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Implementation of the Use of Teaching Materials Modules in Mathematics Learning with the PBL and PjBL Models at the State Islamic Senior High School

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Abstract: ***This article presents a research report which aims to find out the comparison of student learning outcomes after the application of the Mathematics learning module material on the Concept of Derivatives as Limits of Functions and Algebraic Function Derivatives in learning with Problem Based Learning (PBL) and Project Based Learning Models (PjBL) at Madrasah Aliyah Negeri (MAN) 1 Kotamobagu. The research method used is Quasy Experimental type Non equivalent Control Group Pretest-Posttest Group Design. The population in this study was class XI Religion which consisted of 3 (three) parallel classes. Two classes were selected as a random sample - one class was treated with the PBL model and the other class was given the PjBL model. Based on the hypothesis testing that has been done, it shows that the results of the analysis using the independent Sample Test t-test with the help of the SPSS application show that the null hypothesis which states that there is no difference in improving students' abilities, is rejected.The conclusion of this study is that the implementation of the use of teaching material modules with the PBL and PjBL models at MAN 1 Kotamobagu is well implemented and there is an average difference in the implementation of the use of teaching material modules in mathematics learning with the PBL and PjBL models at MAN 1 Kotamobagu. The results showed that student learning outcomes in the PjBL learning model were superior to student learning outcomes in the PBL model learning in the teaching material modules with an equivalent level of difficulty.***

Keywords: Problem Based Learning, Project Based Learning, Teaching Modules, Madrasah Aliyah

1. Preliminary

Learning is a learning process that is repeated and causes a change in behavior that is conscious and tends to be permanent. In the learning process there are two main activities, namely learning that must be carried out by students and teaching which is carried out by the teacher in which the direction of these two activities is to achieve predetermined goals whose form is in the form of learning outcomes both cognitive, affective and psychomotor (Ridho , 2018). An important problem that is often faced by teachers in learning activities is choosing or determining appropriate learning materials or teaching materials in order to help students achieve competence. This is due to the fact that in the curriculum or syllabus, teaching materials are only written in outline in the form of subject matter (Nurdin and Andriantoni, 2016). It is the teacher's job to describe the subject matter so that it becomes a complete teaching material such as a teaching material package known as a module. Modules are teaching materials that are systematically and interestingly arranged which include material content, methods, and evaluations that can be used independently.Prastowo (2011) states that learning using modules aims to (1) students be able to learn independently or with minimal teacher assistance, (2) the teacher's role is not dominating and not authoritarian in learning, (3) practicing student honesty, (4) accommodating various levels and speeds of student learning, and (5) students can measure their own level of mastery of the material being studied. Ramadhani and Amudi (2020) state that modules are prepared accompanied by contextual examples in language that is easier to understand so that students are motivated to learn as student responses through questionnaires. Things from Ardiansyah, Ertikanto, & Rosidin (2018) which state that the phenomenon of problems in everyday life makes students more interested in taking part in learning with modules. Vaino, Jack, & Miia (2012) which states that with the module motivation increases significantly.The project-based learning model (PjBL) is a learning model that guides students to be skilled and independent in solving problems through real projects (Wati, et al. 2022). The PjBL learning model creates innovative learning that emphasizes contextual learning (Cord, 2001). This model focuses on student activities to understand concepts and conduct in-depth investigations of a problem and find solutions independently, and emphasizes learning outcomes on products. Modules are taught using project-based and problem-based learning. Project-based and problem-based learning is carried out to optimize students' knowledge and skills.Students are given the opportunity to develop skills by solving problems and conducting investigations independently accompanied by a teacher. Aziz and Herianto (2021) project-based learning is carried out collaboratively between teachers and students to solve problems in everyday life. Through this learning model students have the ability to solve problems, analyze and solve problems, and make decisions. Trained students collect information, analyze, and reinvestigate the results that have been obtained. The learning model which is oriented towards mathematical problems is the Problem Based Learning (PBL) model. According to Shoimin (2014) the PBL model is a teaching system that stimulates problem-solving strategies and the basics of knowledge and skills by placing students in an active role as everyday problem

solvers that are not well structured. According to Komalasari (2013), the PBL model is a learning model that uses real world problems as a context for students to learn about critical thinking and problem solving skills, as well as to acquire knowledge and concepts that are the essence of the subject.The PBL model is in accordance with the philosophy of constructivism, namely that students are given more opportunities to actively seek and process information on their own, build their own knowledge, and build meaning based on the experiences they gain (Sudewi, 2014). The steps or syntax of the PBL model (Kemendikbud, 2017) are as follows: (1) Orientation of students to problems; (2) Organizing students to learn; (3) Guiding individual or group experiences; (4) Develop and present works; and (5) Analyze and evaluate the problem solving process. According to Saleh (2013), the PBL model is a learning model based on the principle of using problems as a starting point for the acquisition and integration of new knowledge. Aripin's research (2015) concluded that the increase in mathematical understanding when learning using the PBL model is better than learning using conventional models.Sumartini (2016), recommends that in order to improve students' ability to solve problems, it needs to be supported by the PBL learning model. Learning mathematics in madrasas can be done by applying project-based and problem-based learning models. The application of this model can improve student learning outcomes in mathematics (Bernadus, et al. 2020). Madrasah Aliyah Negeri (MAN) 1 Kotamobagu is one of the state madrasas in Kotamobagu, North Sulawesi Province. The lessons given at this madrasa include compulsory lessons according to the Islamic curriculum and lessons. In this madrasa there are also extracurricular activities such as science study groups, karate, basketball, futsal, and so on. Based on an interview with one of the mathematics teachers at MAN 1 Kotamobagu that there are still many student learning outcomes in mathematics that do not reach the KKM score, which is 70. To achieve these KKM results, teaching materials and project-based and problem-based learning models are needed that can help teachers in carrying out the teaching and learning process to improve student learning outcomes in mathematics at madrasah.With regard to the selection of teaching materials, in general the problems referred to include how to determine the type of material, depth, scope, order of presentation and treatment of learning materials. Another problem related to teaching materials is choosing the source where the teaching materials are obtained. Usually both students, parents and teachers tend to think that teaching material sources only focus on books. The existence of books is indeed very helpful in the learning process, but don't just be guided by books. Because there are many other sources of teaching materials besides books that can be used. Other sources of teaching materials in subject modules. The mathematics learning module used at MAN 1 Kotamobagu is the work of Sri Sunarti entitled SMA Learning Module, Class XI General Mathematics issued by the Ministry of Education and Culture-Directorate of High Schools (2020). The use of the mathematics learning module and PjBL and PBL learning models at MAN 1 Kotamobagu has been implemented by the teacher. However, it needs to be done with effective implementation in order to improve students' mathematics learning outcomes by implementing the use of modules.

2. Research Procedure

This study uses experimental research methods by comparing experimental classes, namely learning classes using Problem Based Learning (PBL) and Project Based Learning (PjBL) learning models. The research method used is the Quasy Experimental Non Equivalent Control Group Pretest-Postest Group Design, namely giving treatment to two different groups and measuring the control variables at the beginning and end of the treatment (Muniaty and Winarto, 2019). The two groups were given a pretest, then given a treatment, and finally given a posttest. The research was conducted in Class XI Religion 1 and Religion 2 MAN 1 Kotamobagu, Kotamobagu City, North Sulawesi. The time needed for this research was 3 months, namely March-May 2023. The research population was students of class XI MAN 1 Kotamobagu in 2022/2023, with 83 students. The sample of this research was 55 students who were taken from two classes, namely class XI Religion 1 with a total of 27 students and class XI Religion 2 with a total of 28 students.The sample in class XI Religion 1 was treated as an experimental class using the PjBL learning method and class XI Religion 2 was given a control class using the PBL learning model. Determination of the research class or sampling in this study was carried out randomly. The data to be collected in this study is the activity data of students and teachers during the learning process, data on student learning outcomes on differential material. The data collection techniques in this study were in the form of observation, student response questionnaires, and tests. Data analysis of student learning outcomes was carried out using the T-test ((Independent Sample-Test)) at a significance level of 95% ($\alpha = 0.05$) with the help of the SPSS 16 application. The basis for decision making can be done in two ways, namely by reading the Sig value. . (2-tailed) contained in the output of SPSS data processing. If the value of Sig. (2-tailed) α, then H0 is accepted and Ha is rejected, which means that there is no difference in learning outcomes in the two learning groups with different models. The second way is to compare tcount with ttable. If the value of tcount > ttable, then H0 is rejected and Ha is accepted, which means that there is a difference in the average learning outcomes between the two study groups with different models. Meanwhile, if the value of tcount <ttable, then Ho is accepted and Ha is rejected, which means there is no difference in learning outcomes in the two learning groups with different models. (Priyatno, 2012).

3. Results and Discussion

The results of the calculation of the T-Test (Independent Sample-Test) for the PBL experimental class and the PjBL experimental class can be briefly seen in Table 3.1.

Table 3.1: T-Test Calculation Results (Independent Sample-Test) PBL Class and PjBL Class

Source of Variance	Mean	Varians	Observation	Pooled variance	df	t-Stat	P (T≤ t) two-tail	t Critical two-tail
PBL class	74,54	27,92	27	28,50	53	-2,33	0,02	2,01
PjBL Class	77,89	29,05	28					

From the table above it can be concluded that t count is outside the t table area, the probability value is 0.02 <0.05 and $t_{count}>t_{table}$ (ie 2.33 > 2.005) then H_0 is rejected. H_a accepted, which means there is an average difference between PBL and PjBL. The independent sample test results T test can also be seen in the following SPSS output.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance		Mean		95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Difference	Std. Error Difference	Lower	Upper
Nilai	Equal variances assumed	.001	.981	-2.351	53	.011	.022	-3.405	1.448	-6.309	-.500
	Equal variances not assumed			-2.351	52.935	.011	.022	-3.405	1.448	-6.309	-.500

		Group Statistics			
Value	Class	N	Mean	Std. Deviation	Std. Error Mean
	PBL experiment	27	74.67	5.364	1.032
	PjBL experiment	28	78.07	5.374	1.016

The output from SPSS shows that in the Equal Variances Assumed row the significant value of two-sided p <0.022. Because the sig value <0.05, H_0 is rejected and H_a is accepted, which means that there is an average difference between student learning outcomes in PBL and PjBL learning. In this discussion section, the findings related to the implementation of teaching materials modules in Mathematics learning are presented using PBL and PjBL models. The difference in learning outcomes in Mathematics after the implementation of the teaching material module in learning with the PBL and PjBL models is also explained in MAN 1 Kotamobagu Class XI Religion 1 and Class Religion 2 in the 2022/2023 school year. Based on the results of the research conducted, there is an average difference between the PBL and PjBL models in implementing the use of teaching material modules in mathematics lessons at MAN 1 Kotamobagu Class XI Religion 1 and Religion Class 2 for the 2022/2023 school year.Based on the hypothesis testing that has been done, it shows that the results of the analysis using the T-Test (Independent Sample Test) with the help of the SPSS application obtained Sig.(2-tailed) is 0.022 <0.05 and the value of tcount>ttable (2.33 > 2.005) then Ha is accepted and H0 is rejected so that it can be concluded that there are differences between learning with the PBL and PjBL models. Gunantara, et al. (2015) found that there was an increase in problem solving skills in Mathematics subject through the application of the Problem Based Learning (PBL) learning model. The findings show that the Problem Based Learning (PBL) learning model can improve problem solving abilities in Mathematics. The implementation of PBL and PjBL learning in principle can improve student learning outcomes. However, in the case of MAN 1 Kotamobagu, after the two approaches were implemented using the Mathematics teaching material model, the two differed in measuring student learning outcomes in understanding Mathematics.

The implementation of the two learning models is carried out in accordance with the steps of the two. The results showed that the difference in the achievement of students' skills with the PBL and PjBL models which included observation skills was 50.93 and 57.86, respectively. Classification (classifying) skills were 66.67 and 69.29, interpreting skills were 75.93 and 76.45, communicating skills were 75.93 and 76.43 and summing skills were 75.93 and 78.52. The average achievement of process skills by applying PBL is 69.07 while with the PjBL model it is 71.71. The results of achieving process skills with the application of the PjBL model are superior to the PBL model. However, both models have a role to play in enhancing process skills. This is in line with the findings of Farida, et al. (2022) found that the level of effectiveness of the PjBL (Project Based Learning) learning model in improving numeracy literacy skills. The study showed that the effect that occurred in the experimental class that was given the PjBL learning model treatment was superior compared to the control class that used conventional learning models.The effectiveness of the PjBL model of learning in improving student learning outcomes at MAN 1 Kotamobagu after analyzing student learning outcomes, supported by previous studies. This was stated by Wati, et al. (2022) that the PjBL learning model is a learning model that guides students to be skilled and independent in solving problems through real projects. The PjBL learning model is an innovative learning model that emphasizes contextual learning (Cord, 2001). This model focuses on student activities to understand concepts and conduct in-depth investigations of a problem and find solutions independently, and emphasizes learning outcomes on products. Ralph (2016) stated that project-based learning (PjBL)- to differentiate from problem-based learning-PBL) has become a recurring practice in the K-12 classroom environment. As PjBL has become prominent in K-12 classrooms, it is also emerging in post-secondary institutions. The purpose of writing this paper is to examine

research that has examined various science, technology, engineering, and Mathematics (STEM) subjects using PjBL in post-secondary school classrooms.Fourteen articles (including qualitative, quantitative and mixed methods) were included. Two tables and two figures are included. In this paper, the theoretical background and key terms are identified, followed by a literature review that addresses the four themes of content knowledge, interdisciplinary skills, collaboration and future educational and career development skills. The results show that there is a positive relationship between content knowledge learning and PjBL in collaborative settings. However, some negative perceptions emerged regarding the teamwork situation. Interdisciplinary skills are attainable, but very limited in post-secondary classrooms. PjBL and STEM are considered important for future education and careers. Future discoveries need to be finalized and institutional curriculum changes informed by the results of this research need to occur to better explore interdisciplinary courses and the use of PjBL. Goldstein (2016) put forward a PjBL learning approach to learning and teaching physics from the perspective of pre-service elementary school teacher education students and an instructor. This approach promotes meaningful learning (especially within project scope), higher motivation, and students' active involvement in learning throughout the entire course. This improves students' attitudes toward learning physics, reduces fear, and increases their self-efficacy and enjoyment of learning. This approach develops important learning and collaborative skills, and strengthens interpersonal and intercultural interactions between all. Implementing PBL raises several challenges: the tension between the quality of learning and the scope of course content and the need to combine different teaching methods to meet students' learning needs. This paper describes the advantages and disadvantages from the perspective of students and instructors.Indrawan and Jalinus (2018) explain that through project-based learning, students will work in teams, discovering the skills to plan, organize, negotiate, and make agreements on the issues of tasks to be carried out, who is responsible for each task, and how the information will be collected and presented scientifically. Widana and Septiari (2021) stated that students' learning outcomes in Mathematics used the Project-Based Learning learning model based on the STEM approach. The results of the study show that creative thinking is one of the competencies needed in the Industrial Revolution 4.0, where changes are very dynamic, so they must be balanced with an irregular way of thinking. This study illustrates that there is an influence of the STEM approach-based project-based learning model on creative thinking skills; there is an influence of the STEM approach-based project-based learning model on mathematics learning outcomes; there is an influence of the project-based learning model based on the STEM approach together on creative thinking skills and mathematics learning outcomes. Dewi (2021) states that e-learning with PjBL is in curriculum and syllabus development courses. Teaching tools are validated by accompanying teachers and supporting lecturers. Data analysis used is descriptive statistics. At each meeting students can fulfill the expected learning concept and fulfill part of the project target. So that learning objectives and projects can be achieved properly. This shows that students can work on projects with good validation results.In addition, the results of good learning observations and good learning evaluation questionnaires. Asmi, at.al. (2022) stated that PjBL is one of the learning models that is relevant to the 2013 Indonesian Curriculum which emphasizes the development of 21st century skills. in Indonesia. This SLR reporting is in accordance with the Preferred Reporting Items standards for systematic reviews and Meta-Analyses (PRISMA) statements. Search articles through databases, namely Scopus and Google Scholar, found 44 articles after being filtered according to predetermined criteria. The findings show the effect of the PjBL model on learning achievement, higher sequential thinking skills, conceptual understanding, learning motivation, creative thinking skills, and critical thinking skills.The findings also revealed that most of the studies used quasi-experimental, pre-experimental, action research, and case studies as research designs and PjBL Modules as learning materials. Besides that, most of the studies are conducted for Mathematics subjects such as statistics, linear equations, and geometry. Further PjBL studies are needed in other ways on the topic of Mathematics and its effect on other variables. The two learning models do have the same characteristics, namely being able to facilitate students being directly involved in learning such as practicing or conducting experiments, improving problem solving abilities, increasing scientific attitudes and increasing student motivation to produce real products/projects. Project Based Learning (PjBL) is more can increase student motivation and make learning mathematics more interesting and fun. This is because project-based learning (PjBL) involves more students in making real works in the form of frames as project assignments. This assumption is in line with Wena's opinion in Purwandari (2015: 93) that the focus of project-based learning lies in the concepts and principles of a scientific discipline, involving students in problem-solving investigations and other meaningful task activities, providing opportunities for students to work autonomously in construct their knowledge and culminate in producing tangible products.So that the results of achieving student process skills with the application of the PjBL model in this study as a whole are higher than the results of achieving student process skills with the PBL model. them to move according to their skills, comfort, and learning interests. In addition, this learning model can facilitate students to be directly involved in learning such as practice or conducting experiments, improve problem solving skills, improve students' scientific attitudes and process skills, and increase student motivation to learn through project assignments. Learning Mathematics by applying the Project Based Learning (PjBL) and Problem Based Learning (PBL) models runs effectively and existing constraints can be overcome, namely with careful preparation before implementing the two models. While the advantages are students are very enthusiastic and eager to learn. But the difference is in the Project Based Learning (PjBL) model, students make projects as a means of learning. Making a project, namely making a frame starting from the project planning stage to project completion. Each stage of student learning is very enthusiastic about completing assignments so that learning is more meaningful at each stage of learning. This attitude is shown by students who are always responsive to the stimulus provided by the teacher, actively ask questions and show curiosity, especially when students are looking for

information in groups, and students always show a feeling of pleasure in carrying out tasks in learning. Project Based Learning (PjBL) and Problem Based Learning (PBL) models can increase student activity and be directly involved in learning, improve problem-solving abilities and improve students' processing skills. Research conducted by researchers certainly has limitations in conducting research, namely research conducted only in class XI Religion 1 and Religion 2. Different results may be obtained if this research is conducted in different classes or more populations and classes.

The application of PjBL learning in Mathematics learning was suggested by Melinda and Zainil (2020) who found that the application of the Project Based Learning (PjBL) model could improve students' mathematical communication abilities. Mathematical communication ability is one of the abilities that must be possessed by students because mathematical communication ability is very important in learning mathematics.Mathematical communication is the ability to communicate that are interconnected that occur in the classroom, which includes writing, listening, studying, interpreting, evaluating ideas, symbols, terms, and mathematical information, and where there is transfer/delivery of messages containing mathematical material. PjBL is an innovative learning model, where learning is more student-centered, using projects as learning media. The PjBL model step can improve students' mathematical communication skills, especially when students work in groups and communicate the results of their group work. Several studies have shown that PjBL can improve students' mathematical communication skills.

Other findings related to the implementation of PjBL learning in Mathematics learning, Naudi (2016) found that by implementing the PjBL learning model students' mathematical abilities increased. Students can describe graphs, pictures, diagrams, and tables in full. Students' mathematical ability can express ideas in writing through answers to math questions in a systematic and correct manner. Based on the results of research on the implementation of teaching material modules using the PBL and PjBL approaches at MAN 1 Kotamobagu it appears that both can be implemented. However, the results of the research show that PjBL learning is easier to improve students' understanding of learning Mathematics compared to implementing PBL learning. This is supported by the results of previous studies, although these two learning models are very good, in the case of MAN 1 Kotamobagu it is more effective to use the PjBL learning model compared to PBL in optimizing student learning outcomes in understanding mathematics learning. These have been compared in practice using strictly the second procedure. However, the results are still the same, namely learning PjBL is more optimally applied in improving student learning outcomes in Mathematics, compared to the PBL model.

4. Conclusions and Suggestions

Based on the results of hypothesis testing and discussion as described, this research concludes as follows.

1) The implementation of PBL and PjBL learning models can in principle be applied to learning Mathematics. It's just that, in the case of MAN 1 Kotamobagu after both were implemented it showed differences in student learning outcomes in learning Mathematics using the Mathematics teaching material module. There is an average difference in the implementation of the use of teaching material modules in learning mathematics with the PBL and PjBL models. Based on the hypothesis testing that has been done, it shows that the results of the analysis using the independent Sample Test t-Test with the help of the SPSS application obtained Sig.(2-tailed) is 0.022 <0.05 and $t_{count} > t_{table}$ (2.33 > 2.005) then H_0 rejected and H_a accepted. There are differences in learning outcomes in Mathematics after the implementation of the teaching material module in Mathematics learning with the PBL and PjBL Models at MAN 1 Kotamobagu. The results showed that the difference in the achievement of students' skills with the PBL and PjBL models which included observing skills (observation) was 50.93 and 57.86 respectively, Classification skills (classifying) were 66.67 and 69.29, Interpretation skills (interpretation)) of 75.93 and 76.45, communicating skills of 75.93 and 76.43 and concluding skills of 75.93 and 78.52. The average achievement of process skills by applying PBL is 69.07 while with the PjBL model it is 71.71. The results of the analysis show that the results of achieving process skills with the application of the PjBL model are superior to the PBL model. However, both of these learning models have a role in improving the mathematics learning outcomes of MAN students.

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