THE DEVELOPMENT OF QUIZZIZ-ASSISTED SEQUENCE AND SERIES MODULE TO INCREASE MATHEMATICAL UNDERSTANDING ABILITY OF SENIOR HIGH SCHOOL STUDENTS

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ABSTRACT

Mathematical understanding is a very important aspect and the basis for students' mathematical abilities, but the fact is that mathematical understanding is still difficult for students to do. Based on the results of initial observations found problems in learning mathematics, such as students still having difficulty in (a) applying mathematical concepts, (b) students do not play an active role in the learning process, (c) teachers still use the lecture method. As a result, students do not understand the subject matter well. So from this the purpose of this study was to develop a quizziz-assisted sequence and series module to measure students' mathematical understanding abilities. The research subjects were class XII students. The research method uses R&D level 1 is research and development where this research will develop and validate products without product deployment. The indicators of mathematical understanding used are: (1) identifying the concepts studied, (2) predicting a problem using the sequence concept, (3) developing the concepts studied, (4) proving understanding of a concept, (5) applying the formula to cases simple. The instruments used were tests and non-tests. The test instrument is in the form of questions and non-tests in the form of a student attitude scale questionnaire. From the results of data processing, it was obtained from ICT experts getting a score of 85.12% which was categorized as very valid, from material experts getting a score of 79.5% which was categorized as valid, the practical category got a score of 76% which was categorized as practical and the effective category averaged 68.5% which in the good category,

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INTRODUCTION

Mathematical Mathematical understanding is an important cognitive ability and must be possessed by every student in implementing mathematics learning. Because from understanding mathematics can train students in connecting one mathematical concept to another mathematical concept. The opinion expressed by Nasir (2017) according to him learning mathematics for understanding mathematical concepts and is an important factor

needed to solve mathematical problems and mathematical needs students will find it easier to remember and use a learned mathematical concept to solve all kinds of mathematical problems if they have the ability to understand good mathematical concepts. Apart from that according to Moreno (2018) argues that the level of understanding is higher than rote memorization, because in understanding students can find a relationship or linkage of a concept and can know the meaning or a meaning of the concept, so that this ability is the ability that underlies students in problem solving. Another opinion put forward Yusri (2017) that in solving problems, understanding concepts is a very important basis so that mathematical problems can be resolved properly. It can be concluded that mathematical understanding is a basic aspect and an important factor for students to be successful in learning mathematics.

But in reality, there are still many students who have difficulty solving math problems. The lack of success in learning mathematics is caused by several things. One of the causes of students making mistakes is the low ability to understand students' mathematical concepts. Based on the results of the observations made, it was found that students' mathematical understanding was still quite low by obtaining an average score of 43% for each student. In addition, research conducted by Kania (2018) revealed that failure in solving mathematical problems is caused by poor understanding of concepts, errors in calculations, etc. Another opinion expressed by Agustini & Pujiastuti (2020) according to him, the ability to understand mathematics is still lacking, especially in the form of word problems with an average score of 57%. Another study revealed by Mulyani et al. (2018) according to him the ability to understand mathematics is still relatively low, this is evidenced by the inability of students to apply formulas in simple calculations.

Apart from the lack of students' mathematical understanding, another factor that hinders students in achieving maximum results in learning mathematics is the use of models or methods used, so based on this it is hoped that there will be an innovation or creativity from the teacher in the learning process so that students' mathematical understanding can increase. One of the actions that can be done is by using learning media. Technological developments are developing so rapidly and in almost all fields, one of which is in the field of education. The development of this technology is expected to improve the quality of education to be more advanced and developing. The development of science and technology has helped change the world of education. According to Wicaksono (2016)argues that the role of the media in learning is very important, so that the material provided by the teacher reaches quickly and is easily accepted by students. Apart from that according to Novitasari (2016) the use of instructional media can help make it easier for students to understand difficult material starting from abstract concepts to become more concrete. In line with opinion Amir (2016) according to him learning media is a container in conveying learning information to students, with the media can help teachers in the learning process and is expected to improve students' mathematical understanding. The media used in this study are the Quiziz-assisted sequence and series modules.

Modules are tools used for teaching that provide opportunities for all students to achieve a learning goal according to Suryosubroto (Daryanto & Dwicahyono, 2014). The use of this module is expected to be a means to improve students' mathematical understanding. This opinion is in line with research conducted by Rizqi (2019) according to him, modules that have been validated by experts are able to provide an increase in students' mathematical abilities and can be a concrete solution so that the learning atmosphere is more effective. In addition, the advantages of the module are (a) the module can increase collaboration between students and teachers so that students can immediately find out their shortcomings and fix them (b) in the module, clear learning objectives are set so that student learning performance

is directed towards achieving learning goals, (c) the module is designed interesting, easy to learn and answer certain needs so as to motivate student learning, (d) modules are flexible or easy to read anytime and anywhere. Therefore, to optimize its application in the learning process, researchers must be supported by ICT assistance in the form of the quizziz application.

Quizizz is a web-tool for creating interactive quiz games used in classroom learning. Apart from interactive quizzes, the features of Quiziz can also be utilized by conveying a material or concept from that material. Quizziz also provides data and statistics about student performance. According to Citra & Rosy (2020) the quizziz application effectively improves student learning outcomes. In addition, the implementation of quizziz can make students active in answering the questions given (Ju & Adam, 2018). Based on these problems, the quizziz-assisted sequence and series modules are expected to be a solution in the learning process to improve students' mathematical understanding and become a new breakthrough in the application of learning. The advantages of using Quiziz assisted modules include (a) being able to see directly the results of the student learning process, (b) the ranking system in Quiziz can generate more motivation for students to continue to be in the top positions, (c) the quiz system in Quiziz can used as one of the benchmarks in looking at students' mathematical understanding abilities, the more students answer quickly and precisely it makes an indication that students understand the problems given. Therefore

METHOD

The purpose of this research is to develop modules on sequences and series materials with the help of quizziz media to see students' mathematical understanding abilities. This study used the level 1 research and development method. The R&D method was chosen on the consideration that the activity steps in the existing media were at the request of the researcher. Here are the research steps

Figure 1. research steps

The research begins by looking at potentials and problems, then by studying literature and gathering information, then product design and design validation are carried out by media experts. Sampling in this study using purposive sampling technique. The subject of this research was 10 students of class XII. The instruments used in this study were tests and non-tests. The test instrument is in the form of test questions for assessing students' mathematical understanding abilities, while the non-test instrument is in the form of an attitude scale for student assessment of the use of quizziz learning media. Data collection and analysis techniques were carried out by providing validity, practicality and to measure effectiveness questionnaires. Assessment of the attitude scale using a Likert scale (Aswardi et al., 2019).

$$Nilai = \frac{jumlah\ skor\ yang\ diperoleh}{jumlah\ skor\ maksimum} x100$$

The results of the validity and practicality percentages are interpreted according to the criteria (Sugandi et al., 2020).

Table 1. interpretation of validity and practicality categories

Percentage(%)	Criteria
0-20	Very less vaid / very impractical
21-40	Less valid / less practical
41-60	Valid enough/practical enough
61-80	Valid/practical
81-100	Very valid/very practical

The effectiveness of the module can be seen from the scores of students' mathematical understanding abilities and solving sequence and series questions which consist of 5 questions. Scores obtained by students are then analyzed using the formula

$$P = \frac{S}{M} x100$$

Information:

Q: percentage

S: Total score obtained

M: Maximum Score.

The value obtained is then calculated the percentage of students' mathematical understanding abilities using the categories according to table 2

Table 2. Interpretation of mathematical understanding

Percentage(%)	Criteria
0-20	Very less
21-40	Not good
41-60	Pretty good
61-80	Well
81-100	Very good

RESULTS AND DISCUSSIONS

Results

The research was conducted in class XII, the materials used were sequences and series. The research results are presented based on the development stages as follows:

1. Potential and problems

    The initial activity before conducting research on the development of quizziz-assisted modules is to analyze the potential and problems that arise in learning. This activity was carried out by observation and through observation, several cases were found, among others, students felt bored with learning that was so-so. So it is hoped that quizziz-assisted module developers can be an alternative.

2. Literature study and information gathering

    Based on the problems that occurred in module development, the Quiziz application was chosen as a media for evaluating student learning outcomes. Why did you choose the Quizizz application? Among these applications, it has advantages including:

    a) Questions and answers will appear on each student's device

    b) Teachers and students can review the speed of answering the questions given, this can also be one of the benchmarks for students' mathematical understanding, besides students answering quickly students must also answer correctly

    c) Quizziz is easy to access anywhere and anytime, then if students want to try again to test their knowledge students can repeat it at any time

    d) The results of the teacher's test can be directly downloaded in the form of Microsoft Excel.

    Then analyzing the characteristics of students, this stage is carried out by researchers to find out as well as being the basis for compiling and developing modules. Modules that match the characteristics of students are expected to improve students' mathematical understanding.

3. Product design

    This stage is the manufacture of suitable products or media based on an analysis of the characteristics and problems that occur.

    a) Researchers design modules that will be given to students


Figure 2. Sequence and Series Module

    b) The next stage is making 8 questions on the quizziz application to analyze students' mathematical understanding in terms of the speed of answering correctly

c) Quizziz design

Figure 3. Display of the process of entering questions on quizziz

Figure 3 is the process of entering questions into quizziz in the form of multiplace questions, then after all the questions have been entered into quizziz, the appearance is as follows:
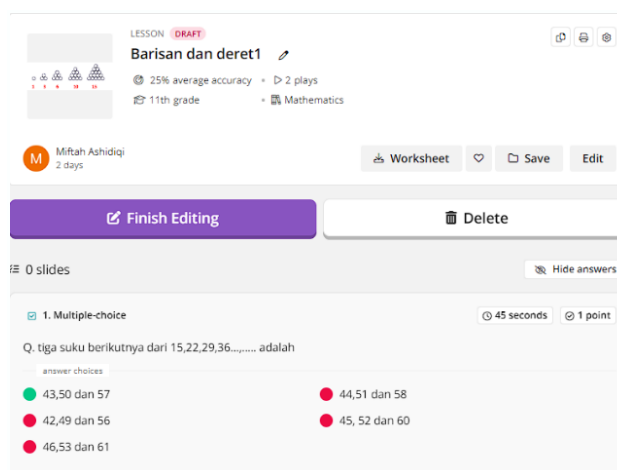
Figure 4. Quizziz final look and ready to use

4. Design validation

Design validation is the stage of testing the validity and practicality of the media that has been made. By giving the module to the validator, then the validator provides the assessment available on the validation sheet. After obtaining valid quality, the module can be tested on learning activities. The sequence and series modules are validated by ICT experts and material experts. The validation results from ICT experts are presented in table 3.

Table 3. ICT expert validator score

Rated aspect	Score average	category
Fill	90%	Very valid
language	87.5%	Very valid
Presentation	88%	Very valid
Benefit	75%	Valid
Average	85.12%	Very valid

Based on the results of the ICT expert validation test, an average percentage of 85.12% was obtained which was categorized as very valid, but there was a suggestion from the validator that the benefits could be maximized.

Furthermore, the results of the assessment of the material expert validator on the row and series modules are presented in table 4.

Table 4. score from the material expert validator

Rated aspect	Score average	category
Fill	85%	Very valid
language	80%	Valid
Presentation	78%	Valid
Benefit	75%	Valid
Average	79.5%	Valid

Based on the results of the assessment of material experts, in terms of each component assessed, namely the content component, language component, presentation component and usefulness component, an average score of 79.5% is categorized as valid.

Based on the assessment of expert validators and ICT in the developed module, it is categorized as valid, from several components that become assessments. Thus the quizziz-assisted sequence and series modules meet the requirements for field trials after being repaired based on suggestions from material expert validators and ICT experts.

Furthermore, a product that is said to be good should have practical properties, student questionnaire responses are used to validate product practicality. Based on the results of data processing on the practicality questionnaire, the results are as shown in table 5.

Table 5. practical trial results

Rated aspect	Score average	category
Usefulness	79%	Practical
convenience	68%	Practical
Efficient	79%	Practical
attractiveness	80%	Practical
Average	76%	Practical

In table 5 it is found that the average practicality of the developed module is in the practical category by obtaining a score of 76%. Meanwhile, based on the convenience aspect, the module can be maximized. This shows that the module already has validity and practicality.

Furthermore, the modules that have been developed are implemented in the learning process in one class

Table 6. Mathematical comprehension test results

No	Indicator	Score average	Category
1.	Identify between the concepts learned	76%	Well
2.	Predict a problem using the concept of a sequence	63%	good
3.	Develop the concepts that have been learned	81%	Very good
4.	Proof of understanding a concept	64%	Well
5.	Apply formulas to simple cases	60%	Pretty good
	Average	68.8%	Well

From table 6 it is found that the results of the students' mathematical understanding ability test averaged a score of 68.8% and entered into the good category. A good or effective module can have a positive impact on students' mathematical understanding.

5. Tested design

After After conducting research, module development has been successfully developed as teaching materials to increase students' mathematical understanding. In this study, media validation by ICT was carried out by obtaining a score of 85.12% which was in the valid category, then material validation was carried out by obtaining a score of 79.5% which was included in the valid category, then a practicality test by students by obtaining a score of 76% which was included in the practical category. After doing some validation by experts and student researchers continued with the implementation of learning to measure students' mathematical understanding by obtaining an average score of 68.8% in the good category.

Discussions

Based on the presentation or the results of the research, it was found that the implementation of the research was carried out in one cycle. In addition, from the results of observations in the preliminary study, it was found that the level of students' mathematical understanding ability was still quite low, as seen from the average score of 43%. Apart from the lack of understanding of students, another factor that causes this is that students feel bored with learning that still uses the lecture method. So a teaching method is needed that can support students to get maximum results, one of which is the use of modules.

Research conducted by Treasure et al. (2014)according to the results of his research using the module, it can be seen that the average results of students' conceptual understanding ability get a score of 85.68% and 79.65% respectively, learning completeness up to 100% and 73%. In addition, other research conducted by Sarah et al. (2019)shows that the module can facilitate students' mathematical understanding after using the module the average score regarding students' understanding of mathematical concepts is 89.2% so that it is categorized as very good.

After using the quizziz assisted module there was a change in students' mathematical understanding by obtaining an average score of 68.8% which was in the good category. In addition to these factors, the modules are designed to be attractive to students and use language that is easy to understand. This can be seen from the results of the media expert validator who received an average score of 85.12%, which is in the very valid category. Modules can facilitate the learning process with more interesting, easy and not static or

monotonous learning media Ainiyah & Roisatul (2022). The module also includes contextual problems that make students understand that mathematics is very close to everyday life.

The quizziz factor also influences the results of students' mathematical understanding according to Ju & Adam (2018)research showing that the implementation of Quizizz makes students more active in answering the questions given, helping students improve their skills. Other research shows that learning using quizziz is effective in improving student learning outcomes Citra & Rosy (2020). In line with Sunardi (2020)said that the application of quizziz learning media provided an increase in student activity, student understanding and accuracy for students.

Based on this explanation, there are several factors that affect students' mathematical understanding, including the use of media in the learning process, the language used in the learning module must be easy for students to understand and interesting, quizziz as a student site so that students are more active in the learning process. Sothe use of quizziz-assisted sequence and series modules is effective in facilitating mathematical understanding abilities.

CONCLUSION

Based on the results of the research that has been done, the development of the quizziz-assisted sequence and series modules to measure students' mathematical understanding obtains valid, effective and practical qualities, so that the modules can and are appropriate for use in the learning process for students. By using the Quiziz-assisted sequence and series modules, it can improve mathematical understanding. It can be seen from the results of the research conducted, which obtained a score of 68.8%, which is classified as good.

The suggestion given is that the results of the research on the development of the Quiziz-assisted sequence and series modules can be used as an alternative teaching material that can be used in the learning process. In addition, this research is also expected to be a reference in conducting similar research or other research.

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