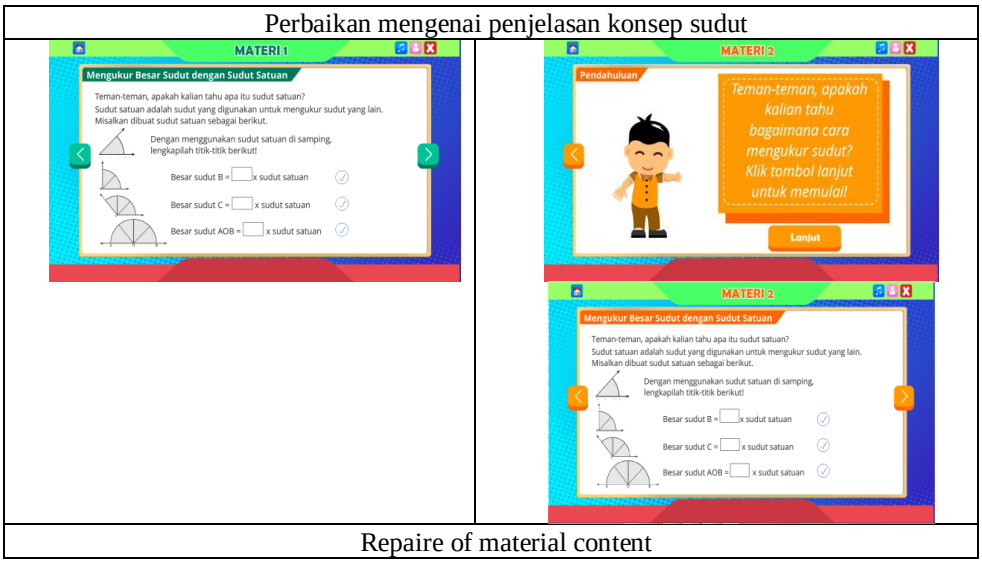


Figure 8. Examples of Results Before and After Revisions from Material Experts

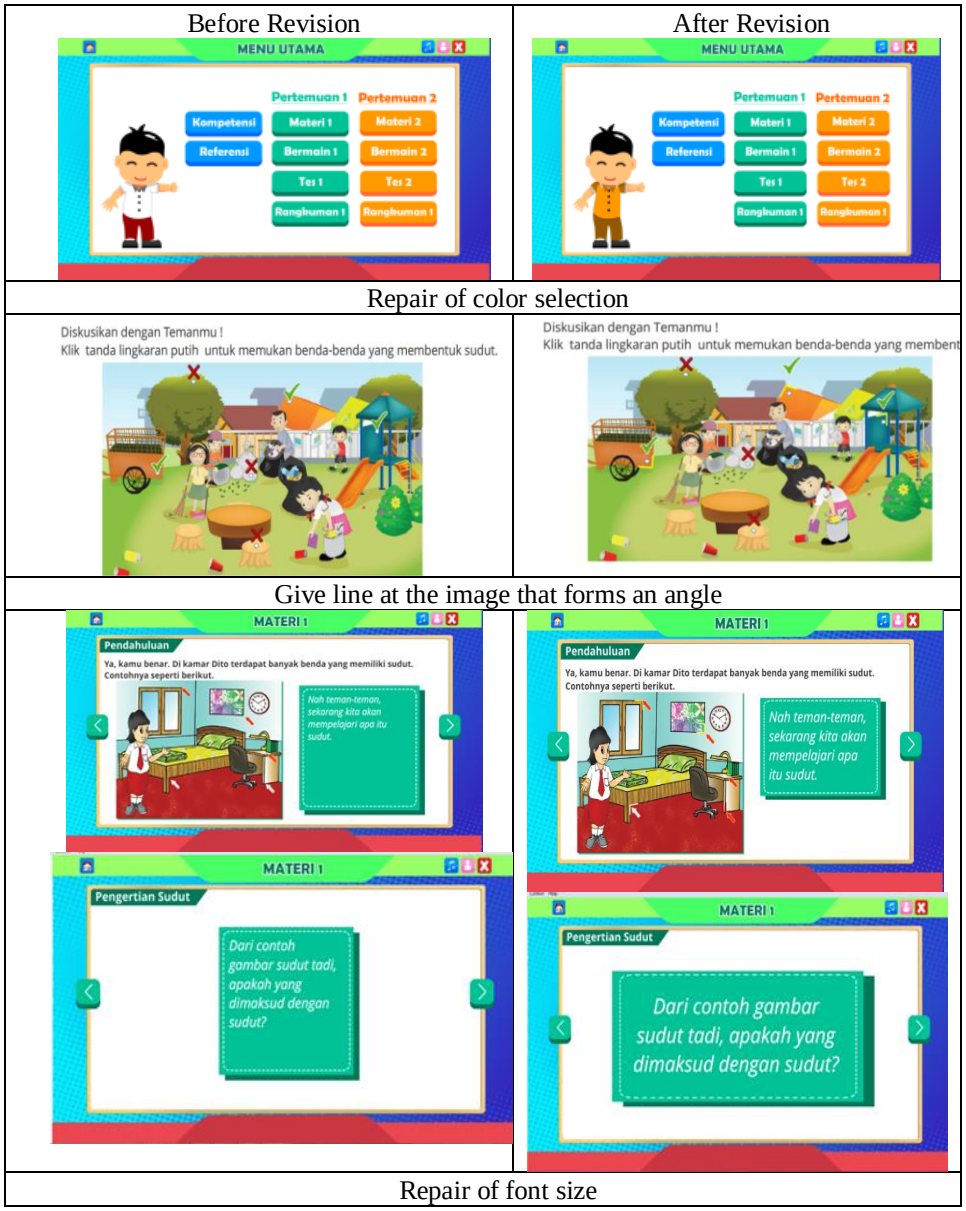


Figure 9. Examples of Before and After Revision Results from Media Experts

Product Field Testing Results

The results of product trials in this study consist of data from initial trial results and data from field trials.

Preliminary Field Testing

The preliminary field testing was carried out on a small scale at SDN Gedongkuning involving 15 fourth grade students and classroom teachers. This stage is carried out to determine the responses of students and teachers to interactive multimedia learning with a contextual approach. The following is an analysis of the results of the teacher response questionnaire.

Table 4. Teacher Response Results in the Preliminary Field Testing

No	Aspect	Score	Value	Category
1.	Presentation of material	40	A	Very Feasible
2.	Media Quality	42	A	Very Feasible
	Jumlah	82	A	Very Feasible

Based on table 4, the results of the teacher's response to interactive learning multimedia with a contextual approach got a score of 82 with the predicate of an A and included in the "very feasible" category. Feasibility assessment based on teacher response questionnaires consists of two aspects, namely the material and media aspects. Based on the table, it is known that in the aspect of presenting the material obtained a score of 40 with the predicate of value A and is included in the "very feasible" category, and then in the aspect of media quality, it has a score of 42 with the predicate A value and is included in the "very feasible" category. Based on the data obtained from the teacher's response to the initial trial, interactive multimedia learning with a contextual approach fulfills the very criteria suitable for use as a medium for learning mathematics and is ready to be tested at the main trial stage.

The teacher's comments on interactive multimedia learning with a contextual approach are good and interesting learning media, the material is in accordance with current teaching and learning activities. Advice from the teacher is to improve the command sentences contained in interactive learning multimedia to make it more appropriate and clear. The follow up of these suggestions is to make revisions according to teacher input. Revisions were made according to the teacher's suggestions by correcting the command sentences to make them clearer and more precise.

Furthermore, the student response questionnaire analysis can be seen in the following table

Table 5. Results of Student Responses to the Preliminary Field Testing

No	Aspect	Score	Value	Category
1.	Presentation of material	7,2	A	Very Feasible
2.	Media Quality	27,8	A	Sangat Layak
	Jumlah	35	A	Very Feasible

Based on table 5, the results of students' responses to interactive learning multimedia with a contextual approach got a score of 35 with an A predicate and was included in the "very feasible" category. Feasibility assessment based on student response questionnaires consists of two aspects, namely the material and media aspects. Based on the table, it is known that in the aspect of presenting the material obtained a score of 7.2 with the predicate A value and is included in the "very feasible" category, and then on the aspect of media quality it scores 27.8 with an A grade predicate and is included in the "very feasible" category. ". Based on the data obtained from student responses in the initial trial, interactive multimedia learning with a contextual approach fulfills the very criteria suitable for use as a medium for learning mathematics and is ready to be tested at the main trial stage.

Students responded that interactive multimedia learning with a contextual approach was very interesting because they could use it directly using computers. Some of the students' comments include: 1) interactive learning multimedia is very interesting and I like to use it to learn mathematics, 2) interactive learning multimedia is easy to use, 3) interactive learning multimedia makes me excited about learning.

Some students suggested that there were sentences that were unclear. In addition, it is also better to add all subject matter to be included in interactive learning multimedia. The follow-up of the suggestions given by students in the initial trial was to make improvements to sentences that were unclear according to student input. But to add all subject matter to be included in multimedia is not done because of time and cost limitations. This is

the documentation during the preliminary field testing.

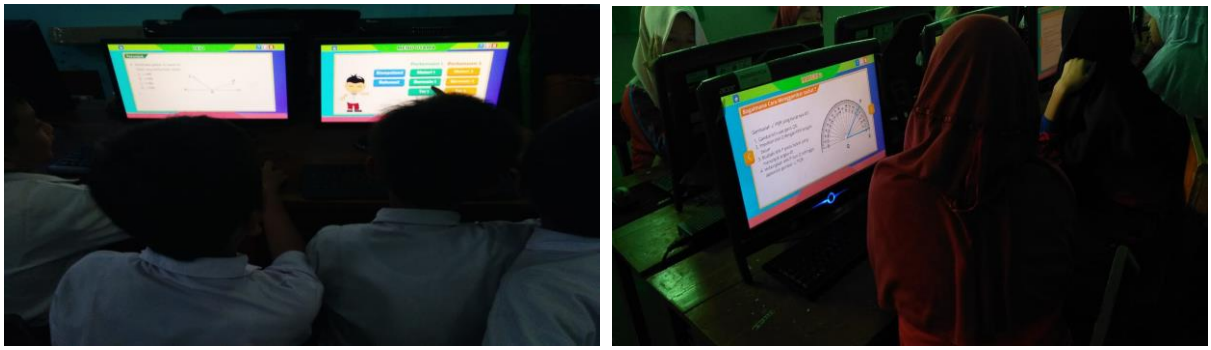


Figure 10. Documentation of preliminary field testing

Main Field Testing

The main field testing was carried out on a broader scale involving 15 grade IV C students at SDN Rejowinangun 1 and 15 grade IV students at SDN Baluwarti as well as two classroom teachers. This stage is carried out to determine the responses of students and teachers to interactive multimedia learning with a contextual approach. The following is an analysis of the results of the teacher response questionnaire.

Table 6. Teacher Response Results in the Main Field Testing

No	Aspect	Score	Value	Category
1.	Presentation of material	44,5	A	Very Feasible
2.	Media quality	43	A	Very Feasible
	Jumlah	87,5	A	Very Feasible

Based on table 6, the results of the teacher's response to interactive learning multimedia with a contextual approach got a score of 87.5 with the predicate of an A and was included in the "very feasible" category. Feasibility assessment based on teacher response questionnaires consists of two aspects, namely the material and media aspects. Based on the table, it is known that in the aspect of presenting the material obtained a score of 44.5 with the predicate of A value and is included in the "very feasible" category, and then in the aspect of media quality it has a score of 43 with an A grade predicate and is included in the "very feasible" category. Based on the data obtained from the teacher's response to the main trial, interactive multimedia learning with a contextual approach fulfills the very criteria suitable for use as a medium for learning mathematics and is ready to be tested at the operational test stage.

The teacher responded that interactive multimedia learning with a contextual approach was interesting and appropriate and suitable for use by students. Furthermore, the student response questionnaire analysis can be seen in the following table.

Table 7. Student Response Results in the Main Field Testing

No	Aspect	Score	Value	Category
1.	Presentation of material	7,57	A	Very Feasible
2.	Media quality	28,3	A	Very Feasible
	Jumlah	35,87	A	Very Feasible

Based on table 7, the results of student responses to interactive learning multimedia with a contextual approach scored 35.87 with an A grade predicate and were included in the "very feasible" category. Feasibility assessment based on student response questionnaires consists of two aspects, namely the material and media aspects. Based on the table, it is known that in the aspect of presenting the material obtained a score of 7.57 with the predicate of value A and is included in the category of "very feasible", and then in the aspect of media quality it gets a score of 28.3 with the predicate of value A and is included in the category "very feasible. ". Based on data obtained from student responses to the main trial, interactive multimedia learning with a contextual approach fulfills the very criteria suitable for use as a medium for learning mathematics and is ready to be tested at the operational field testing. This is the documentation during the main field testing.

Figure 11. Documentation of the main field testing

The research findings obtained from the initial and main trials were that students expressed that they felt more interested and excited about learning mathematics using interactive multimedia learning. In addition, the learning process is more enjoyable and easier to understand. As stated by Novitasari (2016) in his research which states that multimedia learning can improve students' understanding of mathematical concepts. In line with this, research by Arham & Dwiningsih (2016) also reveals that the use of interactive multimedia learning is effective for improving student learning outcomes. As expressed by She & Chen (2009: 1297) which states that "Multimedia offers great potential as a powerful learning technology to enhance human learning". Multimedia provides great potential as a learning technology to enhance human learning.

This is also confirmed by Cairncross & Mannion (2010: 156) who also state that multimedia has the potential to create a quality learning environment. With the implementation of a fun learning process it will also increase student interest and interest in learning in participating in learning activities. This is supported by research conducted by Paseleng & Arfiyani (2015: 147) which found that the use of interactive multimedia learning can increase the learning interest of elementary school students.

The teacher's comment on interactive learning multimedia is that the use of the product is appropriate to increase student interest in learning in mathematics because students look very enthusiastic and eager to learn using interactive learning multimedia. In addition, the use of the product can also improve students' conceptual understanding of mathematics material, especially measuring angles in grade IV elementary schools. Because the material presented in multimedia is also contextual, which is linked directly to the environment around students. In addition, students can learn independently to repeat or relearn. As stated by Fuadi, Johar, & Munzir (2013: 51) in their research which states that the implementation of the learning process which always links material with student experiences can improve understanding of mathematical concepts. Where in this case the implementation of learning with a contextual approach is more fun and meaningful for students. In line with these findings, Fatra & Zulkifley (2017: 59151) also revealed in their research that a contextual approach can improve student achievement because learning mathematics with a contextual approach can provide opportunities for students to be directly involved in the learning process and students can also build their own knowledge.

Based on several product feasibility trials which include material expert validation tests, media expert validation tests, initial trials, and main trials, the results show that interactive learning multimedia products with a contextual approach are declared feasible to be used as learning media to support learning implementation. mathematics, especially in the material of measuring angle for fourth grade elementary school.

CONCLUSION

Based on the results of the development of interactive multimedia learning with a contextual approach, it can be concluded that interactive learning multimedia with a contextual approach is a suitable medium to use to support the implementation of mathematics learning, especially the angle measurement material for fourth grade elementary school. This is in accordance with the validation of material experts and media experts with a decent category, as well as student responses and teacher students with a very decent category.

REFERENCES

[1] Arham, U. U., & Dwiningsih, K. (2016). Keefektifan Multimedia Interaktif Berbasis Blended Learning Untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Kwangsan*, *4*(2), 111. https://doi.org/10.31800/jurnalkwangsan.v4i2.89

[2] Borg, W. R., & Gall, M. D. (1963). EducatioResearch: An Introduction. In N. Benevnto (Ed.) (4th ed.). New York: Longman Inc.

[3] Cairncross, S., & Mannion, M. (2010).

Interactive multimedia and learning: Realizing the benefits. *Innovations in Education and Teaching International*, *38*(2), 156–164. https://doi.org/10.1080/14703290110035428

[4] Crompton, H. (2015). Understanding Angle and Angle Measure: A Design-Based Research Study Using Context Aware Ubiquitous Learning. *International Journal for Technology in Mathematics Education*, *22*(1), 19–30. https://doi.org/10.1564/tme

[5] Daryanto, & Karim, S. (2017). *Pembelajaran Abad 21*. Yogyakarta: Gava Media.

[6] Fatra, M., & Zulkifley, M. (2017). Improving Student Achievement in Mathematics Using Contextual Teaching and Learning. *International Journal of Current Research*, *9*(10), 59148–59152. Retrieved from http://www.journalcra.com

[7] Fuadi, R., Johar, R., & Munzir, S. (2013). Peningkatkan Kemampuan Pemahaman dan Penalaran Matematis melalui Pendekatan Kontekstual. *Jurnal Didaktika Matematika*, *2013*, 47–54.

[8] Gusniwati, M. (2015). Pengaruh Kecerdasan Emosional dan Minat Belajar terhadap Penguasaan Konsep Matematika Siswa SMAN di Kecamatan Kebon Jeruk. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *5*(1), 26–41. https://doi.org/10.30998/formatif.v5i1.165

[9] HØgheim, S. (2017). *Making Math Interesting: an Experimental Study of Interventions to Encourage Interest in Mathematics*. University of Bergen.

[10] Li, Y. W. (2016). Transforming Conventional Teaching Classroom to Learner-Centred Teaching Classroom Using Multimedia-Mediated Learning Module. *International Journal of Information and Education Technology*, *6*(2), 105–112. https://doi.org/10.7763/ijiet.2016.v6.667

[11] Lotulung, C. F., Ibrahim, N., & Tumurang, H. (2018). Effectiveness of Learning Method Contextual Teaching Learning (CTL) for Increasing Learning Outcomes of Entrepreneurship Education. *The Turkish Online Journal of Educational Technology - TOJET*, *17*(3), 37–46.

[12] Mariyana, F. A., Rosady, I. A., & Latifah, N. (2018). Pemahaman Konsep melalui Pendekatan Pendidikan Matematika Realistik Indonesia pada Materi Pengukuran Sudut di Kelas IV Sekolah Dasar. *Sekolah Dasar: Kajian Teori Dan Praktik Pendidikan*, *27*(2), 98–107. Retrieved from http://journal2.um.ac.id/index.php/sd/

[13] Novitasari, D. (2016). Pengaruh Penggunaan Multimedia Interaktif terhadap Kemampuan Pemahaman Konsep Matematis Siswa. *Fibonacci Jurnal Pendidikan Matematika & Matematika*, *2*(2), 8–18. Retrieved from https://jurnal.umj.ac.id/index.php/fbc/article/view/1650/1402

[14] Novitasari, L., & Leonard. (2017). Pengaruh Kemampuan Pemahaman Konsep Matematika Terhadap Hasil Belajar Matematika. *Prosiding Diskusi Panel Nasional Pendidikan Matematika, Universitas Indrapasta PGRI*, (December). Retrieved from https://www.researchgate.net/publication/321824137

[15] Paseleng, M. C., & Arfiyani, R. (2015). Pengimplementasian Media Pembelajaran Berbasis Multimedia Interaktif Pada Mata Pelajaran Matematika Di Sekolah Dasar. *Scholaria : Jurnal Pendidikan Dan Kebudayaan*, *5*(2), 131. https://doi.org/10.24246/j.scholaria.2015.v5.i2.p131-149

[16] Presiden Republik Indonesia. (2016). Peraturan Menteri Pendidikan dan Kebudayaan Nomor 22, Tahun 2016, tentang Standar Proses Pendidikan Dasar dan Menengah.

[17] Priyambodo, S. (2016). Peningkatan Kemampuan Pemahaman Konsep Matematis Siswa dengan Metode Pembelajaran Personalized System of Instruction. *Mosharafa: Jurnal Pendidikan Matematika*, *5*(1), 10–17.

[18] Selvianiresa, D., & Prabawanto, S. (2017). Contextual Teaching and Learning Approach of Mathematics in Primary Schools. *Journal of Physics: Conference Series*, *895*(1), 1–7. https://doi.org/10.1088/1742-6596/895/1/012171

[19] Shadiq, F. (2014). *Pembelajaran Matematika: Cara Meningkatkan Kemampuan Berpikir Siswa*. Yogyakarta: Graha Ilmu.

[20] Shah, I., & Khan, M. (2015). Impact of Multimedia-aided Teaching on Students' Academic Achievement and Attitude at Elementary Level. *US-China Education Review A*, *5*(5), 349–360. https://doi.org/10.17265/2161-623X/2015.05.006

[21] She, H. C., & Chen, Y. Z. (2009). The impact of multimedia effect on science learning: Evidence from eye movements. *Computers and Education*, *53*(4), 1297–1307. https://doi.org/10.1016/j.compedu.2009.06.012

[22] Shi, X. (2017). Application of multimedia technology in vocabulary learning for engineering students. *International Journal of Emerging Technologies in Learning*, *12*(1), 21–31.

https://doi.org/10.3991/ijet.v12i01.6153

[23] Surjono, H. D. (2017). *Multimedia Pembelajaran Interaktif: Konsep dan Pengembangan*. Yogyakarta: UNY Press.

[24] TIMSS. (2015). *Highlights From TIMSS and TIMSS Advanced 2015: Mathematics and Science Achievement of U.S.Students in Grade 4 and 8 and in Advanced Courses at the End of High School in an International Context*. United States.

[25] Widyastono, H. (2015). Pendayagunaan Teknologi Informasi Dan Komunikasi (TIK) Dalam Pengembangan Pembelajaran Dan Manajemen Sekolah Rintisan Penerapan Kurikulum 2013. *Jurnal Kwangsan*, *3*(2), 77. https://doi.org/10.31800/jurnalkwangsan.v3i2.26

[26] Widyastuti, N. S., & Pujiastuti, P. (2014). Pengaruh Pendidikan Matematika Realistik Indonesia (PMRI) terhadap Pemahaman Konsep dan Berpikir Logis Siswa. *Prima Edukasia*, *2*(2), 183–193.

A MOBILE LEARNING BASED – SCIENCE-MATH STORY TO IMPROVE PROBLEM-SOLVING SKILLS AND RESPONSIBILITIES

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Abstract

Education needs to be supported by renewal that utilizes technological developments to maximize results, one of which is through innovative supporting media of digital learning. This research aims to develop a mobile learning based - science math story as digital literacy media that can improve problem-solving skills and character of elementary school students' responsibility. The Borg & Gall Research and Development model used in this research uses 5 stages simplified by the Puslitjaknov Team. Data were collected using interviews, observations, expert judgment, and response scales. The media feasibility test is carried out through expert judgment and the assessment of teachers and students as media users. The research and development that has been carried out have resulted in applications with content in the form of realistic fiction adventure stories, two-dimensional cartoon illustrations, summaries of science-math content materials, theme songs, and storytelling supported music. The resulting product meets the eligibility criteria based on the validation of media experts and material experts as well as the response of teachers and students in very feasible categories.

Keywords: Science-math story, mobile learning, elementary school student, problem-solving skills, responsibilities.

INTRODUCTION

Education has an important role in preparing students to face global competition based on information and technology [20][37]. Development in various matters related to education, including the development of learning support media, is important in the midst of current developments and conditions by considering technology, management, and effectiveness of learning using media [33].

Learning support media are all things that have a supporting function in delivering material and communicating learning resources to students during learning in class and outside the classroom [18][34]. The use of media to support digital learning is one of many ways to increase abilities in an effort to develop student potential in the global era with all technological developments.

The development of modern learning support media is carried out by considering several things for the functioning of the media in general and continuously. These considerations include the ability of educators to use technological media, student management skills related to the use of technology, and the ability to teach using these technological devices [33]. One of the technological devices that can meet these needs and according to these considerations is cellular technology or mobile technology.

Learning media that utilize cellular technology with the concept of mobile learning or mobile learning allows students to create a dynamic, visual representation of the situation they faced [6]. In addition, both students and teachers now can operate and even own personal mobile technology devices. So it can be assumed that it is easier for teachers to use mobile devices to support learning for students.

An important part of mobile learning is that learners are mobile and not limited to certain locations [38]. In the use of the support media of mobile learning-based, media designers must consider various characteristics of mobile devices and mobile learners to design good media [42]. Cellular technology is a supporting medium that has the potential to be used in learning and is easily adapted and made according to student characteristics.

Mobile learning-based media can be developed as interactive multimedia that combines several types of media into a more attractive unit with a variety of content. As stated by Deliyannis, multimedia is a series of various media in a display concept or independent learning program, usually combining text, audio, and still or moving images [11]. Multimedia as a form of presenting material uses words and pictures, with the aim of increasing interest in learning. With a series of words, the material is presented in a verbal form such as using printed text or directly orally. Whereas by using images, the material is presented in a pictorial form such as using illustrations, graphics, photos, maps, or even animation and video [26].

The interactive concept on mobile learning-based media is intended so that students as media users can choose what to do next using the media created. Interactive multimedia is equipped with a control device and can be operated by the user, so that users can do what they want in a more interactive and interesting manner [9]. Interactive multi-

media also engages and enhances their interest in learning in a student-centered environment [24]. So that the media developed in this study is interactive multimedia with a mix of content in the form of text, images, and music that can be operated interactively as desired and centered on students as users.

In the age of Elementary school students have unique characteristics. According to Piaget, elementary school-age students ranging from 7 to 11 years are at the concrete operational thinking ability stage [32]. The thought process at this stage involves the use of the reasoning stage. Logical reasoning replaces intuitive reasoning, but only in concrete situations. Have the skills to do classification, but have not been able to solve abstract problems. At this stage, students need learning media that has interesting content that is concrete.

According to the characteristics and needs of elementary school-aged students, the media developed is a mobile learning based - science math story. The media is an application that contains science math stories with two-dimensional illustrated images with the help of children's songs as the theme song and accompanying music as an intermediary or a medium that is in accordance with the stage of concrete operational development in the age of elementary school students.

The concept of science math comes from an effort to integrate the contents of science and mathematics as a whole and comprehensively. The construction of sciencematics learning will involve students in various skill improvements. Science process skills for the elementary school level include skills in observing, classifying, measuring, communicating, predicting, and concluding [5]. Meanwhile, basic math skills lead to students' ability to connect mathematics with various disciplines, think critically about the content, and communicate key components of mathematical concepts [10]. Basic mathematical abilities are also the basis for students to build good procedural skills so that they can and are able to solve mathematical and contextual problems [3].

Students involve content and process skills in the construction of sciencematics learning. The basic mathematical concepts for comparing, classifying, and measuring are basic process skills of science. Science is learning that contains knowledge (content) and how to find out (process). Science process skills such as observing, communicating, inferring, and controlling for important variables are to solve problems in both science and mathematics [17]. The media is developed to contain science and mathematics material that is integrated into thematic learning. Sciencematics material that is presented and associated with real-life students will stick and last a long time, explaining that learning activism has a positive impact on students' ability to maintain and understand new material obtained in the implementation of learning [21].

Innovation in media development with science and mathematics material was also supported by the results of interviews with teachers and students showing that on average most of the fourth-grade students experienced problems in participating in learning mathematics and then learning science, especially when working on problem-solving analysis questions. The lack of the character of responsibility is also the cause of the students being less maximal in carrying out their roles and duties as students. In addition, the need for mobile learning based - science math story is also supported by measurement results using a needs scale, analysis of student needs includes aspects of scientific thinking skills, learning responsibilities, and characteristics of innovative learning media that students want.

The story developed in this study is a tool used to make it easier for children to understand the material as well as a form of literacy activity. As its function, stories for children are made as an effort to teach and spread religious, moral, and educational values [40]. Stories for elementary school students are literary works that play an important role in their life and character development. Stories can lead readers to explore the three components of character, namely knowing, feeling, and doing moral deeds or behavior [29]. In addition, the right story can also help students improve their thinking skills. As stated by Ozsezer & Canbazoglu, stories should be designed with an environment that will help students think at a higher level [31].

There are several elements that make up a story, namely the storyline, characters and characterizations, story settings, story themes, and points of view [4]. In addition, there is also a mandate which is one of the goals of the story. The story must have a message in the form of a mandate that gives values to children as readers [28]. This mandate is a marker of success or failure of a story to shape personality and increase students' knowledge. The story is expected to bring happiness to students' lives through building physical health, mental intelligence, and moral virtue. A good story also contains character enhancement content for children [23]. Stories can also help develop imagination and gain new, satisfying experiences [30].

Based on the problems and potentials in the explanation above, a development in the form of science math-based stories based on mobile learning is initiated as a learning support medium that utilizes technology according to the times and contains a substance for grade IV at the elementary school level. The media developed is a supporting media that students can use independently in their literacy activities. This media is expected to be a concrete step in improving thinking skills and as a means of character education in a meaningful and

fun way. The questions that will be discussed in this research are:

1. What kind of mobile learning-based science math story needs can increase the problem-solving skills and responsibilities of fourth-grade elementary school students through literacy activities?
2. How is the mobile learning-based science math story appropriate to increase the problem-solving skills and responsibilities of fourth-grade elementary school students?

METHOD

The research and development model used in this research is the adaptation of the Borg & Gall model, which has been simplified by the Puslitjaknov Team [36] into 5 stages, namely: 1) Conducting product analysis, 2) Developing initial products, 3) expert validation and revisions, 4) initial/ small scale field trials and revisions, 5) large/ main scale field trials and final products). The approach used is a mixed method by combining quantitative and qualitative research [7]. Determining the research sample for the feasibility test of this product design using a purposive random sampling technique, namely determining the subject by considering the expertise of each subject [35]. The research was conducted at elementary schools in the city of Yogyakarta

Research data obtained from several data collection techniques. Data collection was carried out by interview, observation, expert judgment, and response scale. The preliminary research study was conducted data collection using in-depth interviews and needs scale analysis. Meanwhile, the feasibility of the media is known from the scale data for assessment by material experts and media experts on the feasibility of the media, as well as the responses of teachers and students after the use of mobile learning-based science math story media. Especially for the student response instrument, the scale used was only the "yes" and "no" scales to facilitate filling and the others used a Likert scale. By using a scale, data is obtained in the form of numbers which are then interpreted in a qualitative explanation. The data obtained were then searched for the average score for each aspect and categorized into a score with the criteria of a scale of four, following the scoring categorization guidelines used [25]:

Tabel 1. Guidelines for Product Feasibility Assessment Scores Categorization

Interval Score	Score	Categorization
Ri + 1,5 Sdi < score ≤ the maximum number of scores	A	Very Feasible
Ri < score ≤ Ri + 1,5 Sdi	B	Feasible
Ri – 1,5 Sdi < score ≤ Ri	C	Less Feasible
the minimum number of scores < score ≤ Ri – 1,5 Sdi	D	Not Feasible

Based on the data analysis technique, the feasibility of the product is categorized by the analysis results. Material and media experts provide an overall assessment covering various aspects of the feasibility of cheerful sciencematics based on mobile learning as a product developed followed by an assessment based on teacher and student responses to product trials. The score obtained based on the assessment is then categorized as feasible. The eligibility criteria for cheerful sciencematics based on mobile learning are deemed feasible if they meet the minimum criteria or category of "feasible".

RESULTS AND DISCUSSION

Product development is carried out through several stages, namely: 1) analyzing the needs and characteristics of the media that support the learning process standards; 2) analyzing the material according to the mapping of basic competencies in science and mathematics content in the applicable curriculum; 3) identify the ability to solve problems in grade IV elementary school students; 4) identify the character of responsibility for fourth-grade elementary school students; 5) identify media characteristics for elementary school students, 6) collect material sources; 7) make a product design; and 8) planning trials for the product.

An analysis of the needs and characteristics of the media that support the learning process standard is carried out before media development. The needs analysis was carried out in three schools, namely SD N Bangunrejo 1, SD N Blunyahrejo, and SD N Pingit using the method of observation, interviews, distribution of needs scales, and Focus Group Discussion (FGD) with teachers. The results of observations made at SD N Bangunrejo 1, SD N Blunyahrejo, and SD N Pingit on August 19, 20, and 21, 2019 show that in general, the learning carried out has not maximized the increase in solving skills and the character of responsibility. The use of digital media facilities is still lacking due to limited numbers in schools.

The results of interviews with teachers and students showed that on average the majority of fourth-grade students had problems in following mathematics learning and then science learning, especially when working on problem-solving analysis questions. The lack of student ability is due to the lack of responsibility attitude of students in carrying out their roles and duties as students.

In grade IV of primary school for the 2019/2020 school year, from the results of interviews, almost every student has a mobile device in the form of an android type cellphone which is used to access various information, especially playing games. Misuse of mobile devices is also a factor in the lack of students in carrying out their responsibilities as students. From the measurement using the scale of the needs, the analysis of student needs includes aspects of the ability to think sciencematically, learning responsibilities and the characteristics of innovative learning media that students want, the results of the need for supporting media for scientific stories based on mobile learning are 80.10%. The percentage value of this need scale reinforces the need for supporting media in increasing problem-solving skills and the character of student responsibility is a science-based mobile learning story.

Product development begins with the development of scientific stories as the core content of the product being developed. Science content is packaged in the form of a realistic fictional adventure story entitled "Pengeran Nara dan Penjelajah Waktu" which raises environmental issues. In each section of the story, there is a "Tahukah kamu?" which contains learning material according to the needs of students in increasing their competence Media is also supported by supporting content in the form of a theme song that encourages students to learn.

The science-math story consists of 3 parts containing science and 2 parts containing mathematics. Science-math stories and other supporting contents are made in the form of application software with the ".apk" format titled "Petualangan Citraloka" which can be used on Android type mobile devices.

The first media feasibility test is carried out through expert judgment. The assessment was carried out by two material experts and one media expert. The assessment by science and mathematics material experts aims to determine the feasibility of the product developed in the form of mobile learning-based science math stories in terms of science and mathematics content as a medium that can improve problem-solving skills and the character of responsibility based on student needs.

The feasibility of product design is determined by three experts according to their fields. The subjects of the feasibility test for the product are: (1) a mathematics subject matter expert, a lecturer in the field of mathematics education expertise, (2) a science subject matter expert, a lecturer in the field of science education expertise, and (3) a media expert, a lecturer in the field of educational technology expertise. However, before testing the feasibility of the product, a lecturer in the field of educational research and evaluation expertise is first tested for the instrument's feasibility

Aspects assessed by material experts include learning objectives and the quality of media content as well as the quality of instructional media. These aspects are developed into several indicators according to theoretical studies, namely: the availability of learning objectives, presentation of learning material, the suitability of media content with basic competencies, motivating students, directing the improvement of science skills, using media in increasing problem-solving skills, and using media in improving responsible character. The indicators are then formulated into 15 statement items. The assessment is also accompanied by giving suggestions/comments in writing for media improvement on the assessment sheet. The following is a summary of the results of the assessment obtained from science and mathematics material experts.

Tabel 2. Results of Product Assessment by Natural Science and Mathematics Experts

Aspects	Score		Value		Categorization	
	I	M	I	M	I	M
Media quality	23	20	A	B	Very Feasible	Feasible
Effectiveness of media content	28	27	A	A	Very Feasible	Very Feasible
Number	51	47	A	B	Very Feasible	Feasible

Information
I: Science material
M: Mathematics material

The table shows that the results of the assessment of science stories based on mobile learning by science and mathematics material experts get a total score for all aspects that meet the minimum eligibility criteria. Thus, it can be concluded that the product being developed is "feasible" for use. Based on the results of validation by science material experts, the following suggestions for improvement are obtained: 1) the story description is adjusted to the material (the level of rationality); 2) a summary of the material on the interest section is completed; and 3) the writing system of story descriptions needs to be improved according to correct writing rules. Meanwhile, based on the results of the assessment by Mathematics material experts, the following suggestions for improvement are obtained: 1) verbs on indicators need to be made more operational; and 2) the level of interactivity needs to be added and make the appearance clearer.

Assessment by media experts is carried out with the aim of knowing the feasibility of mobile learning-based science stories in terms of media in improving problem-solving skills and the character of responsibility. The media expert's assessment uses a media expert assessment questionnaire on a scale of 1-4. Aspects assessed by media experts include the effectiveness of mobile learning and technical media development.

This aspect develops into several indicators according to theoretical studies, namely: suitability of display screens, use of icons and guides, direct feedback, direct manipulation, interface metaphors for users, availability of features and their functions, segmentation, simplicity of application packaging, and suitability of age and user experience. The indicators are then formulated into 20 statement items. The following is a summary of the results of the assessment obtained from media experts.

Tabel 3. Results of Product Assessment by Media Experts

Aspects	Score	Value	Categorization
Mobile learning Effectiveness	44	B	Feasible
Media development techniques	18	A	Very Feasible
Number	62	A	Very Feasible

The table shows that the results of the assessment of science stories based on mobile learning by media experts get a total score for each aspect that meets the minimum criteria for the feasible category. It can be concluded that from the media aspect, the product developed has met the eligibility standards. Media experts also provide suggestions for improvements to the revision process before it is used at the next research stage. Based on the results of the assessment by media experts, the following suggestions for improvement are obtained: 1) audio back sound accumulates so that the sound is not clear; 2) it is necessary to add technical instructions for use and media information and 3) to add video or animation elements.

The media was then revised according to suggestions for improvement from material experts and media experts. Some improvements have been made to mobile learning-based science stories, including 1) the description of the story is adjusted to the material (the level of rationality), 2) completes the material summary, especially the interest section, 3) makes verbs on indicators more operational, 4) increases their interactivity and clarifying the appearance of the material summary, 5) adding technical instructions for use and media information, and 6) adding video or animation elements to the media.

Revisions made to some media content. Sentences in the story are converted into sentences that support the concept of realistic fiction. In the material summary, sentences are used that describe the material in a sufficiently deep and complete manner as a summary. The material description is conveyed as necessary to avoid student boredom because the material in the application is also presented in the teacher's book and student's book. Other improvements were made to the writing of sentences and words that were less operational. Furthermore, a pop-up display is added as confirmation of true or false after the answer is selected before continuing the display of the answer explanation. The developer created a pop up using a 2-dimensional cartoon character. Then the display of technical manuals was added.

After revisions to the product according to expert advice, the media was then tested twice to find out the feasibility based on the assessment of media users, namely teachers and students. The subjects used to determine the appropriateness of the application of the media in this study were 64 elementary students of grade IV from SDN Bangunrejo 1 and SDN Tegalpanggung. Measurement of teacher and student responses is based on two aspects, namely the quality of the media and the effectiveness of media content. The results of the initial field trials on the product being developed obtained the following results:

Tabel 4. Results of Teacher and Student Responses in Initial Field Trials

Aspects	Score		Value		Categorization	
	G	S	G	S	G	S
Media quality	59	6,05	A	A	Very Feasible	Very Feasible
Effectiveness of media content	22	9,30	B	A	Feasible	Very Feasible
Number	81	15,35	B	A	Feasible	Very Feasible

Information
G: Teacher's Response
S: Student's Response

Based on the data obtained from the responses of teachers and students in the initial field trials, mobile learning-based science stories have met the eligibility criteria as learning support media

that can improve problem-solving skills and the character of responsibility of fourth-grade elementary school students and can be retried at the trial stage main field. The follow-up to student responses in this initial trial was to make revisions according to input from students, namely improving story descriptions, rearranging music sessions on story descriptions, and adding questions to the quiz. Meanwhile, the results of the main field trials on the products developed were as follows:

Tabel 5. Results of Teacher and Student Responses in the Main Field Trial

Aspects	Score		Value		Categorization	
	G	S	G	S	G	S
Media quality	64	7,41	A	A	Very Feasible	Very Feasible
Effectiveness of media content	25	10,34	A	A	Very Feasible	Very Feasible
Number	89	17,75	A	A	Very Feasible	Very Feasible

Information
G: Teacher's Response
S: Student's Response

Based on the data obtained from the responses of teachers and students in the main field trials, mobile learning-based science math stories have also met the eligibility criteria as a learning support medium that can improve problem-solving skills and the character of responsibility of fourth-grade elementary school students and can be tested at the main field trial stage.

The follow-up to student responses in this initial trial was to make revisions according to student input, namely improving the application program system so that it was not error-free and easy to use. The following is an overview of the results of the final revision of the science math story based on mobile learning as digital literacy to improve problem-solving skills and the character of responsibility.

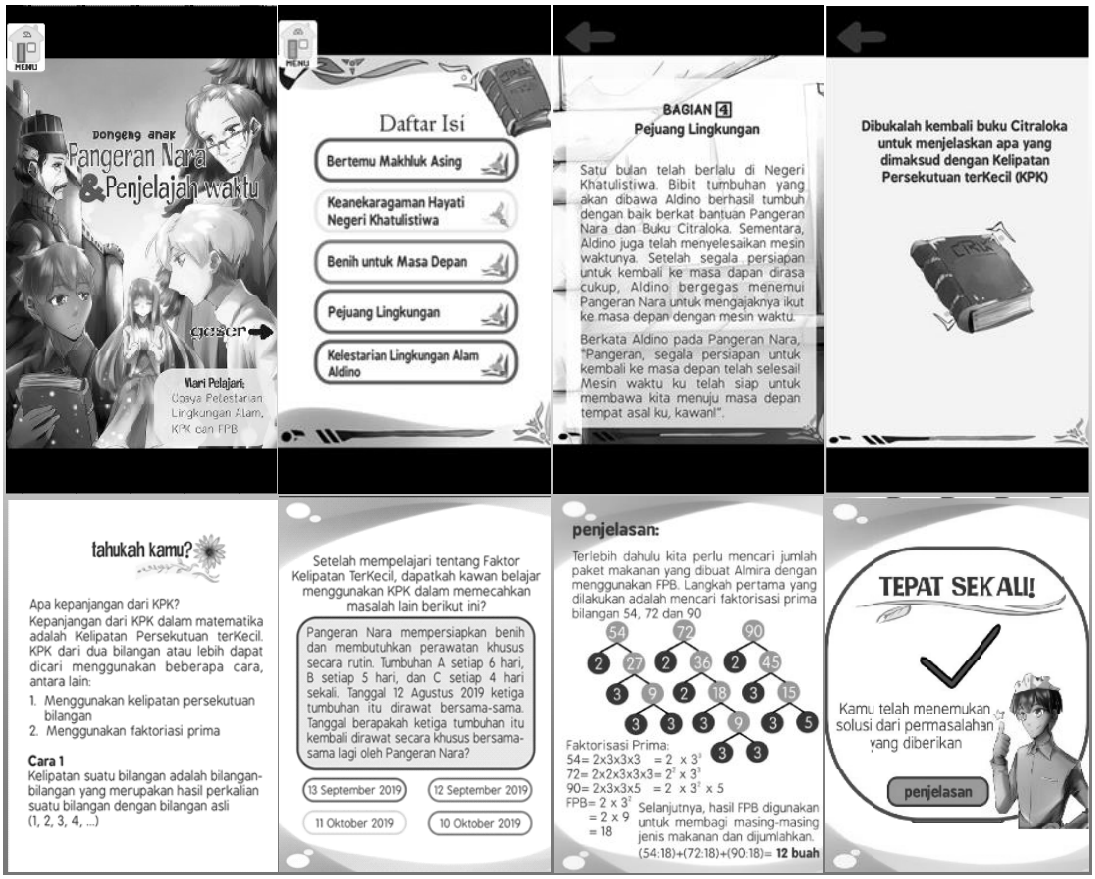

Figure 1. Final Revision of Mobile Learning Based - Science-Math Story

Based on various feasibility tests and improvements to the products developed, it can be concluded that a science-based mobile learning story deserves to be a digital literacy medium that can improve problem-solving skills and the character of responsibility.

The development of supporting media used in literacy activities is in accordance with one of the stages of implementing the literacy movement, namely the development stage. This stage is an effort to improve students' abilities through responding to media containing enrichment to support learning activities [13]. Science stories based on mobile learning provide learning experiences for students in addition to conventional learning carried out by teachers in class. The media also contains enrichment materials and questions that are suitable for learning at school and can be studied again to support student literacy activities. As intended by McCann (2015) that with the concept of mobile learning it is possible for students to record their reflections on something through text, images, and audio, the product developed also contains text content in the form of stories and material summaries, illustration images in the form of two-dimensional cartoons, and theme songs [27]. As well as accompanying music as audio content to support media.

This media is interactive support that can be used independently containing pictorial stories about realistic fictional adventures about environmental problems supported by theme songs and music to accompany stories as well as quizzes or exercises in problem-solving. Through a series of stories with the support of practice questions or quizzes, students are given examples and directions in solving problems. One way to provide learning that can improve student abilities is to use stories[14]. The process of character internalization, especially the character of responsibility, is shown through the role models of the characters in the story[1]. This concept is in accordance with the assumptions of Uzunboylu, Cavus, & Ercag (2009) that mobile learning has the potential to facilitate and increase collaboration between students to access, discover, discuss, share concerns for the environment through its features and argue about environmental problems [39]. Media is developed in the form of native apps, which are applications that are created and compiled with a programming language to run specifically on a particular OS, in this study the Android OS [19].

The ability to solve problems is one of the key competencies developed in this media because it is needed by students with regard to change, uncertainty, and phenomena that exist in the world[8]. By increasing the ability to solve problems through this media, students can meet their needs in increasing their competencies, especially in the field of science. Because basically sciencematic material is based on conditions, events, and phenomena that occur in nature. Meanwhile, the character of responsibility is part of the value and character education that must be developed in the learning process as a type of social skills ability [41].

Sciencemath stories based on mobile learning are made with a complex variety of content containing various activities that improve problem-solving skills. As stated by Zheng & Zhou (2006), media that can be used as a support in increasing problem-solving skills are also complex in nature, containing all the competencies needed by students[43]. Critical thinking often involves the ability to interpret information and make decisions in the form of solutions based on that information [22]. Thus, it can be interpreted how to condition a conducive learning environment in increasing problem-solving skills by providing information to students to be studied in the process of finding solutions.

Efforts to increase the character of responsibility through mobile learning-based science math stories are carried out through strategies that include the physical environment, learning materials, and activities related to learning [16]. Improving the character of students is effectively carried out through planting in terms of inclusion, namely dialogical planting, through exemplary, namely providing good examples [12]. Through story characters who show the character of responsibility, students are directed to learn and interpret the importance of behaving and being responsible. Responsibility is very important in behaving ethically and being sensitive to social, cultural, economic, and environmental problems so that helping students have a positive impact on their lives[15]. So that this character is enhanced through media that gives students sensitivity to social problems and the natural environment.

A series of activities, content, and features in a mobile learning-based science math story directs the improvement of problem-solving skills according to the indicators of problem-solving stages, namely 1) formulating problems, 2) developing problem-solving strategies, 3) exploring possible strategies, and 4) evaluating their effects or effects of the problem solution. The storyline and examples of how the story characters solve the problems faced in the story are the main factors causing increased problem-solving skills.

Meanwhile, increasing the character of responsibility according to the behavioral indicators and attitudes are shown by students, namely 1) understanding self-needs, 2) fulfilling self-obligations, and 3) contributing to the environment. The characters of the story "Pangeran Nara" and "Aldino" provide direct examples of behavior and responsibility towards oneself, family, and even the natural and social environment which are the main factors in increasing the character of student responsibility.

CONCLUSION

Science-math stories based on mobile learning that are needed to improve problem-solving skills

and responsibility characters are multimedia in the form of applications with content in the form of realistic fictional adventure stories, two-dimensional cartoon illustrations, summaries of sciencematics material content, theme songs, and musical support to the story.

Increased problem-solving skills are directed by describing the problem in the story and various alternative solutions based on the material studied in the application. Meanwhile, the increase in the character of responsibility is directed by giving examples of responsible attitudes and behaviors from the characters in the story towards themselves, their families, especially the environment.

The resulting products have met the eligibility criteria by science material experts, mathematical material experts and media experts, initial field trials, and main field trials in improving problem-solving skills and character of responsibility. The results of the expert assessment obtained a "Very feasible" category for science material experts, an "Eligible" category for math material experts, a "Very feasible" category for media experts, and a "Very Appropriate" category based on the results of teacher and student responses.

The use of mobile learning-based science math stories should be done according to the direction of the teacher in collaboration with parents to maximize their use in student literacy activities. The resulting product can be used as a reference for the development of similar products with other materials and as an effort to improve thinking skills and other characters.

REFERENCES

[1] Almerico, G. M. (2014). Building Character Through Literacy with Children's Literature. *Research in Higher Education Journal*, 26, 1–13.

[2] Borg, W. R., & Gall, M. D. (1983). *Educational research*. New York: Longman Inc.

[3] Brahier, D. J. (2016). *Teaching Secondary and Middle School Mathematics (5th ed.).* New York: Routledge.

[4] Brown, C. L., & Tomlinson, C. M. (1999). *Essentials of Children's Literature (3rd ed.)*. New York: Allyn & Bacon A Viacom Company.

[5] Bundu, P. (2006). *Penilaian Keterampilan Proses dan Sikap Ilmiah dalam Pembelajaran Sains*. Jakarta: Departemen Pendidikan Nasional.

[6] Calder, N., Larkin, K., & Sinclair, N. (2018). *Using Mobile Technologies in The Teaching and Learning of Mathematics*. Canada: Springer.

[7] Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research (4th ed.).* Boston: Pearson Education Inc.

[8] Csapó, B., & Funke, J. (2017). *The Nature of Problem Solving: Using Research to Inspire 21st Century Learning*. Paris: OECD Publishing. https://doi.org/10.1787/9789264273955-en

[9] Daryanto. (2010). *Media Pembelajaran*. Yogyakarta: Gava Media.

[10] De Zeeuw, A., Craig, T., & You, H. S. (2013). Assessing Conceptual Understanding in Mathematics. *Proceedings - Frontiers in Education Conference*, FIE, (October 2013), 742–744. https://doi.org/10.1109/FIE.2013.6685135

[11] Deliyannis, I. (2012). *Interactive Multimedia*. Rijeka: InTech. https://doi.org/10.4018/irmj.1993100101

[12] Dimerman, S. (2011). *Character is The Key: How to Unlock The Best in Our Children and Ourselves*. Canada: Freemont Blvd.

[13] Direktorat Jenderal Pendidikan dan Menengah. (2017). *Materi Umum Literasi dalam Pembelajaran*. Jakarta: Kementerian Pendidikan dan Kebudayaan.

[14] Fettig, A., Schultz, T. R., & Ostrosky, M. M. (2016). Storybooks and Beyond: Teaching Problem-Solving Skills in Early Childhood Classrooms. *Young Exceptional Children*, 19(3), 18–31. https://doi.org/10.1177/1096250615576803

[15] Fink, S. B. (2017). *Teacher, Parent, and Administrator Perceptions of Social Responsibility at The Elementary School Level*. Illinois: Northern Illinois University. https://doi.org/10.1017/CBO9781107415324.004

[16] Gagne, R. M., Briggs, L. J., & Wager, W. W. (1992). *Principles of Instructional Design (4th ed.)*. New York: Holt, Rinehart, and Winston. https://doi.org/10.1002/pfi.4140391011

[17] Gallenstein, N. L. (2009). Engaging Young Children in Science and Mathematics. *Journal of Elementary Science Education*. https://doi.org/10.1007/bf03174679

[18] Heinich, R., Molenda, M., Russell, J. D., & Smaldino, S. E. (2002). *Instructional Media and Technologies for Learning* (7th ed.). New Jersey: Prentice-Hall.

[19] Holzer, A., & Ondrus, J. (2011). *Mobile app development: Native or web? Tematics and Informatics*, 23(1), 22–31. Retrieved from

http://www.janondrus.com/wp-content/uploads/2008/05/WEB2012.pdf

[20] Hopkins, D. (2005). *The Practice And Theory of School Improvement International Handbook of Educational Change*. Netherlands: Springer.

[21] Hyun, J., Ediger, R., & Lee, D. (2017). Students' Satisfaction on Their Learning Process in Active Learning and Traditional Classrooms. *International Journal of Teaching and Learning in Higher Education*, 29(1), 108–118.

[22] Kereluik, K., Mishra, P., Fahnoe, C., & Terry, L. (2013). What Knowledge is of Most Worth: Teacher Knowledge for 21st-Century Learning. *Journal of Digital Learning in Teacher Education*, 29(4), 127–140. https://doi.org/10.1080/21532974.2013.10784716

[23] Kready, L. F. (2004). *A Study of Fairy Tales*. Boston: The Riverside Press.

[24] Leow, F.-T., & Neo, M. (2014). Interactive Multimedia Learning: Innovating Classroom Education in a Malaysian University. *The Turkish Online Journal of Educational Technology*, 13(2), 99–110.

[25] Mansyur, Rasyid, H., & Suratno. (2015). *Asesmen Pembelajaran di Sekolah Dasar: Panduan bagi Guru dan Calon Guru*. Yogyakarta: Pustaka Pelajar.

[26] Mayer, R. E. (2009). Multimedia learning (2nd ed.). New York: Cambridge University Press.

[27] Mccann, S. (2015). Higher Order M-Learning : Critical Thinking in Mobile Learning. *ModSim World 2015*, (028), 1–11.

[28] Mitchell, D. (2002). *Children's Literature: An Invitation to The World*. Boston: Allyn and Bacon.

[29] Mosher, J. (2011). Children's Literature and Character Development. *Journal The Fourth and Fifth Rs Respect and Responsibility*, *8(1)*.

[30] Nurgiyantoro, B. (2013). *Sastra Anak: Pengantar Pemahaman Dunia Anak. Yogyakarta*: UGM Press.

[31] Ozsezer, M. S. B., & Canbazoglu, H. B. (2018). Picture in Children's Storybooks : Children's Perspective. *International Journal of Educational Methodology*, *4(4), 103–115*. https://doi.org/10.12973/ijem.4.4.205

[32] Santrock, J. W. (2018). *Educational Psychology: Theory and Application to Fitness and Performance (6th ed.)*. New York: McGraw-Hill Education.

[33] Scarratt, E., & Davison, J. (2012). *The Media Teacher's Handbook (1st ed.)*. Oxon: Routledge.

[34] Smaldino, S. E., Lowther, D. L., Mims, C., & Russell, J. D. (2019). *Instructional Media and Technology for Learning (12th ed.)*. New York: Pearson Education, Inc. All. https://doi.org/10.1016/J.ARABJC.2011.11.008

[35] Sugiyono. (2016). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.

[36] Tim Puslitjaknov. (2008). *Metode Penelitian Pengembangan*. Jakarta: Pusat Penelitian Kebijakan dan Inovasi Pendidikan Badan Penelitian dan Pengembangan Departemen Pendidikan Nasional.

[37] Trilling, B., & Fadel, C. (2009). *21st-Century Skills – Learning for Life in Our Times*. San Francisco: Jossey-Bass.

[38] Udell, C., & Woodill, G. (2015). *Mastering Mobile Learning: Tips and Techniques for Success*. New Jersey: John Wiley & Sons, Inc.

[39] Uzunboylu, H., Cavus, N., & Ercag, E. (2009). Using Mobile Learning to Increase Environmental Awareness. *Computers and Education*, 52(2), 381–389. https://doi.org/10.1016/j.compedu.2008.09.008

[40] Winch, G., Ljungdahl, L., Holliday, M., March, P., & Johnston, R. R. (2006). *Literacy Reading Writing and Children's Literature*. New York: Oxford University Press.

[41] Yontar, A., & Yel, S. (2018). The Relationship Between Empathy and Responsibility Levels of 5th-Grade Students: A Sample From Turkey. *International Journal of Education and Literacy Studies, 6(4), 76.* https://doi.org/10.7575/aiac.ijels.v.6n.4p.76

[42] Zhang, Y. A. (2015). *Handbook of Mobile Teaching and Learning*. Berlin: Springer. https://doi.org/10.1007/978-3-642-54146-9

[43] Zheng, R., & Zhou, B. (2006). Recency Effect on Problem-Solving in Interactive Multimedia Learning. *Educational Technology and Society*, 9(2), 107–118.

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VIRTUAL LABORATORY BASED GAME LEARNING: HOW TO DEVELOP THE GAME FOR SCIENCE LEARNING?

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Abstract

Trends for perspective teaching and learning are changing resulting from the technologies of the fourth industrial revolution (4IR) and the pandemic era. The technologies take an impact on two of the most important subjects for students in today's schools that are technological and digital literacy. Because it leads to changes in the education landscape including learning media and teaching methods, teachers require sustained effort at improving the quality of education as a core priority. To support secondary school students for better understanding science, building mobile learning incorporating with virtual laboratory becomes our focused research. Unfortunately, constructing such mobile learning is being a heavy burden for a teacher. However, mobile learning incorporating virtual laboratory is still limited in number whereas this initiative could be one of the best learning media as an embodiment of the digital age. In addressing these goals, the research aimed to develop game-based learning incorporating virtual laboratory as a learning media on electrical conductivity for secondary school. The research model is procedural research that described the procedure of product development and adapted the ADDIE model. This research involved two experts (subject materials experts and media experts) to assess product quality and to provide suggestions for product improvement. The research instruments used product quality questionnaires and suggestion sheets. The result showed that the product has been successfully developed and has a good quality according to the experts' judgment. So, the product can be implemented in further research and can be used as a science learning media in secondary school.

Keywords: game-based learning, electrical conductivity, virtual laboratory, 4IR.

INTRODUCTION

Technological headways in the fourth industrial revolution (4IR) have affected the development in various fields including education. Technology becomes meaningful when it has a contribution to enhancing education [1]. Trends for perspective teaching and learning are changed resulting from the technologies. Utilizing technology in education has an important role in improving teaching and learning activities [2][3]. It supports the teacher in explaining learning materials and for evaluating the learning process efficiently and effectively. Moreover, it helps the student to understand the learning content.

Utilizing technology in the learning process called e-learning or electronic learning. It is learning material delivery through various electronic devices [4]. It means that electronic media such as the internet, computer, video/audiotape, CD room can be used to support the learning process. E-learning has a broader meaning than mobile learning. Mobile learning is the use of an installed application on a mobile device to gain, to communicate, and to share information or knowledge in learning activity [5]. With mobile learning, students can access learning materials everywhere and every time. The difference between e-learning and mobile learning lies in the device used. Mobile learning uses a portable mobile device that can be used everywhere and every time. It uses a mobile device connected with the internet, such as a notebook, smartphone, and tablet [3].

Amid the covid-19 pandemic era, learning activities in schools, colleges and universities have been suspended without any clear indicators for 2020/2021 [6] [7]. It is done to prevent the spread of covid-19 in schools. So, e-learning resources, virtual teaching, and simulated labs work based on the online learning approach could be the best alternative ways for learning from home as a result of the rapid progress in information and communication technologies.

In science education, especially in secondary schools, virtual teaching is applied to conduct online learning using zoom or google meet the application. Using these applications, teachers can interact with students directly. But, using these applications is not sufficient for science learning because it cannot provide adequate skills and knowledge concerning experiments or data analysis [6]. It caused by, conducting experiments that are a vital part of science that students can gain meaningful knowledge and skills [7]. So, mobile learning is applied to facilitate students' online investigation and online simulations by using video and virtual labs; to exercise students' achievement and personal relevance, and to enhance students' participation in the learning process [8]. Therefore, the application of mobile learning in science education can be carried out by applying virtual labs and game applications in the learning process. Using game-based

learning and virtual labs in science education are considered to be an enjoyable learning environment and a powerful instructional approach [2][9].

Virtual labs are web-based platform designs to enhance the learning approach by presenting a secure and interactive laboratory environment for students [2]. It is a virtual environment that simulates the real laboratory and sets on-screen to perform experiments subjectively [10]. By applying virtual labs in the learning process, students can experiment without a real laboratory and can connect between practical skills and theoretical aspects without papers and pens [11]. The laboratory environment in the virtual labs can be defined as a playground for experimentation setting tools that can be used to control relevant objects to a specific domain (such as chemicals in a chemistry lab) [12]. It visualized using a real-time animation technique, so the students can receive instant feedback, repeat the experimental activities, and draw a conclusion from the data [7][10]. The implementation of virtual labs in the learning process has a significant influence on students' learning process and leads them to higher quality learning. [13]Using virtual labs, students can do practicum anytime and anywhere without worrying about materials and tools. Therefore, virtual labs are one of the low-cost alternatives solutions to experiment with the covid-19 pandemic.

Besides virtual labs, game-based learning can be used to support the online learning process in science. It is the development and the application of the game for educational goals [14]. In game-based learning, the content materials are designed into the game to set learning environment scenarios and the learning evaluation uses 3D game development tools related to the content materials level [9]. The game is developed by illustrating the daily phenomena related to the science content. By applying game-based learning in the learning process, students can enhance higher-order thinking skills such as critical thinking skills, problem-solving skills, and learning motivation when facing the challenges provided by the enjoyable game [1][9][14].

Developing virtual labs and game-based learning must be appropriated with content materials and incorporated with media aspects including interaction design and visualization such as design and production of texts, images, 3D environment and interactivity, and animation [12]. Therefore, the development of a virtual lab integrated with game-based learning (virtual-game based learning) must be planned properly. Virtual-game-based learning is consists of a virtual lab to conduct experimentation virtually and game-based learning to present the science content and to test students' knowledge understanding. So, by applying virtual-game based learning, students can enhance their practical skills, higher-order thinking skills, motivation, and self-regulated.

On the contrary, developing such mobile learning is being a heavy challenge for the teacher who has many administration tasks. However, mobile learning incorporating virtual laboratory is still limited in number whereas this initiative could be one of the best learning media as an embodiment of the digital age and distance learning. In addressing these goals, the research aimed to develop game-based learning incorporating virtual laboratory as a learning media on electrical conductivity for secondary school.

METHOD

The research model is procedural research that describes the procedure of product development. ADDIE model was adapted to develop the product that consists of three steps of the ADDIE model i.e. analysis, design, and development. In this research, we focused on developing the product and validating the product according to experts' judgment whereas the implementation and evaluation will be discussed in the next research. The validating process of the product involved one subject material expert and one media expert.

The instruments of the research are a product quality questionnaire and suggestion sheet for subject material expert and media expert. The product quality questionnaire is used to validate and to evaluate product quality based on material and media aspects. It is composed based on the result of a literature study about quality learning media indicators and experts' judgment. There are two types of product quality instruments, i.e. subject materials aspect questionnaire and media aspect questionnaire. The subject material aspect questionnaire consisted of 14 statements which are described from two aspects namely the learning aspect and subject materials aspect. The media aspect questionnaire is composed of 16 statements which are explained from two aspects namely the audio-visual aspect and soft engineering aspect. Besides, to assess product quality, experts are provided suggestions for completing the final product.

The research data consisted of two types of data, such as the product development process data and product quality data. The product development process data are descriptive data according to product development steps while the product quality data are data category which is then converted into a score using a Likert scale. The data is tabulated in the form of a score, then the average score of the validating results are calculated. Determining quality criteria for the product can be seen in Table 1.

Table 1. Ideal Assessment Criteria

No	Range of Score (i)	Category
1	$X_i + 1{,}8SB_i < \overline{X}$	Very Good
2	$X_i + 0{,}6SB_i < \overline{X} \leq X_i + 1{,}8SB_i$	Good
3	$X_i - 0{,}6SB_i < \overline{X} \leq X_i + 0{,}6SB_i$	Adequate
4	$X_i - 1{,}8SB_i < \overline{X} \leq X_i - 0{,}6SB_i$	Poor
5	$\overline{X} \leq X_i - 1{,}8SB_i$	Very Poor

RESULT AND DISCUSSION

Product Development Process Data

The research started from analysis steps for performing need analysis to prepare the development of the product. The researcher conducted interviews with the science teachers to discover learning problems in secondary school especially on electrical conductivity subjects. The result of the teacher interviewed showed that because of the pandemic, the learning process is conducted online learning. So, the selection of learning media must be appropriate with the characteristic of the subject. Particularly in the electrical conductivity subject, the learning process not only explaining the theoretical knowledge but also doing the experiment. However, if the learning process is conducted online learning, the student could not conduct experimentation.

To solve the problem, the researcher offered suggestions to the teacher to use game-based learning as learning media for assisting the students in the learning process and to use a virtual laboratory for conducting experimentation virtually. Besides, the research conducted to develop learning media consisted of game-based learning incorporated with virtual laboratory.

After the need analysis steps are completed, the product design is conducted. The product design was the storyboard of the game and the design of the virtual laboratory. The storyboard consisted of the overview story of the game (game figures, mission in each level, and feedback) and electrical conductivity content included in the game. The design of the virtual laboratory consisted of the electrical conductivity of solution experimentation overviews like the aim, materials and tools, procedures, and results.

Having finished the product design, then it is realized into a game and virtual laboratory. The game is developed using Adobe Animate CC 2017 software. The product was not only game-based learning but also it was a combination of games and virtual laboratory. Thus, the user will be asked to conduct experimentation at one of the game levels. In every level of the game, the user will be given a mission related to daily phenomena about electricity. In the first level, the user is asked to rescue the citizens from the lightning strike. In the next level, the user is asked to save the citizens from floods before the lightning strike occurs. The product is named Amazing Science. This product has been revised four times according to experts' suggestions.

Figure 1. Hompage Screen and Information Screen of The Product

As seen in Figure 1, the homepage screen consisted of six buttons namely start, subject content, virtual laboratory, evaluation, information, and exit. When the user pressed the button, he or she will enter the introduction story. The subject, vlab, and evaluation button were still locked. These buttons will be unlocked when the user finished the mission of each level. The subject button will be unlocked when the user finished the first level mission. Moreover, the vlab button will be unlocked when the user completed the second level mission. Furthermore, the evaluation button will be unlocked when the user entered the third level mission. When the user pressed the information button, he or she will go to the information screen of the game. It consisted of the developer team and the explanation of the mission of each level.

When the user pressed the start button, he or she will go into the introduction story. The story told about the character who entered the mysterious book to enjoy the real experience. After finished reading the introduction story, the user will go to the first level mission. In the first level, the user is given the mission to save the citizens of Galvanic village from the lightning strike. The user must avoid the lighting to save the citizens, then all of them are taken to the hospital. Having completed the first level mission, the user would receive the reward. It is a chance to access electrical conductivity content materials. The content consisted of static electricity, dynamic electricity, electrical conductivity, and advanced material about electrical conductivity (electrochemistry). In these steps, we did three times revision to revise the content materials like adding detailed content of electricity, adding

animation and video to provide more information about the content, and refining the language for easy understanding by the user. After the user has finished learning about these subjects, they continued to the next level. The first level display can be seen in Figure 2.

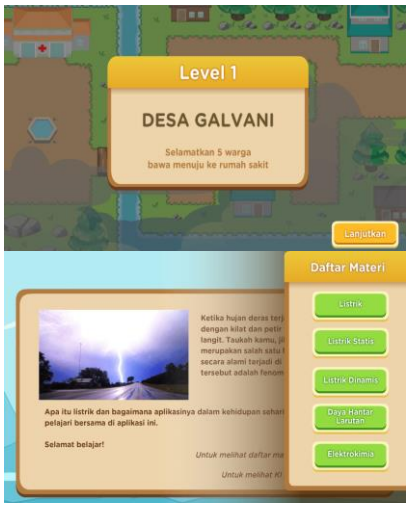

Figure 2. The First Level Screen

In the second level, students are provided the mission to save the citizen of Volta city from the flood. The citizen must be moved to a higher building before hit by a lightning strike. After finishing the mission, the user would receive the reward to play the virtual laboratory. This level is the main part of our product because students can do the practicum as if they were in the laboratory. We focused a lot on constructing the storyboard of the virtual laboratory. In this step, we did many revisions than other parts. In the beginning, we determined that students should examine 12 solutions, but after the researchers' meeting and the experts' advice, we revised that only 6 solutions are tested the electrical conductivity. The students can choose freely the solutions. We chose the solutions that are easily found in everyday life so that the students do not confused. At first, the instruction of the virtual laboratory did not clear. There was no instruction to click the button which can make the user confused. So we revised the virtual laboratory instructional to the detail. We added an explanation to describe the function of each button. Figure 3 illustrates the screen of the virtual laboratory.

In the third level, the user is given a mission to answer the question as an evaluation process of the study. The evaluation process is designed like a game, where the user must find the question. Fifteen questions are hidden in the pandora box. If the user can give a correct response, he or she will get the diamond. However, if the user gives an incorrect response, he or she will get the broken diamond. Thus, the number of diamonds that students earned shows the correct answer. Otherwise, the number of broken diamonds shows the users' incorrect answers. After the user completed the mission, the character will return to his or her world. The story ended with the character getting the best score on the assignment. Illustrated scenes of the third level were presented in Figure 4.

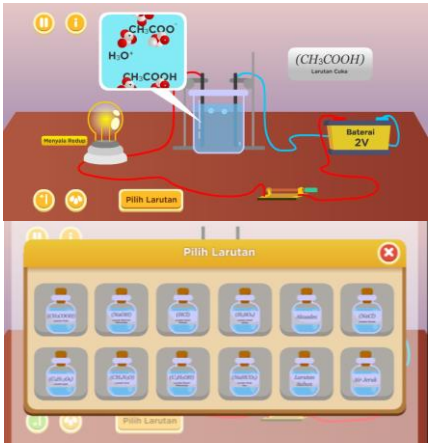

Figure 3. The Virtual Laboratory Screen

Figure 4. The Evaluation in Third Level Screen

Product Quality Data

After the initial product is completed, it will be validated by the experts (subject expert and media expert). Besides, the experts also give suggestions for revising the product. The subject expert validated the product based on the learning aspect and subject material aspect. The learning aspect includes the suitability of materials presented on the product with the learning objectives and learning indicators. The subject material aspect covers the correctness of concepts, coherent concepts, and good unambiguous language. Furthermore, the media expert assessed the product based on the audiovisual aspect and software engineering. The audiovisual aspect covers layout proportion (texts, figures, and animations), the proportion of color selections, the selection of sound effects, the suitable animation and figure with the content, and the

smooth animation movement. The software engineering consisted of easy media operation, creativity, and innovation of developing media, operating system compatibility with the program, and developing media opportunities for science and technology developments. The initial product validated results by the experts are given in Table 2.

As seen in Table 2, The initial product has a good quality based on the subject and media aspect. The learning aspect and the subject material aspect has a good quality according to subject expert judgment. It can be inferred that material content presented in the product is appropriate with learning objectives and learning indicators. Moreover, the content presented in learning media is coherently and correctly.

Table 2. The Initial Product Validated Results by The Experts

No	Expert	Aspects	Score	Quality
1	Subject expert	Learning	21	Good
		Subject materials	36	Good
2	Media expert	Audiovisual	47	Good
		Software engineering	22	Good

The audiovisual and software engineering aspect have a good quality according to media expert judgment. The product can be installed and run in the existing variety of smartphones. It can be operated smoothly and ease to usage. Furthermore, the visualization of the game is clear and presentable. Because these aspects have been fulfilled, the game can be stated that it has good quality as learning media

If we focused on virtual laboratory on this game, it can help the students to perform practicum virtually. It can be an alternative choice to do lab work in the pandemic era. Even though students studied online, they can still do the practicum. Furthermore, it can be combined with hands-on experiments. The combination of virtual laboratory and hands-on experiments can enhance the conceptual understanding of scientific phenomena and provided better conceptual understanding than using hands-on experimentation only [12]. Using the virtual lab in the learning process is not only helps the students to understand science process skills but also train the students to apply their knowledge to practice [15].

CONCLUSION

Based on the result, we can conclude that the virtual lab incorporated with mobile game-based learning product has been successfully developed and have a good quality according to the experts' judgment. So, the product can be implemented in further research and can be used as a science learning media in secondary school.

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REFERENCES

[1] Sanchez, J., Salinas, A., & Saenz, M. (2007). Mobile Game-Based Methodology for Science Learning. In J. Jacko, *Human-computer interaction, part iv* (pp. 322-331). Berlin: Springer.

[2] Aljuhani, K., Sonbul, M., Althabiti, M., & Meccawy, M. (2018). Creating a virtual science lab (VSL): the adoption of virtual labs in saudi schools. *Smart Learning Environments, 5*(16), 1-13.

[3] Cheng, Y. M., Kuo, S. H., & Cheng, E. L. (2014). Mobile learning achievement from the perspective of self-efficacy: a case study of basic computer concepts course. In J. S. Pan, *Intelligent Data Analysis and Its Applications, Volume 1* (p. 403). Swisterzerland: Springer.

[4] Riyana, C. (2018). Developing mobile learning management system (MLMS) based on android for curriculum literacy. *Edu lib, 8*(2), 222-239.

[5] Elkhateeb, M., Shehab, A., & El-bakry, H. (2019). Mobile learning system for egyptian higher education using agile-based approach. *Education Research International*, 1-13.

[6] Ray, S., & Srivastava, S. (2020). Virtualization of science education: a lesson from the COVID-19 pandemic. *Journal of Proteins and Proteomics, 11*, 77-99.

[7] Vasiliadou, R. (2020). Virtual laboratories during coronavirus (COVID-19) pandemic. *Biochem Mol Biol Educ, 48*, 482-483.

[8] Nikolopoulou, K., & Kousloglou, M. (2019). MobilelLearning in science: a study in secondary education in greece. *Creative Education, 10*, 1271-1284.

[9] Cheng, C. H., & Su, C. H. (2011). A Game-based learning system for improving student's learning effectiveness in system analysis course. *Procedia - Social and Behavioral Sciences* (pp. 669-675). Amsterdam: Elsevier.

[10] Pramono, S. E., Prajanti, S. W., & Wibawanto, W. (2019). Virtual laboratory for elementary students. *Journal of Physics: Conference Series* (pp. 1-6). Padang: IOP Publishing.

[11] Babateen, H. M. (2011). The role of virtual laboratories in science education. *IPCSIT* (pp. 100-104). Singapore: Lacsit Press.
[12] Wastberg, B. S., Eriksson, T., Karlsson, G., Sunnerstam, M., Axelsson, M., & Billger, M. (2019). Design considerations for virtual laboratories: A comparative study of two virtual laboratories for learning about gas solubility and colour appearance. *Education and Information Technologies, 24*, 2059-2080.
[13] Ostroukh, A. V., & Nikolaev, A. B. (2013). Development of virtual laboratory experiments in iLabs. *iJOE, 9*(6), 45-47.
[14] Hung, C. M., Huang, I., & Hwang, G. J. (2014). Effects of digital game-based learning on students' self-efficacy, motivation, anxiety, and achievements in learning mathematics. *J. Comput. Educ., 1*(2-3), 151-166.
[15] Liu, D., Valdiviezo-Díaz, P., Riofrio, G., Sun, Y. M., & Barba, R. (2015). Integration of virtual labs intosScience e-learning. *Procedia Computer Science* (pp. 95-102). Mexico City: Elsevier.

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DISTRIBUTION OF ATTRIBUTIVE ELEMENTS OF NOUN PHRASE IN INDONESIAN

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Abstract

The structure of Indonesian narrative discourse has complex elements, namely words, phrases, clauses and sentences. In a phrase there is attributive functioning as an explanatory constituent that describes a noun in a noun phrase, a verbal phrase, an adjective phrase or another class of words that has an explaining function. The attribute location can be to the left of the core, to the right of the core or to the side of the core. Based on this, research on the distribution of attributive elements of noun phrases in Indonesian is important because it is based on the reasons for knowing the distribution of attributive elements for each phrase, especially noun phrases. This research used a qualitative approach. The data were written text of Indonesian discourse obtained through recording techniques. Data were analyzed using a distributional study. The data analysis procedure was carried out through four stages of activity, namely (1) data collection, (2) data reduction, (3) data presentation, and (4) concluding research findings and verification. Attributive distributions of noun phrases include: attributive nouns to the right (post attributive nouns) and attributive nouns left (pre attributive nouns). The attributive distribution of nouns to the right (post attributive nouns) has the following elements: a) noun + noun (N1 + N2), b) noun + adjective (N + A), and c) noun + verb (N + V). The attributive distribution of nouns to the left (pre attributive nouns) has the following elements: a) numeral + noun (Num + N) and b) article + noun. These findings are expected to be useful for the formation of appropriate phrases to coherent and coherent narrative discourse.

Key words: attributives, phrases, nouns, post-noun attributives, pre-noun attributives

INTRODUCTION

Language as a phenomenon that combines sound and meaning is not sufficiently described and described based on the lexicon, grammar and phonology subsystems, but the description of language is also based on syntactic and pragmatic principles. The grammatical approach, especially syntax, is not only recognized by the closeness of the grammatical subsystem to the lexicon subsystem but is based on the grammatical structure, namely: structure, categories, and functions. In Indonesian there are four main syntactic categories, namely: (1) verbs, (2) nouns, (3) adjectives, and (4) adverbs. Nouns, verbs, adverbs, and adjectives are often developed with the addition of certain delimiters. The existence of certain delimiters on each word or phrase in a sentence has the function of relating to other words or phrases in the sentence. The function is syntactic meaning that it relates to the order of words or phrases in a sentence. The main syntactic functions in language are predicate, subject, object, complement and description. In addition, there are other functions such as attributive (explaining), coordinative (which combine equally), subordinate (which combine in stages).

Attributive is unique because as an attributive modifier has an important role in phrases. Judging from its position, it can be attached to the left (preceding) and sticking to the right (ending) and even both can be used to flank the core if it functions as a comparison (Sulistyowati, 2013: 9). Phrases are generally defined as a combination of two or more words which are not predicative (Kridalaksana, 2008: 66) and in sentences fill syntactic functions. Discourse is the highest grammatical unit above phrases, clauses, and sentences. Narrative discourse is a type of discourse that contains stories, be it folk tales, fairy tales, fables or legends. Previous research on narrative discourse has been viewed from a literary aspect, but in this study, narrative discourse will be viewed from a linguistic aspect. This is based on the fact that there are still many mistakes in writing phrases, be it noun phrases, verbs and adjectives. The results of research by Alber (2018) state that there are still many errors in writing phrases in the editorial plan of the Kompas newspaper. In addition, Sapanti (2019) states that the error in writing the structure

of phrases in Indonesian language essays for students who come from China (the language mastered in Mandarin) is due to a misunderstanding of the level of phrases, namely nouns and verbal. The distribution of the attributive elements of the phrase has a big role in determining the use of the phrase. The results of Karyaningsih's research (2018) state that attributive endocentric noun phrases with adjectives are one of the types of productive phrases in Russian and Indonesian. However, in the phrases of these two languages there are differences due to different grammar systems. This can be a problem when the two languages are used simultaneously, such as in translation. This research is a form of contrastive analysis of Russian and Indonesian. The results of this study are to minimize the constraints of using phrases when the two languages are used, namely Russian and Indonesian.

Based on previous studies, this study aims to describe the distribution of attributive elements of noun phrases in Indonesian. By knowing the distribution of attributive elements, it can be seen the distribution of attributes that precede the core structure or follow the core. The distribution of the attributive elements in each phrase has various structures. Based on the distribution of elements, it is found that there is a distribution to the right (post attribute) and a distribution to the left (pre attributive). The results of the distribution analysis of attributive elements can be in the form of various structures that are characteristic of each phrase. It is hoped that these findings can contribute ideas in determining attributive phrases, especially noun phrases and generally all types of phrases to form grammatical sentences.

METHOD

This research used a qualitative approach as stated by Bogdan and Biklen (1982: 2) that qualitative research as an umbrella has certain characteristics. The data source were folklore discourse in Jombang district in the form of phrases used in the context of narrative discourse. The data were utterences indicating attributive structures used in every folklore discourse in the form of distribution construction of noun phrases. The data collected by recording, transcribing, reducting, codificating, and verifying. Data were analyzed using a distributional study. The data analysis procedure was carried out through four stages of activity, namely (1) data collection, (2) data reduction, (3) data presentation, and (4) summarizing research findings and verification.

RESULTS AND DISCUSSION

Table 1. Distribution of Attributive Elements of Indonesian Noun Phrases

Distribution	Elements	Data
The connector to the right	Noun +noun	Kaki kerbau
The connector to the right	Noun+noun	Pohon jarak
The connector to the right	Noun +adjective	Badannya lepek
The connector to the right	Noun+adjective	Pengantin baru
The connector to the right	Noun +verb	Orang kepercayaan
The connector to the right	Noun +verb	Cincin kawin
The connector to the left	Numeral+noun	Seorang anak
The connector to the left	Numeral+noun	Beberapa rumah
The connector to the left	article +noun	Si perempuan
The connector to the left	article +noun	Sang laki-laki

Distribution of Indonesian Noun Phrases' Attributive

The noun phrase is an arrangement of two or more words that has a Head element in the form of a noun and an attribute in the form of attributes. Categorically noun phrases in Indonesian have distribution / expansion of nouns as the post-modifier position, as the pre modifier position, and both.

Attributive distribution of noun phrases is the distribution of noun attributes in various structures. By knowing the distribution of noun phrases, it can be seen that there was an expansion of each element. The distribution of nouns with extended elements can be described as follows.

Attributive nouns to the post modifier position (post attribute nouns)

The distribution of noun attributes to the post modifier position means that noun phrases (NP) consist of nouns as the Head followed by other nouns as attributes. Nouns that have expanded to the post modifier position have the following elements.

Noun + Noun (N1 + N2)

The noun phrase with the distribution to the post modifier position means that it consists of two noun elements, namely noun 1 (N1) which functions as the Head and noun 2 (N2) which functions as attributes showing all the elements forming phrases in the form of words or noun phrases. This can be seen in the following data:

(1) Dan untuk kelengkapan ilmu Liring Kuning harus melakukan puasa yang ditutup dengan Telasan Pati Geni. Pada pagi harinya menjelang subuh Liring kuning keluar berjalan-jalan karena mengantuk secara tidak sengaja telah menginjak jejak *kaki kerbau* dan akhirnya terjatuh.(CRA 3.8)

(2) Tanpa menunggu lebih lama lagi, Ki Gedong segera memrintahkan warganya untuk segera menanam *pohon jarak* di

sepanjang batas-batas desa temasuk wilayah yang baru saja dibabat.(CRA 6.25d)

Based on the elbow arrow connector to the right in datum (1) and (2), it can be explained that the distribution of nouns with post modifier position. In examples (1) and (2) there is a distribution of noun phrases to the post modifier position of a noun with the order N1 (Head) + N2 (attribute). The noun occurred at the beginning of the sequence is the Head followed by another noun (N2) which functions as an attribute of the previous noun. In the data (1) phrase *kaki kerbau* showed a distribution of nouns to the post modifier position of the Head noun. Likewise in data (2) the distribution of J *pohon jarak* is composed of N1 + N2 with the distribution to the post modifier position. Thus, it proves the distribution of nouns to the post modifier position of the Head noun. A noun that functions as a Head has not been limited by other nouns as an attribute indicating that identity is still indefinite.

Nominal + Adjective

The noun phrase has a Head element with an adjective attribute. The adjectives in noun phrases have the structure N + Adjective which generally functions to modify nouns. The distribution of nouns with this adjective attribute is like the following data:

(3) Sumini yang merasa badannya sudah sangat lelah dan merasakan bahwa *badannya lepek* dan

berbau karena mandi keringat, melihat air sendang yang bening dan menggiurkan, terdorong niatnya untuk mandi dan membersihkan diri di sendang tersebut. (CRA 5.8)

(4) Karena Ki Jaga Karya memang mulai menyinggung-nyinggung bahwa *pengantin baru* tidak boleh meninggalkan rumah dalam hitungan lima hari (CRA 5.12)

Based on the elbow arrow connector to the right in examples (3) and (4), it can be explained that the distribution of the noun phrases to the post modifier position is composed of N (Head) + Adjective (attribute) in the sense that the noun occurred at the beginning of the sequence is the Head followed by the adjective that functions as an attribute of the previous noun.

Noun + Verb (N + V)

Noun phrases have Head elements with verb attributes. Attributes as constituents on the noun phrase structured N + Verb which generally functions to modify nouns. The distribution of nouns with this verb attribute is like the following data:

(5) Rombongan ini terdiri dari sepasang pengantin itu sendiri dan beberapa pelayan serta pengawal yang berjumlah kurang lebih 40 orang yang dipimpin oleh
orang kepercayaan orang tua Rara Sumini,bernama Ki Jaga Karya.(CRA 5.6)

(6) Dengan tidak diakui bahwa ayam itu bukan miliknya buaya putih berwujud manusia itu menyembelih ayam tersebut memasak dan menghidangkan setelah jam 12 tepat, sang laki-laki menyantap makanan dengan lahap hingga ia memakan kaki ayam itu lalu ia melihat ada *cincin kawin* di kaki ayam tersebut.

Based on the elbow arrow connector to the right existed in examples (5) and (6), it can be explained that the phrase *orang kepercayaan* and *cincin kawin* with the distribution of noun phrases to post modifier position is composed of N (Head) + verb (attribute) in the sense that the noun that is located at the beginning of the sequence is the Head followed verbs that function as attributes of previous nouns. Therefore, it proves the distribution of nouns to the post modifier position of the Head nouns. A noun that functions as a Head has not been limited by other nouns as an attribute indicating that identity is still indefinite.

Attributive Nouns to the pre modifier position (pre attributive nouns)

The distribution of nouns to the pre modifier position means that the distribution of noun phrases consists of nouns as Head preceded by attributes as constituents. Distributed nouns have expanded to the pre modifier position which has the following elements:

Numeral + Noun

The distribution of nouns to the pre modifier position is indicated by the existence of a barrier which is an attribute of the noun phrase in the form of numeral. This is seen in the following example:

(7) Di sanalah lahir *seorang anak* perempuan yang diberi nama Wandan Manguri.(CRA 3.1)

(8) Dahulu kala desa Jarak Kulon masih terdiri dari *beberapa rumah* saja dan belum memiliki nama yang pas, tidak seperti sekarang yang relatif padat dan terdiri dari *tiga dusun,* yakni dusun Jarak, dusun Dongeng, dan dusun Santren.(CRA 6.1a)

Based on the elbow arrow connector to the left existed in the data (7) and (8), it can be explained that the distribution of the noun phrases to the pre modifier position is composed of N2 (attribute) + N1 (Head) in the sense that the noun occurred at the end of the sequence is the Head preceded by the noun (N2) which functions as an attribute of the previous noun. In this case the attribute in the noun phrase is numeral. In the phrase *seorang anak*, *beberapa rumah* , are phrases that are distributed to the left with various numerals, namely *seseorang*, *beberapa*. Thus, it proves the numerical distribution to the left of the Head noun.

Basically in Indonesian there are two kinds of numeral, namely: (1) main numeral and (2) level numeral. Principal numeral refers to the principal number while the level numeral is behind the noun. Indonesian has a group of words which divide nouns into certain categories. Thus, it is clear that in phrase (7) and (8) the Head is a noun with a fixed attribute distribution meaning the order cannot be changed, that is preceded by numerals and then classed.

The article + noun

The distribution of nouns to the left is indicated by the existence of a barrier which is an attribute of the noun phrase in the form of the article. The use of article functions to determine nouns and substantive words other than nouns. This is seen in the following data:

(9) Suatu ketika *si perempuan* ini sedang mandi di sungai brantas dekat desa itu.(CRA 4.2b)

(10) Sedang beberapa jam kemudian *sang laki-laki* (mas nganten) mencari pinggiran sungai setelah tidak akan menemukan kemudian mencari di rumah-rumah tangga hingga sampailah ke rumah buaya putih berwujud manusia menanyakan di mana keberadaan istrinya (CRA 4.6a)

Based on the data (9) and (10), it can be apparently explained that there are attributes in the form of articles. This is seen in the data phrases of *si perempuan* and *sang laki-laki*. Data (9) shows that the use of the article '*si'* is used as a personal pronoun for the names of people and animals. In contrast to the data (10) the use of the article '*sang*' is widely used in ancient literary times, although in reality there is still some use. Thus, it appears that the distribution of the word N + to the left with the noun structure on the right while the article as an attribute is occurred on the left.

CONCLUSIONS

Based on the results of the study it can be seen that there are two attributive distributions of noun phrases, namely: a) attributive nouns showed by the elbow arrow connector to the right (post attributive nouns) and b) attributive nouns showed by the elbow arrow connector to the left (pre attrib-

utive nouns). Attributive distribution of the right-side of a noun (post attributive noun) has the following elements: a) Noun + Noun (N1 + N2), b) Noun + Adjective (N + A), and c) noun + verb (N + V). The attributive distribution of nouns to the left-side noun (pre attributive nouns) has the following elements: a) numeral + noun (Noun + N) and b) article + noun.

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REFERENCES

[1] Alber. (2018). *Analisis Kesalahan Penggunaan Frasa pada Tajuk Rencana Surat Kabar Kompas. Jurnal Madah*, Vol.9. No. 1 Edisi April 2018: 55-62. https://madah.kemdikbud.go.id/index.php/madah/issue/view/15

[2] Brown, Kenneth dan J.Mile. (1996). *Syntax: A Linguistic Introduction to SentenceStructure*. London: Rouldge.

[3] Chamettzky, Robert.A. (2000). *Phrase Structure: From GB to Minimalism*. Malden: Massachusetts USA.

[4] Djajasudarma, T.Fatimah (1999). *Analisis Bahasa Sintaksis dan Semantik*. Bandung: Humaniora Utama Press.

[5] Dik, Simon C. (1980). *Studies in Functional Grammar*. New York: Academic Press.

[6] Genette, Gerard. (1972). *Narrative Discourse*. French: Cornell University.

[7] Givon,T. (2001). *Syntax* Volume 2. Amsterdam: Philadelphia

[8] Huddleston, Rodney.(1985). *Phrase Structure*. Cambridge: Cambridge University Press.

[9] Karyaningsih, Tri Yulianti. (2018). *Frasa Noun Endosentris Atributif Berpewatas Adjektiva dalam Bahasa Rusia dan Bahasa Indonesia: Aplikasi Analisis Kontrastif dalam penerjemahan*. Jurnal Linguistik Terapan. 2018. Jlt.polinema.org

[10] Kridalaksana, Harimurti.(1988). *Beberapa Prinsip Perpaduan Leksem dalam Bahasa Indonesia*. Yogyakarta: Kanisius.

[11] Kridalaksana, Harimurti.(1993) *Kelas Kata dalam Bahasa Indonesia*. Jakarta: PT Gramedia.

[12] _____. (2008). *Kamus linguistik*. Jakarta: PT Gramedia Pustaka Utama.

[13] Sapanti, Intan Rawit. (2019). Analisis Struktur Frasa pada Karangan Berbahasa Indonesia Pembelajar Tiongkok. Artikel Jurnal Indonesia Language Education and linterature. Vol. 4,No. 2 Juli 2019: 144-157. https://www.syekhnurjati.ac.id/jurnal/index.php/jeill/

[14] Sudaryanto. (1993). *Metode dan Aneka Teknik Analisis Bahasa*. Yogyakarta: Duta Wacana University Press.

[15] Sulistyowati, Heny. (2013). *Mengenal Struktur Atributif Frasa*. Malang: Madani.

[16] Suhardi. (2005). Verba Berpreposisi Dalam Bahasa Indonesia. *Jurnal Ilmiah bahasa, Sastra dan Pengajarannya* 12(2): 274-278

[17] Verhaar, J.M.W. (Ed.) (1978). *NUSA Linguistics Studies in Indonesian Volume 6. Part V*. Jakarta: Badan Penyelenggara Seri NUSA.

[18] Verhaar, J.M.W.1999. *Azas-Azas Linguistik Umum*. Yogyakarta: Gajah Mada University Press.

THE EFFECT OF USING REFLECTIVE MODUL ON ECOLITERACY FOR ELEMENTARY SCHOOL STUDENTS'

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Abstract

Ecoliteracy is a person's ability to understand and be aware of the surrounding environment concerning environmental sustainability. These literacy skills include analytical skills and problem-solving processes to students' knowledge and understanding of the concept of the ecological environment. This study aims to determine the effect of the reflective thinking process integrated into the child-friendly learning module on students' ecoliteracy abilities. This study used a quasi-experimental research method with a non-equivalent comparison group design. Data collection techniques used were interviews, observations, and tests involving 78 students. The credibility of the research data was tested based on the t-test while the data collected were analyzed inferentially. The results showed that the use of reflective module based child-friendly schools had a positive effect on students' ecoliteracy abilities. A reflective module based on child-friendly school facilities to explore students' ecoliteracy skills through various reflective activities in the form of stories and questions so that it can motivate students to learn and understand ecological concepts, analysis of environmental problems, and problem-solving. The t-test results show a significance value of 0.00 <0.005 so that H0 is rejected and states that the use of child-friendly schools based on the reflective module can affect students' ecoliteracy abilities.

Keywords: reflective module based child-friendly school, reflective module, child-friendly school, ecoliteracy, literacy, learning module, elementary school, reflective thinking, ecology. Indonesia Literacy Program.

INTRODUCTION

Literacy programs in Indonesia began to be implemented in 2015 following Permendikbud Number 23 of 2015 concerning Character Development. The existence of this literacy program is intended to improve one's skills in processing and analyzing information[1]. The 2018 PISA results reported on the www.kemdikud.go.id page on 4 December 2019 stated that the reading ability of Indonesian students reached an average score of 389 with an OECD average score of 489. This score still shows a low literacy score. in Indonesia. Especially with the high population and productive age in Indonesia, it explains that the country is currently experiencing a literacy crisis.

The school literacy program is implemented at every level of education in Indonesia, especially elementary schools. As carried out in the initial study at elementary schools in Tegalrejo District, Yogyakarta. SDN Bener, SDN Bangunrejo 1, SDN Tegalrejo 1, and SDN Petinggen said that they have carried out school literacy activities. Based on the observations it was found that these four schools were still focused on literacy. According to the 2015 World Economic Forum, it is stated that basic literacy consists of literacy, numeracy, scientific literacy, digital literacy, financial literacy, and cultural literacy for citizenship.

The focus of this research is on grade V SD students. By the material in the 2013 curriculum, class V has a lot of environmental themes. In the interview conducted by the teacher, the teacher stated that there was a desire that this literacy program would be the initial provision for students before entering the thematic learning process. So it is hoped that there will be continuity of material that is carried out during student literacy hours and thematic learning. In this regard, one type of literacy that can be linked is ecoliteracy. Ecoliteracy is a sub-part of scientific literacy that discusses one's awareness of the natural environment and living sustainably with nature[2][3].

As it is known that Indonesia has the nickname the emerald of the equator. The forest area of 128 million hectares (reported from www.lokadata.beritagar.id) has earned Indonesia the title as one of the world's lungs. This enormous wealth is regretted by the people's indifference to the natural environment. Based on the findings of a survey by the Ministry of Environment (KLH) in 2012, it was stated that 50% of Indonesia's population did not know the environment. It is stated that 61.4% of the people have not been able to innovate on the problems of the natural environment around them. Considering the importance of forests and the natural environment as a human habitation, it is necessary to increase literacy skills in this field.

The survey results are in line with findings in the field about the knowledge and care of students in schools regarding the natural environment. There were still students who littered in random places

and class conditions that were not neat. In the learning process students also show a lack of knowledge in analyzing natural environmental problems or providing solutions to these problems.

The teacher said in the interview that he had not specifically introduced ecoliteracy to students. Knowledge of the natural environment is given in learning materials and related to giving students awareness of the natural environment given through advice during the learning process. The observation process shows that the environment around the observation school (SDN Bener, SDN Petinggen, SDN Tegalrejo 1, SDN Bangunrejo 1) is close to natural features such as large rivers and rice fields. Seeing the condition of the school which is very close to these natural appearances, students must learn more and have more concern for the natural environment.

Students at SDN Bener mentioned in interviews that when it rains heavily, schools are often flooded because the river is located near the school. This has forced schools to suspend the learning process until conducive conditions return. Students at SDN Bangunrejo also explained that the school was a Disaster Prepared School (SSB). The location which is directly adjacent to a large river requires students to have knowledge and preparedness related to disasters that can occur around them.

Ways that can improve ecoliteracy skills in elementary schools, first understanding the concept of ecology. One needs to know a concept first before being able to analyze or solve a problem. Understanding the concept of ecoliteracy is very important so that later students have a lot of knowledge and insight so that they can apply it in everyday life[4]. Therefore, in this study analysis was carried out related to ecoliteracy ability which consisted of indicators a) having a basic knowledge of ecological principles, b) being able to analyze environmental problems, c) being able to provide solutions to environmental problems.

Facilities and infrastructure are needed to support increased ecoliteracy capability. Regarding this ability support, Mustadi et al. [5] stated that the use of reflective picture storybooks media was able to improve students' social literacy through the development of picture book media. Based on this study, further research conducted by Permata and Mustadi[6] explained that the development of products reflective module based child-friendly school is suitable for improving student literacy skills based on the results of the scale of responses from media experts, material experts, teachers, and students. Departing from this research reference, a study was conducted on the effect of using a reflective module based child-friendly school on students' ecoliteracy abilities.

Learning modules are teaching materials that are arranged systematically, adjusted to student development so that students can learn independently[7][8]. The learning module has characteristics that include self-instructional, independent, independent, adaptive, user friendly, consistency[9]. The characteristics of various learning modules indicate that the use of modules can make students more independent and serious in understanding the material. Also, reflective module product development is different from other modules in the integration of reflective thinking processes.

The reflective thinking process is synthesized as an in-depth thinking process that includes activities of analysis, evaluation, and problem solving[10][11]. Reflective thinking processes can develop higher-order thinking processes for students so that students become more insightful, have good analytical and problem-solving skills. Activities that can integrate the reflective thinking process in the learning module include reflective journals, daily journals, and self stories[12]. In product development for Permata and Mustadi[6], reflective activities are implemented in reflective story activities, reflective journals, observation activities, and self-stories.

A child-friendly basis is used in this study as a form of fulfilling children's rights in learning. The form of child-friendly learning modules in reflective module based child-friendly school refers to the principles of a) absence of pornography, radicalism, violence and racial violence, b) informative content for students related to ecoliteracy material, c) providing opportunities for students to participate through work activities in modules[13][14].

One of the child-friendly concepts is that children/students participate in the learning process. That way students will develop an active attitude in learning and motivate students to communicate, ask questions, and discuss with friends and teachers[15]. Active students will find it easier to understand material and will continue to try to dig up their knowledge.

The form of child-friendly learning modules is to adapt this learning media to student characteristics. Students at the age of class V have high objectivity towards the period of investigating, trying, and experimenting. They have a high curiosity. Grade V students will be happy with things related to physical activity and concrete objects[16]. To facilitate this, this reflective module based child-friendly school product presents the "Let's Observe, Let's Practice, I Want to Know and Let's Play" activity.

This reflective module based child-friendly school product has been subjected to feasibility tests based on material and media. Assessment of product feasibility is carried out by material experts, media experts, and then field trials are carried out on students and teachers. Based on the

results of material validation, a total score of 127 was obtained in the feasible category. Meanwhile, the media validation got a total score of 145 in the very feasible category. The results of limited field trials based on the results of the teacher's response questionnaire obtained a score of 19 in the very feasible category and a score of 13.14 in the very feasible category based on the results of the student response questionnaire. The product was continued at the main field trial stage with a teacher response questionnaire score of 20, the category was very feasible and the students gave a questionnaire score of 14.22, the category was very feasible. The results of the product testing became a reference in this study to determine the effect of reflective module based child-friendly school products on the ecoliteracy ability of grade V SD students in Tegalrejo Regency, Yogyakarta.

METHOD

This study used a quasi-experimental research method. The type of research design used was the nonequivalent comparison group design[17]. This type of research method involves the existence of an experimental class and a control class to determine the difference in the effect that occurs in classes that use child-friendly school-based reflective modules and those that do not on students' ecoliteracy abilities. The experimental class used a reflective module based child-friendly school when school literacy activities were carried out while the control class used the 2013 curriculum theme 8 student book about "Our Friends' Environment". The material in reflective module based child-friendly school has been adjusted to the material contained in theme 8. The research was carried out in the 2018/2019 academic year on grade V students.

This study involved 78 grade V students at SDN Petinggen, SDN Bangunrejo 1, and SDN Tegalrejo 1, Tegalrejo District, Yogyakarta City who were selected based on a simple random sampling technique. The variable assessed in this study is the ecoliteracy ability of elementary school students.

The research instruments used were interviews, observation, and tests. Interviews were conducted with students and teachers aimed at obtaining information related to the process of literacy activities. The open interview guide grid for teachers and students consists of the following.

1. Implementation of literacy activities
2. The process of evaluating literacy activities
3. The supporting facilities for literacy activities
4. Description of students' literacy skills
5. Types of literacy being developed

Observation activities are also carried out to observe the implementation of teacher and student learning activities. Literacy activity observation indicators consist of:

1. Literacy activities at school
2. Reflection after literacy activities
3. Literacy support facilities used by students
4. The learning atmosphere in the classroom
5. Students' abilities

The form of test questions used is a limited description of the questions arranged based on the following indicators. Based on the test results, it will be known about the differences that occur in students' ecoliteracy abilities before and after taking action in the control class and the experimental class. The indicators used in this study are.

1. Basic knowledge of ecological principles
2. Analyze environmental problems
3. Provide a solution to environmental problems

The data analysis used was inferential statistics. This is intended to analyze the sample data and the results can be applied to the population. The standard N-gain test is used to determine the increase in the value of ecoliteracy ability in the experimental class and control class, while the t-test with a significance <0.05 is used to determine the significant effect that occurs on students' ecoliteracy ability using a reflective module based child-friendly school in the experimental class and control class.

RESULTS

The experimental class and the control class in this study showed different results before and after the use of reflective module based child-friendly school. More clearly, the test results of ecoliteracy ability per indicator in the control class and experimental class are shown as follows.

Table 1. Ecoliteracy test results for the control class

Indicator	Pretest	Postest	Skor Max	Ngain	Cate-gory
Basic knowledge of ecological principles	71	99	168	0.289	Low
Analyze environmental problems	60.5	74,5	112	0.272	Low
Provide a solution to environmental problems	80	105	168	0.284	Low
Mean	47.21	62.16	100	0.283	Low

The control class when the research was given treatment carried out literacy activities using the 2013 curriculum student book. It appears in the table that the three indicators show improvement even though they have low criteria. Overall, as

shown in table 1, the value of the increase in the control class is 0.28.

The results of the ecoliteracy ability test in the experimental class are shown in the following table.

Table 2. Ecoliteracy Test Results for Experimental Class

Indicator	Pretest	Postest	Skor Max	Ngain	Cate-gory
Basic knowledge of ecological principles	118.5	242	300	0.680	Medium
Analyze environmental problems	94	146	200	0.491	Medium
Provide a solution to environmental problems	155	239	300	0.579	Medium
Mean	45.93	78.37	100	0.600	Medium

In contrast to the results shown in the control class, the experimental class gave test results with a medium increase. The three indicators improved well after treatment using a reflective module based on child-friendly school products. Before the paired sample t-test, the data were tested for normality using the Kolmogorov-Smirnov test and the homogeneity test using the Levene test. The results of the normality test at the significance level (p)> 0.05 in the control class showed a significance value of 0.478 at pretest and 0.450 at the posttest. While the experimental class showed a significance value of 0.262 at pretest and 0.077 at the postest. All of these values indicate that the value is greater than 0.05 so that the data is declared to be normally distributed. The homogeneity test results also show that the data is homogeneous with a significance value of 0.079> 0.05.

The results of the normality and homogeneity tests were then carried out by paired sample t-tests to determine differences in students' ecoliteracy abilities before and after participating in literacy activities using a reflective module based child-friendly school. The following are the results of the paired sample t-test shown in Table 3.

Table 3. The Results of Paired Sample t-test

Condition	Significance Value
Pretest	0.000
Postest	0.000

Paired sample t-test results show a significance value of 0.000 <0.005, it can be concluded that H0 is rejected. Based on these results, it shows that the use of reflective module based child-friendly school products have a positive effect on increasing the ecoliteracy ability shown in each research indicator.

DISCUSSION

The reflective module based child-friendly school is a product of developing literacy activities. The essence of this product development is to support the school literacy program launched by the government and to improve students' ecoliteracy skills. Through increasing ecoliteracy, students are expected to be more concerned about and able to preserve the natural environment. This product integrates a reflective thinking process in the form of a learning module by applying a child-friendly basis.

Ecoliteracy material is presented clearly and combined with activities such as reflection journals, reflection stories, self stories, and questions related to reflective thinking processes. The delivery of clear and straightforward material in the module can have an impact on students' ecoliteracy abilities[18]. The learning module consists of various components that can provide flexibility for students in exploring a material. The use of learning modules can practice learning independently, making it easier to understand the material[19].

This statement is following the results of research which clearly shows that the product affects increasing students' knowledge of the ecological environment. In the experimental class, the basic knowledge of students' ecological concepts increased by 0.680 in the moderate category compared to the results in the control class which only showed an increase of 0.289 and in the low category. This proves that the existence of material that is clear, straightforward, contains real examples and the integration of a reflective thinking process in a learning medium has a positive impact on the development of student knowledge.

In a study conducted by Sadeh and Zion[20], it was stated that the various reflective activities presented in the learning module provided an increase in students' thinking processes. Students become more active so that the material being studied can be received well. Furthermore, research conducted by Zulfah and Aznam[21] also proved that the integration of reflective thought processes in the learning module improved students' abilities related to natural environment material. Students become more concrete and able to analyze well.

Child-friendly schools are applied in the contents of this reflective module. Through materials and modules that pay attention to children's rights, it will provide more support for students to construct knowledge concepts[22]. Learning modules that pay attention to children's rights will help students in constructing concepts because they provide experiences to students so that they can help the process of developing their thinking. In developing a reflective module based child-friendly school, the content is adjusted to the characteristics of students. Concrete examples in

modules such as articles, pictures are presented so that students better understand the material based on real forms.

These statements are also proven in the results of this study where the process of integrating reflective thinking and fulfilling children's rights in learning provides an increase in student analysis regarding natural environmental problems. From the test results, it shows that the students' analytical skills towards natural environmental problems in the control class increased by 0.272 and were categorized as low. Meanwhile, the experimental class showed better results, namely 0.491 in the medium category. These results explain that students learn from concrete examples in the module and the material that appears clearly helps the student's analysis process. The ease with which students use the module as a learning tool makes them comfortable and able to develop their analytical power more optimally.

The integration of the reflective thinking process is contained in activities such as "Let's Observe, Come Reflect, My Reflection Journal". Good analytical skills of students for the natural environment have an impact on problem-solving and can provide solutions related to natural environmental problems[23].

The purpose of this product is to support literacy programs, material in the form of stories and articles is presented so that in addition to fostering students 'love for reading, it is also able to improve students' understanding in the learning process[24]. Besides, through stories, students can take a message that can be imitated in everyday life. A story shows the existence of conflict and problem solving so that it can be imitated and helps develop students' problem-solving abilities so that students can apply it to learning related to the natural environment.

During the research process, students showed an increase in their problem-solving abilities by being able to answer correctly about solutions that could be given related to natural environmental problems. The test results showed that the experimental class got a higher score increase than the control class with the final mean results of 0.579 and 0.284 for the control class. Based on these results, it is clear that the use of reflective module based child-friendly school has a positive effect on increasing student thinking regarding solutions to problems in the natural environment.

Based on the results of the tests carried out in the control class and the experimental class, the results of the improvement were obtained. In the control class, there was an increase even though it was still in the low category. This can happen because students become more enthusiastic about learning because of this research activity and the seriousness of the teacher in providing material to students. Meanwhile, the students in the experimental class showed a significant increase with the results of an increase in the medium category. The visible results from the experimental class prove that the feasibility of reflective module based child-friendly school is not only on the feasibility of the product but also has a positive effect on students. The thinking ability of students, especially in the ability of analysis and problem solving as a form of higher-order thinking processes, increases. So it is clear that this product can be used by the general public or can be a reference for further research.

REFERENCES

[1] Kementerian Pendidikan dan Kebudayaan, "Materi Pendukung Literasi Sains", Jakarta: Kementerian Pendidikan dan Kebudayaan,2017.

[2] F.Capra, "The Hidden Connection", London: Flamingo, 2003

[3] S.Keraf, "Filsafat Lingkungan Hidup : Alam Sebagai Sebuah Sistem Kehidupan", Yogyakarta: PT. Kanisius, 2014.

[4] B.McBride, C. Brewer, A. Berkowitz, & W. Borrie, "Environmental Literacy, Ecological Literacy, Ecoliteracy: What Do We Mean and How Did We Get There ?", Ecosphere, Vol 4 (5), pp 67, 2013.

[5] A. Mustadi, Suhardi.,E.S. Susilaningrum, R. Ummah, M.Purwatiningtyas, P.E.Wijayanti, "Character Based Reflective Picture Storybook:Improving Student's Social Self-Concept in Elementary School", Cakrawala Pendidikan:Jurnal Ilmiah Pendidikan.Vol Oktober 2017 Th XXXVI No 3, 369-381, 2017.

[6] S.D. Permata, A. Mustadi, "*Reflective Modul* Berbasis *Child Friendly School* Untuk Meningkatkan Kemampuan Literasi Dan Karakter Siswa", unpublished.

[7] Depdiknas, "Panduan Pengembangan Bahan Ajar", Departemen Pendidikan Nasional, 2008.

[8] Daryanto, "Menyusun Modul (Bahan Ajar untuk Persiapan Guru dala Mengajar)", Yogyakarta: Gava Media, 2013.

[9] R. Rufii, "Developing Module on Constructivist Learning Strategies to Promote Student Independence and Performance", International Journal of Education ISSN 1948-5476 Vol. 7 No 1, 18-28, 2015.

[10] A. Gurol, "Determining the Reflective Thinking Skills of pre-service Teachers in Learning and Teaching Process", Energy Education Science and Technology Part B: Social and Educational Studies 2011 Vol (issue) 3(3), 387-402, 2011.

[11] J.Smith, "Reflective Practice", Dalam Anne D.Cockburn&Graham Handscomb(Eds).

Teaching Children 3-11: a student's guide (3rd ed). London: SAGE Publications Ltd, 2013.
[12] E.E. Ahmed, K.Y. Al-Khalili, "The Impact of Using Reflective Teaching Approach on Developing Teaching Skill of Primary Science Teacher", The Online Journal of New Horizons in Education, Vol 3 (2). 58-64, 2013
[13] Utami, Saputri, & Kartikasari, "Implementasi Penerapan Sekolah Ramah Anak", The 5 Urecol Proceeding, 170-176, 2017.
[14] Kemen PPPA, "Panduan Sekolah Ramah Anak", Jakarta: Kementerian Peberdayaan Perempuan dan Perlindungan Anak, 2015.
[15] C.A. Ekemezie, E.S. Chinasa, "Child-Friendly Pedagogy for Sustainable Human Capacity Development in Nigerian Primary Schools", Journal of Emerging Trends in Educational Research and Policy Studies, Vol 6 Issue 7, 217-224, 2015.
[16] S. Yusuf, N. Sugandhi, "Perkembangan Peserta Didik", Jakarta: Raja Grafindo Persada, 2011.
[17] R. Johnson, L. Christensen, "Educational Research: Quantitative, Qualitative, and Mixed Approaches", California: Sage Publications, Inc, 2014.
[18] A. Rigolon, "A Grener Future: The Active Role of Place in Enhancing Ecoliteracy in Children", Journal of Argitectural and Planning Research, 29 (3), 181-203, 2012.
[19] E. Perangin-angin, M.Solin, I.Pramuniati, "Material Assessment and Expert Advice on the Literacy Explanation Text-Module at Medan Kudus Christian Middle School Medan, Indonesia", Budapest International Research and Critics Institute-Journal (BIRCI-Journal), 207-219, 2019.
[20] I.Sadeh, M. Zion, "Which Type of Inquiry Project do High School Biology Student Prefer: Open or Guided", Journal of Science Education, 42, 831-848, 2011.
[21] H. Zulfah, N. Aznam, "Development of Natural Sciences Module with Reflective Learning Journal to Enhance Students Reporting-Interpretative Skills", Biosaintifika: Journal of Biology & Biology Education, 10 (2), 362-368, 2018.
[22] H. Damanik, S. Pakpahan, "Pengembangan Bahan Ajar Tentang Sekolah Ramah Anak", Jurnal Keluarga Sehat Sejahtera, 16 (1), 1-13, 2018.
[23] B. Lian, M. Kristiawan, R. Fitriya, "Giving Creativity Room to Students Through The Friendly School's Program. International", Journal of Scientific & Technology Research, 7 (7), 1-7, 2018.
[24] M.N. Wangid, "The Benefit of Educational Tales in Teacher and Student Perspective", Jurnal Prima Edukasia, Vol 6 (2), 192-202, 2018.

IMPROVE PROBLEM BASED LEARNING TO INCREASE CADETS' SATISFACTION

Abstract

User satisfaction is one thing that becomes a measuring tool in the success of a system. One system that can be measured to assess the systems' success is the application as a medium for spreading information and is very easily accessed. The learning model applied is Problem Based Learning. The subjects in this study were the Air Navigation Engineering Cadets of the XI Surabaya Polytechnic, totaling 23 cadets. Data collection techniques are through documentation and questionnaire techniques. Data analysis techniques use data from product reviews and trials as a basis for media improvement. Furthermore, the respondent's assessment questionnaire related to instructional media's effectiveness on the satisfaction of using Radio Aids Navigation learning media. Measurement of user satisfaction on this issue uses the Creative, Effective, Efficient, Attractive, and Interactive Individual Learning Media Assessment (KEEMI) method. Based on research that has been done, the value of the evaluation results of the Creative Aspect is 3.4528; the Effective Aspect is 3.4456, the Efficient Aspect is 3.4022, the Attractive Aspect is 3.8405, and the Interactive Aspect is 3.4582. Following the evaluation result, it was found that the evaluation value of the five indicators> 3.1; these findings show that overall, Cadets was very satisfied with the Macromedia Flash 8 application that was implemented in Surabaya Aviation Polytechnic.

Keywords: Problem Based Learning, Media Improvement, Learning Media, Macromedia Flash 8, and Satisfaction

INTRODUCTION

The shift of perspective in learning towards constructivism has occurred lately. The lecturer can't just convey knowledge obtained from learning to Cadets, but the knowledge is constructed into the mind of the Cadets themselves. Lecturers are not the only learning source for students (teacher-centered), but what is expected is that learning is student-centered. In this case, the lecturer functions more as a facilitator in learning. So, students actively interact with learning resources in the form of the environment. The environment in question is the lecturer itself, other cadets, school principals, library staff, teaching materials or materials (in the form of textbooks, learning media, magazines, video recordings, or audio, and the like), and various learning resources and supporting facilities that are others (Arsyad, 2002).

In essence, the teaching and learning process is a communication process, namely delivering messages (the content or teaching material) from the message's source through certain channels/media to the recipient of the message (cadets or maybe also lecturers). In certain situations, the interpretation process is successful and sometimes fails. Several factors can cause this failure, for example, psychological barriers (concerning interests, attitudes, beliefs, intelligence, and knowledge), physical barriers in the form of fatigue, limited sense power, and the recipient of the message (Sadirman, 2009). Other factors that also affect are cultural barriers and environmental barriers that are obstacles that are caused by the situation and conditions surrounding conditions.

To minimize the obstacles that arise during the interpretation process and so that learning can take place effectively, it is endeavored to deliver messages (the content or teaching material) using the learning media. With the use of learning resources in learning media, communicating communication in the learning process takes place more effectively and efficiently. The media can be used as a tool to convey messages to students (Crichton & Kopp, 2006).

The media can convey messages from the sender to the recipient to stimulate the thoughts, feelings, concerns and interests, and attention of students so that the learning process occurs (Sadirman, 2009). Learning media also functions as a tool to convey learning messages. Learning is also defined as a process of communication between learners, instructors, and teaching materials. Communication will not work without the help of a means of delivering messages or the media.

The media has a function as a tool that has an important role. The development of technology now allows students to learn from anywhere and anytime by utilizing information technology results. Therefore, the teacher's role and task shifted from its original role as a learning resource shifted to a manager of learning resources.

Much research has been done to examine the effect of developing interactive multimedia media. Muhammad (2011) and Kingsley & Boone (2008) used the same variable, which is the development of interactive multimedia media. The findings show no significant difference in student learning outcomes between classes using animated film

learning media after treatment. Furthermore, other results were found. Namely, the obstacles encountered related to the use of animation film learning media in the learning process.

Previous research related to the development of interactive multimedia, namely Lin & Dwyer (2010) and Thatcher, (2006), showed significant differences in student learning outcomes between classes using and not using animated computerized learning media after treatment with the average age of the population in research is 16-21 years.

The quality of the application will greatly affect the level of user satisfaction itself. The higher the quality of an application, the more users will access the application. User involvement in the use of information system technology will determine a quality system's success and the information it produces. By users' needs and needs, the quality of the information will foster satisfaction for the users themselves. The level of user satisfaction with Macromedia Flash 8 applications is important in assessing the usability and success rate of a system's quality.

Problem-Based Learning (Problem Based Learning) or in the future, referred to as PBL, is one of the learning models centered on students by confronting the students with various problems encountered in their lives. With this learning model, students from the beginning face various life problems that they may encounter later after graduating. Problem-Based Learning (PBL) is a learning approach that uses work world problems as a context for students to learn about critical thinking and problem-solving skills and obtain essential knowledge and concepts from lecture material or subject matter (Sadirman, 2009).

The main purpose of Problem Based Learning is to direct students to develop collaborative learning abilities (Masek & Yamin, 2011), thinking abilities, and learning strategies to learn with their abilities without others or learners (self-directed learning strategies). So, the purpose of problem-based learning is very influential in the success of students in developing learning materials because they have variations in solving problems together. Each opinion is combined into problem-solving, which is a shared responsibility in becoming an agreement to find common ground on the problems.

From the above background, research will be conducted to measure the user's satisfaction using the Macromedia Flash 8 application at Poltekbang Surabaya. This study will later analyze user satisfaction using Macromedia Flash 8 applications, which have an important role in the college. The obstacle that has occurred so far is the lack of measurement of user satisfaction with the system that has been implemented, which impacts the success rate of an unmeasured system and unknown system weaknesses. It becomes an obstacle in the development of the Macromedia Flash 8 system.

Some components that will assess user satisfaction in this study are the interface design, user convenience in using Macromedia Flash 8 applications, fast access to information, and availability of material. This study will measure user satisfaction with an analysis model of the Five Aspect of Individual Learning Media Assessment, namely Creative, Effective, Efficient, Attractive and Interactive (KEEMI), to evaluate user-level satisfaction with the application. This study will illustrate user satisfaction with Macromedia Flash 8 applications and become a measure of application success. This evaluation will be a guideline to fix the system's weaknesses and weaknesses to increase user satisfaction.

RESEARCH METHOD

This type of research is development research. The development carried out is a flash-based interactive multimedia learning media for Cadets.

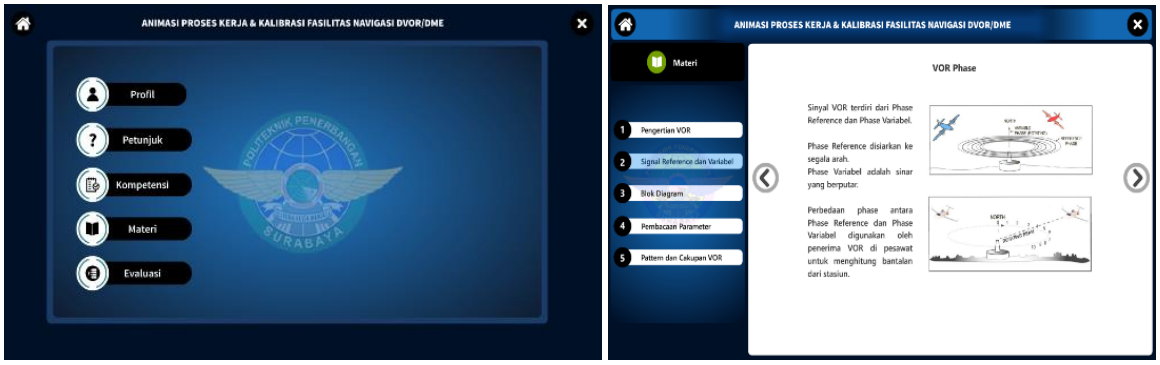

Figure 1. Macromedia Flash 8

The development of instructional media used in this study uses modifications from the Borg & Gall (2003) development model, including (1) Preliminary studies; (2) Planning; (3) Initial product development; (4) Initial (limited) field trials; (5) Revision of limited field test results; (6) wider field test; (7) Revision of field test results; (8) due diligence; (9) Revision of the results of the due diligence; (10) Dissemination and dissemination of final products. The ten development research activities, in general, can be grouped into five development procedures, namely: (1) a preliminary study; (2) planning; (3) development; (4) product trials; and (5) dissemination. The following is a model for developing flash-based learning media.

Based on the Borg and Gall development model, the composition in learning media consists of teacher profiles, instructions for use, learning objectives, material, and evaluation, according to figure 1.

Population and Sample

The population in this study is the area that the researchers want to study. According to Sugiyono (2016), the population is a generalization area consisting of objects/subjects with certain qualities and characteristics determined by researchers to study them and draw conclusions. The subjects sampling in this study were the Air Navigation Technique Cadets XI Surabaya Polytechnic, totaling 23 cadets. The development carried out is a flash-based interactive multimedia learning media for Cadets

Data Collection Techniques

Data collection techniques in this study were carried out through documentation and questionnaire techniques. Data analysis techniques in this study are (1) data from product reviews and trials for responses and suggestions that form the basis of media improvements, which produce qualitative data,; (2) Questionnaire evaluations of respondents that produce quantitative data. The assessment questionnaire was to determine the effectiveness of instructional media on the level of satisfaction of cadets during the middle of the semester, using the level of satisfaction as a reference for the success rate of products in the form of flash-based learning media.

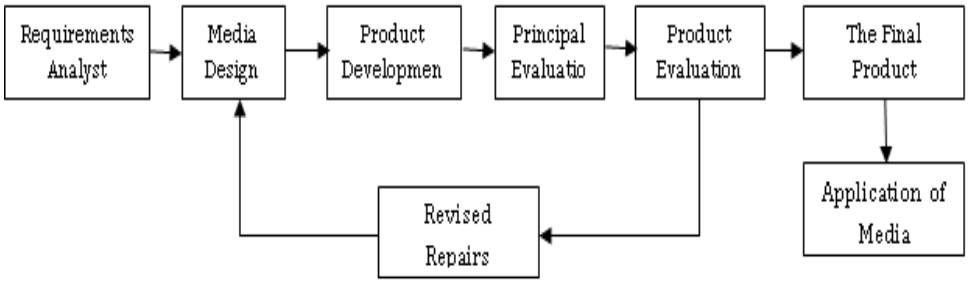

Figure 2. Implementation of Media Applications

RESULTS AND DISCUSSION

Analysis of Macromedia Flash 8 Satisfaction Indicators

The satisfaction indicators using the Individual Learning Media Assessment Method Five Aspects are as follows:

1) Creative

   According to Syah & Kariadinata (2009) , Creative means using a new creation/creation or different from before. Learning seeks the ability to create, imagine, innovate, and do other creative things in students.

2) Effective

   According to Syah & Kariadinata (2009), learning can be said to be effective (effective/effective) if it reaches the target or at least reaches the basic competencies that have been set. Besides, what is also important is the amount of experience and new things "gained" by students. Teachers are also expected to gain "new experiences" due to two-way interactions with their students.

3) Efficient

   Efficiency is a concept that reflects the best comparison between business and results (Phillips et al., 2019).Efficiency has meaning, improve the quality of learning and mastery of learning material; shorten learning time; improve teacher skills; reduce costs without reducing the quality of learning.

4) Interesting

   According to Uno & Nurdin (2012), interesting learning is a holistic educational process. It aims to motivate students to understand the meaning of the subject matter they learn by linking the material in their daily lives so that they can flexibly apply from one problem to another problem.

5) Interactive

According to Syah & Kariadinata (2009), interactive learning is a learning process in which interactions occur between teachers, students, and students. Interaction between teachers and students is not only done through face-to-face relationships but also done using media. Students can obtain information in a broad scope with learning media, which is the interaction between teachers and students, students with students, and learning resources to support learning objectives.

Results of Data Calculation and Data Analysis

Table 1. Results of Data Calculation and Data Analysis

Score	Satisfaction Level
0-1	Very Dissatisfied
1.1-2	Dissatisfied
2.1-3	Sarisfied
3.1-4	Very Satisfied

Based on Table 1, the satisfaction level scale above, the study was carried out by distributing questionnaires to 23 Cadets of D3 Air Navigation Engineering Force XI. users of this application use the Likert scale to find out the level of satisfaction according to the choice of answers and scores, then to get an average level of satisfaction using the formula:

$$RK = JSK/JK \quad (1)$$

Equation (1) on (Wibowo, 2005).
RK = Average Satisfaction, JSK = Number of Questionnaire Scores, JK = Number of Questionnaires.

Creative Aspect

Table 2. Tabulation of Questionnaire Domains on the Creative Aspect of Learning Interface Media

RESP	VS	S	D	VD
SCORE	4	3	2	1
KR1	12	11	0	0
KR2	12	11	0	0
KR3	11	11	1	0
KR4	12	9	2	0
KR5	11	10	2	0
KR6	12	11	0	0
KR7	10	11	2	0
KR8	11	9	3	0
KR9	14	8	1	0
KR10	11	11	2	0
KR11	13	9	1	0
TOTAL	129	111	14	0

This table is using equation (1). Meanwhile, to determine the level of satisfaction using the model defined by Kaplan and Norton with the following levels:

$$RK = \frac{(4x129) + (3x111) + (2x14) + (1x0)}{129 + 111 + 14 + 0}$$

$$RK = \frac{516 + 333 + 28 + 0}{254}$$

$$RK = \frac{877}{254}$$

$$RK = 3{,}45\ (Vert\ satisfied$$

Effective Aspect

Table 3. Tabulation of Domain Questionnaire Aspects of Effective Media Interface Learning

RESP	VS	S	D	VD
SCORE	4	3	2	1
EK1	9	11	3	0
EK2	8	15	0	0
EK3	13	7	3	0
EK4	13	10	0	0
EK5	12	9	2	0
EK6	10	13	0	0
EK7	11	12	0	0
EK8	15	7	1	0
TOTAL	91	84	9	0

This table is using equation (1). Meanwhile, to determine the level of satisfaction using the model defined by Kaplan and Norton with the following levels:

$$RK = \frac{(4x154) + (3x128) + (2x17) + (1x0)}{154 + 128 + 17 + 0}$$

$$RK = \frac{616 + 384 + 34 + 0}{299}$$

$$RK = \frac{1034}{299}$$

$$RK = 3{,}46\ (Vert\ satisfied$$

Table 4. Satisfaction Evaluation Results

Indicator	Evaluation Score	Description
Creative Aspects	3.4528	Very satisfied
Effective Aspects	3.4456	Very satisfied
Efficient Aspects	3.4022	Very satisfied
Interesting Aspects	3.8405	Very satisfied
Interactive Aspects	3.4582	Very satisfied

Based on the evaluation of the five indicators on Macromedia Flash 8, it can be concluded that:

1. The five indicators are indicators of cadets satisfaction in using the Macromedia Flash 8 application
2. By the evaluation results, it was found that the evaluation value of the five indicators> 3.1. This finding shows that overall, cadets were very satisfied with the Macromedia flash eight application implemented in Poltekbang Surabaya.
3. From the evaluation of the five indicators, the highest value of satisfaction on the indicator of interesting aspects so that it can be concluded in terms of interest in the Macromedia flash 8 application is very satisfied for cadets.

CONCLUSION

Some of the things were concluded successfully based on the implementation of research conducted at Surabaya Aviation Polytechnic up to the analysis of the results carried out, are as follows:

1. Factors that influence Cadet's satisfaction in using Macromedia Flash 8 are creative, effective, efficient, interesting, and interactive.
2. Based on the evaluation results, the value of the creative aspects' evaluation is 3.4528; the practical aspect is 3.4456, the efficient aspect is 3.4022, the interesting aspect is 3.8405, and the interactive aspect is 3.4582. By the results of the evaluation, it was found that the evaluation value of the five indicators> 3.1. This finding that overall, Cadets was very satisfied with the Macromedia Flash 8 application at Surabaya Aviation Polytechnic.

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REFERENCES

[1] Arsyad, A. (2002). *Media Pembelajaran* (Edisi 1). PT. Raja Grafindo Persada.

[2] Crichton, S., & Kopp, G. (2006). Multimedia Technologies, Multiple Intelligences, and Teacher Professional Development in an International Education Project. *Innovate: Journal of Online Education*, *2*(3). http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ854488&lang=pt-br&site=eds-live&scope=site%5Cnhttp://www.innovateonline.info/index.php?view=article&id=39

[3] Kingsley, K. V., & Boone, R. (2008). Effects of multimedia software on achievement of middle school students in an American history class. *Journal of Research on Technology in Education*, *41*(2), 203–221. https://doi.org/10.1080/15391523.2008.10782529

[4] Lin, H., & Dwyer, F. M. (2010). The effect of static and animated visualization: a perspective of instructional effectiveness and efficiency. *Educational Technology Research and Development*, *58*(2), 155–174. https://doi.org/10.1007/s11423-009-9133-x

[5] Masek, A., & Yamin, S. (2011). The effect of problem based learning on critical thinking ability: a theoretical and empirical review. *International Review of Social Sciences and Humanities*, *2*(1), 215–221.

[6] Muhammad, R. (2011). Pengaruh Pemanfaatan Media Pembelajaran Film Animasi Terhadap Hasil Belajar. *Jurnal Penelitian Pendidikan, Edisi Khus*(1), 154–163.

[7] Phillips, F., Chang, J., & Su, Y. S. (2019). When do efficiency and flexibility determine a firm's performance? A simulation study. *Journal of Innovation and Knowledge*, *4*(2), 88–96. https://doi.org/10.1016/j.jik.2017.12.003

[8] Sadirman. (2009). *Interaksi dan Motivasi Belajar Mengajar*. PT Rajawali Pers.

[9] Sugiyono. (2016). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. PT Alfabeta.

[10] Syah, M., & Kariadinata, R. (2009). *Bahan Pelatihan Pembelajaran Aktif, Inovatif, Kreatif, Efektif, dan Menyenangkan (PAIKEM)*. UIN Sunan Gunung Djati Bandung.

[11] Thatcher, J. D. (2006). Computer animation and improved student comprehension of basic science concepts. *Journal of the American Osteopathic Association*, *106*(1), 9–14. https://doi.org/10.7556/jaoa.2006.106.1.9

[12] Uno, H. B., & Nurdin, M. (2012). *Belajar dengan Pendekatan PAIKEM: Pembelajaran Aktif, Inovatif, Lingkungan, Kreatif, Efektif, Menarik* (2nd ed.). Bumi Aksara. http://opac.kaltimprov.go.id/opac/detail-opac?id=69552

[13] Wibowo, A. (2005). Estimating general threshold traffic levels of typical build, operate, and transfer toll road projects in Indonesia. *Construction Management and Economics*, *23*(6), 621–630. https://doi.org/10.1080/01446190500040901

THE ANALYSIS OF SCIENTIFIC LITERACY ON STUDENTS' COMPETENCY AT ELEMENTARY SCHOOL TEACHER EDUCATION PROGRAM OF UNIVERSITY OF MUHAMMADIYAH TANGERANG

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Abstract

The skills of scientific literacy is one of the main aspects that must be mastered by students that will affect the science learning process in elementary schools. This study aims to analyze the ability of scientific literacy seen from the aspect of scientific competence of students at elementary school teacher education program of University of Muhammadiyah Tangerang. This study used a descriptive qualitative approach, which aims to describe the nature of the events that took place during data collection in the form of a scientific narrative. The subjects of this study were 100 students of elementary school teacher education program of University of Muhammadiyah Tangerang. The sources of data were obtained directly using instruments of scientific literacy tests, questionnaires, and interviews. The data analysis techniques consists of data reduction, data presentation, and conclusion drawing. The results showed that the ability of scientific literacy in the competency aspects of elementary school teacher education program of University of Muhammadiyah Tangerang students obtained the "sufficient" category. Each indicator on the science literacy abilities of students showed a different result. A "low" category on the indicator of explaining scientific phenomena, and the "sufficient" category on the indicator of identifying scientific questions or issues and uses scientific evidence. Based on the research results obtained, it shows that the scientific literacy skills of elementary school teacher education program of University of Muhammadiyah Tangerang students have not showed satisfying results, so it needs to be improved. The efforts to overcome the scientific literacy skills of PGSD students in competency aspects that are still unsatisfactory carried out in various ways including: lecture must make detailed and more structured scope of the material provided and systematic process, lecture must choose the right media, and use learning models that in line with the concept of Science.

Keywords: scientific literacy, competency aspects, PGSD students.

INTRODUCTION

Science education has a significant role in providing children a solid stepping stone of their life. Science is essentially a product and a process. The result of scientific products is in forms of facts, concepts, principles, theories, and laws. However, in the scientific process it includes ways of obtaining, developing, and applying knowledge on how to work, how to think, how to solve problems, and how to behave. Therefore, science is formulated systematically, mainly based on experimental and induction observations. Mudzakir (in Hernani, et al., 2009) states that science education has great potential and a strategic role in preparing quality human resources to face the era of industrialization and globalization. This potential shall develop if science education can produce students who are competent in their fields and succeed in cultivating logical thinking, creative thinking, problem-solving skills, being critical, mastering technology, and adaptive to changes and developments. A common problem in science learning is the assumption that as long as learning accommodates many facts and theories, the students will consider to have literacy skills so that learning is successful. Regardless of how effective students are in the inquiry process of the problem at hand. It is the opposite of the framework regarding scientific literacy proposed by PISA (2013) that learning science requires knowledge of concepts and theories, also requires knowledge of general and practical procedures related to scientific investigation and how to integrate them.

Originally, the literacy science terminology comes from the word *"literacy"* which means literacy/illiteracy eradication movement. While the word science comes from the English language means science. According to the National Science Education Curriculum, scientific literacy is the awareness and comprehension of scientific principles and processes necessary for personal decision-making, civic and cultural involvement. Scientific literacy is a knowledge and understanding of scientific concepts and processes that will enable a person to make decisions with the knowledge they

have, and be involved in matters of state, culture, and economic growth. Scientific literacy according to the Program for International Student Assessment (PISA) is defined as the ability to use scientific knowledge, identify questions, and draw conclusions based on evidence, to understand and make choices by human actions about nature and improvements made to nature. This definition of scientific literacy views scientific literacy as multidimensional, not just an understanding of scientific knowledge, but has broaden views. PISA also assesses students' understanding of the characteristics of science as a scientific investigation, awareness of how science and technology shape the material, intellectual and cultural environment, and the desire to be involved in science-related issues, as reflective human beings. PISA also defines three major dimensions of scientific literacy in its measurement, namely: the science process, science content, and the context of science application.

In 2015, PISA determined that scientific literacy consists of four aspects including competence (scientific process), knowledge or content, context, and attitude. The first aspect is the competency aspect, also known as the scientific process, which is a dimension of scientific literacy that has an understanding of the process of answering a question or solving a problem. Cognitive processes involved in scientific competence include inductive/deductive reasoning, critical and integrated thinking, changing representations, constructing explanations based on data, thinking using models, and using mathematics. To build scientific inquiry abilities of students based on logic, reasoning, and critical analysis, scientific competence in PISA divided it in three aspects. PISA defines three aspects of the components of scientific competence or scientific processes that measures in scientific literacy.

In the aspect of scientific competence (scientific process), it measures scientific literacy which consists of three indicators, namely identifying scientific issues or questions, explaining phenomena scientifically, and using scientific evidence. The first indicator is to identify scientific questions or issues, scientific questions are questions that in answering them must be based on scientific evidence. In identifying these scientific questions, students are required to be able to recognize questions that may be scientifically investigated in a given situation, seek information, and identify keywords and recognize features of scientific investigation. For example, what things to compare, what variables should be changed, and what additional information is required or what action must be taken to collect relevant data. The second indicator is to explain phenomena scientifically, what needs to be considered is the ability to apply scientific knowledge in a given situation, describe phenomena, predict changes, and be able to identify appropriate descriptions, explanations, and predictions. The third indicator is to use scientific evidence. This indicator requires a person to be able to interpret scientific findings as evidence in concluding and be able to identify evidence and communicate the reasons behind the conclusion. Besides, it also states evidence and decisions in words, diagrams, or other forms of representation.

The second aspect of scientific literacy is content or knowledge. Scientific knowledge refers to the key concepts of science needed to understand natural phenomena and the changes made to nature through human activities. The criteria for selecting science content are relevant to real situations and are important knowledge and long-term use. Three aspects of knowledge are assessed on scientific literacy skills including content knowledge, procedural knowledge, and epistemic knowledge, which are explained as follows: a) content knowledge which is knowledge relevant to real-life; b) procedural knowledge is knowledge that explores knowledge in identifying experimental variables; c)epistemic knowledge is the knowledge that relates to identifying scientific aspects, justifying data, and providing scientific arguments.

The third aspect is the aspect of the scientific context, which is a dimension of scientific literacy that contains an understanding of situations that have to do with the application of science in everyday life, which is used as material for the application of processes and understanding scientific concepts. The PISA context includes fields of science application in personal, social, and global settings, namely: (1) health; (2) natural resources; (3) environmental quality; (4) danger; (5) the latest developments in science and technology. The last aspect of scientific literacy is the attitude aspect, the main goal of science education is to develop students' interest in science and support scientific inquiry. Attitudes towards science play an important role in the decisions of students to develop further scientific knowledge, pursue careers in science, and use scientific concepts and methods in their lives. PISA's view of scientific abilities is not only skills in science, also how their attitude towards science. A person's scientific ability includes certain attitudes, such as belief, motivation, self-understanding, and values. The components of attitude in scientific literacy include independence in learning science, the ability to think scientifically, curiosity, and the ability to think critically. Another opinion states that aspects of attitudes to scientific literacy include supporting

scientific inquiry, self-confidence, interest in science, and responsibility for science.

In science learning process on the higher education level especially in the Elementary Teacher Department of Education Faculty at University of Muhammadiyah Tangerang, it has been observed that the literacy skills of students were still very low. It can be seen that there are still many students who have difficulty understanding the learning material and also have difficulty analyzing learning material, especially science learning. The low literacy skills of students will have an impact on the occurrence of misconceptions in students so that it can decrease learning outcomes both in terms of cognitive, affective, and psychomotor. Teachers specifically as the science teachers must have adequate knowledge of science so that elementary students have a better ability to learn science, especially those related to basic science concepts. In addition to mastering the basic concepts of science theoretically, teachers must also have a good knowledge of the application of the theory of basic scientific concepts in science practicum. In the learning process in elementary schools, the teacher most often interacts with students, so that the role of the teacher greatly determines student learning outcomes.

Teachers, as educators, must be able to integrate concepts and processes in learning and also teach attitudes to their students on how they respond on the materials that cannot be replaced by any media. The vital role of the teacher makes the teacher one of the most important components in determining the success of this learning. Sagala (2008) in his view stated that teachers often given task to plan and to implement the learning process, assessing students' result, giving guidance and training, do research and study, and making contact with the community. Given the very important role of the teacher in learning, a teacher must possess more ability than others to improve the quality of education. Learning carried out by the teacher must also be able to arouse students' interest in learning, so that learning becomes more meaningful. Not only teachers but prospective elementary school teacher students must also have better abilities so that later they can carry out their duties as teachers as well as possible. Therefore, students need to have in-depth knowledge of science. In other words, students must have good scientific literacy. Based on this assumption, it is very important to map or analyze students' scientific literacy abilities, especially the competency aspects of elementary school teacher education program of University of Muhammadiyah Tangerang, the results of the analysis obtained can be used as a reflection and consideration for policymaking to be applied.

METHODS

The research approach used is a qualitative approach with descriptive analysis method. Descriptive research is a study that seeks to describe or observe problems systematically and accurately regarding the facts and nature of certain objects. Descriptive research is to describe and map facts based on a certain perspective. This research is carried out according to a predetermined schedule. Making the research schedule intended so that the research steps can be carried out completely and thoroughly and systematically so that the research time can be carried out effectively and efficiently. There are two types of sources used in this study, namely primary data sources and secondary data. Primary data were obtained from the results of students 'scientific literacy tests, the results of questionnaires regarding students' scientific literacy abilities, and the results of student interviews during the lecturing process in class, while secondary data came from document studies in the form of documentation and other supporting documents.

Data collection techniques used were in the form of a scientific literacy test in the form of multiple-choice tests, questionnaires, and interviews. The data analysis model in this study follows the concepts given by Miles and Huberman. Miles and Huberman (1984), suggest that activities in qualitative data analysis are carried out interactively and continue to be completed, so that the data is saturated (Sugiyono, 2016). The activities in data analysis namely data reduction, data display, and verification. The data reduction in question is that the researcher summarizes, chooses main things, focuses on important things. and look for patterns. Presentation of data in qualitative research can be done in the form of brief descriptions, charts, relationships between categories, and the like. Data verification is the initial conclusions that are stated to be temporary, and will change if strong supporting evidence is found at the next data collection stage. This research has the following flow:

Picture 1. Research Flow

RESULT AND DISCUSSION

This research aim is to analyze scientific literacy skills of elementary school teacher education program of University of Muhammadiyah Tangerang, especially in the competency aspect. The initial activity of this research was carried out by carrying out learning activities, giving scientific literacy test questions according to related material that students had studied, the next stage interviewing several students related to indicators of scientific literacy skills in the aspects of competence and material to be taught, and in the last stage giving a questionnaire. After taking data and analyzing data from the results of the science literacy test for 100 students, it was found that there were still students who had not reached scientific literacy, although based on the average science literacy test results were in the moderate or moderate category with a percentage value of 63%. In each indicator on the science literacy ability of students, it shows a "low" category in the indicator using scientific evidence with a percentage of 49%, and the "sufficient" category on the indicator identifies scientific questions or issues with a percentage of 71% and explains scientific phenomena with a percentage of 69%, as shown in the table below:

Tabel 1. Percentage in Science Literacy on Students' Competency at elementary school teacher education program of University of Muhammadiyah Tangerang

Indicator	Science Literacy Skills (%)
Use scientific evidences	71%
Explain scientific phenomena	49%
Identify scientific issues or questions	69%

Based on students' scientific literacy abilities in the aspect of scientific competence, it can be seen that the highest competency indicators achieved by students in this study are indicators using scientific evidence which is then followed by indicators of identifying scientific issues/questions and indicators of explaining scientific phenomena. The achievement of literacy skills on indicators using scientific evidence of 71% or "sufficient" is reflected in the ability of students to interpret scientific evidence and draw conclusions by interpreting the data contained in several tables and pictures on the instrument of scientific literacy test questions used in this study. Also, the ability to use scientific evidence is demonstrated by identifying the assumptions, evidence, and reasons behind the conclusions drawn in solving problems surrounding the concept of matter (OECD, 2013).

The ability to identify scientific issues achieved by 69% or "sufficient" shows that students with the ability to recognize issues and key features of the phenomena contained in instruments of literacy questions that may be scientifically investigated. The ability of students to identify scientific issues is certainly closely related to the aspects of scientific knowledge they understand regarding the concept of heat. Analytical questions on literacy items connected to the cognitive aspects of students with phenomena commonly encountered in their lives. Based on cognitive learning theory, students use their initial knowledge to process new information by connecting the new information with their initial knowledge (Lyle & Robinson, 2001). The level of cognitive aspects contained in student memory affects students' ability to identify scientific issues.

The competency indicator aspect explains the scientific phenomenon achieved by 49% with the "low" achievement category indicated by the students' ability to apply the scientific knowledge they have understood in solving scientific literacy problems to the concept of material. The concept of knowledge possessed by students affects their ability to describe or interpret scientific phenomena. The "low" category obtained on the indicators of explaining scientific phenomena illustrates the inadequate ability of students to explain scientific phenomena which are triggered by several factors that will affect the results of achieving scientific literacy skills.

The mastery of science literacy skills is influenced by several factors, based on the analysis of

the questionnaire used in the study, the factors that affect students' scientific literacy skills include: (1) interest in science, (2) learning motivation, (3) lecturer approach to learning/lectures. and (4) available facilities and infrastructure. The science learning approach or method used by lecturers in building learning concepts. Learning that can arouse students 'curiosity regarding learning topics and encourage students' enthusiasm to solve problems presented by lecturers is believed to be able to build science process skills which are part of the aspects of scientific literacy competencies. One of the learning methods suitable for learning science is the practicum method that uses scientific method steps in building knowledge concepts. Science literacy skills also include the ability to understand the Nature of Science which is in line with the concept of science inquiry skills such as designing experiments, collecting and analyzing data, and drawing conclusions drawn based on scientific evidence (Mc. Donald & Dominguez in Salamon, 2007).

Inquiry-based science learning provides opportunities for students to continue to develop their potential optimally, both cognitive, affective, and psychomotor in discovering scientific concepts (Toharudin, et al., 2011). Inquiry learning is also in line with constructivism-based learning which also has the potential to encourage the emergence of various skills needed to master scientific literacy skills. Constructivism-based learning facilitates students to be able to construct their knowledge concerning the real world. One of the science learning activities that encourage students to be able to construct their knowledge is to apply learning methods based on practicum activities. Through practicum activities carried out in integrated science learning, students will get used to being able to plan their learning, carry out learning, and evaluate their learning independently. Scientific investigation is a multidimensional activity which includes observation, finding problems, investigating books and other sources, planning investigations, conducting experiments, collecting data, analyzing data and interpreting, proposing solutions, explaining and presenting the results of investigations (National Research Council in Tatar, 2011). So, students' scientific literacy skills in aspects of scientific competence can be optimized through the application of practicum-based learning.

Science is the knowledge about the naturalness of the universe systematically, namely by using scientific methods to observe, identify, describe and investigate natural phenomena (Fang & Wei, 2010). In addition to aspects of knowledge and aspects of science process skills (science competence), aspects of science attitudes are also important aspects that affect students' scientific literacy skills. One of the goals of science education is to develop participant attitudes that make them interested in scientific issues and then acquire and apply science and technology knowledge for personal, social, and global benefit (OECD, 2006). One of the factors that affect the results of this scientific literacy study is the aspect of scientific attitudes related to emotional factors which include interest and comfort in learning science and the involvement of students in learning science (Huang, et al., 2012).

Science literacy skills possessed by students are a complex problem and must be addressed immediately because scientific literacy is very important in everyday life which has a direct application for life. As prospective elementary school teachers, students must also have high scientific literacy skills. The low level of scientific literacy among students greatly affects science learning in elementary schools. If the science literacy of students is still in the sufficient category, it is feared that the science learning carried out in elementary schools is not good enough, so that later the children's ability to understand science material is also low and only oriented to final grades. Even though scientific literacy is related to various aspects of life in society, it is related to the activities of people of all ages, both young and old.

Lin (in Sujana, 2014) argues that scientific literacy is related to people of all ages, so it needs to be improved to achieve higher chemical literacy. Therefore, students as elementary school teacher candidates must have high literacy because the teacher's role is very important in implementing learning. The very vital role of the teacher makes the teacher one of the important components that determine the success of students. A teacher must have a high ability in scientific literacy, as well as another knowledge. Saud (2008: 33) suggests that teachers are required to have a set of teaching knowledge and technical skills in addition to mastering the knowledge or material to be taught. The success of students in learning is largely determined by the ability of the teacher to teach. On the other hand, teachers also need to guide and direct their students so that they have high scientific literacy. This is according to what Shwartz, et al. (2005) stated that as a teacher, they must support the development of scientific literacy, to provide opportunities for students to build the meaning of scientific literacy. With the results obtained, the science literacy skills of students in the competency aspect which is still in the sufficient category indicates that there are still many processes in the

basic concepts of science that have not been achieved.

The competency of scientific literacy refers to the mental processes involved when answering a question or solving a problem such as identifying and interpreting evidence and explaining conclusions. This includes recognizing the types of questions science can and cannot answer, recognizing what evidence is needed in a scientific investigation, and recognizing conclusions according to the available evidence. PISA views science education as a function of preparing future citizens. Therefore, science education needs to develop the ability of students to understand the essence of science, scientific procedures, and the strengths and weaknesses of science. The cognitive processes involved in the scientific process include inductive/deductive reasoning, critical and integrated thinking, changing representations, constructing explanations based on data, and thinking using models (Zuriyani, 2012). Carin and Sund (in Puskur-Depdiknas, 2006) define science as knowledge that is systematic or arranged regularly, generally accepted, and is a collection of data from observations and experiments. The activity in science is always associated with experiments that require skill and craft. Thus, science is not only a collection of knowledge about objects or living things but concerning how to work, how to think, and how to solve problems. Good scientific literacy skills are certainly expected to improve understanding of the concept of science better. Through this research it is hoped that the literacy skills of students can improve not only in science learning alone, so later they can become educators who can transfer insightful knowledge to their own students.

CONCLUSION

The results showed that the ability of scientific literacy in the competency aspects of elementary school teacher education program of University of Muhammadiyah Tangerang students obtained the "sufficient" category. In each indicator on the science literacy ability of students, it shows a "low" category on the indicator explaining scientific phenomena, and the "sufficient" category on the indicator identifies scientific questions or issues and uses scientific evidence. Based on the research results obtained, it shows that the scientific literacy skills of students have not shown good and satisfying results, so it needs to be improved. The efforts to overcome the scientific literacy skills of students in competency aspects that are still unsatisfactory are carried out in various ways including structuring the scope of the material provided and the lecture process, choosing the right media, and using learning models that are under the concept of Science. To improve students' scientific literacy is through the improvement of the learning process carried out, which not only emphasizes mastering concepts, but also pays attention to other aspects. Based on the research results, the researcher suggests that it is necessary to identify the scientific literacy skills of students to make their learning process to be more meaningful.

REFERENCES

Abidin, Yunus., dkk. 2017. *Pembelajaran Literasi: Strategi Meningkatkan Kemampuan Literasi Matematika, Sains, Menulis, dan Membaca*. Jakarta: Bumi Aksara.

Arikunto, Suharsimi. 2013. *Dasar-dasar Evaluasi Pendidikan.* Jakarta: Bumi Aksara.

Eko, Hariadi. 2009. *Perkembangan Kemampuan Sains Siswa Indonesia Berusia 15 Tahun Berdasarkan Data Studi PISA.* Jakarta: Pusat Penilaian Pendidikan Departemen Pendidikan Nasional.

Fang, Z & Wei. 2010. *Improving Middle School Student's Literacy Through Reading Infusion. The Journal of Educational Research*. 103(4): 262-273.

Huang, S. L., Zuway, R. H., Tai, C., H. 2012. *The Role of Emotional Factors in Building Public Scientific Literacy and Engagement with Science*. International Journal of Science Education 34 (1): 25-42.

Jufri, Wahab A.. 2017. *Belajar dan Pembelajaran Sains (Modal Dasar Menjadi Guru Profesional)*. Bandung: Pustaka Reka Cipta.

Lyle, K., and Robinson, W. 2001. *Teaching Science Problem Solving: An Overview of Experimental Work*. Journal of Chemical Eduction. 78 (9): 1162-1165.

OECD. 2016. *PISA 2015 Results in Focus PISA*, Paris: OECD Publishing.

Permendiknas. 2006. *Peraturan Menteri Pendidikan Nasional Republik Indonesia No. 23 tentang Standar Kompetensi Lulusan untuk Satuan Pendidikan Dasar dan Menengah*. Jakarta: Depdiknas.

Sagala, Syaiful. 2010. *Supervisi Pembelajaran dalam Profesi Pendidikan*. Bandung: Alfabeta.

Salamon. 2007. *Scientific Literacy in Higher Education*. University of Calgary: Tamarat Teaching Professorshing.

Schwartz, Yael; Ben-Zvi, Ruth; Hofstein, Avi. (2005). *The importance of involving high-school chemistry teachers in the process of*

defining the operational meaning of 'chemical literacy'. International Journal of Science Education, 27(3), p.323-344. Doi 10.1080/0950069042000266191.

Sugiyono. 2016. *Metodologi Penelitian Kuantitatif, Kualitatif Dan R&D*. Bandung: Alfabeta.

Sujana, A, dkk. 2014. *Literasi Kimia Mahasiswa PGSD dan Guru IPA Sekolah Dasar*. Jurnal Pendidikan IPA Indonesia Vol 3 No.1 (2014). http://journal.unnes.ac.id/nju/index.php/j pii (Diakses 20 Januari 2020).

Tatar, E. and Oktaym M. 2011. *The Effectiveness of Problem Based Learning on Teaching the First Law of Thermodynamics*. Research in Science and Technological Education, 29, (3): 315-332.

Toharudin, Uus., dkk. 2011. *Membangun Literasi Sains Peserta Didik*. Bandung: Humaniora.

Zuriyani, Elsy. 2012. *Literasi Sains dan Pendidikan*. Sumatera Selatan: Kemenag.

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STUDENT GESTURES DURING THE DISCUSSION PROCESS IN CORRECTING PROCEDURAL ERRORS OF CALCULUS PROBLEM SOLVING

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Abstract

This study aims to determine the effect of student gestures during the discussion process in correcting procedural errors of calculus problem solving and to examine the types of getures they use to correct these procedural errors. This research is a qualitative research with a descriptive type. The data obtained were described based on the actual situation, then inductive data analysis was carried out and matched with the existing theory in order to obtain the characteristics of the gesture variation used by students and the role of gesture in correcting mathematical procedural errors. The results showed that the gestures used by students with high abilities during the discussion process could correct procedural errors in calculus problem solving by students with medium and low abilities. The types of gestures used by high-ability students in correcting the procedural errors of medium and low-ability students during the discussion process include: pointing gestures, writing gestures, and representational gestures. These three types of gestures can make it easier for students with medium and low abilities to understand the language and information presented.

Keywords: gesture, procedural errors, calculus

INTRODUCTION

The inclusion of mathematics into a subject that is always tested for graduation requirements at every school level, shows that mathematics is an important subject. Even mathematics is also included in the college level curriculum even though it is not a mathematics major. This statement of the importance of mathematics is reinforced by the opinion of Hudojo (2005) that mathematics is indispensable in everyday life and in the face of advances in science and technology. Therefore, mathematics learning must be attractive to students.

Assessment and improvement of the quality of mathematics learning must continue to be carried out in accordance with the circumstances of the students. Mathematics, which has been feared, needs to be redesigned so that it becomes a subject of interest so as to increase students' confidence in mathematics. Wilson (2008) states that self-confidence can increase achievement, convince abilities, develop internal motivation, and enable a person to achieve the goals to be achieved. Therefore, the demands of teachers to innovate in mathematics learning need to be done, for example by analyzing student errors, especially procedural errors.

According to Bray (2011), teachers or lecturers will benefit from the results of their analysis of common mistakes made by their students. The teacher needs to design a good strategy or procedure so that it can be used to analyze the mistakes made by students. The error is then corrected by providing the right solution, one of which is group discussion.

Group discussion is an appropriate way to develop students' mathematical communication skills (LACOE, 2004). Through group discussions all group members are actively involved to express their opinions. The process of correcting each other's mistakes during a discussion can occur because when one student makes a mistake, the other students will control how to correct it. In the process of group discussion, when one student corrects another student's mistakes, it must not be separated from the role of various gestures.

Gesture is defined as arm and hand movement that corresponds to the release of speech (McNeill, 1992). Gestures are all body movements that are integrated with speech or not which are intended to communicate something (A. Becvar, J. Hollan, & E. Hutchins, 2008). According to Ibraheem & Khan (2012) gesture can be defined as a meaningful physical movement of the fingers, hands, arms or other parts of the body that accompany verbal communication with the aim of reinforcing the information conveyed. While the gesture referred in this study is the hand movement that accompanies verbal or non-verbal communi-

cation to correct mathematical errors made by students during the discussion process.

Gesture is very needed in learning and teaching mathematics. This is in line with Núñez's statement (2004) that the use of appropriate gestures can construct mathematical knowledge. Cook & Goldin-Meadow (2006) states that children in school imitate their teacher's gestures in solving mathematics problems. Thus, it is clear that gestures are needed in mathematics, both when teachers or lecturers teach mathematics or when students solve mathematical problems, such as problems in calculus courses.

Based on the description above, researchers are interested in conducting a study on informatics engineering students at the Universitas Islam Lamongan with the title: Student Gestures during the Discussion Process in Correcting Procedural Errors of Calculus Problem Solving.

The main purpose of this study is to determine the effect of student gestures during the discussion process in correcting procedural errors of calculus problem solving and to examine the types of getures they used to correct these procedural errors.

METHOD

This study is a qualitative research with descriptive type. The data obtained were described based on actual conditions to obtain a natural picture of the gestures used by students during the discussion process. Furthermore, inductive data analysis was carried out and matching with existing theories was carried out in order to obtain the characteristics of the gesture variations used by students and the role of these gestures in correcting mathematical procedural errors.

The subjects of this study were students of Informatics Engineering at the Universitas Islam Lamongan who were taking calculus courses. In group discussions, of course students use many gestures as a form of communication. The groups formed are designed so that they consist of high, medium, and low ability students (heterogeneous groups). From the gestures made by high-skilled students, it will be used as data and analyzed.

The procedure in this study was carried out according to the following steps:

1. Give Individual Test

To find out which students have high, medium, and low abilities, the researchers make individual test about calculus to be given to students. After being corrected, finally the student data was obtained based on the level of ability or understanding of the concept.

2. Forming Heterogeneous Groups

After obtaining student data based on their level of ability, a heterogeneous group was formed consisting of high, medium, and low ability students in each group.

3. Group Discussion

In each heterogeneous group that has been formed, students carry out discussions about calculus problems.

4. Making observations during the group discussion process

The observation center is aimed at gestures made by students with high abilities in correcting procedural errors made by students with medium and low abilities.

5. Interviews

To obtain complete information or data in the group discussion process that had been observed, interviews were conducted with high-ability students.

The research instrument is the researcher himself. Because the research data was taken from video recordings or photos of student activities during the discussion, this research instrument also used a camera. Furthermore, as a supporting instrument used individual test and interview guidelines.

Individual test are used to obtain data on the level of student ability which is then used as a reference in forming heterogeneous groups.

Interview guidelines are used to guide researchers in revealing the role of gestures when high ability students correct procedural errors made by medium and low ability students.

RESULTS

Some of the procedural errors that the researcher got from the students' answers in working on individual test were found at MF's answer for question number 4 as shown in Figure 1 below.

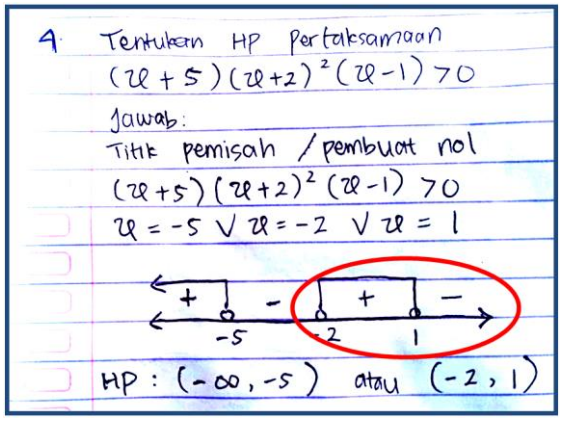

Figure 1. MF's Error in Working Individual Test Number 4

In his work, MF understands that after obtaining the zero maker points, namely -5, -2, and 1, the next step is to test the points on a number line to determine which areas satisfy the inequality in

question number 4. However, in the number line test process MF made an error when testing area between -2 and 1 and area more than 1. MF did not test these areas because he thought that the test results must form a pattern of +, -, +, -, even though it doesn't always happen. Must be tested in each area to get the correct areas. Due to the wrong steps, MF finally got the wrong answer.

MF's answer above is said to be a procedural error because MF did not take the right steps when doing a number line test. MF did not test for area between -2 and 1 and area greater than 1 because he thought that the test results would form a +, -, +, - pattern. Even though MF understands that to find the set of solutions for an inequality is to look for the zero maker points then find the area that satisfies them by doing a number line test, MF has missed a step. This is appropriate with the opinion of Seah (2005) which states that procedural or algorithmic errors are errors that arise from failure to carry out manipulations or algorithms although have understood the concept behind the problem.

The next error was made by student AO for question number 3 as shown in Figure 2 below.

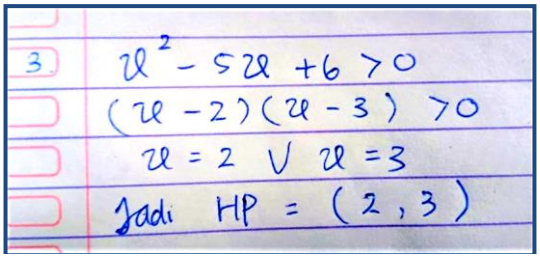

Figure 2. AO's Error in Working Individual Test Number 3

In his work, it can be seen that AO has not understood the steps after obtaining the zero-maker points, namely 2 and 3. The points should be tested using a number line to find out which areas satisfiy the requested inequality, not directly concluding that the Solution Set is (2,3). The results obtained by AO are wrong because when a number between 2 and 3 is substituted for the inequality it turns out to be negative, even though what is requested is positive or > 0. Because the results obtained by AO are wrong and there are steps that AO has missed, it can be said that AO made a procedural error.

DISCUSSION

In correcting the procedural error made by student MF when working on individual test number 4, gestures used by student AK included pointing gesture, writing gesture, and representational gesture. Pointing Gesture performed by AK is when pointing the sign "+" in the area between -2 and 1 and the sign "-" in the area more than 1 on the number line. This is meant by AK so that MF understands that these parts are wrong. If MF did the number line test process correctly, of course the area between -2 and 1 would be worth "-" while areas more than 1 would be worth "+".

The AK movement can be seen in Figure 3 below.

Figure 3. Student AK doing Pointing Gesture by Pointing Sign "+" in Area between -2 and 1 and Sign "-" in Area More than 1 on the Number Line

AK pointed using a pen on the wrong MF's answer sheet as an object to be understood. This movement performed by AK is included in the pointing gesture category. This is appropriate with the opinion of Alibali and Nathan (2007) which states that pointing gestures are movements used to show objects, locations, inscriptions, or students. Most of the pointing movements are done with the fingers or hands, but some are done using the pen as a "pointer".

The writing gesture performed by AK during discussed the individual test number 4 is when drawing the numbers line again and testing each area with the correct process. For the area between -2 and 1 AK takes the number that is easy to test, namely 0 and turns out to be -20 which means it is negative. Whereas for areas more than 1 AK takes the number 2 to be tested and the result is 112, which means this area is positive. Writing the number line test process correctly can make MF understand that the test results do not always form a +, -, +, - pattern, because it could be the correct result are +, -, -, +. This movement can be seen in Figure 4 below.

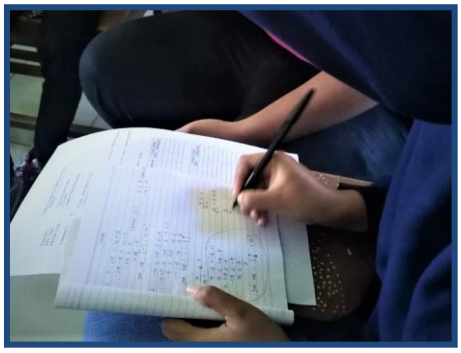

Figure 4. Student AK Performs Writing Gesture by Writing Process of Number Line Test

The movement performed by AK is said to be a writing gesture because AK makes a writing movement and leaves a permanent mark. This is appropriare with the opinion of Shein (2012) which states that "writing gestures occur when gestures leave permanent marks on new media (for example, worksheets, whiteboards, or visual representations)".

Representational Gesture performed by AK when discussing the individual test number 4 is when AK crossed out a "+" sign in area between -2 and 1 and a sign "-" in area more than 1 accompanied by a statement that these parts are wrong. It shows that, these parts that make the result wrong. After being given the correct number line test process, MF finally understood that he had missed a procedure when working on this individual test number 4. This movement can be seen in Figure 5 below.

Figure 5. Student AK Performs Representational Gesture by Crossing "+" and "-" Signs on Numbers Line

The movement of crossing and accompanied by statement carried out by AK is included in the representational gesture category. This is appropriate with the opinion of Thompson (2014) that representational gestures can be accompanied by speech and without speech. Representational gestures that coincide with speech occur when students are thinking or trying to explain something both to themselves and others.

CONCLUSION

Based on the results of this study it can be concluded that: 1) Gestures used by high-ability students during the discussion process can correct procedural errors in calculus problem solving performed by students with medium and low abilities. 2) The types of gestures used by high-ability students to correct procedural errors for medium and low-ability students during the discussion process of solving calculus problems include: pointing gesture, writing gesture, and representational gesture. These three types of gestures can make it easier for students with medium and low abilities to understand the language and information presented.

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REFERENCES

[1] Alibali, M, W & Nathan, M, J. 2007. Teachers' Gestures as a Means of Scaffolding Students' Understanding: Evidence from an Early Algebra Lesson. In press in R. Goldman, R. Pea, B. Barron, & S. J. Derry (Eds.), Video Research in the Learning Sciences. Mahwah, NJ: Erlbaum.

[2] Becvar, A., Hollan, J., & Hutchins, E. 2008. Representational Gestures as Cognitive Artifacts for Developing Theories in a Scientific Laboratory. Ackerman, M.S., (eds) Resources, CoEvolution and Artifacts: Theory in CSCW. Hal: 117-143.

[3] Bray, W. S. 2011. A Collective Case Study of the Influence of Teachers' Beliefs and Knowledge on Error-Handling Practice During Class Discussion of Mathematics. Journal of Research in Mathematics Educations, 42 (1): 2- 38.

[4] Cook, S, W & Goldin-Meadow, S. 2006. The Role of Gesture in Learning: Do Children Use Their Hands to Change Their Minds? Journal of Cognition and Development, 7(2), 211–232.

[5] Hudojo, H. 2005. Kapita Selekta Pembelajaran Matematika. Malang: UM Press.

[6] LACOE (Los Angeles Country Office of Education). 2004. Communication. (Online)(http://teams.lacoe.edu/documentation/classrooms/amy/algebra/56/teacher/guide/commun.html)

[7] McNeill, D. 1992. Hand and Mind: What Gesture Reveal about Thought. Chicago: Chicago University Press.

[8] Núñez, R, E. 2004. Embodied Cognition and The Nature of Mathematics: Language, Gesture, and Abstraction. Mathematical Representation at the Interface of Body and Culture (pp. 309-328). Charlotte NC: IAPInformation Age Publishing. (Online) (http://www.cogsci.ucsd.edu/~nunez/web/CogSci04_paper.pdf).

[9] Seah, E, K. 2005. Analysis of Students' Difficulties in Solving Integration Problems. International Journal of The Mathematics Educator, 9 (1): 39-59, (Online)(http://math.nie.edu.sg/ame/matheduc/tme/tmeV9_1/Seah%20FK.pdf)

[10] Shein, P, P. 2012. Seeing With Two Eyes: A Teacher's Use of Gestures in Questioning and Revoicing to Engage English Language Learners in the Repair of Mathematical Errors. International Journal of Research in Mathematics Educations, 43 (2): 182-222.

[11] Soedjadi, R. 2000. Kiat pendidikan matematika di Indonesia. Jakarta: Dirjen Dikti Diknas.

[12] Thompson, J.M. (2014). Teachers' Perceptions of Other Teachers' Spontaneous Hand Gesturing in The EFL Classroom. Novitas-ROYAL (Research on Youth and Language), 8(2), 119-135.

[13] Wilson, J. A. R. 2008. Psychologycal Foundation of Learning and Teaching. New York: McGraw-Hill Book Company.

THE NEEDS OF THE COMMUNITY'S SPORTS INFORMATION SYSTEM IN THE INDUSTRIAL 4.0

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Abstract

The importance of sports activity to public fitness must be supported by way of available sports facilities and infrastructure. This study was a descriptive research with mixed methods. Access facilities and sports infrastructure are essential factors as key to increasing people's interest in practicing to enhance the community's physical health. The purpose of this study is to recognize the needs of the sports information system in the city in industrial 4.0 that require human beings to improve their physical condition and health to stay productive. It has a shut connection with the availability of information systems and sports activities infrastructure accessible around the residence. The subjects of this research were 137 public of Yogyakarta city by convenient sampling. Data analysis techniques using descriptive and correlation among indicators-item themselves with Software SPSS.25. The results showed TCR in the Good category in each item that these indicate that there was a lack of a productive sports activities information system to locate the capability and sports activities infrastructure around the public, which affect the lack of public interest and participation in the exercise knowledge became strong management tools that help physical education, sports medicine, coaching training managers to decide how to improve peak of performance, to maintain the excellent quality of public health: This study is the first to apply to evaluate the needs of the Community's Sports Information System In The Industrial 4.0.

Keywords: *Information system in sport, sports facilities, public health, sports activity participation*

INTRODUCTION

Sports activities have health benefits that are an important factor in a healthy lifestyle. (Brinkley et al., 2017; Downward & Rasciute, 2011; Phillips & Young, 2009) Exercise is recommended for human health, specifically to keep the physique active to keep away from various diseases. To prevent some diseases, of course, exercise is the main answer in life, so that fitness is maintained properly. Besides being top for health, exercise is also regarded to reduce depression, stress, and anxiety, increase self-confidence, make bigger energy, improve the quality of sleep, and improve the ability to concentrate (Downward & Rasciute, 2011; Jaarsma et al., 2015). Exercise as a form of sports activity can help minimize fitness care costs for human beings with obesity, cardiovascular disease, high blood pressure, hypertension, diabetes, stroke, from diarthcersekute (2011) Basic Health Research facts (2018) which shows the prevalence of non-infectious diseases increased compared to 2013 data, the prevalence of most cancers increased from 1.4% to 1.8%; The stroke prevalence increased from 7% to 10.9%; chronic renal failure decreased from 2% to 3.8%; diabetes mellitus fell from 6.9% to 8.5%; and hypertension increased from 25.8% to 34.1% (Ministry of Health RI, 2018). The increase in non-communicable illnesses is due to an unhealthy lifestyle and rarely to regular exercise [4], [5].

The importance of activity for public health ought to of path be supported with the aid of an adequate sports infrastructure [4], [6]–[9]. Providing get admission to sports facilities is a critical element of the success of a developing pastime in high-quality sports participation [10]. The availability of sports activities infrastructure or infrastructure is one of the government's obligations and insurance policies, which is based on the Law of the Republic of Indonesia (2005) regarding the countrywide sports activities system, particularly Article 67, factor (2). the availability of sports activities infrastructure under the requirements and needs of authorities and regional government. Looking at sports activities policy in Europe, in general, implies that access to sports activities facilities influences growing sports activities participation in quite many sports activities [5], [10]–[12].

In a country like China, by using developing sports infrastructure, research has confirmed the dependency relationship between the provision of sports infrastructure and facilities and sports activities participation (Guo et al., 2014; Gratton & Jones, 2010). In the UK, public sports insurance policies and non-public funding in sports activities facilities have succeeded in balancing provide and

demand [15], [16]. And in the Netherlands, the growth in the provision of sports activities infrastructure and facilities helped to increase the level of sports activities participation until the threshold for participation was reached in the 1980s. But in the decades considering Following this, the growth of recreation participation slowed down and eventually declined (Van Bottenburg dan de Bosscher, 2011). With the availability of sports activities facilities, it can increase sports participation in the community. And public fitness will improve with the enlarge in activity participation or physical activity which is supported by the availability of necessary sports facilities.

With the development of Industry 4.0, the development of sports facilities has to of path be balanced with an appropriate sports information system, as it provides facts to the public to be able to understand the sports services available. The purpose of the sports activities information device is to collect, store, maintain, process, and provide essential information for all segments related to sport (Miocic et al., 2019: 1363). so that sports activities information is on hand and useful to all. Therefore, it is necessary to understand the objectives and means of all ranges of sports facilities as well as systematic planning and method to build a sports information system [18]–[21]. It was explained through a review of the literature and lookup outcomes on the importance of the availability of sports activities facilities to promote sports participation in society, it is not enough to cover the truth that there are still stereotypes on the lack of developing and increasing sports information systems. Community Sports Participation in the Industrial 4.0 Age Public awareness of recreation contributes to the development of smart, healthy, skilled, tough, competitive, prosperous, and dignified individuals and societies [6]–[8], [21], [22].

Based on the relevant information above, according to the Rikesdas 2018, which shows that the prevalence of non-communicable diseases has increased compared to the Riskesdas of 2013, which includes cancer, stroke, chronic kidney disease, diabetes sweet and cancer prevalence improved from 1.4% in 2013 to 1.8% in 2018 with the very best prevalence in Yogyakarta Special Region (DIY). For this, public participation in sports activities has to increase, as indicated with the aid of an increase in community participation in the Sports Development Index or the Sports Development Index (SDI).

In this case, research to see the need for sports activities information systems in the community in Indonesia, particularly in Yogyakarta, was once not conducted. Therefore, this study aims to determine sport in society through an efficient and easy-to-use sports information system in the industrial 4.0 era.

MATERIAL AND METHOD RESEARCH

The method used in this research is quantitative research with a case study graph [23]. Data collection techniques using observation techniques were collected using a sports information system requirement instrument that had been carried out validity and reliability in the past. The data in this study uses primary data taken directly by researchers in the field; data collection is carried out. Research subjects can be individuals, groups, institutions, or communities. The researchers discovered that there is still no effective and adequate sports information system in Indonesia, especially in the special area of Yogyakarta province.

The residents of this study were all residents of the city of Yogyakarta. Participants had been taken using a stratified random sampling technique, with the criteria that the participants were a certain population group: age, sex (Gratton & Jones, 2010). Participants in this study, ie N = 139. Data collection used to be done online using a survey form on the website. Respondents can receive questionnaires via whatsapps, forums, Facebook, and other social media. A brief description of the study is directed to the online questionnaire link posted on the web. The questionnaire is available online through google shape for one month from August 1, 2020, to September 1, 2020.

To analyze sports activities in society, several aspects are defined by using the effects of age, period, and cohort/group (Breuer & Wicker, 2009). In this study, the sample criteria were drawn according to the period, category, active participation of sports in the community in the exercise of recreational sports (Moens & Scheerder, 2016). To determine the respondent's socio-economic background, numerous social characteristics are also used. At the level of education, the professional situation, the level of sports facilities in the area, and sleep habits are also considered.

The data collection instruments used in this study were the observational technique and the questionnaire guidelines prepared through the researcher based on the data series need to aid the interpretation of the research results. Before use, the observation guidelines and the questionnaire recommendations were checked by the expert judgment to guide elements of the questions/statements that were not biased or deviated from the research objectives.

With the SPSS.25 application, the validation (Pearson correlation product-moment) and reliability (Cronbach, 1951) were decided. If the statistic inferential result shows how that well, a variable can explain a factor. Item 1 with a value of each element, where all the elements are> 0.05, we can conclude that all the elements can explain the factor. TCR (Tingkat Capaian Respondent) (Sugiyono, 2012) is used to decide categorically of The Needs of the Community's Sports Information System in The Industrial 4.0.

RESULTS

The validity of the instruments used in this study using the correlation of the moment of the product analyzed using the program SPSS.25 was declared valid.

Table 1. The results of the analysis of the questionnaire's validity to measure the need for an information system on sports venues.

Item	V	R table	Information
1	0.736	0.497	Valid
2	0.728	0.497	Valid
3	0.712	0.497	Valid
4	0.748	0.497	Valid
5	0.689	0.497	Valid
6	0.740	0.497	Valid
7	0.712	0.497	Valid
8	0.748	0.497	Valid
9	0.749	0.497	Valid
10	0.750	0.497	Valid
11	0.588	0.497	Valid
12	0.500	0.497	Valid
13	0.573	0.497	Valid
14	0.556	0.497	Valid
15	0.576	0.497	Valid
16	0.500	0.497	Valid

Based on the decision making, if the score r> r table (0.497), we can confirm that the instrument is valid. Based on Table 1, all items have a value greater than 0.497, therefore, it can be concluded that the instrument is valid.

Table 2. Reliability analysis results of the questionnaire to measure the need for a sports venue information system.

Cronbach's Alpha	N of Items
0.756	21

The reliability of the instruments used in this study obtained a value of 0.756 in Table 2. Therefore, these results indicate that the questionnaire for the need for sports information systems is reliable.

With the SPSS.25 application, the value of Communalities explains that the table above shows how well a variable can explain a factor. Item 1, with a value of (0.558) means item 1 can account for a factor of 55.8%. Likewise, with other elements, where all the elements are>50%, we can conclude that all the elements can explain the factor.

Table 6 above explains that the TCR results show the excellent categories for each item. Thus, all the elements constituting a questionnaire assessing the public's need for a sports activities information system are of precise value.

The excellent category in every object suggests that a sports information system's need is genuinely crucial to make it easier for people to locate sports activities sites for the community.

CONCLUSION

It can be concluded from the TCR obtained from each item of the correct category of the questionnaire, so the need for the sports information system in Yogyakarta city is quite necessary. Thus, this becomes the basis for further research to develop an information system that can be used to identify sports venues for people to play sports.

DISCUSSION

We are dwelling in the midst of one of those very unusual activities that occur once every few generations: a societal paradigm shift. The end of the last millennium noticed a critical trade that brought society from the industrial age to the records [20], [24]. The foreign money in this new emerging society is statistics, and the medium of alternate is called IT (and every so often IT - CT). Computing is sincerely the tools and strategies used to identify, organize, and manipulate facts that we name data.

The excellent category of TCR confirmed the previous argument. The need for a sports information system is more excellent and extra fundamental in the industrial 4.0 era, thinking about that every person is inseparable from an increasingly practical science [19], [24], [25]. Information technology (in the future, referred to as IT) has become a benchmark for human civilization development in today's information age [17], [26]. Those who live in large cities that have benefited from the presence of technology modern worldwide depended on some of his activities technolo-

gy, especially as a means of communication, such as the Internet, telephone, cell phone, GPS, computer networks, and others. IT support facilities and infrastructure continue to develop. IT projects have sprung up everywhere, among others: website creation projects, renovation of office computer networks, manufacturing projects software for administrative applications in offices, and others [4], [19], [20], [26], [27].

The essential element is that these IT tools shortly become necessary for the sports activities administrator, regardless of the level of the sports hierarchy where it works. In general, the public needs Sports Information System in The Industrial 4.0 to allow them to look for sport places to maintain their health.

REFERENCES

[1] A. Brinkley, H. McDermott, and F. Munir, "What benefits does team sport hold for the workplace? A systematic review," *J. Sports Sci.*, vol. 35, no. 2, pp. 136–148, 2017, doi: 10.1080/02640414.2016.1158852.

[2] P. Downward and S. Rasciute, "Does sport make you happy? An analysis of the well-being derived from sports participation," *Int. Rev. Appl. Econ.*, vol. 25, no. 3, pp. 331–348, 2011, doi: 10.1080/02692171.2010.511168.

[3] E. A. Jaarsma, P. U. Dijkstra, A. C. E. De Blécourt, J. H. B. Geertzen, and R. Dekker, "Barriers and facilitators of sports in children with physical disabilities: A mixed-method study," *Disabil. Rehabil.*, vol. 37, no. 18, pp. 1617–1625, 2015, doi: 10.3109/09638288.2014.972587.

[4] M. Stuij and R. Stokvis, "Sport, health and the genesis of a physical activity policy in the Netherlands," *Int. J. Sport Policy*, vol. 7, no. 2, pp. 217–232, 2015, doi: 10.1080/19406940.2014.962073.

[5] M. Weed, "Should we privilege sport for health? The comparative effectiveness of UK Government investment in sport as a public health intervention," *Int. J. Sport Policy*, vol. 8, no. 4, pp. 559–576, 2016, doi: 10.1080/19406940.2016.1235600.

[6] U. Wigger, "Exercise and youth: Physical activity, sport involvement, and development," *Eur. J. Sport Sci.*, vol. 1, no. 3, pp. 1–8, 2001, doi: 10.1080/17461390100071305.

[7] D. Dudley, J. Cairney, N. Wainwright, D. Kriellaars, and D. Mitchell, "Critical Considerations for Physical Literacy Policy in Public Health, Recreation, Sport, and Education Agencies," *Quest*, vol. 69, no. 4, pp. 436–452, 2017, doi: 10.1080/00336297.2016.1268967.

[8] B. Watson, B. Lashua, and P. Trevorrow, "What difference does dance make? Critical conversations across dance, physical activity and public health," *Int. J. Sport Policy*, vol. 8, no. 4, pp. 681–693, 2016, doi: 10.1080/19406940.2016.1238404.

[9] D. H. Schunk, *Learning Theories: An Educational Perspective*, 6th ed. Boston: Allyn & Bacon, 2012.

[10] R. Hoekman, K. Breedveld, and G. Kraaykamp, "A landscape of sport facilities in the Netherlands," *Int. J. Sport Policy*, vol. 8, no. 2, pp. 305–320, 2015, doi: 10.1080/19406940.2015.1099556.

[11] R. and H. Nicholson, M. Hoye, "Participation in sport: international policy perspectives , edited by Nicholson, M. Hoye, R. and Houlihan, B.," *Int. J. Sport Policy Polit.*, vol. 3, no. 1, pp. 145–147, 2011, doi: 10.1080/19406940.2011.553902.

[12] M. Coimbra, R. Cody, J. N. Kreppke, and M. Gerber, "Impact of a physical education-based behavioural skill training program on cognitive antecedents and exercise and sport behaviour among adolescents: a cluster-randomized controlled trial," *Phys. Educ. Sport Pedagog.*, vol. 0, no. 0, pp. 1–20, 2020, doi: 10.1080/17408989.2020.1799966.

[13] Xiujin Guo, Jian Dai, P. Xun, and L. M. J. & K. He, "Sport facility proximity and physical activity: Results from the Study of Community Sports in China," *Eur. J. Sport Sci.*, vol. 15, no. 7, pp. 663–669, 2014, doi: 10.1080/17461391.2014.982203.

[14] C. Gratton and I. A. N. Jones, *Research Methods for Sports Studies, Second Edition*, 2nd ed. New York, 2010.

[15] T. Kokolakakis, F. Lera-López, and P. Castellanos, "Regional differences in sports participation: The case of local authorities in England," *Int. J. Sport Financ.*, vol. 9, no. 2, pp. 149–171, 2014.

[16] J. Kim, N. Yamada, J. Heo, and A. Han, "Health benefits of serious involvement in leisure activities among older korean adults," *Int. J. Qual. Stud. Health Well-being*, vol. 9, no. March 2017, 2014, doi: 10.3402/qhw.v9.24616.

[17] J. Miocic, L. Zekanovic-Korona, and B. Bosancic, "Information systems in sports organizations: Case study of the sports association of the city of Zadar," *2019 42nd Int. Conv. Inf. Commun. Technol. Electron. Microelectron. MIPRO 2019 - Proc.*, pp. 1362–1367, 2019, doi:

10.23919/MIPRO.2019.8756923.
[18] D. Vuleta and I. Gruić, "Informatizacija u rukometu. [Information and computer science advances in handball. In Croatian]," in *15th Summer School of the Kinesiologists of the Republic*, 2005, pp. 256–261.
[19] M. Peters, F. Piazolo, L. Köster, and K. Promberger, "The deployment of intelligent local-based information systems (ilbi): A case study of the European Football Championship 2008," *J. Conv. Event Tour.*, vol. 11, no. 1, pp. 18–41, 2010, doi: 10.1080/15470141003587574.
[20] K. Matsui, "An information provision system according to residents' indoor comfort preferences for energy conservation," *Cyber-Physical Syst.*, vol. 3, no. 1–4, pp. 121–142, 2017, doi: 10.1080/23335777.2017.1415980.
[21] P. Wittels and L. Mansfield, "Weight stigma, fat pedagogy and rediscovering the pleasures of movement: experiencing physical activity and fatness in a public health weight management programme," *Qual. Res. Sport. Exerc. Heal.*, vol. 00, no. 00, pp. 1–18, 2019, doi: 10.1080/2159676X.2019.1695655.
[22] Y. Prasetyo, "Kesadaran Masyarakat Berolahraga untuk Peningkatan Kesehatan dan Pembangunan Nasional," *MEDIKORA*, vol. VOL.XI, pp. 219–228, 2013.
[23] D. C. Montgomery, *Design and Analysis of Experiments*, 8th ed., vol. 2. Hoboken: John Wiley & Sons, Inc, 2013.
[24] M. C. Wu, Y. Tang, and H.-J. Lo, "A Study on the Willingness to Use Information System of Sport Event Based on Information System Success Model," *J. Hum. Resour. Adult Learn.*, vol. 9, no. 2, pp. 31–40, 2013.
[25] A. Moeuf, R. Pellerin, S. Lamouri, S. Tamayo-Giraldo, and R. Barbaray, "The industrial management of SMEs in the era of Industry 4.0," *Int. J. Prod. Res.*, vol. 56, no. 3, pp. 1118–1136, 2018, doi: 10.1080/00207543.2017.1372647.
[26] E. Crook, "Sport and access to sport information in Australia," *Aust. Libr. J.*, vol. 62, no. 4, pp. 295–304, 2013, doi: 10.1080/00049670.2013.845074.
[27] N. C. H. Ong, "The use of the Vienna Test System in sport psychology research: A review," *Int. Rev. Sport Exerc. Psychol.*, vol. 8, no. 1, pp. 204–223, 2015, doi: 10.1080/1750984X.2015.1061581.

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