Creative Learning Model Toolkit: An Essential Element of Science Learning to Develop Learning Skills in Students

IOP Conf. Series: Journal of Physics: Conf. Series **1233** (2019) 012101 doi:10.1088/1742-6596/1233/1/012101

Creative Learning Model Toolkit: An Essential Element of Science Learning to Develop Learning Skills in Students

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Abstract. This study aims to (1) produce Creative Learning Model Toolkit (CLMT) on science learning which is appropriate to develop learning skills in students, (2) know the students learning skill that can be developed when using CLMT in science learning, (3) know the validity of CLMT that is used to develop students' learning skills in science learning. The research method uses Research and Development (R&D), by pointing to Four-D model with 4 main phases namely define, design, develop, disseminate. The instruments used in this study were product validation questionnaire, learning skills observation sheet, and test of cognitive knowledge. Result data of validation toolkit and observation sheets were analysed descriptively while N-gain for test of cognitive knowledge. The result showed that: (1) CLMT have been produced by several approach namely Contextual Teaching Learning, Collaborative Learning and Web based Learning; (2) CLMT could develop student's learning skills for instance critical thinking, social skill, and ICT literacy; (3) CLMT that was developed was considered as very good category both by expert and N-gain. Moreover, based on the analysis CLMT was appropriate to use in science learning process for develop students' learning skills.

Keywords: Creative Learning Model Toolkit (CLMT); Science; Students.

1. Introduction

In the 21st century, the development of education is a challenge for teachers to improve the quality of learning process, especially in science learning. Partnership for 21st Century Skills [1] identifies six key elements for the 21st century skills, one of which is emphasizing learning skills where students need learning skills consisting of three skills namely skills that related to information and communication, thinking and problem solving skills, interpersonal skills and self-regulating skills. A teacher needs to integrate these skills in science learning intentionally, strategically and as widely as possible. These skills will help students solve problems in their daily lives [2].

Students are required to actively learn which is implicated in physical or mental activities when they participate in science learning, not only includes hands-on but also minds-on activities. Hastuti, *et al*. in [1] define the dimensions of science as a way of thinking, a way of investigating, the body of knowledge, and its interaction with technology and society. This has become a fundamental substance of the importance of science learning that develops scientific processes for the formation of the mindset of students and the achievement of Nature of Science [3].To realize student centered learning,

it requires teacher creativity in developing creative learning processes, including in science learning [4].

Creative learning is a learning process that allows students to use their imagination, have ideas, produce solutions to solve problems, communicate in various media and can think outside the box. The experience of innovation students can improve by using creative learning. In addition, creative learning has many advantages, including students will become more sensitive or aware of a problem, differences, the existence of knowledge gaps, and missing elements [5]. The problems and phenomena that discovered by students then will be identified to find a new solution.

The learning process cannot be separated from the problems experienced by students and teachers. A few students who have difficulty in understanding the concept of learning material when their teacher only use the lecture method in learning process. Students listen the explanation from the teacher and are not actively constructing their own knowledge to find solutions of a problem. Therefore, it is necessary to apply learning model that activates students, one of them is a creative learning model. If a creative learning model is applied, students will better understand the knowledge that is built by themselves and be able to find solutions to the surrounding problems [6]. This is accordance with the objective of the classroom learning process according to the Ministry of Education and Culture in Indonesia that the learning process must provide students with broad opportunities to develop their potential into learning outcomes that are equal or higher than those stated in the Graduates Competency Standards.

Many creative learning models can be used in the classroom, including collaborative learning, Contextual Teaching learning, and Web Blogs Learning. Collaborative learning is group learning to understanding a concept, meaning, or creating a product, together between students and teachers [7]. In collaborative learning, students will be required to develop collaboration with their friends. On the other hands, contextual learning is a learning concept that can help teachers associate the material to students' real-world situations and encourage students to make connections between the knowledge they have with their application in their lives as family members and society [8]. Whereas Web Blog learning is learning carried out using blog software and can be accessed online that will develop students' ICT (Information Communication Technology) skills.

The competency standards of Indonesian students mentioned clearly that students must have 4 competencies, 2 of which are related to attitudes, cognitive knowledge and others skills. Through creative learning models, students will gain learning skills [9], are a skill that develops students' independence in learning. Learning skills are acquired skills by an individual through a continuous training process and include aspects of optimizing learning methods in the cognitive, affective or psychomotor domains [10]. However, the main component of learning skills training in the concept of learning how to learn is focused on the individual itself as a learner, so that each individual is trained to develop his own learning and not forced to follow a one size fits for all learning style. In general, learning skills focus on learning strategies to help students become better and more independent in learning. Learners will learn how to develop and apply learning, personal, and interpersonal management skills and teamwork skills to improve learning and achievement in school. The student learning skills that can be produced through creative learning models namely contextual teaching learning, collaborative learning and web blogs learning are critical thinking skills, social skills, and ICT literacy respectively. These skills are very necessary for students to be able to live in the global era[11].

The learning process requires the existence of a guideline in the form of learning toolkit that play an important role in the achievement of learning objectives, in which there are plans to implement learning and student activity. A few of science teacher using creative learning models in learning process, therefore the availability of science learning toolkit by using creative learning models are minimal. It can be a significant obstacle because these tools are needed to support the achievement of learning competencies, so that toolkit are needed to support learning activities using creative learning models. The hope, with learning toolkit using creative learning models can be implemented in science

learning to create student learning skills. The formulation of the problem in this study is: whether the developed device is valid, practical, and effective in developing student learning skills.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presented the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Method of Research

This section presents the research method.

2.1 Design of research

This study used the method of R & D (Research and Development) which adapted to the Four-D model by Thiagarajan. The research phase included four phases namely define, design, develop and disseminate. First phases were defining, a stage to define a description of learning that is considered ideal which consists of five stages, they were front end analysis, the learner analysis, the concept analysis, task analysis, and specifying instructional objectives. Second, design phase has aims to design Creative Learning Model Toolkit (CLMT) that consist of four steps must be taken at this stage, namely: (1) criterion-test construction, (2) media selection, (3) format selection, (4) appropriate design. Third phase was developing, a stage to produce Creative Learning Model Toolkit (CLMT) carried out through two steps, namely: (1) expert appraisal from science teacher and lecture followed by revision, (2) developmental testing or main field testing and followed operational revision. The main field testing has been done at 2017 for collecting the student's learning skill. The sample in this research is chosen with cluster random sampling technique while the criteria of the samples have normal and homogeneity data. While, the number of students are 180 students Junior High School in Yogyakarta. The last phase was disseminating, a stage to dissemination of creative learning model toolkit in science learning.

2.2 Instrument

The data in this study were taken using several instruments consisting of (1) Questionnaire of Creative Learning Model Toolkit (CLMT) validation sheet used to get data about product in this research that review from science teachers and lecturers as an expert; 2) learning skills observation sheets was used to know the improvement of critical thinking skill, social skill and ICT literacy; 3) the improvement of student's cognitive knowledge was measured by tests' instrument.

2.3 Data Analyses

The feasibility of creative learning model toolkit and observation sheet using scale 1 to 4 score. Moreover, the resulting score was counted its average in each aspect of validation and observation sheet, then analysed qualitatively of them based on the classification of four categories, namely: (1) very good, good, poor, and very poor with the interval score $3.25<X\leq4.00$; $2.50<X\leq3.25$; $1.75<X\leq2.50$; and $1.00\leq X\leq1.75$, respectively. Meanwhile the improvement of cognitive knowledge by instrument test was analysed by N-Gain by Hake $\langle g\rangle$, a value of obtained $\langle g\rangle$ was consulted with three categories, namely high, medium and low with have interval score $\langle g\rangle \geq 0.7$; $0.3 \leq \langle g\rangle < 0.7$; and $\langle g\rangle < 0.3$, respectively.

3. Results and Discussion

It is known that the problems found in the field that in teaching science, the teacher has not maximized to develop student learning skills which include critical thinking, social skills and ICT literacy which are skills that are needed by students in the 21st century. This is caused by not only is it less varied in the approach and learning model used by teachers but also too few science learning tools that could develop some of these learning skills. Therefore, one of the learning models that could develop student learning skills is the creative learning model. In addition, it was also necessary to

develop tools that in accordance with creative learning models to develop student learning skills. In this study a creative learning toolkit was developed that was able to improve student learning skills through a four-phase of R & D model.

3.1. Define Phase

Define stage is a stage to define a description of learning that consist of first, front end analysis which aims to raise and determine the basic problems encountered in learning, so that a device development is needed. The basic problem of this research was that the teacher has not been able to apply the creative learning model due to the limited learning tools available, so that they cannot develop student learning skills that are needed in the 21st century learning. Whereas we know that some learning skills are needed by students in the 21st century.

According to Partnership 21st Century Framework, teacher have to emphasizing learning skills consisting of three skills namely information and communication skills, thinking and problem solving skills, interpersonal skills and self-regulating skills. From the results of observations, it was found that some of the student learning skills that must be raised in science learning. For example, students could not fluently to make a question of a problem, could not analyzed connection the problems and solutions, and how to make a good conclusion, where it was several aspects of critical thinking. Besides, students have not maximized collaboration with friends in the group, not willing to share tasks yet and not respect differences in ideas in the group, which were aspects in social skills. Moreover, students have not maximized skills in using computer in science learning, it was aspect in ICT literacy. The fact that has been observed were learner characteristics, in second stage.

Third, the concept analysis to identify the main concepts that will be taught, it was *characteristics of substances.* The analyzes that have been carried out were analysis of competency standards and basic competencies that aim to determine the number of lesson plans and students' worksheets, and analysis of learning resources by collecting and identifying which sources support the teaching materials.

Fourth, task analysis aims to identify the main skills, they were critical thinking, social skills and ICT literacy. Finally, specifying instructional objectives, based on analysis concept, task analysis and learner characteristic a solution has been determined to overcome the problems in learning by developing Creative Learning Model Toolkit to improve students' learning skill in science learning. The result of define phase in Table 1.

Table 1. The result of Define phase

Basic competence	Essential concept	Learning skills	Creative learning model
Explain the concept of mixtures and single substances (elements and compounds), physical and chemical properties, changes in physics and chemistry in everyday life.	Mixture, elements, compounds, properties of matter, change of matter	Critical thinking	Contextual Teaching Learning
		Social	Collaborative Learning
Presenting the results of an investigation or problem solving work about the nature of the solution, physical changes and chemical changes, or separation of the mixture	Identification changes of matter and separation of mixture	ICT Literacy	Web Blogs Learning

3.2. The Design Phase

In design phase, have the objective to design the Creative Learning Model Toolkit as a product in this study. The design of learning toolkit consist of lesson plans and student's worksheet that develop to support learning activities in science learning.

Components of lesson plans accordance with the Indonesian Ministry of Education and Culture Regulation number 22 concerning the lesson plan format. While the students' worksheet has several components that related with the model of learning, namely Contextual teaching learning, collaborative learning and Web blogs learning which develop students learning skills critical thinking skills, social skills and ICT literacy, respectively.

Each creative learning model have different characteristic, for instance first, contextual teaching learning is a learning concept that can help teachers associate the material they teach with the real-world situation of students and encourage students to make connections between their knowledge and their application in their lives as family members and society [12]. By linking the material with everyday life, students will be motivated to think about relationships in their lives and how to solve problems around them so that students' thinking skills will develop. Second, in collaborative learning, students will be required to develop cooperation with their friends. Syntax of collaborative learning namely orienting students, forming learning groups, developing learning tasks, facilitating student collaboration, assessing and evaluating learning [13]. Moreover in collaborative learning, students will be required to develop collaboration with their friends or social skills with several aspects they were using agreements, appreciating contributions, taking turns and sharing tasks, being in groups, being in assignments, encouraging participation, inviting others, completing assignments in time, and respect for individual differences [14]. Lastly, learning using a blog, students can construct the information needed so that it can foster students' enthusiasm in finding information they want to know. In addition, through the blog learning materials can be accessed anytime and from anywhere, in addition the material can also be enriched with a variety of learning resources including multimedia [15].

3.3. The Develop Phase

This phase aims to produce products in the form of creative learning models toolkit which are carried out in two steps, namely: (1) expert appraisal followed by revision, (2) developmental testing.

3.3.1 Expert appraisal of product

The product assessment involved two expert lecturers and two science teachers using an expert validation assessment sheet for each type of product. Product valuation uses a score assessment range between one to four which is then converted to values and categorized. Table of product validation results from experts and science teachers can be presented in the Tables 2 and 3.

Table 2. The Result Validation of Lesson Plans

Aspect	Lectures	Teachers
Completeness of the components of the lesson plan	4	4
Accuracy in formulating indicators	3.5	3.5
Complete indicators with core competencies and basic competencies	3.5	3.5
Suitability of learning objectives with core competencies and basic competencies	3.5	3.5
Completeness of the components of learning objectives	4	3.5
Completeness of the Creative Learning model syntax in the scenario	4	4
Suitability of scenario with time allocation		
Media compliance with materials and activities	4	3.5
Completeness of tools and materials with activities	3.5	4
Completeness of learning resources	4	4
	4	4

Table 3. The Result Validation of Students' Worksheet

Aspect	Lectures	Teachers
Conformity of Title with activities	4	4
Conformity of activities with the aim	4	3.5
Conformity of activities with Core Competencies and Basic Competencies	4	3.5
Activities of creating creative learning	3.5	3.5
Student-centered activities	4	3.5
Activities can train learning skills	3.5	4
Activities to guide students to discussions	4	3.5
Material can train students to conduct investigations in groups	4	4
Materials presented accordingly with the truth of the concept	4	4
The concept of material and activities is displayed in harmony with the cognitive chain	4	4

Based on the results of validation by the validators' two lecturers and 2 two science teachers, it is known that the developed creative learning model toolkit is in the very good category and the validation sheet is reliable. The suggestion from the validator of the product is that in the column of material equipped to be adjusted to the basic competencies, the formulation of the indicators is operational, the special characteristics of creative learning that distinguishes from other learning is less visible, changing motivation in accordance with what they want to do at the core activities.

3.3.2. Developmental Testing

After the revision was carried out in accordance with the input of the validators, product testing was conducted on junior high school students on substances characteristics to know the development of learning skills of students. The field main testing conducted in student's grade VII in junior high school which learnt about substances characteristic by one shoot design experiment. The result of field main testing can be showed in Tables 4, 5, and 6.

Table 4. The result of critical thinking using Creative Learning Model Toolkit

Aspect	score	Category
formulating questions of problems	3.5	Very good
analysis discussion in group	3.7	Very good
conducting solution	3.6	Very good
choose better solution	3.8	Very good
communication by conclusion	3.6	Very good
average	3.64	Very good

Critical thinking skills such as data collection skills, analyzing skills, and conclusions making skills are very important things in life regardless of their scope as aspects or indicators in the skills in conducting research [16]. As data gathering skills are things that need to be applied in life if students receive information that is not necessarily true, students need to collect data in the form of information in the community or the internet for analysis. This is inseparable from analyzing skills from indicators of critical thinking skills that guide students to solve problems in the midst of a flood of information that has been collected or obtained by students through experiments or other discussions so that students can draw conclusions from the existing problems, related to skills make a conclusion.

Table 5. The result of Social Skill using Creative Learning Model Toolkit

Aspect	score	Category
using agreements	3.6	Very good
appreciating contributions	3.5	Very good

taking turns and sharing tasks	3.7	Very good
being in groups	3.5	Very good
being in assignments	3.7	Very good
encouraging participation	3.8	Very good
inviting others	3.6	Very good
completing assignments in time respect	3.6	Very good
for individual differences	3.6	Very good
average	3.62	Very good

The success of collaborative learning is determined from the process of collaboration between students and teacher-students. The collaboration process there is a shared understanding to share activities, roles, and responsibilities, how to process in various situations, who will do the tasks and what tasks are given and how to do it, what is the end result, and what is the final result [17]. The behavior of students in a collaborative learning situation is (1) giving and receiving assistance and guidance, (2) exchanging resources and information, (3) explaining information that is being explored, (4) sharing knowledge they have, (5) giving and receive feedback, (6) ask for the contribution of other members, (7) encourage other members to increase enthusiasm, (8) participate in small groups, and (10) monitor the contribution and enthusiasm of other members [18].

Table 6. The result of ICT Literacy using Creative Learning Model Toolkit

Aspect	score	Category
Access	3.8	Very good
Manage	3.6	Very Good
Evaluate	3.6	Very good
Create	3.3	good
Communicate	3.6	Very good
average	3.58	Very good

Based on Table 6, it can be seen that ICT literacy student have very good category in all aspect of ICT literacy. By using a student's blog students can construct the information needed so as to foster students' enthusiasm in finding information they want to know. In addition, in the blog the teacher can also make permalink to other information sources that support learning activities and students can freely access information relevant to learning activities both in writing, images, audio, and video. As long as students access an information or material that is being carried out, students can obtain ICT literacy skills namely manage and evaluate aspects. By accessing various sources of information available in the teacher's blog that have been linked to other websites, students can train themselves to process and provide an assessment or sort out which information is relevant or not. Blogs can support the improvement of reflective thinking skills [19]. Students have been able to use computer and internet devices, open Microsoft office programs and internet explorer, download text, images, videos, animations, and combine information obtained in a simple display, so that the aspect of create and communicate was answered

4. Conclusion

The level of feasibility of learning devices with creative learning models to realize learning skills in science learning according to the validator included in the excellent category. The Creative Learning Toolkit model is able to develop the achievement of learning skills, namely with several models namely contextual teaching learning can develop critical thinking, collaborative learning models developing social skills and web blog learning will develop ICT literacy.

Acknowledgments

It is hoped that the use of Creative Learning Model Toolkit will be able to develop students' learning skills. Science learning with investigating activities will train students' psychomotor skills and attitudes. Thank you very much to all those who helped and participated in this research.

Reference

[1] Hastuti P W, Nurohman S, and Wibowo W. 2013. *Jurnal Pendidikan Matematika dan Sains.* **1(2)** 158–164.
[2] Sinaga P. 2017. *J. Turkish Sci. Educ.***14(4)** 92–107.
[3] Achmad M and Suhandi A. 2017. *AIP Conf. Proc.* **1848.**
[4] Hastuti P W, Tiarani V A, and Nurita T. 2018. *J. Pendidik. IPA Indonesia*. **7** 232–238.
[5] Solehuzain and Dwidayati N K. 2017. *Unnes J. Math. Educ. Res.***6(1)** 103–111.
[6] Hairida. 2016. *J. Pendidik. IPA Indonesia.* **5(2)** 209–215.
[7] Dema O and Moeller A K. 2012. *The 2012 Central States Conference on the teaching of Foreign Language*.75–91.
[8] Bissell A N and Lemons P P. 2015. Bioscience. **56 (1)** 66–72.
[9] Buaraphan K. 2011. J. Sci Educ Technol. **2544(2001).**
[10] Nurita T, Hastuti P W, and Sari D A. 2017. *J. Pendidik. IPA Indonesia.* **6(2)** 41–345.
[11] Barkley E F. 2010. *Student engagement techniques: A handbook for college faculty*
[12] Lucas B and Anderson M. 2015. *Creative Learning In Schools : What It Is And Why It Matters A Rapid Evidence Scan*. Dusseldrop Forum.
[13] Baynes R. 2016. *Aust. J. Indig. Educ.* **45 (1)** 80–90, 2016.
[14] Bybee R W. 2015. *Leaning Science and Science Of Learning*, vol. XXXIII, no. 2.
[15] Noel L. 2015. *Procedia - Soc. Behav. Sci.* **174** 617–621.
[16] Arifin L and Sunarti T. 2017. *J. Penelit. Fis. dan Apl.* **7(2)** 68.
[17] Larusson J A & Alterman R. 2009. *International Journal of Computer-Supported Collaborative Learning.* **4(4)** 371-402.
[18] Mitarlis S, Ibnu S. Rahayu S, and Sutrisno. 2017. *Pap. Conf. Proceedings, A I P Conf. Inq. Sci. View, Lect. Literacy, Improv. Sci.* December. 0200201–0200206.
[19] Ismail N S, Harun J, Zakaria M A Z M, and Salleh S M. 2018. *Think. Ski. Creat.* **28** 177–195.