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THE DEVELOPMENT OF A REALISTIC MATHEMATICS-BASED E-MODULE USING PROJECT ASSIGNMENTS TO IMPROVE STUDENTS' CONCEPT UNDERSTANDING

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ABSTRACT
The objectives of elementary school mathematics learning are to encourage students to solve problems in everyday life that require a good understanding of concepts. The fact is that student's understanding of concepts at Aisyiyah Innovative Elementary School and Modern Sakti MI is still need improvement. The reason is that teaching materials and teaching strategies don't support students' conceptual understanding. The objectives of this study are, (1) to describe the design of a realistic mathematics-based e-module (RME) with project assignments, and (2) to describe the effect of a realistic mathematics-based e-module (RME). Assist project assignments in improving students' conceptual understanding. This study uses 7 steps Borg &Gall development model adopted by Sugiyono, which are potentials and problems, data collection, product design, design validation, design revision; product trials, and usage trials. The results of the percentage assessment of the questionnaire included material experts 90%, linguists 86.67%, media experts 84.5%, teachers 80%, and students 83.6%. The results of the t-test of the post-test value of the experimental class and the control class showed a sig-2-tailed value of 0. 000 < 0.05. So it can be concluded that the design of a realistic mathematics-based e-module (RME) with project assignments fulfills process, structure, component, and user requirements and effectively improve students' conceptual understanding.
Keywords: Concept Understanding, E-Module Development, Realistic Mathematics (RME), Project Assignments,

ABSTRAK
Tujuan pembelajaran matematika Sekolah Dasar (SD) adalah mendorong siswa untuk memecahkan masalah dalam kehidupan sehari-hari yang membutuhkan pemahaman konsep yang baik. Faktanya pemahaman konsep siswa di SD Inovatif Aisyiyah dan MI Modern Sakti masih membutuhkan peningkatan. Penyebabnya adalah bahan ajar dan strategi guru kurang mendukung pemahaman konsep siswa. Tujuan dari penelitian ini adalah, (1) mendeskripsikan desain e-module (RME) berbasis matematika realistik dengan tugas proyek, (2) mendeskripsikan pengaruh e-module (RME) berbasis matematika realistic dengan tugas proyek dalam meningkatkan pemahaman konsep siswa. Penelitian ini menggunakan 7 langkah Model pengembangan Borg&Gall yang diadopsi oleh Sugiyono yaitu potensi dan masalah, pengumpulan data, desain produk, validasi desain, revisi desain, uji coba produk, dan uji coba penggunaan. Hasil persentase penilaian angket meliputi ahli

materi 90%, ahli bahasa 86,67%, ahli media 84,5%, guru 80% dan siswa 83,6%. Hasil uji-t nilai posttest kelas eksperimen dan kelas kontrol menunjukkan nilai sig-2 tailed sebesar 0,000 < 0,05. Sehingga dapat disimpulkan bahwa desain e-module (RME) berbasis matematika realistik dengan tugas proyek telah memenuhi syarat proses, struktur, komponen, dan persyaratan pengguna dan secara efektif meningkatkan pemahaman konseptual siswa.
***Kata kunci**: pengembangan modul, RME, Pemahaman Konsep, Tugas Proyek.*

1. Introduction

Mathematics plays a role in the development of other sciences. Because the concept of mathematics is related to the concept of science. So many theories and other branches of science are found through mathematics concepts (Kenedi, Helas, Ariani, 2019). Because mathematics material at the elementary school level (SD) is the basis for mastery at the next level. While one of the objectives of learning mathematics is for students to be able to understand the concept (Nurhidayah and Salahudin 2022) Through the ability to understand good concepts, students can solve mathematical problems easily. Concept understanding is a student's cognitive process indirectly in understanding the meaning of the concept and showing its ability to apply the concept understood in different situations (Puspita & Dewi, 2021). So, understanding the concept is very important for the success of students' mastery of mathematics at the elementary school level (SD).

Elementary school students will have difficulty identifying or analyzing abstract objects in mathematics material (Lubis & Dasopang, 2021).Because the cognitive development of elementary school students is still at the level of concrete thinking (Syah 2011). Based on Permendikbud No. 22 of 2016 concerning Standards for Primary and Secondary Education that learning at the SD/MI level is adjusted to the level of development of students. That is, students need to know concrete mathematics objects to master concepts (Saleh, Prahmana, Isa, 2018).

Based on previous research, it was stated that many elementary school teachers carried out the mathematics learning process directly, and as a result, students' ability to utilize relationships between concepts was still low (Kenedi, Helas, Ariani, 2019). Mathematics learning carried out by teachers tends not to provide opportunities for students to understand the material(Praja, Setiyani, Kurniasih, 2021). Many students do not understand the concept of adding fractions, namely adding fractions by operating between the numerator and denominator (Puspita & Dewi, 2021).

The problem above is in line with the results of the researcher's interview with the fourth-grade teacher on mathematics learning at Aisyiyah Innovative SD and MI Modern Sakti the teacher uses the lecture method. The teacher algorithmically explains mathematics concepts, then gives examples of problems and the flow of their solutions. Whereas knowledge cannot be transmitted directly from teacher to student (Innes 2004) Next, the teacher gives assignments to students to complete the practice questions in the Module or LKS. Based on the results of the researcher's analysis of working on UTS questions, many students have difficulty working on contextual questions whose solutions use relationships between concepts.

The solution to the above problems is the use of interesting and meaningful teaching materials. Because teaching materials have an important role in learning activities (Puspita, Puspitaningsih, and Cahyono 2022) One of the interesting teaching materials is the e-module which can be accessed by students with the help of electronic equipment. This needs to be developed by combining a realistic mathematics education (RME). Because the principle of realistic mathematics education (RME) is to make the real world the student's media for the

mathematizing procdure (Heuvel-Panhuizen, 2019). This makes it easier for students to understand abstract mathematical concepts independently and meaningfully.

The results of previous studies explained that an e-module based on realistic mathematics learning (RME) is very interesting and effective for fourth-grade elementary school students to support geometry problem-solving (Buchori & Rahmawati, 2017). While the principle of realistic mathematics learning (RME) is that students are responsible for acquiring and constructing knowledge independently (Revina & Leung, 2018). This will be difficult for students to do independently. So that real learning steps are needed in finding and building mathematical concepts. Learning steps can be designed using project assignments. One of the principles of project assignments is to strengthen students' understanding of mathematics concepts through interesting and open-ended exploration activities of mathematics problems (Krauus &Boss, 2013).

Based on the explanation above, the development of teaching materials in the form of realistic mathematics-based e-module with project assignments is very important for students. So that understanding of mathematical concepts can increase because it provides opportunities for students to rediscover mathematics concepts (Ulandari, 2019). Where students are guided by project assignments in finding the concept. Whereas previous research explained that project-based learning teaching materials are effectively used by elementary students because they contain a work step that uses project assignments as media (Khotimatuzzahra 2020). Thus, the realistic mathematics (RME) based e-module with project assignments can increase understanding of student concepts.

The objectives of this study are (1) to describe the design of developing a realistic mathematics-based e-module with the help of project assignments, and (2) to describe the effectiveness of developing a realistic mathematics-based e-module with project assignments on improving students' conceptual understanding.

2. Method

The development research model is a research method used to produce certain products and test the effectiveness of these products (Sugiyono, 2019). For this reason, research is used that needs analysis (using survey or qualitative methods) and to test the effectiveness of the product so that it can be function in the wider community (using experimental methods). This reaserch uses the *Research and Development* (R&D) model, they are research approach that attempts to combine both qualitative and quantitative approaches. The product developed is an E-Module based on realistic mathematics with project assignments that aim to improve the understanding of mathematical concepts for fourth-grade elementary students.

2.1 Research Subjects

This research was carried out in two stages, namely the initial trial stage and the field trial stage. The research subjects in the initial trial were 10 students in class IV MI PSM Ngantru using the *One Group Pretest-Posttest Design technique.* The research design used was *True Experimental* with *a Pretest-Posttest Control Group Design.* Researchers use *True Experimental Design* because in this design researchers can control all external variables that influence the course of the experiment. The samples that is used for the experimental class and control class were taken randomly from a certain population. The population in this study was all class IV students, which is 57 students. The field test was carried out in two different locations, namely 19 fourth-grade students of SD Inovatif Aisyiyah as the experimental class and 17 grade IV students of MI Modern Sakti as the control class.

2.2 Design and Procedure

The research and development procedure used in this study refers to the Borg and Gall model, consisting of 10 steps adopted by Sugiyono. The implementation carried out in this study only uses 7 of the 10 steps. The research and development steps according to Sugiyono are shown in Figure 1.

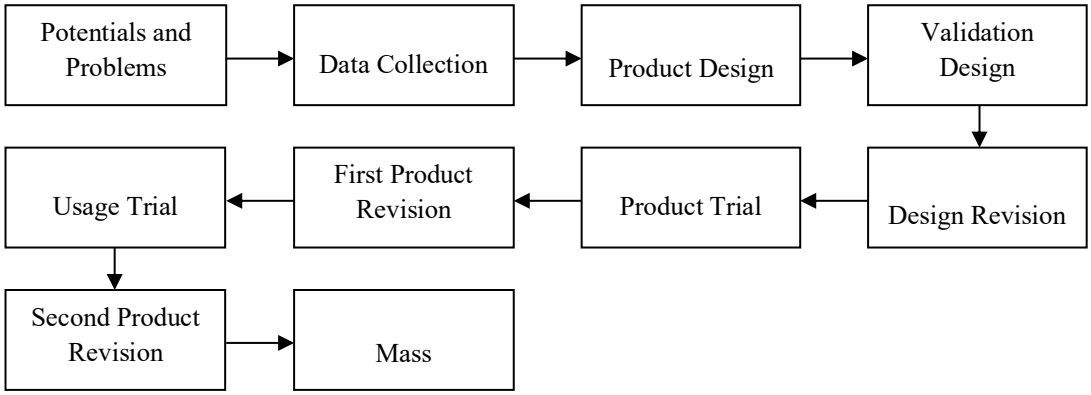


Figure 1 Research and Development Steps According to Sugiyono Instruments

Instruments in this study are interview guidelines, questionnaires, and written test questions. Data collection techniques used in this study were interviews, questionnaires, tests, and documentation. In this study, the interview aims to explore in-depth information related to the analysis of the needs of mathematics teaching materials and to determine the effectiveness of the product after the research. The questionnaire aims to measure the feasibility and effectiveness of the product using a *Likert Scaleshown* as in **Table 1.** The test is used as a tool to measure students' ability to master the subject matter. The tests used in this study were *Pretest* and *Posttest.* While documentation is used to collect data by viewing or recording a report that is already available.

Table 1. Questionnaire Data Analysis Projecting Criteria

Score		Qualification		Follow-up
Category	Percentage	Appropriate	Effective	
4	85% - 100%	Very Appropriate	Very Effective	Implementation
3	75% - 84%	Appropriate	Effective	Implementation
2	55% - 74%	Sufficiently Appropriate	Sufficiently Effective	Need Revision
1	<55%	Not Appropriate	Not Effective	Must Revise

Data Analysis

Analysis in this study was qualitative and quantitative. Qualitative data were obtained from interviews accompanied by criticism, suggestions, responses from validators, and documentation, while quantitative data were obtained from questionnaire assessments and test scores. Quantitative data analysis using a t-test as an assessment of whether there are differences in the ability of students to understand the concept of significance between the experimental class and the control class. A prerequisite test is conducted to review the assumption/requirement test of the data. Prerequisite tests used by researchers are normality and homogeneity test

3. Results and Discussions

3.1 Results

3.1.1 Initial E-Module Design

This research and development have adapted the Borg&Gall model which uses 7 steps from 10 steps. The first step is preliminary research that begins with a literature study of journals and books related to the e-module that will be developed. Then the researchers conducted a field survey to obtain analyzing the need for electronic mathematics teaching materials. The second step is planning which includes the design of concept maps, preparation of materials, preparation of project activities, design of e-module, and design of student learning evaluations. The material used in the e-module development is angle measurement. The next step is the development of an initial product that will be validated by validators of material, language, and media experts. The initial products of the development of the mathematics e-module are as follows:

(a) (b) (c) (d)

(e) (f) (g)

Figure 2 (a) Front and back cover pages, (b) concept maps, (c) material perception pages, (d) contextual problems, (e) project activities, (f) learning activities, (g) evaluation of concept understanding

3.1.2 Product Design Validation

Before the product is tested, the researcher validates the product to material, language, and media experts. The validation is in the form of quantitative and qualitative assessment questionnaires. The following is a table of the results of quantitative questionnaire assessments from material experts, linguists, and media experts.

Table 2. Assessment of the Material Expert Questionnaire

Number	Assessment Aspect	Material Experts I	Material Experts II	Material Experts III
1.	Content eligibility	46	42	45
2.	Serving eligibility	24	20	24
3.	Eligibility of e-module influence	20	17	18
	Number	90	79	87

	Maximum Grade	95	95	95
	Presentation of *e-module* eligibility test (%)	95%	83%	92%
	Average *e-module* eligibility		90%	

Table 3 Assessment of Linguists Questionnaire

Number	Assessment Aspect	Linguists I	Linguists II	Linguists III
1.	Suitability of language with students' cognitive level	18	16	19
2.	Sentence structure	13	11	13
3.	Linguistic rules	14	13	13
	Number	45	40	45
	Maximum Grade	50	50	50
	Presentation of *e-module* eligibility test (%)	90%	80%	90%
	Average *e-module* eligibility		86,67%	

Table 4 Assessment of Media Experts Questionnaires

Number	Assessment Aspect	Media Experts I	Media Experts II	Media Experts III
1.	E-module sizing	10	9	9
2.	E-module display	31	27	28
3.	Spacing	10	9	8
4.	Illustrations and Figure captions	9	6	8
	Number	60	51	54
	Maximum Grade	65	65	65
	Presentation of *e-module* eligibility test (%)	92%	78,5%	83%
	Average *e-module* eligibility		84,5%	

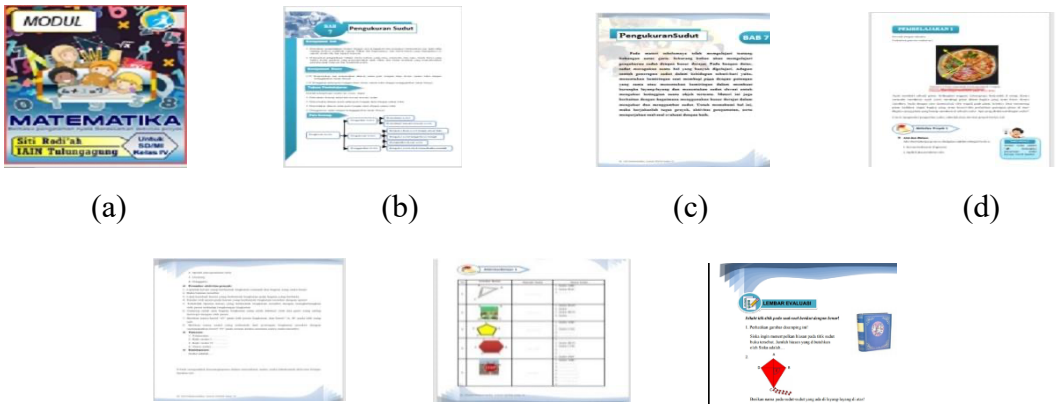
While the results of the questionnaire assessment are qualitative in the form of suggestions given by expert validators for product improvement.

3.1.3 Product Design Revision

Based on the results of the quantitative questionnaire assessment, the e-module is valid for testing. While the results of the qualitative questionnaire assessment from the three Experts on the validity of the realistic mathematics-based e-module (RME) with project assignments, several things must be improved by researchers. Suggestions from the material expert validator are to improve the sentence redaction in the perception section and the question of evaluating concept understanding, questions on learning activities, and evaluation of conceptual understanding are directed more specifically. Suggestions from the linguist validators are sentences that support the main idea must be coherent, project activities with conclusions obtained by students must be clear, and the use of imperative sentences and interrogative sentences must be clear. Meanwhile, suggestions from media expert validators are that the e-module cover must show the method used with an Islamic nuance, pay attention to the space on the concept map and the content of the e-module, the

background on the display of the e-module content must be clear, and the images displayed in the e-module content. The module must be provided with a reference source. So based on the qualitative assessment of the three expert validators, the researchers revised the product as follows.
(https://drive.google.com/drive/folders/1-NbuYpRbHs3igxsjNHGi5aXYyMGhN9t4)

Thus, the final product design of the e-module is as follows:



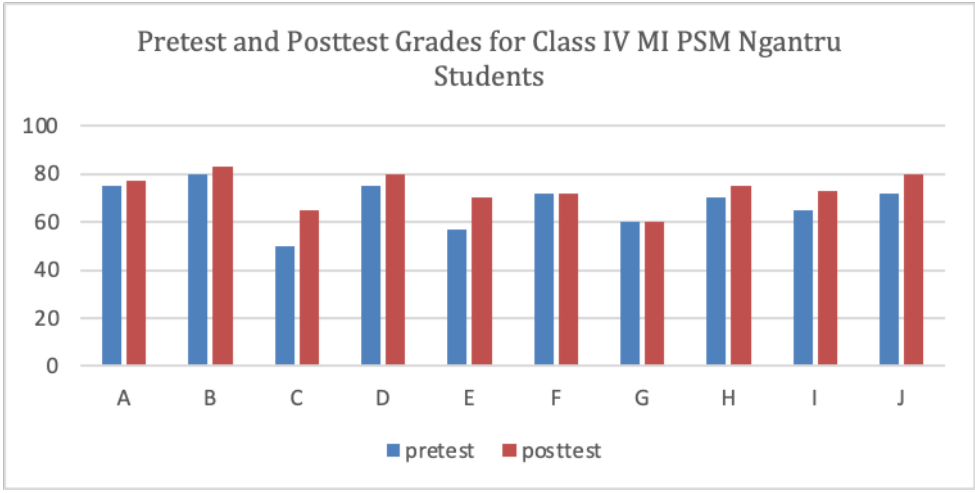
(a) (b) (c) (d)

(e) (f) (g)

Figure 3. (a) Front and back cover pages, (b) concept maps, (c) material perception pages, (d) contextual problems, (e) project activities, (f) learning activities, (g) evaluation of concept understanding

3.1.4 Product Initial Trial

After the e-module was declared valid and revised based on the questionnaire assessment of the three material experts, linguists, and media experts, the researchers conducted an initial trial in class IV MI PSM Ngantru. Before conducting the initial trial, the researcher gave 5 pretest description questions to 10 grade IV students to measure the students' initial concept understanding ability. Furthermore, the researcher conducted an initial trial by distributing electronic teaching materials that had been developed by the researcher to 10 fourth-grade students through the class WhatsApp group. To determine the effect of realistic mathematics-based e-module with project assignments on students' concept understanding, the researchers gave 5 post-test description questions. The following is a diagram of the results of the pretest and posttest of 10 students who were used as research subjects:



Based on the diagram above, it can be seen that 8 students have an increased understanding of a concept, while 2 students have not improved their understanding of a concept, and 1 student has improved their understanding of the concept but has not reached the KKM. Out of the 10 students 2 students have not reached the KKM. But classically it has reached above the KKM, which is an average of 73.5. While the percentage of students' achievement of posttest scores above the KKM is 80%. So that based on the criteria for the success rate of realistic mathematics-based e-module (RME) with project assignments in improving students' understanding of concepts, they are included in the successful category which is 80%.

The results of the researchers' observations on student learning activities using realistic mathematics-based e-module with project assignments showed that students who experienced an improvement in concept' understanding had done learning activities according to the flow of the teaching materials. Such as doing project activities correctly, presenting findings correctly, and doing practice questions. However, two students made an error in presenting the findings, so they did not experience an improvement in understanding the concept. Like the student, G said that the vertex of a corner is O, the leg of an angle I is B, the leg of angle II is A, the name of the angle is a right angle, and the definition of an angle is the meeting of various sides. This has an impact on the completion of post-test questions about the meaning of angles and naming angles. Meanwhile, student C who has not reached the KKM did not complete the evaluation sheet for understanding the concept in the e-module. So that student C is less skilled in solving the problem of understanding the concept.

The results of teacher and student questionnaire assessments on the effectiveness of realistic mathematics-based e-module with project assignments in improving students' concept understanding are as follows:

Table 5. Results of Teacher and Student Questionnaire Grade IV MI PSM Ngantru on the effectiveness of e-module

Number	Assessment Aspect	Teacher	Student	Criteria
1.	The use of e-module can improve students' interest in learning mathematics	90%	75%	Valid
2.	e-module presents the problems of everyday life that are known to students	95%	80%	Valid

Number	Assessment Aspect	Teacher	Student	Criteria
3.	Image display makes it easier for students to understand the material	95%	75%	Valid
4.	Project activities according to daily experience	92%	75%	Valid
5.	The tools and materials used in project activities are easy to obtain	95%	78%	Valid
6.	Students easily understand the steps for completing project activities	80%	75%	Valid
7.	The cover of the e-module attracts students' attention to learning mathematics	96%	78%	Valid
8.	Project activities provide an interesting experience for students	96%	75%	Valid
9.	Project activities help students discover the concept of angles and calculate angles	95%	76%	Valid
10.	Contextual practice questions make it easier for students to apply the concepts they have learned	96%	76%	Valid
	Response percentage	93%	76,3%	Valid

Based on the results of the average response of students and teachers to the effectiveness of e-module based on realistic mathematics with project assignments, they are included in the valid category to improve students' conceptual understanding. While the post-test results are classically above the KKM. Thus, the researcher did not revise the product and proceed to the next stage, they are field testing. Because the product has been declared worth testing on a larger scale.

3.1.5 The Field Test

The field test was conducted in the fourth grade of SD Inovatif Aisyiyah as the experimental class, which consisted of 19 students, and the fourth grade of MI Modern Sakti as the control class, which consisted of 17 students. The experimental class uses a realistic mathematics-based e-module with project assignments in student learning activities. While the control class uses a printed module provided by educational institutions for student learning activities.

Next, the researcher analyzed the data from the students' concept understanding test from the experimental and control classes in the form of a normality test. The data used by the researcher is the post-test grade. The normality test used by the researcher is the I-Sample Kolmogrov-Smimov. The following are the results of the normality test for the two classes:

Table 6. Normality Test of *Posttest* Grade for Control Class and Experiment Class

Tests of Normality

	Class	Kolmogorov-Smirnov[a]		
		Statistic	Df	Sig.
Learning outcomes	Experiment Class	.145	19	.200*
	Control Class	.137	17	.200*

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.

The results of the data normality test output using SPSS can be obtained that the significance value is sig 0,200 > 0,05 for the experimental class and sig 0,200 > 0,05, then the data is declared normally distributed. So that researchers can continue the next data analysis.

The next data analysis is the homogeneity test which is used to determine whether the two groups have the same level of data variance or not. The homogeneity test in this study was done using SPSS. The following are the results of the homogeneity test of the two classes.

Table 7. Homogeneity Test Results on *Posttest* Grades in Control Class and Experiment Class

Test of Homogeneity of Variances

Posttest Learning Outcomes			
Levene Statistic	df1	df2	Sig.
2.424	1	34	.129

The output of the homogeneity test results in the test of homogeneity of variances table on the data test has a significant value of sig. 0,129. Where the value is 0,129 > 0,05, it can be concluded that the data is homogeneous.

Based on the results of the normality test and homogeneity test, shows that the data are normal and homogeneous. Next, the researchers tested the post-test grades with an independent t-test with the help of SPSS Statistics 18.0. The aim is to determine whether there are differences in students' concept understanding abilities between the experimental class and the control class. The results of statistical analysis can be presented in the form of the following table:

Table 8. Results of T-test Analysis of Posttest Grades In The Experimental Class and Control Class

Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Posttest	Equal variances assumed	2.424	.129	4.756	34	.000	9.771	2.054	5.596	13.946
	Equal variances not assumed			4.824	33.369	.000	9.771	2.025	5.652	13.890

The results of the t-test on the post-test grades in the experimental class and control class contained in the independent samples test output table show the sig-2 tailed value is 0,000. Where the value is less than 0,05. Thus, it can be concluded that the student's understanding of concepts in the experimental class and the control class has a significant difference. This means that there is a difference in understanding of concepts between classes that use e-modules developed and classes that use the print module from publishers.

In addition to the data from results of the experimental class and control class students' concepts understanding test results, other data is used as a reference to determine the effectiveness of the e-module developed to improve students' concepts understanding. That is in the form of student assessment in the form of a questionnaire about the effectiveness of the use of e-module developed in mathematics learning activities. The student questionnaire assessment data can be presented in the following table:

Table 9. Results of Questionnaire Grades for Class IV Teachers and Students of Aisyiyah Innovative Elementary School on the Effectiveness of e-module

Number	Assessment Aspect	Teacher	Student	Criteria
1.	The use of e-module can improve students' interest in learning mathematics	85%	86%	Valid
2.	e-module presents the problems of everyday life that are known to students	80%	84%	Valid
3.	Image display makes it easier for students to understand the material	80%	82%	Valid
4.	Project activities according to daily experience	78%	78%	Valid
5.	The tools and materials used in project activities are easy to obtain	80%	85%	Valid
6.	Students easily understand the steps for completing project activities	78%	78%	Valid
7.	The cover of the e-module attracts students' attention to learning mathematics	83%	90%	Valid
8.	Project activities provide an interesting experience for students	78%	80%	Valid

Number	Assessment Aspect	Teacher	Student	Criteria
9.	Project activities help students discover the concept of angles and calculate angles	76%	80%	Valid
10.	Contextual practice questions make it easier for students to apply the concepts they have learned	82%	83%	Valid
	Response percentage	80%	83,6%	Valid

Based on the results of student assessments of the effectiveness of using e-module that have been developed, it is classified as valid, with an average score of 83.6%. In addition, in terms of increasing students' understanding of concepts, it is classified as good. So it can be concluded that the e-module based on realistic mathematics (RME) with project assignments is effective in improving students' conceptual understanding.

3.2 Discussion

3.2.1 Development design of a realistic mathematics-based e-module (RME) with project assignments in improving students' understanding of the concept

Research and development (R&D) steps according to Borg & Gall adopted by Sugiyono are conducting preliminary research, making e-module design, validating e-module design, e-module design revision, e-module product manufacture, e-module trial, 1st e-module product revision, field test, 2nd e-module product revision, then the final product of e-module based on realistic mathematics (RME) with mass-produced project assignments (Sugiyono 2019a). But on the results of the research that has been described previously that the researcher only stops at the 7th step. That is, the researcher stops at the field test step. In the 1st and 2nd product revision steps, the e-module was not carried out by the researcher. This is because the percentage of students' achievement of posttest scores in the trial above the KKM is 80% which is included in the successful category. This is based on the interval range of students' success rates in understanding the concept as follows (Arikunto 2006).

Table 10. Criteria for Success Rates

Percentage of Students who Received Scores above KKM (%)	Predicate
75-100	Success
50-74	Quite Successful
≤ 49	Failed

Meanwhile, based on the results of the average assessment of teacher and student questionnaires on the effectiveness of realistic mathematics-based e-module (RME) with project assignments in increasing students' conceptual understanding by 93% and 76.3%, respectively. Meanwhile, in the field test, the results of the average teacher and student questionnaire assessments were 80% and 83.6%, respectively. This means that e-module products are effective in increasing students' understanding of the concept and do not need to be revised.

In addition to paying attention to the research and development (R&D) procedures, in developing teaching materials it is necessary to pay attention to the subject matter and learning objectives so that the effectiveness of the use of teaching materials can be felt (Khatimah & Kamid, 2015).This is following the e-module design made by the researcher,

namely the preparation of a concept map of e-module teaching materials. The concept map is in the form of a syllabus which is the foundation of the e-module preparation steps. This arrangement consists of six components, namely, titles, study instructions, competencies to be achieved, supporting information, tasks, and steps for working on e-module and assessments. The six components must be listed in the writing of the e-module as in shown Figure 1 and Figure 2**.**

Furthermore, according to Slameto that in conducting the preparation and development of good quality teaching materials, four applicable requirements must be met, namely process requirements, structural requirements, component requirements, and user requirements (Widodo, 2017). In carrying out the design of developing an e-module based on realistic mathematics (RME) with project assignments, researchers have met these four requirements, as explained in the results section. Researchers also pay attention to suggestions in the qualitative assessments of the three expert validators to improve the product. So that the final product is produced shown in Figure 2**.**

In the field test, the t-test analysis data obtained on the posttest value of the experimental class and the control class on the independent samples test output table shows a sig-2-tailed value of 0.000. Where the acquisition is less than 0.005. So there is a difference in the ability to understand the concept of the two classes. Meanwhile, the average percentage of the questionnaire scores on the effectiveness of e-module in improving students' understanding of the concept from teachers and students is 80% and 83.6%, respectively. Where the acquisition of the average percentage is included in the valid category without revision. So that the final product of the e-module remains the same as in Figure 2**.**

3.2.2 The effectiveness of realistic mathematics-based e-module (RME) with project assignments in improving students' understanding of the concept

Realistic-based mathematics learning makes it easier for students to understand concepts. Because understanding the concept is easy to understand if students are allowed to get concrete examples that are already known to students (Kesumawati, 2012). Of course, realistic mathematics-based e-module teaching materials can facilitate students' understanding of the concept as the result of this study. Previous researchers explained that based on teaching materials math realistic presented images of concrete related to contextual problems close to the student environment can be easier for students to understand the concepts to solve contextually (Ulandari, 2019).

The results of previous studies mention that the learning model is realistically capable help students generate their ideas and express these ideas in mathematics models (Setyaningsih, Rejeki, and Ishartono 2019). Realistic mathematics learning with the help of teaching materials can help students conclude concepts with the language that they use to solve practice questions (Arsoetar and Sugiman 2019). As in this study, student learning activities using the developed e-module lead students to find the concept of corner points, angle legs, angle names, and angle definitions based on their findings.

One of the principles of realistic mathematics learning is the principle of activity, namely that students are responsible for acquiring and building their knowledge (Revina & Leung, 2018). So realistic mathematics-based teaching materials need a guide that helps students acquire and build their knowledge. One of them is presenting project assignments in teaching materials realistic mathematics. Project-based learning or project-based learning focuses on organizing independent learning in one project (Tseng et al. 2013). Where in the developed electronic teaching materials, independent project assignments are designed as shown in Figure 2e**.** This presentation is in line with the results of previous research that

project activities compiled on e-module can be done individually and carried out within a certain period (Sari & Agustini, 2019).

Project-based learning emphasizes students acquiring knowledge that causes them to think critically to construct their meaning by applying what they have learned (Krauus &Boss, 2013). This is in line with the researcher's findings that the project activity sheet provides students' experience in finding the concept of corner points, legs of angles, names of angles, and definitions of angles independently. Through learning activities according to the flow of project activities that have been presented in the e-module. This finding is similar to the results of previous investigators that during worksheets project-based, student exploration, assessment, interpretation, synthesis, and information to produce various forms of learning outcomes (Khotimatuzzahra 2020). Meanwhile, to train concept understanding, students are given practice questions and concept understanding evaluation sheets as shown in Figure 2f and Figure 2g.

Through a realistic mathematics-based e-module, students can construct knowledge independently by utilizing various media as described in Figure 2e**.** In constructing this knowledge, students are guided through project activities as in shown Figure 2f**.** This makes it easier for students to understand and remember the mathematical concepts they receive. In addition, various practice questions that contain realistic problems will train students' concept-understanding skills. So based on the research results that have been described previously, the realistic-based e-module (RME) with project assignments helps effectively improve students' understanding of the concept. This is based on the results of the t-test of the post-test value in the experimental class and control class which shows a 2-tailed sig value of 0.000. Where the value is less than 0.05 based on the acquisition of these scores, it can be concluded that there is a significant difference in conceptual understanding between the experimental class and the control class.

4. Conclusions

E-module is one of the teaching materials that can be used in the learning process either directly or indirectly. Developing teaching material in learning is very important, especially when learning is undergoing a change from an offline system to an online system. The purpose of developing this e-module is to improve the quality of learning, especially in understanding the concept of learning mathematics. In this study, the e-module developed by researchers based on realistic mathematics was assisted by a project assignment consisting of 7 steps. In its development, this e-module is arranged systematically and adjusted to the objectives to be achieved. Based on the results of the assessment obtained from each validator related to the design and presentation of the material, it is in the category of success in increasing students' understanding of the concept with a percentage of 80%. While the results of field trials on teachers and students obtained a teacher questionnaire of 80% and 83.6% of teachers. The results of the effectiveness test using statistical tests, namely the independent sample t-test test, the results are 0.000. This shows that the development of a realistic mathematics-based e-module (RME) with project assignments in improving students' conceptual understanding and is effectively used by grade 4th grade primary school.

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