

Development of Quizizz Application-Based Assessment to Measure Reasoning Ability of Middle School Students' on Flat Shape Materials

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Abstract

This research is development research that aims to develop an assessment based on the Quizizz application to measure the reasoning ability of junior high school students' flat wake material. The research subjects were 60 junior high school students. Data sources were obtained from the results of the test and student response questionnaires. The steps for adopting test development using the Djemari Mardapi stage with the following steps: compiling test specifications, writing tests, reviewing tests, conducting test trials, analyzing test items, refining tests, assembling tests, administering tests, and interpreting test results. The results showed that the Quizizz application-based assessment was valid, reliable, practical, and effective. The test has a characteristic difficulty level, namely two easy category questions and eight medium category questions, and the distinguishing power of 8 very good questions and two good questions. The reasoning ability of students' flat shapes, as measured by an assessment based on the Quizizz application, has an average of 67.83, with a fairly good category.

Keywords: assessment; quizizz; reasoning

INTRODUCTION

Mathematics is a crucial subject in human survival, mathematics has a role in various aspects even in today's digital and technological era (Siregar, 2017). According to Annur (2020), that learning mathematics is an important teaching and learning process to prepare Human Resources (HR) to compete in the global era. Mathematics also plays an important role in various other disciplines and plays a role in the development of the human mind (Buraish, 2016). If someone is capable of mathematics, then an individual has innovative, creative thinking, curiosity, thoroughness, making decisions carefully, making assumptions, high reasoning, and forming a systematic mindset (Mardhayanti et al., 2020). Thus, mathematics is very possible to be able to increase the ability to reason (Wibowo, 2017).

Reasoning ability is an ability that must be possessed by students that can be developed in the teaching and learning process of mathematics (Saputri, 2017). This mathematics learning has an important goal and must be applied, namely to provide learning to students regarding reasoning, then students must have the ability to reason (Oktaviana, 2021). In the National Council of Teachers of Mathematics (NCTM) It is stated that there are 5 basic mathematical abilities that are included in the standard of the mathematics education process, namely (1) the ability to represent, (2) the ability to make connections, (3) the ability to reason, (4) the ability

to communicate, and (5) problem solving ability (Khadijah et al., 2020). Reasoning ability is a thought process for drawing a conclusion or making a new statement according to a statement that is understood correctly (Ratau, 2016). Many problems in mathematics or daily life require reasoning to do them (Jami, 2020). Referring to the Ministry of National Education in (Shadiq, 2004) that mathematical reasoning and mathematical material are two things that are difficult to separate, namely material that is understood through reasoning, while reasoning is understood and trained through learning mathematical material.

In fact, what happens in the field is that students' reasoning abilities are still relatively underdeveloped. Most students in Indonesia, especially the Junior High School (JHS) level, have difficulty reasoning in solving mathematical problems (Umaroh, 2020). Based on research in junior high schools by giving reasoning ability tests, it was found that students' reasoning abilities were still categorized as low (Zubaidah Amir et al., 2021; Hasmal, 2020; Gradini et al., 2021). In the study of Nuriadin (2021) it was confirmed that the reasoning abilities of junior high school students were low, namely the inability to formulate valid arguments and the inability to draw logical conclusions. The facts indicate that the mastery of reasoning abilities of junior high school students in Indonesia is still low. Junior high school mathematics teachers must prioritize students in terms of mastering basic concepts and apply reasoning questions more concretely, so that students are better able to relate their knowledge to working on problems using reasoning abilities (Fauziah et al., 2021).

Giving reasoning questions specifically designed is one way to train students' reasoning abilities (Rizta, 2013). Appropriate and good test instruments can be seen through the nature of the test itself through analyzing both items and the test as a whole (Sa'diyyah, 2021). However, a common problem that arises in schools is that the questions submitted to students do not pass the test analysis stage to see the nature of the test. So that students are less trained to work on reasoning questions (Lesiana & Hiltrimartin, 2020). Students should not only be given to solve problems that are almost the same as the examples taught by educators (Masitoh & Aedi, 2020). There are a number of factors that cause teachers to rarely give practice questions that require reasoning, including the lack of references to reasoning questions that can be used directly in the teaching and learning process (Putri, 2020). This should really be considered by the teacher so that it is more frequent to give students training from questions that require reasoning (Nurwahidah, 2018).

Assessment has a role as a determinant of the quality of education and the direction of learning (Pantiwati, 2016). Assessment plays an important role in education because it is used to identify what teachers should do to improve and develop students' abilities (Puspitasari, 2016). Each learning process must have a goal (Asrori, 2016). As a measure of the realization of goals in the teaching and learning process, information about the learning process and outcomes is needed, information can be in the form of assessment data (Talango & Pratiwi, 2018). Assessment is the main component in the teaching and learning process whose purpose is to identify the level of learning achievement, objectives, and see the process of teaching and learning effectiveness (Yuniarti, 2018). With the assessment, we can also see how far the effectiveness of the method used is to see

the success of the material provided, so that this assessment can carry out the teaching and learning improvement process (Hambali, 2020). In the assessment results, students are still categorized as low, so this assessment is useful in order to be able to see what students have gained throughout the learning process (Nawawi & Wijayanti, 2018).

Assessment has various forms that can be presented by educators through online media (Mertasari, 2016). One of the commonly used online-based learning applications is Quizizz (Zuhriyah & Pratolo, 2020). The Quizizz application is not only for learning media but can also be used as a tool for assessment of mathematics learning (Wahyudi, 2020). Quizizz is a well-known e-learning platform offering many quizzes that teachers and students can use in their daily lessons (Lim & Yunus, 2021). Quizizz provides the form of formative questions with various forms of choices that are presented in an interesting and exciting way for students (Pusparani, 2020). The Quizizz application can show questions in the form of sound and images, so the teacher's need to use this application can be helped properly (Agustina & Rusmana, 2019). Quizizz can be used as an interesting and fun assessment medium (Salsabila, 2020). Quizizz applies the concept of gamification to students and demonstrates the attitude position for quizzes as a tool for online teaching and assessment during class (Darmawan, 2020). This Quizizz allows students to motivate them to learn and to compete with each other so that learning outcomes can increase (Mulatsih, 2020).

The use of the Quizizz application has an impact on students in the examination process (Malik et al., 2021). Quizizz can make students challenged and active to answer questions, so the teacher will more easily assess the teaching and learning process that is being carried out (Wijayanti et al., 2021). Quizizz succeeded in significantly increasing understanding of the material provided through its use as a self-assessment medium (Irwansyah & Izzati, 2021). High learning outcomes show good reasoning abilities, in contrast, low learning outcomes show low reasoning abilities (Rosyidah et al., 2021). Reasoning abilities are so important that the development of these abilities must be taken into account during the learning process (Citra et al., 2021). In line with this opinion, students' reasoning abilities are needed to achieve good learning outcomes in learning mathematics (Gunawan, 2017). Therefore, Quizizz can be a medium to measure students' reasoning abilities.

In a previous study from Suharsono (2020) regarding the use of the Quizizz application in the millennial generation of CPNS Ministry of Finance basic training, he said that teaching and learning using Quizizz was more fun and interesting. Students' responses to the use of the Quizizz application to solve problems received very positive responses (Hamidah & Wulandari, 2021). With a variety of features and a well-packaged display, the Quizizz application is very effective for learning in both low and high grades (Utari et al., 2021).

In a study written by Elisa et al. (2021) stated that an interactive quiz-based assessment using the Quizizz application to measure students' physics competence has been tested to be valid, practical, and effective. Quizizz can provide an increase in the creativity of an educator to compile questions online, learning outcomes using Quizizz are more detailed, making it easier for educators to make learning outcomes decisions more precisely and quickly (Suciningsih, 2020). In addition, in a study conducted by Haryati et al. (2021) stated that students' assessment of the assessment

instrument using the Quizizz application was considered very good and students were motivated to be the best during the test using the Quizizz application. Previous research conducted by Setiawati (2021) revealed that the use of Quizizz in the application of learning was fun and quite challenging. Quizizz applications can improve thinking skills (Wihartanti et al., 2019). The measurement of reasoning ability using online media was also carried out in research by Ramdani (2021) who stated that there was a difference between mathematical reasoning ability for pre-test and post-test using online media, namely Edmodo. The research shows that Edmodo-based development media get decent results. The online media-based mathematics learning is practical and effective in measuring students' mathematical reasoning.

Based on the description of previous research, the thing that makes it different from previous research is that this research focuses on developing a Quizizz application-based assessment as a measurement of reasoning ability. It was found that Quizizz is one of the useful applications for teaching and learning assessments. The development of an assessment to measure reasoning ability is important, especially in learning mathematics in junior high school. In addition, studies on the development of Quizizz-based assessments in measuring reasoning ability have not been widely carried out. Therefore, the researcher conducted a study to develop an assessment based on the Quizizz application as a measurement of reasoning abilities, especially from the flat-shaped material of junior high school students.

RESEARCH METHOD

This research is in the form of research and development or Research and Development (R&D) with the aim of developing a Quizizz application-based assessment to measure the reasoning ability of junior high school students' flat-shaped material. The development carried out applies the research and development model of Djemari Mardapi in (Handayani et al., 2021). The 9 steps of instrument development used in this study, namely: compiling test specifications, writing test questions, reviewing test questions, conducting test trials, analyzing test items, refining tests, assembling tests, administering tests, and interpreting test results.

The description of the explanation of the 9 steps of the Djemari Mardapi Research and Development Model is as follows.

1. **Compiling Test Specifications**
The test specification shows all the characteristics that a test must have. Things that are applied when compiling test specifications are determining Basic Competence (KD), Competency Achievement Index (GPA), question indicators, question form, cognitive level, and determining the duration of the test. This is done to make it easier to write questions and anyone who writes questions will create a level of difficulty that tends to be the same.
2. **Writing Test Questions**
This is the stage of translating indicators into questions that have characteristics according to the material and basic competencies used. Each question requires an arrangement so that it is clear what is asked is also clear in the desired answer.
3. **Reviewing Test Questions**

To carry out the process of reviewing the questions, after completing the questions, it is necessary to avoid mistakes that result in students not being able to master the questions in question. The examination of the test items was carried out by three reviewers, namely two lecturers of mathematics education experts and one mathematics teacher. The purpose of studying test questions is so that the questions made are of really high quality.

4. Conducting Test Trials

Test trials are carried out as a means of obtaining empirical data regarding the level of goodness of the questions that have been compiled. Trials are carried out on students who will not get the questions for assessment. The trial test was held at SMP Negeri 4 Pare. The subjects of this study were students of class VII-I totaling 30 students.

5. Analyzing Test Items

From the item analysis, information is obtained about the question in terms of validity, reliability, practicality, effectiveness, discriminatory power, and level of difficulty.

6. Refining Tests

Apabila soal ada tidak sesuai harapan artinya soal tidak berkualitas. Langkah ini dilakukan untuk sebagai perbaikan setiap butir soal yang nyatanya belum masuk ke dalam kategori soal yang baik dan berkualitas.

7. Assembling Tests

If there are questions that are not as expected, it means that the questions are not of high quality. This step is carried out as an improvement for each item which in fact has not been included in the category of good and quality questions.

8. Administering Tests

In this study, researchers conducted tests at SMP Negeri 4 Pare which is located at Jl. Merbabu, Plongko, Pare, Kec. Pare, Kediri Regency, East Java 64211. The subjects of this study were 60 students in grades VII-C and VII-D.

9. Interpreting Test Results

The test results provide quantitative data results which include scores. This score is further categorized and then declared as a low, medium, or high value so that students' reasoning abilities can be known.

The instruments used for data collection are questionnaires and tests. Data analysis techniques include tests of validity, reliability, practicality, effectiveness, level of difficulty, and discriminatory tests. The data analysis criteria are presented in Table 1.

Table 1. Data Analysis Criteria

No.	Conclusion	Drawing Conclusion
1.	Validity	The minimum question reaches the valid category
2.	Reliability	The minimum question reaches the reliable category
3.	Practicality	The student response questionnaire has at least reached the practical category
4.	Effectiveness	Minimum 75% of students have reached KKM
5.	Difficulty Level	The results of working on each question in the most moderate category
6.	Distinguishing Power	The results of each question are in the medium, good, and very good categories

RESULTS AND DISCUSSION

This research was conducted referring to the goals that have been set to develop an assessment based on the Quizizz application in measuring the reasoning abilities of junior high school students. The results of the research that refer to the purpose of the development step, then use the R&D steps adopted from the stages of the development model by Djemari Mardapi, namely as follows.

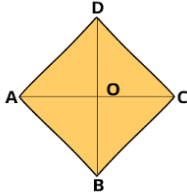
Developing test specifications is an explanation that shows the overall characteristics of a test. At this stage, the test specifications are compiled in the form of a test grid. The test grid includes determining BC, determining GPA, determining question indicators, determining the form of questions, and determining the cognitive level of questions. The sample grid of questions is as follows.

Table 2. Sample Questionnaire

Basic Competencies	GPA	Question Indicator	Form of Cognitive	Level Questions
3.11 Associate the perimeter and area formulas for various types of quadrilaterals (square, rectangle, rhombus, parallelogram, trapezoid, and kite) and triangles.	3.11.2 Summarize the problem of various types of flat shapes by linking the formula for perimeter and area	Presented pictures and information about the shape of a rhombus. conclude the circumference of the figure, if the ratio of the length of the diagonal and the area is known.	Short Fill	C5

Referring to the test specifications that have been prepared, the next step is writing test questions. The test questions that are prepared are adjusted to the specifications of the tests that have been planned. Sample test items are listed in the following table.

Table 3. Sample Test Items

Question
<p>Take a look at the image of the rhombus below!</p>  <p>In rhombus ABCD, the length of the diagonal $AC : BD = 2 : 3$ and the length of $AC : AB = 3 : 4$. If the area of the rhombus is 243 cm^2. The perimeter of rhombus ABCD is...</p>

Before carrying out the research, the test device was first reviewed by experts who focused on the content of the research instrument. The instrument study was carried out by 2 lecturers of mathematics education at the University of Muhammadiyah Malang and 1 teacher of mathematics at SMPN 4 Pare. The results of the expert's review can be seen in the following table.

Table 4. The results of the examination of test questions by experts

Σ score	Percentage (%)	Validity
54	90	Very High

Based on the analysis, it can be concluded that the research instrument in the form of test questions has a percentage of 90%, which means that the test questions developed have very high validity.

Table 5. Results of Questionnaire Review by Experts

Σ score	Percentage (%)	Validity
68	94,4	Very High

Based on the analysis, it can be concluded that the research instrument in the form of a questionnaire has a percentage of 94.4%, which means that the developed questionnaire has very high validity.

After the instrument was declared valid by the expert, a test trial was conducted. This stage aims to determine the quality or feasibility of the test instrument. The trial test was carried out on 30 grade VII students of SMPN 4 Pare who were randomly selected by the teacher. From the trial, it was found that the item validity, reliability, practicality and effectiveness, level of difficulty, and discriminatory power were obtained.

The validity test at the test trial stage obtained 3 invalid items, namely numbers 1, 2, and 4. This is indicated by the item having an rcount value of less than rtable, where the value of rtable = 0.349. The results of the reliability test resulted in a Cronbach's Alpha value of 0.461, so it can be concluded that the items are not reliable or categorized as low reliability.

Based on the item analysis with a total of 10 questions, 3 questions were obtained that were invalid, unreliable, practical, less effective, had easy, medium, and difficult levels of difficulty, had excellent and moderate discriminating power. The causes of invalid and unreliable items are the small number of respondents (N) and the use of language and numbers in less simple questions. The revised questions will then be assembled. The test questions are arranged based on the level of difficulty of the questions obtained from the results of the analysis of the test trials. Questions that have an easy level of difficulty should be placed at the beginning of the test, while questions with a difficult level of difficulty should be placed at the end of the test (Aisyah, 2010).

After the test was assembled, the test was given to 60 students of SMPN 4 Pare covering 2 classes. Subjects are selected from classes that have active and moderate levels of student ability. Respondents for the implementation of the test are different from the respondents when conducting the test trial. This research was conducted directly at the school online based on the Quizizz application using each student's cellphone.

From the implementation of the test, it was found that the validity of the items, reliability, practicality and effectiveness, discriminatory power, level of reasoning, and the level of difficulty of students. Validity test with 60 students respondents obtained an rcount value of 10 items, which is between 0.459 to 0.689 so that it is greater than the rtable value, where the rtable value = 0.25, it can be

stated that all items are valid. The results of this test resulted in a Cronbach's Alpha value of 0.751, so it was concluded that the items were reliable or highly reliable.

The level of practicality obtained an average percentage of student response questionnaires of 80.11%, which means it is very practical. The test results from 60 students showed that 46 students had succeeded in reaching the KKM limit of 60. The percentage of students who had succeeded in reaching the KKM limit was 76.67%. So that the overall average test scores get a score of 67.83 with the effective category.

Analysis of the level of difficulty of the test items obtained items with moderate and easy levels of difficulty. Questions with easy difficulty levels are item number 1 and 3. While items numbered 2, 4, 5, 6, 7, 8, 9, and 10 are categorized as moderate items. The discriminatory power of the questions obtained by the test items includes very good and good discriminating items. Items with very good discriminating power are questions number 2, 4, 5, 6, 7, 8, 9 and 10. While the items with good discriminating power are questions number 1 and 3.

The level of reasoning of students according to the results of tests that have been carried out is presented in Table 6.

Table 6. Reasoning Level Results

Range of Value	Criteria	Total	Percentage (%)
$80 \leq x \leq 100$	Very good	29	48,33
$70 \leq x < 80$	Well	0	0
$60 \leq x < 70$	Pretty good	17	28,33
$x < 60$	Not good	14	23,33
Average	67,83	St. Deviation	25,71

In this study, it was found that the reasoning abilities of students were categorized as quite good. The average reasoning ability with the subject of 60 students is 67.83. It is shown that 29 out of 60 students are categorized as having very good reasoning, 17 students are categorized as quite good, and 14 students are categorized as poor. In line with Lesiana & Hiltrimartin (2020) that the average reasoning ability with 30 students as the subject is 63,867 with a fairly good category. This result is different from the study by Ramdan & Lessa Roesdiana (2022) which showed that the average reasoning ability test with 20 students was 20.63 in the very low category. This is because there are still many students who find it difficult to understand mathematical material and concepts, so many of them also have less than optimal results. Agree with Shofia (2016) that students are lazy to think so they don't know how to solve the problem and don't check the final answer obtained.

CONCLUSION

The Quizizz application-based assessment to measure the reasoning ability of junior high school students met the valid and reliable criteria. The assessment has a very practical level of practicality and an effective level of effectiveness. The assessment has various levels of difficulty, namely easy and moderate, and has good

and very good discriminating power. The reasoning ability of students has an average of 67.83 which means that it meets the criteria quite well. So that the Quizizz application-based assessment can be used by teachers to measure the reasoning abilities of junior high school students.

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