JIPM (Jurnal Ilmiah Pendidikan Matematika) 8(2), 2020, 108-121
DOI : 10.25273/jipm.v8i2.5048

JIPM (Jurnal Ilmiah Pendidikan Matematika)

Journal homepage: http://e-journal.unipma.ac.id/index.php/jipm

Beginner Teacher's Perception of Application of Project-Based Learning in Mathematics Learning

Muhamad Ikhsan Sahal Guntur*, Heri Retnawati

Universitas Negeri Yogyakarta, Indonesia
**muhamadikhsan.2018@student.uny.ac.id*

Abstract: This research aims to describe the teacher's perception of the application of project-based learning in mathematics learning and how they will apply it using a qualitative case study method. The research subjects in this study amounted to 12 students consisting of 3 men and 9 women, where they were students of post-graduate mathematics education study programs at Yogyakarta State University who were beginner teachers where they had taught between 1 and 3 years. Data collection using interviews with open questions to provoke written perceptions of respondents to the project-based learning approach. The time of the study was carried out starting from December 1, 2018, to January 2, 2019, located at Yogyakarta State University. The data analysis techniques applied in this study are Bogdan, R. C., & Biklen models. The results of this study indicate that: (1) respondents have a good perception of the project-based learning approach, (2) the majority of respondents are interested in using a project-based learning approach after they complete their studies (3) all respondents believe they will find obstacles when applying project-based learning approach later (4) the majority of respondents have less knowledge and experience regarding the project-based learning approach. (5) the need for training and further discussion of the project-based learning approach to the research subjects.

Keywords : Project-Based Learning; Beginner Teacher; Perception

Introduction

Increasing human resources is the goal of every nation. These objectives can be achieved through education (Rafi, Yogyakarta, Retnawati, & Yogyakarta, 2018). In addition to increasing human resources, education also aims to change the behavior of these individuals, depending on the community and the environment in which they live. Following this objective, the approach used to advance education and teaching continues to develop. When we live in the 21st century, where conventional educational approaches that are teacher-centered learning are becoming obsolete and give way to a student-centered approach to development, one student-centered approach is project-based learning or project-based learning approaches.

The project-based learning approach emphasizes that teachers are expected to guide students to play an active role in the learning process, conduct research, connect their learning

with real life, and construct knowledge itself (Erdem & Demirel, 2002). The main objective of the project-based learning approach is to guide students to create solutions-oriented products for new situations they face by linking their learning with real-life even though creating a product or work at the end is a major force in the project-based learning approach but it is fundamental and most important is the attainment of the basic skills and knowledge needed to produce the final project (Ruangrit, 2008).

The use of this approach contributes to educating students with 21st-century skills, identified with the emergence of critical thinking skills, problem-solving skills, increasing creativity, use of digital resources, being responsible, being able to express opinions (Bell, 1981). The application of the project-based learning approach itself has many challenges such as taking a long time, the difficulty of keeping students to focus on what is discussed and not discussing things outside of the topic, using a lot of costs, abducting students who are not accustomed to learning by discussing, the limitations of teachers who may not be equipped with the skills and knowledge to manage classes in this approach (Bayasura, 2016). Other research conducted over 3 years explains that the beneficial effects of using a project-based learning approach, with a significant increase in performance in students (Haller, Billinghurst, & Thomas, 2007)

In applying the project-based learning approach the teacher's role is very important. The teacher's role is to direct learning in the classroom to stay on track and the first thing the teacher must have is a positive perception in the approach itself. Perception is an internal process that allows a person to choose, organize, and interpret stimuli from his environment and the process affects one's behavior (Dedy, 2001).

The process of forming one's perception takes place when a person receives a stimulus that is captured by his aid organs which then enters his brain. In it there is a thought process that finally manifests in an understanding, this understanding is called perception (Sarwono & Sarilto.W., 2012) The wrong perception of an approach will be very influential in teaching and learning activities in the classroom because to change a person's behavior starts from changing his perception (Guntur, 2015) . A teacher's perception of an approach is very important to know because it will affect how a teacher uses the approach to support teaching and learning activities in the classroom. The urgency of this research itself is to illustrate how the teacher's perception of the application of project-based learning so that it will be the basis of other researchers in developing research using project-based learning.

The research question concerns the extent to which respondents are familiar with the project-based learning approach and the extent to which they have gained the skills needed to apply this approach during their teacher education. This research is also useful for imposing previous research that discusses the teacher's perception of project-based learning.

Method

This research is intended to illustrate the teacher's perception of the project-based learning approach and how it will be applied in class using the case study qualitative research method. The qualitative case study approach provides an opportunity to explore in-depth the rich information from the case (Creswell, 2013; Denzin & Lincoln, 2005; Denzin & Lincoln, 2005; Yin, 2009) and is very suitable in situations where variables cannot be easily identified and theories are not available to explain all subject behavior (Yin, 2009).

Each respondent represents one case and each respondent represents a common problem. Also, case studies are appropriate in exploration from time to time and involve many rich sources of information.

Participant

Case study research begins with identifying one specific case. Where research subjects can be individuals, small groups, organizations or partnerships (Creswell, 2013).

The subjects of this study were 12 students consisting of 3 men and 9 women, where they were postgraduate mathematics education students at UNY. the research subjects were chosen because they were categorized as novice teachers. Where according to Permendiknas no 27 of 2010 explains that "Beginner teachers are teachers who are first assigned to carry out the process of learning/guidance and counseling in educational units organized by the Government, local government, or the community" (Permendikbud, 2010).

Data collection

Data were collected using interviews with open-ended questions aimed at provoking written perceptions from respondents about the project-based learning approach. When the research was conducted from 1 December 2018 to 2 January 2019. The research was located around the campus of Yogyakarta State University. Interviews are recorded audio on a smartphone and recorded conversations are written verbatim. The interview protocol is designed semi-structured and some questions arise during the conversation. Has the following outline.

- Have you studied the project-based learning approach? if you have, do you have the opportunity to apply it in the real class?
- What do you think of the project-based learning approach?
- Will you implement a project-based learning approach in your class, after you graduate, and explain why.
- What skills will students get through the project-based learning approach?
- Do you think that you will experience obstacles when using the project-based learning approach later? If so, what will be the problem?
- How should a lesson be planned to apply the project-based learning approach more effectively?

Data Analysis

Qualitative data are collected and analyzed to determine the theme (Creswell, 2013; Denzin & Lincoln, 2005). Data analysis models generally become a reference for analyzing qualitative data, namely Creswell (2013), (Miles & Huberman, 2007). But the data analysis technique applied in this study is a model developed by (Bogdan & Biklen, 1982). This data analysis technique was chosen because it can describe a relationship between themes and get a more detailed understanding (Retnawati, 2017).

Regarding the credibility of the findings, the researcher noted the themes, codes, and responses that supported and also did not support, (Lincoln & Guba, 1985 Lincoln & Guba, 1985;Patton, 1999). Thus, during the data analysis process, alternative responses, refutations or statements that do not support are coded and used as evidence.

This class action research started from the first cycle and ended if the score of the mathematical communication ability of students under study has reached an average score of 75. The instruments used as data collectors were tests of mathematical communication abilities,

lecturer observation sheets, student observation sheets, and notes during the research process. Each cycle had 4 stages, namely the planning phase, the implementation phase, the observation phase, and the reflection phase. The planning phase consisted of determining the actions to be carried to solve the problem, arranging the Semester Learning Plan, arranging mathematical communication abilities test questions, arranging lecturer and student observation sheets. The implementation phase was giving an opening greeting, praying before the learning activities, checking the attendance of students, conveying the lesson plan, dividing students into groups, students learned geometry material through group discussions, students wrote important notes of group discussion results, one student presented the results of their group discussions in front of the class, and students made conclusions about the material they had learned. The observation phase was the stage of evaluating the activities of implementing actions while the reflection phase was the analysis phase of the learning process to find out the improvement in mathematical communication abilities in the learning process.

Result and Discussion

As a result of data analysis, six themes were successfully reduced from existing data, namely the theme of learning based on project-based learning approaches, the definition of the project-based learning approach, the use of project-based learning approaches in the future, the contribution of the project-based learning approach, the constraints in applying the project-based learning approach, and things that must be prepared before using a project-based learning approach. The findings obtained are presented under these themes and exemplified by quotations from respondents' interviews.

Table 1. Experiences of learning and applying a project-based learning approach

Study and apply approaches project-based learning	theme	Relationship between themes
Have studied, have applied for 2 years	Have already studied and applied	Have already studied the project-based learning approach.
Have studied and have planned several classes in class		
Never studied when s1 but still confused about the difference, never implemented	Have studied and haven't applied it	
Never studied but didn't understand, never applied		
Never studied but, rather forgot to remember, had never applied it in class.		

All respondents responded that they had studied the project-based learning approach when they were studying at the first level. but almost the majority of respondents only learned it in theory but never practiced it in a real class, only 2 respondents had applied it directly in class. Some respondents' responses are as follows:

S1: "I have studied even though it is not too deep but I happen to have applied it twice in my class."

S6: "Yes, I learned this strategy during my undergraduate lecture in the mathematics learning strategy course, if I'm not mistaken, but I haven't had the chance to apply this."
S7: "Yes, I learned it on campus when I graduated from S1, but I have never applied it in class, the problem is it's rather complicated, it takes quite a lot of time and preparation."

The reason for never practicing the project-based learning approach is more because of the lack of time respondents have to implement a project-based learning approach.

Table 2. Theme two: understanding of the project-based learning approach

Understanding	Theme	Relationship between themes
Student-centered learning through a given project	Project-based learning	Project-based learning focuses on the project and is done in groups and in the allotted time
Resolve problems in the form of projects within a certain time		
A project as a core lesson		
Students solve problems in groups and they make projects from problems	Done in groups	
Group assignments but help students grow their concepts		

Most respondents explained simply what the project-based learning approach was. Their answers generally have in common where the project-based learning approach focuses on the project and is carried out within the allotted time. They also consider that the process is important for creating a product. Also, they show that the project-based learning approach requires a lot of time and energy. Some respondents define the project-based learning approach as learning-centered on students through a given project. Some respondents' responses are as follows:

S2: "Okay, what I know about this project-based learning approach is that the project-based learning approach asks students to solve problems in groups and they make a project of these problems by determining the problem solving of the problem."
S6: "In general, this approach is good enough to be applied in class, solving problems in the form of projects within a certain time, but there may also be obstacles such as lack of time and students may be confused about what projects they will do in class."
S10: "I think the project-based learning approach is good learning, the focus of the project-based learning approach is the project as the core of the lesson."

Learning by growing its concepts and get meaningful learning from it. Respondents' responses include statements about, students learn themselves, conduct research and apply what has been learned and result in more independent learners

S1: "The project-based learning approach is, in my opinion, an excellent learning alternative, group-based learning but can train students to be independent, so it can help students develop their concepts so that students can get more meaningful learning."

Other respondents are still not sure what the project-based learning approach is. Some of the respondents' responses are as follows:

S4: "If I am very close to each other, initially the students were given a problem, basically the problem was based on the project he became a media that helps in learning."

Table 3. Theme Three: future use of project-based learning approaches

Using PBL in the future	Theme	Relationship between themes
Will be used because this strategy requires students to be active and independent	The teacher will use PPA because it has so many advantages and adds variety to teaching	It does not rule out the possibility to implement PPA in the future.
Agree, because learning is fun, not boring and hone students' creativity		
Will apply to add variety to the teaching approach in the classroom		
Hoping to apply, but will re-understand the PjBL	Still hesitant in implementing the PPA due to lack of understanding, seeing field conditions and will take a lot of time	
Depending on how the characteristics of my students if my students are intelligent talented and special I will apply		
Will avoid if there are other options because it will eat a lot of time-consuming		

Almost all respondents said that they would use the project-based learning approach after graduation because of the benefits of the project-based learning approach they felt, such as active learning, encouraging students to learn independently, learning was fun, not boring and honing students' creativity. Some respondents' responses are as follows:

S6: "Yes, because in this strategy students are highly demanded to be active and independent according to the teacher's instructions on that matter."

S7: "If given the opportunity yes because the learners are fun and not boring and hone students' creativity."

Some correspondents also want to apply this approach because according to the learning in that class must be varied and not monotonous. Some respondents' responses are as follows:

S3: "Yes, it is possible that someday if there is an opportunity, there is a possibility of implementing a learning strategy why because maybe there will be variations in learning in class so not only this learning method and this but there are other variations when there is suitable material and students already feel suitable why not just use it. "

S4: "Yes, if there is an opportunity, right? Especially if we later become teachers, we have to be innovative, right? So we have to try it, there are many learning approach models that we can apply, one that supports the certification of classroom action research, mas, at least I have to carry out research maybe I can apply the project-based learning approach there, right that's one good approach that's not conventional."

S11: "If I want to, I just because I like new things and I am sure my students will also be enthusiastic when learning in many class variations."

However, some correspondents seem hesitant to apply this approach, they will look at the condition of the students first and look more deeply about this approach. Some respondents' responses are as follows:

S8: "I hope to be able to implement it, but I will better understand the project-based learning approach, what the syntax is like."
S9: "Depending on the characteristics of my students, if my students are intelligent, talented and special, I will apply a project-based learning approach, but it will not continue only when the time is right, I will do it."
S12: "I seem to be avoiding when there are other options, try other ones because it will take a lot of time."

This doubt is fairly reasonable because respondents have never applied it and still feel they don't understand what project-based learning is.

Table 4. Theme Four: Contribution of the project-based learning approach.

Contribution	Theme	Relationship between themes
The link between the theme of Collaboration, due to groups, her communication skills, problem-solving skills	PjBL contribution that students will get after joining PjBL based learning	PjBl has a very good impact on students both during learning and afterward
Skill to express opinions and collaborate		
Cooperation, communication, learning on time		
Students become more active,	The PjBL contribution that students will get when they take PJBL-based learning	
Make learning fun		
Provide learners' experiences on how to practice well		
provide memorable learning for students		
Expand knowledge already learned		

According to the responses of respondents, the skills that will be obtained through a project-based learning approach or others, solving problems, improving collaboration skills, expressing opinions, cooperation, communication. Some respondents' responses are as follows:

S2: "The first collaboration skill is because this is a group, the possibility of her communication skills, maybe also the ability to solve problems after applying this project-based learning approach."
S3: "What is clear is that the skill to solve problems is because the students themselves are doing the project process so that they conduct their experiments and the skills to express their opinions later on from the results of their research the students will be allowed to present it in front and write their report."

S4: "Cooperation, communication, then he learns on time is more motivated."

Some correspondents also think that the skills that will be improved through a project-based learning approach are student motivation, student creativity, critical thinking skills, collaboration, and independence. Some respondents' responses are as follows:

S1: "Immediately the advantages are yes, so in my opinion, it can increase the motivation of students, obviously yes, increase the ability of problem-solving to be able, the third one is that students become more active than the other side because they are directed towards self-study, increasing students' elaboration too. Providing learners' experiences of how good practices should continue to provide good learning experiences that are memorable for students and then make learning fun."

S9: "More to the creativity of students, the ability to think critically, the ability of students to expand the knowledge that has been studied will end up being applied to the project, what is it like and more when if the project-based learning approach will be more demanding teamwork and communication, so it is more collaborative, independent."

Table 5. Fifth Theme: Constraints in the implementation of project-based learning approaches

Obstacles	Theme	Relationship between themes
Students often do not want to bother	Constraints centered on students	Some obstacles will be experienced by the teacher when doing good project-based learning that comes from students, the teacher and the student's learning environment itself
Some students are less interested when they work alone,		
Uneven distribution of student abilities		
Requires a lot of time to solve the problem	Constraints that come from student learning environments	
The cost needed for the equipment is not small		
teacher have a problem to create projects that attract attention	Obstacles experienced by the teacher	
the difficulty of teachers to create projects that hone students' critical thinking		
The difficulty of teachers controlling students so that they are not absorbed in themselves		

All respondents thought they would face difficulties when using a project-based learning approach. These constraints are grouped into three main categories: related to students, related to teachers, and related to the learning environment. Obstacles centered on students: students are

less interested, students will need a lot of time, do not know how to do research, and cannot learn in groups. Some respondents' responses are as follows

S4: "If the obstacles cannot be denied, bro, there are always difficulties. Maybe the reality that we are facing right now is that students often don't even bother to feel comfortable, the project-based learning approach is more encouraging active students and teachers as facilitators. If what I meet is like that, students are less interested when they work alone, what are we doing. Even though kids can't be generalized these days, we don't want to bother, you know, so we have to be able to condition so students can be active."

S10: "Some difficulties arise, first the students will need a lot of time to solve the problem so the teacher must consider whether there is enough time, in addition to costs, equipment is also prepared, then students who have difficulties in testing and gathering information, for example in class not it only contains active students but those who are not active so non-active students have less role in group work. "

Obstacles related to teachers include obstacles controlling students, problems managing classrooms, finding different and interesting project topics. As well as maintaining student focus Some respondents' responses are as follows

S1: "From my experience, the problem is that in time, so the project-based learning approach uses a lot of time, so the teacher must be clever to manage how to manage the time, then the costs need a lot because here we need some facilities. In the preparation process, it is very important. Then planning is no less important too. so, in my opinion, the preparation is complicated and requires a lot of time. "

S2: "Yes, like most learning methods that are based in groups, usually the teacher has the first difficulty is controlling students, supervising students sometimes they are engrossed themselves and then forming groups themselves then there are some students who sometimes one student dominates so other students sometimes do not get the opportunity to contribute to their respective groups. "

S7: "Yes, the difficulty is for the teacher to make a project that attracts the attention of the students and is a way of thinking critically students."

S12: "The most difficult part of project-based learning itself is maintaining the concentration of the students themselves to focus on completing what became our initial goal."

S5: Difficulties in determining the project itself are good like what, what do you want to be afraid of if it is too difficult to help students instead confuse students. "

In addition to problems related to students and teachers, some respondents felt constraints related to the learning environment, such as lack of materials, the large number of costs incurred, the focus of students who were difficult to maintain and limited time. Some respondents' responses are as follows

S3: "If there are difficulties, this is because this is project-based, experiment-based is the problem in the device and requires a lot of time."

S6: "Yes, as I said at the beginning, the problem is time. Because students are required to be active in making their projects, 2 hours of learning time will not be enough. Especially for students who are new to touch with this approach. But if the teacher can manage the class well, no problem. "

Table 6. Theme Six: things that must be prepared

Things that must be prepared	Theme	Relationship between themes
Most important is in the opening	What teachers must think about before teaching and applying the PjBL approach	What should be prepared by teachers related to technical matters before learning
Clear instructions		
The teacher must position himself as a facilitator		
The teacher must be clever at dividing tasks		
Understand all the syntax of project-based learning approaches		
Guess what might happen		
Project to be used	Material/project and assessment system that must be prepared by the teacher	
The teacher must determine what material or theme is suitable		
students 'assessments are transparently and assess students' portfolios		

Related to the teaching of the learning process, the respondents suggested before the project-based learning approach that must be prepared is a good apperception, clear instructions determine what material or theme is suitable. The division of time and groups must also be precise and how to assess students' projects transparently and fairly. Some respondents' responses are as follows

S3: "The most important thing is that in the opening, then the instructions that we give to students because if the instructions at the beginning are not appropriate or there are students who do not understand, backward in my opinion it affects the experiments conducted by students, students will not know where we are going. "

S6: "I think what should be considered is the project that we will do, whether the project will finish one meeting or not, if possible, the material does not cover one large material, if possible, the material is only one small sub-material, can one meeting or not? must proceed to the next meeting. In general, one meeting must be finished so the teacher must be clever in dividing the tasks. "

S8: "First, of course, we must understand all the syntax of the project-based learning approach, secondly we must know the types of problems that should be raised, thirdly we must use questions that can direct students towards problem-solving without having to give direct instructions so still the teacher must be as facilitators and students as a center of learning. "

S10: "The teacher must determine what material or theme is suitable for the project-based learning approach, the teacher designs, and plans learning to enrich the interactions that may arise

between the teacher and students and how to assess students in a tarnished manner and assess students' portfolios."

Some material suggested by respondents regarding any material that is suitable to be used in the project-based learning approach is still limited in the construction of space and a flat shape almost as much as it suggests. Only a few suggested other materials such as linear equality and opportunity. Some respondents' responses are as follows

S1: "I once applied this project-based learning approach to determine the surface area of the limas building so first, we help students construct approximately how to determine the area of the building up to how through the project after that the student will get his knowledge so he already has his completion, for example, determine the surface area of a cube without a base. Because he already has the concept, he can do it. "

S2: "Maybe the material is linear equations, so in linear equations, there are some solutions and there may be several groups that are given the task of solving problems with a particular method."

S8: "One of the suitable materials is to build flat and build space because there are many sub materials that can activate students directly, such as cube nets, beam nets, many sub-materials that we can make into small projects for learners."

S11: "In my opinion, the material of opportunity is because it is close to everyday problems, a lot of which is related to opportunities and students can determine many designs to determine problem-solving not just in one way."

The main purpose of this study is to determine the perception of novice teachers about project-based learning approaches. One of the reasons the research subjects were chosen was that they were beginner teachers who had less than 3 years of teaching experience and then decided to continue their studies to postgraduate courses at Yogyakarta State University, specifically in the Mathematics Education Study Program. The results showed that all respondents had learned the project-based learning approach theory even though only a few of them had applied it in the real class. The cause of respondents never practicing this project-based learning approach is not because this approach is not good but rather because of the lack of time the respondents have to implement the project-based learning approach.

Most respondents explained simply what the project-based learning approach was. Their answers generally have in common where the project-based learning approach focuses on the project and is carried out within the allotted time, learner-centered learning. Almost none of the respondents managed to define the project-based learning approach correctly, each of them only knew their skin. The reason respondents only know their skin is because they haven't studied this concept in a long time and the majority haven't had the chance to apply it.

Almost all respondents mentioned that they would use the project-based learning approach after graduation, although most respondents who expressed interest in implementing it were not too familiar with it. Only a small proportion of respondents who felt hesitant to implement it. Some doubtful correspondents felt the need to revisit the condition of their students and look more deeply at this project-based learning approach.

Respondents have a positive perception of the use of this approach, they believe that the project-based learning approach has many benefits for students. Respondents mentioned many

contributions from this approach to the learning process and students. This finding is consistent with the results of other studies, where respondents were found to have a positive attitude towards the project-based learning approach (for example, Erdem & Demirel, 2002; Gultekin, 2007; Tertemiz, 2012).

Respondents said that the project-based learning approach would develop problem-solving skills, improve collaboration skills, express opinions, collaborate, communicate skills, conduct research skills, these findings were consistent with other research (for example, Gultekin, 2007; Alacapinar, 2008; Baysura, 2015) noted that the project-based learning approach helps students to develop unique skills in the 21st century, such as conducting research, finding information, collaborating, communicating well, thinking critically and actively in using technology.

All respondents thought that they would experience obstacles when applying a project-based learning approach. These constraints were grouped into three main categories: related to students, related to teachers, and related to the learning environment. Obstacles centered on students: students are less interested, students will need a lot of time, do not know how to do research, and cannot learn in groups. Obstacles related to teachers include obstacles controlling students, problems managing classrooms, finding different and interesting project topics. constraints related to the learning environment, such as lack of materials, the number of costs incurred and limited time.

These constraints are in line with the results of previous studies (for example, Baysura, 2015; Gultekin, 2007) problems that can arise relating to the time management of students during the project. Most students are not experts in analyzing project workload correctly. So that the time constraints experienced by students when at the end of the work period causes students to try to complete the project in a hurry so that the expected skills cannot be obtained successfully and in an intended manner.

The respondents also suggested before applying the project-based learning approach that must be considered is good apersepsion, clear instructions, determine what material or theme is suitable for use and learning should be planned step by step. Although the respondents appear to be still limited in providing examples of what material is suitable to be applied. Some of the material suggested by respondents regarding any material suitable for use in the project-based learning approach is still limited in the construction of space and a flat shape almost as much as it suggests. Only a few suggested other materials such as linear equality and opportunity.

The project-based learning approach can be applied well if it is based on the active enthusiasm of student participation in which the teacher acts as a good facilitator in the class, knowing when to assist the right students to stay on target and on time. In-class learning the teacher must also be able to see the differences of each student in the classroom and the learning styles of the students must also be considered so that the application of lessons based on the project-based learning approach can run well and do not forget in designing this lesson must be planned step by step accompanied by step anticipatory if there are students in the class who are not focused or less active.

Conclusion

In conclusion, the respondents had a good perception of the project-based learning approach, which resulted in the interest of respondents to use the project-based learning approach after they completed their studies and returned to teaching in class. However, what concerns the researchers is that they appear to lack sufficient knowledge and experience

regarding this approach, and almost all respondents believe that they will find obstacles in applying the project-based learning approach in their class.

This result raises the question of how well they will apply the project-based learning approach in the classroom with insufficient knowledge and skills. This research highlights the need for training and further discussion of the project-based learning approach to research subjects. So when they apply this approach in class they will give more maximum results.

This study is limited to the beginner teacher's perception of the project-based learning approach in which the research subjects were 12 novice teachers who continued their postgraduate education at Yogyakarta State University. It is hoped that in the future, other researchers can conduct research with broader and more diverse subjects so that the results of their research can be generalized to a larger population.

In addition, other researchers can conduct research to see the beginner teacher's perceptions of the problem based learning approach which definition and its stages have a lot of slices or similarities with the project-based learning approach. Expectations from the results of these studies can be a comparison between their perceptions of the project-based learning approach with their perceptions of problem based learning. So that it can be the basis for other researchers to choose an approach that is suitable to be used as a variable in their research.

References

Alacapinar, F. (2008). Effectiveness of Project-Based Learning Eurasian. *Journal of Educational Research*, *32*(17–34). https://doi.org/http://doi:10.1016/j.sbspro.2009.01.044

Baysura, O.D., Altun, S. & Yucel-Toy, B. (n.d.). Perceptions of teacher candidates regarding project-based learning. *Eurasian Journal of Educational Research*, *62*(15–36). https://doi.org/http://dx.doi.org/10.14689/ejer.2016.62.3.

Bell, F. H. (1981). *Teaching and learning mathematics (In Secondary School)*,. Iowa: W.M.C.Brown Company.

Bogdan, R. C., & Biklen, S. . (1982). *Qualitative research for education: An introduction to theory and methods*. Boston: MA: Allyn and Bacon.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Dedy, M. (2001). *Ilmu Komunikasi Suatu Pengantar*. Bandung: PT Remaja Rosdakarya.
Denzin, N. K., & Lincoln, Y. S. (2005). *The Sage handbook of qualitative research* (3rd ed.). Thousand Oaks, CA: Sage.

Erdem, E., & Demirel, Ö. (2002). *Constructivism in curriculum development*. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi.

Gultekin, M. (2007). The effect of project based learning on learning outcomes in the fifth-grade

science education. *Elementary Education*, *6*(1), 93–112. Retrieved from http://ilkogretim-online.org.tr/vol6say1/v6s1m8.pdf

Guntur, M. I. S. (2015). Persepsi guru matematika sma di kayuagung terhadap kurikulum 2013. *Jurnal Pendidikan Matematika*, *9*(pendidikan matematika), 68–77. https://doi.org/10.22342/jpm.9.1.2134.68 - 77

Haller, M., Billinghurst, M., & Thomas, B. H. (2007). *Emerging Technologies of Augmented Reality: Interfaces and Design.* London: Idea Group Publishing.

Lincoln, Y. S., & Guba, E. E. (1985). *Naturalistic inquiry.* Thousand Oaks, CA: Sage.

Miles, M. B., & Huberman, M. (2007). *Analisis Data Kualitatif.* Jakarta: Penerbit Universitas Indonesia.

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. ,. *Health Services Research*, *34.*(5), 1189–1208.

Permendikbud. (2010). *Peraturan Menteri Pendidikan Nasional Nomor 27 Tahun 2010 Tentang Program Induksi Bagi Guru Pemula*.

Rafi, I., Yogyakarta, U. N., Retnawati, H., & Yogyakarta, U. N. (2018). What are the common errors made by students in solving logarithm What are the common errors made by students in solving logarithm problems ?, (September). https://doi.org/10.1088/1742-6596/1097/1/012157

Retnawati, H. (2017). Learning trajectory of item response theory course using multiple softwares. *Olympiads in Informatics*, *11*, 123–142. https://doi.org/10.15388/ioi.2017.10

Ruangrit, N. (2008). Collaborative Project-Based Learning and Blended Learning According to the Principle of Edutainment of Participant The APEC Edutainment Exchange Program. *Jurnal ICT*, *1*(3).

Sarwono, & Sarilto.W. (2012). *Pengantar Psikologi Umum*. Jakarta: PT Rajagrafindo Persada.
Tertemiz, N. (2012). The effects of project- and activity-supported practiceson mathematics education achievement and student views. *Egitim Arastirmalari - Eurasian Journal of Educational Research*, (46), 159–178.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Thousand Oaks, CA: Sage.