

## DEVELOPING THE PROBLEM OF NUMERATION LITERACY WITH ISLAMIC CONTEXT

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### Abstract:

This study aims to develop assessment questions or instruments to measure students' numeration literacy skills integrated with the Islamic context. The research was conducted through 4 stages: initial assessment, design, test making, and a study of problem items then limited trials and analysis. The instruments used include algebra and statistics by taking the Islamic context of zakat material. Experts validated the instrument, and the validation results were analyzed using Aiken's formula. The instrument was also tested online and limited to 22 students of grade 8 MTsN 1 Surabaya. The test results were analyzed using product-moment correlation to determine its empirical validity and used alpha Cronbach to determine its reliability. The results showed that the 6 questions developed are valid with a validity value of 0.783. This result is reinforced by empirical validity results that show that the instruments developed are valid in terms of material/content, construct, and language. The reliability test results using alpha Cronbach obtained the reliability coefficient is 0.72. The instrument developed in this research is expected to be one of the references of students in practicing their numeracy skills and preparing to face national assessments by the Ministry of Education. Because it was found in this study that students have difficulty answering the question of numeration literacy with Islamic context. This case shows that students' numeration literacy skills are still low.

**Keywords:** Literacy, Numeracy, Islamic Context

## MENGEMBANGKAN SOAL LITERASI NUMERASI BERKONTEKS ISLAM

### Abstrak:

Penelitian ini bertujuan untuk mengembangkan soal atau instrumen penilaian untuk mengukur kemampuan literasi numerasi siswa yang diintegrasikan dengan konteks Islam. Penelitian dilakukan melalui 4 tahapan yaitu pengkajian awal, desain, penulisan soal, telaah butir soal kemudian uji coba terbatas serta analisis. Instrumen yang digunakan meliputi soal aljabar dan statistika dengan mengambil konteks Islam materi zakat. Instrumen tersebut divalidasi oleh para ahli kemudian hasil dari validasi tersebut dianalisis menggunakan formula Aiken's. Instrumen juga diujicobakan secara daring dan terbatas kepada 22 siswa kelas 8 MTsN 1 Surabaya.

Hasil ujicoba dianalisis menggunakan korelasi product moment untuk menentukan validitas empirisnya dan menggunakan Alfa Cronbach untuk mengetahui reliabilitasnya. Hasil penelitian menunjukkan bahwa dari 6 butir soal yang dikembangkan bernilai valid dengan nilai validitas isi sebesar 0,783. Hasil ini diperkuat dengan hasil validitas empiris yang menunjukkan bahwa instrumen yang dikembangkan valid dari aspek materi/konten, konstruk serta bahasa. Hasil uji reliabilitas menggunakan Alfa Cronbach diperoleh koefisien reliabilitasnya adalah 0,72. Instrumen yang dikembangkan dalam penelitian ini diharapkan mampu menjadi salah satu rujukan siswa dalam melatih kemampuan numerasi yang mereka miliki serta mempersiapkan diri untuk menghadapi asesmen nasional oleh Kemendikbud. Karena didapati dalam penelitian ini siswa mengalami kesulitan dalam menjawab soal literasi numerasi berkonteks Islam. Hal tersebut menunjukkan bahwa kemampuan literasi numerasi siswa masih rendah.

**Kata Kunci:** Literasi, Numerasi, Konteks Islam

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## INTRODUCTION

Numeracy literacy skills are one of the skills needed in the 21st century. Therefore, students are directed to be able to have such abilities. In line with this, the Ministry of Education established a new policy related to the National Assessment in which it contains a Minimum Numeracy Competency Assessment. The policy is expected to provide information related to the quality of learning from the education unit.

Definition of numeracy literacy is applying mathematical knowledge related to various symbols and numbers to solve everyday problems (Team GLN, 2017). Numeracy is not the same as mathematics. Mathematics is more about the science of counting with a specific formula. In comparison, numeracy leads more to mathematical and quantitative logic (Steen, 2001). Related to this, numeracy literacy is interpreted as applying the ability to solve everyday problems. Therefore, students need both mathematics and numeracy literacy. Based on this definition can be analyzed that numeracy literacy is not limited to the use of mathematical formulas only. But it is more about using the knowledge or mathematical concepts possessed to solve mathematics-related problems in everyday life. Numeracy presents a focus on mathematics

at all levels of education to prepare for solving future life problems (Sullivan, 2011). In this case, students who have numeracy literacy skills will understand the problems faced and determine relevant mathematical concepts to solve the problem.

The reality that occurs is that the achievement of numeracy literacy skills of Indonesian students is still relatively low. This case is evidenced by the PISA study results in 2018. Indonesia got a score of 379, and the average score of OECD is 487. This result shows that the average Indonesian student still has low-order thinking skills, so numeracy literacy skills are also low. This result is reinforced by the results of the TIMSS study that Indonesia got a score of 395 from an average score of 500 (Team GLN, 2017). This fact is also evidenced by research conducted by Wati, Sugiyanti, and Muhtarom at SMPN 6 Semarang (Wati, Sugiyanti, & Muhtarom, 2019) that students in the 8th grade of SMPN 6 Semarang have not been maximal in using their mathematical knowledge to solve everyday problems related to numeracy literacy.

The low achievement of numeracy literacy of Indonesian students is due to several factors (Syawahid & Putrawangsa, 2017). The first is the personal factor related to the lack of confidence in their mathematical abilities and their impression of mathematics. Both instructional factors are related to the quality, level of proficiency, and methods used in the learning process. And the third factor is the environmental factor associated with the character of teachers and teaching media provided by schools as a support for learning about numeracy literacy.

One of the things that cause the third factor to occur is that teachers are not accustomed to giving questions related to numeracy literacy to students in the learning process (Fiangga, Amin, Khabibah, Ekawati, & Pratiwi, 2019). In learning, teachers still often provide closed-ended questions in which students can solve the problem only by using a formula (Kartikasari, Kusmayadi, & Usodo, 2016). This is because many teachers use the available textbooks as a reference. Even though not all textbooks have the appropriate content and high quality (Fajriatin, 2015). Therefore, teachers must be able to choose textbooks that have high quality and are by following the learning objectives to be achieved.

Based on the problems above, it is necessary to provide teachers with training activities related to numeracy literacy. Then the procurement of learning media and appropriate measuring tools to support numeracy literacy activities. The measuring instrument in question is a test to determine the level

of numeracy literacy skills possessed by students and to increase students' opportunities in applying these numeracy literacy skills to solve daily problems. Therefore, the development of tests related to numeracy literacy is an essential part of this research. The developed test is expected to be a supporting medium for students to understand the meaning of numeracy literacy and prepare themselves to face the National Assessment, which contains numeracy literacy as a new policy from the Ministry of Education and Culture. The main characteristics that a test must own are validity, reliability, and the level of usefulness (Gronlund, Linn, & Miller,, 2009). The same thing was also revealed by Setyosari (2009) that a test must pay attention to validity and reliability. Validity is defined as the extent of the accuracy of a measuring instrument to measure what must be calculated under its measuring function (Azwar, 2011). Furthermore, reliability can be interpreted as the stability or consistency of assessment results (Reynolds, Livingston, & Willson, 2010). Therefore, a test can be good if it contains validity and reliability.

Several studies review numeracy literacy. The research is only limited to developing reflective modules based on child-friendly schools (Rakmawati, 2019) and analyzing numeracy skills in several parties (Mahmud & Pratiwi, 2019). Apart from previous research, no instrument has been developed to assess students' numeracy literacy by including the Islamic context. Integrating the Islamic context in mathematics problems can encourage students to think critically and reason about the truth of Islamic teachings (Kusaeri, Sadieda, Indayati, & Faizien, 2018). In addition, the integration of the Islamic context in mathematics can reduce students' perceptions of the difficulty of combining mathematics with an Islamic context (Kurniati, 2015). So that students will be interested in improving their numeracy literacy skills because they will assume that numeracy literacy is an important thing in their lives.

The development of the test in this study is not only limited to the numeracy literacy component that the National Literacy Movement team has determined. However, the numeracy literacy component belonging to the GLN team was combined with the numeracy literacy component belonging to the ministry of religion in Madrasah Action activities (Kusaeri, 2021). These components include 1) content in the form of material that forms the basis of test development, namely algebra and statistics; 2) cognitive processes in the form of understanding, application, and reasoning; and 3) context that determines the type of question in the form of personal and socio-cultural context. The researcher's components used as a reference are adjusted to the

existing literacy dimensions, namely critical thinking, creative thinking, and problem understanding thinking (Abidin, Mulyani, & Yunansah, 2018).

**METHODS**

This research is development research to produce a product in numeracy literacy questions in an Islamic context. The development model used in this study is the Plomp model, which consists of four stages. The first stage is the initial assessment, an investigation to collect and analyze helpful information for the next stage (T. Plomp & Wolde, 1992). At this stage, curriculum data, students, and materials are obtained to be analyzed as instrument writing guidelines. The second stage is design, this stage aims to design problem-solving that has been analyzed in the first stage (Tj. Plomp, 1997). At this stage, the formulation of grids and problem indicators is carried out. The third stage is the realization of construction, this stage aims to realize the problem-solving design that has been created. At this stage, the writing of the problem item is done. The fourth stage is the test, evaluation, and revision stage. At this stage, the developed instrument must be tested and evaluated until the instrument can be said to be valid, reliable, and fit for use. Chart 1 describes the stages of development.

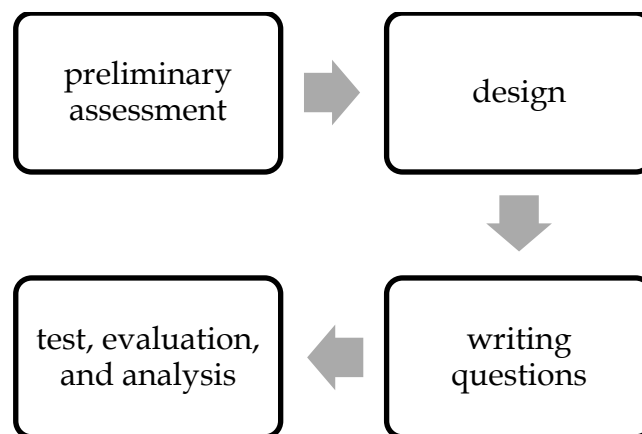


Chart 1. Stages of Instrument Development

The thinking dimensions developed are directed at three aspects of numeracy literacy dimensions (Abidin & Mulyati, 2018): 1) critical thinking, 2) creative thinking, 3) problem understanding thinking. The questions developed in this study use a system of linear equations with two variables and statistics combined with the Islamic context of calculating zakat. A mathematical problem of numeracy literacy will be built from the combination of dimensions and material selection, emphasizing the ability to think in a

personal and socio-cultural context. Based on these considerations, 6 (six) items of numeracy literacy were developed, consisting of 4 complex multiple-choice questions and 2 (two) descriptive questions.

A study to determine the quality of the items was carried out before the items were tested, namely by validation by mathematics lecturers and mathematics teachers at MTsN 1 Surabaya. The selection of MTsN teachers is intended to evaluate the Islamic context used in the items. The validation results by experts were then analyzed using Aiken's V formula. The limited online trial was conducted in class 8 of MTsN 1 Surabaya with 22 students as subjects. The test results were analyzed using product-moment correlation to determine the empirical validity index of the developed items. This study also conducted a descriptive analysis to identify students' problems solving numeracy literacy problems in an Islamic context.

## RESEARCH RESULTS AND DISCUSSION

The results of the development of numeracy literacy questions in an Islamic context are as follows:

### 1. Development of numeracy literacy questions in an Islamic context

#### a. Preliminary Assessment

Observations were made at MTs Negeri 1 Surabaya, recorded in field notes. Then the data from the field notes were strengthened by giving a questionnaire to one of the mathematics teachers at the school. Observation and giving questionnaires were carried out to obtain information about the curriculum used, students' characteristics, and the suitable material for a numeracy literacy test. The data obtained is then analyzed and adapted to development needs.

#### b. Design

The material chosen is a system of linear equations with two variables and statistics. From these basic competencies, they are translated into six achievement indicators. Furthermore, the formulation of question indicators adapted to the dimensions of numeracy literacy are critical thinking, creative thinking, and problem understanding thinking and adapted to the zakat material as an Islamic context.

#### c. Writing Questions

Based on the grid that has been prepared, as many as six questions will be developed in this study. The six questions consist of 4 complex multiple-choice questions and two description questions with the following

indicators: 1) solving problems related to SPLDV with zakat on livestock and zakat on agricultural products, 2) interpreting line diagrams and solving problems related to trade zakat, 3) solving problems related to SPLDV with zakat on industrial commerce, 4) interpreting a bar chart that involves calculating the average with problems related to plantation zakat, 5) solving problems related to SPLDV with zakat on agricultural products, and 6) solving problems related to calculating the average (mean) by interpreting table and commercial zakat.

d. Test, Evaluate, dan Analysis

1) Content validation by experts

Content validation is carried out to know the validity index and quality of the questions before a limited trial is carried out. Content validation was carried out by four experts, namely two mathematics lecturers and two mathematics teachers from MTs Negeri 1 Surabaya.

Validation of the material obtained improvements regarding the suitability of basic competencies with the indicators of the questions used, precisely in item numbers 4 and 6. These improvements add the average (mean) calculation in the questions and affirmations related to zakat material in an Islamic context.

Construct validation obtained improvements in the diagrams presented on complex multiple-choice questions number 2 and 4, sentences in questions numbers 1 and 3, which are still a little confusing, and the assessment rubric is incomplete on question number 2.

Language validation obtained advice and input from experts to use effective and easy-to-understand language in writing questions. Researchers improve the questions according to the results of validation by experts.

2) Revision of the results of content validity (evaluation)

Based on the suggestions at the content validation stage, the follow-up to the material validation was to improve the complex multiple-choice question number 4 and the description question number 6. The indicator questions on the questions were adjusted to the basic competencies used.

Improvement of the constructed realm, namely fixing unclear diagrams on complex multiple-choice questions number 2 and 4, improving sentence structure that is less understandable on complex

multiple-choice questions number 4, and completing the assessment rubric on complex multiple-choice questions number 2.

Furthermore, improving the language aspect, namely improving the question sentences that are less understandable using effective and easy-to-understand language.

This validation stage is carried out in 4 stages, namely, stage 1 to validator 1, then the instrument is corrected according to the input from validator 1. Furthermore, the instrument that has been repaired is validated in the second stage by validator 2. The instrument is repaired again according to the input given. The instrument repaired based on the input of validator 2 is then validated in stage 3 by validator 3. There are a few revisions obtained in stage 3. The instrument is repaired again based on input from the validator 3. Then the instrument is given to validator 4 to be validated in stage 4. The results of the fourth validation are the instrument meets the assessment criteria and is suitable for use for limited trials.

### 3) Content validation test

The content validation results provided by validators were then analyzed using Aiken's V formula and obtained a score of 0.802 for material or content aspects, a score of 0.771 for the constructed aspect, and a score of 0.775 for language aspects with an average score of all three aspects being 0.783. The score indicates that the instrument developed is valid and worthy of a trial.

### 4) Limited trial (test)

The limited trial was conducted online by 22 respondents from class 8 MTs Negeri 1 Surabaya. From the trial obtained information that only 8 students were able to solve the description problem but have not maximally applied the mathematical knowledge they have to solve numeracy literacy problems such as figure 1 below.



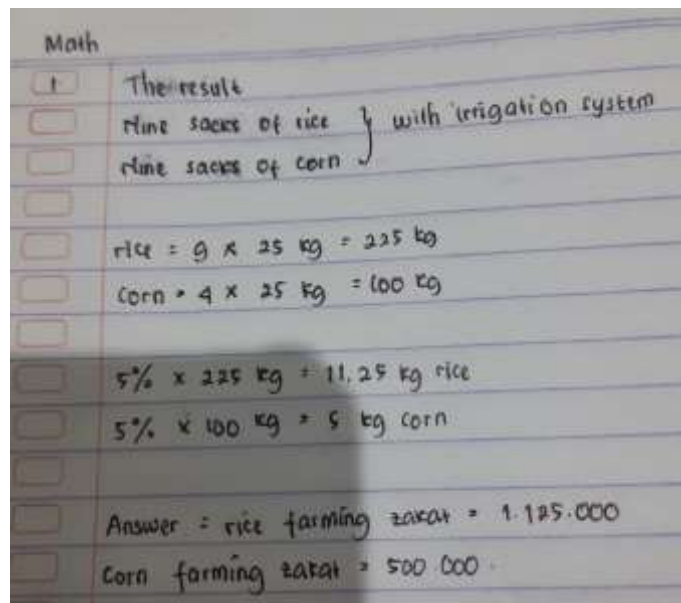


Figure 1. Students' Answers to Question Description Number 1

As for complex multiple-choice issues, most students score less than 20 with a maximum score of 40, as in figure 2 below:

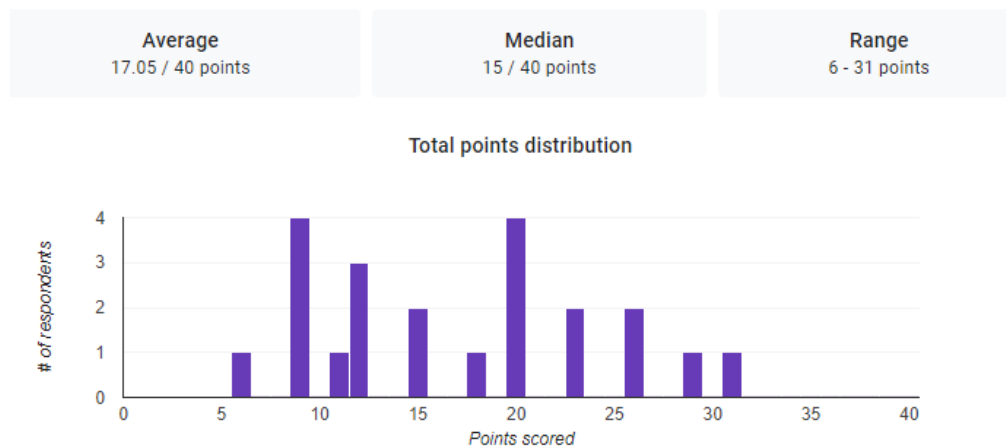


Figure 2. Student Value Diagram on Complex Multiple Choice Questions

This result shows that students of MTs Negeri 1 Surabaya are less able to understand the problem of numeracy literacy.

5) Empirical tests and reliability tests of limited trial results

Limited trial results data are then analyzed and calculated using product-moment correlations. From the calculation with the  $r_{tabel}$  of 0,248 obtained items about questions numbers 1 and 3 are in valid low-

level value with  $r_{hitung}$  of 0,349 and 0,390. Questions numbers 2 and 4 are valid and are of medium  $r_{hitung}$  of 0,680 of 0,488. Question items numbers 5 and 6 are in valid high-level value with  $r_{hitung}$  of 0,830 and 0,730. Because all the points of the problem get  $r_{hitung} > r_{tabel}$  then the problem developed is valid.

Next, test reliability using Alpha Cronbach. From the calculation obtained, the reliability coefficient is 0.72. The tests developed are reliable.

## 2. Response to Islamic numeracy literacy

### a. Teacher

In the validation process by experts that must be improved based on the advice of experts, needs to be improved the problems writing that use sentences effectively, easily understood, and by the rules of good and correct Indonesian. Because several sentences in the problem are useless precisely, which can cause two perceptions and need to be improved again, the diagram is presented so as not to confuse the reader.

In limited trials, the problem developed is good enough because it has made improvements at the validation stage. However, there are still some comments and suggestions. The advice that must be improved, namely, the description in question number 5, can confuse students because there will be two perceptions if the affirmation of zakat context is not done and the sentences improve more effectively.

### b. Student

Based on the results of limited trials of the instruments developed obtained results on each item of the problem. For complex multiple-choice questions with right or wrong type in problem number 1, the percentage of students who answered correctly overall is 13.6%, answering correct 3 is 9%, answering correct 2 is 40.9%, and answering correct 1 is 36.4%, as presented in figure 3 below.

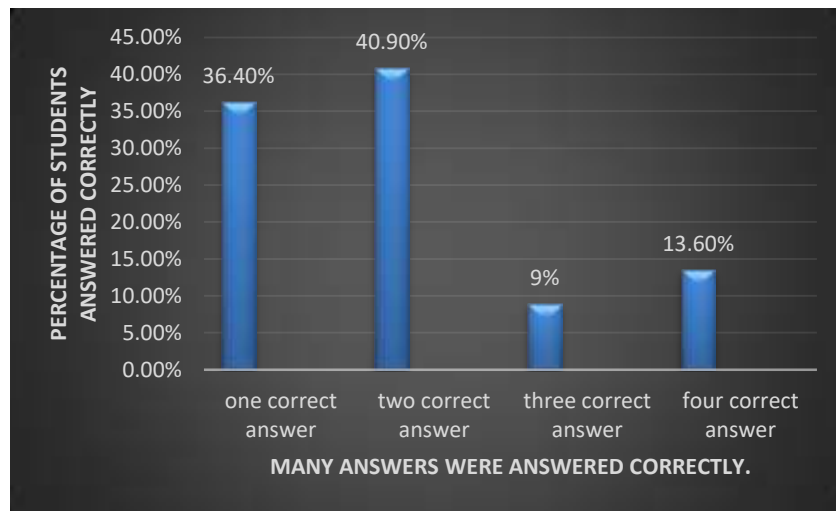


Figure 3. Student Answer Graph on Question Number 1

Based on figure 3 above, most students have not understood and solved problems on question number 1 of complex multiple choices with right or wrong type.

For complex multiple-choice questions with the type choosing one correct answer from the four answer options available in question number 2, the percentage of students who answered correctly was 36.4%, and the percentage of students who answered wrong 63.6%, as presented in figure 4 below.

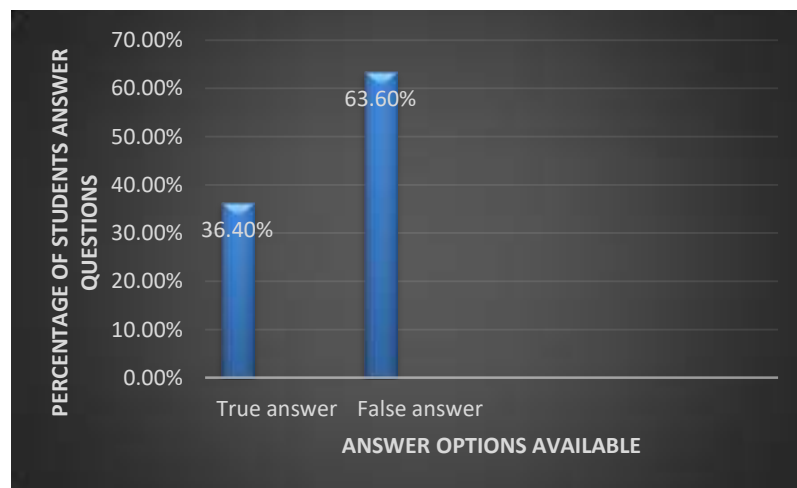


Figure 4. Student Answer Graph on Question Number 2

Based on figure 4 above, almost half of the many students who are respondents have not understood and solved problems in question number 2 of complex multiple choices with the type choosing one correct answer from four available answer options.

For complex multiple-choice questions with the type choosing one correct answer from the four answer options available in question number 3, the percentage of students who answered correctly was 18.2%, and the percentage of students who answered incorrectly 81.8%, as presented in figure 5 below.

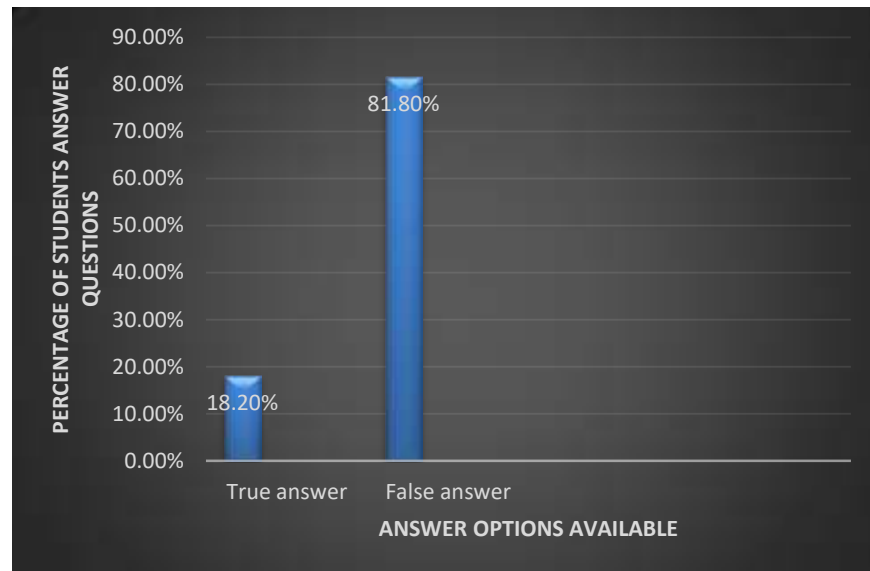


Figure 5. Student Answer Graph on Question Number 3

Based on figure 5 above, most students have not understood and solved problems on question number 3 complex multiple choices with the type choose one correct answer from four available answer options.

For complex multiple-choice questions with right or wrong type in question number 4, the percentage of students who answered correctly overall is 4.5%, answering correct 3 is 45.5%, answering correct 2 is 27.3%, answering correct 1 is 18.2%, not answering correctly is 4.5% as presented in figure 6 below.

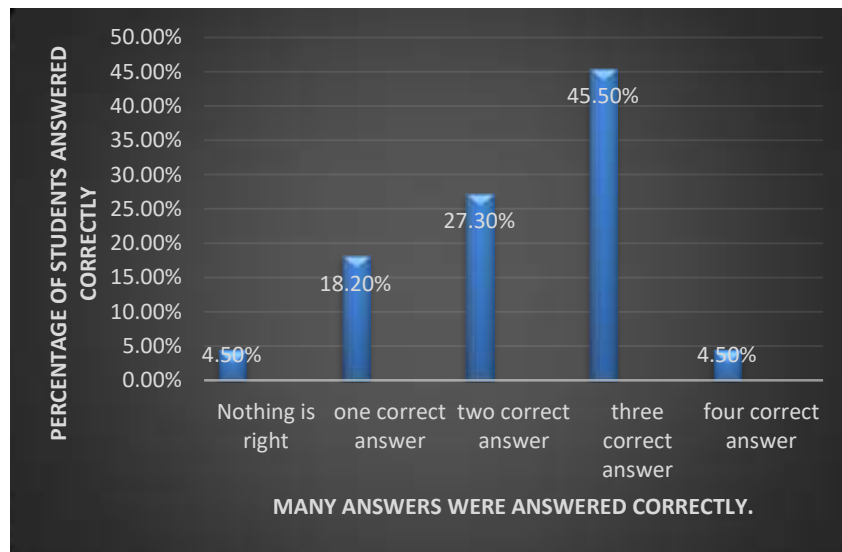


Figure 6. Student Answer Graph on Question Number 4

Based on figure 6 above, most students can understand and solve problems on question number 4 complex multiple choices with right or wrong type.

For the description of question number 5 obtained information that students who can solve the problem using the settlement step even though not yet the maximum is 2 students with a score of 16 from the maximum score are 60, 1 student with a score of 7, and 5 students with a score of 3. The other 14 students had a score of 0 for not answering. As presented in figure 7 below.

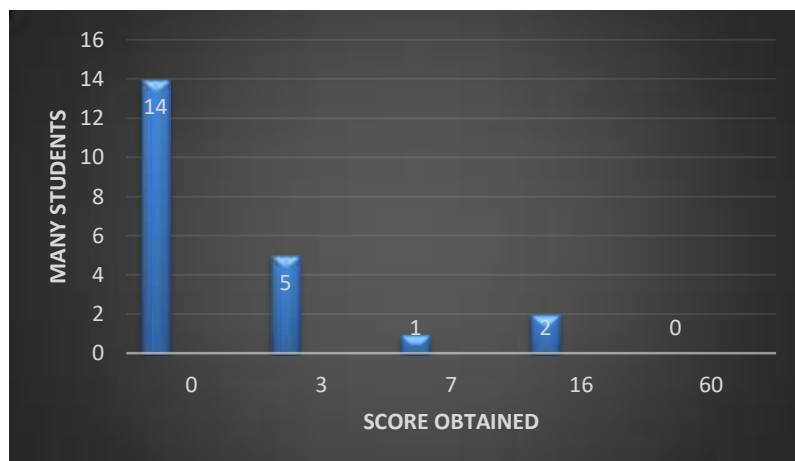


Figure 7. Student Answer Graph on Question Number 5

Based on Figure 6 above, most students cannot understand and apply their mathematical knowledge to solve numeracy literacy

problems with Islamic zakat agriculture in question number 5 description.

For the description of question number 6, obtained information that students who can solve the problem using the settlement step even though it is not yet a maximum of 1 student with a score of 10 from the maximum score are 60, 1 student with a score of 7, 1 student with a score of 4, 1 student with a score of 3, and 3 students with a score of 2. The other 15 students had a score of 0 for not answering. As presented in figure 8 below.

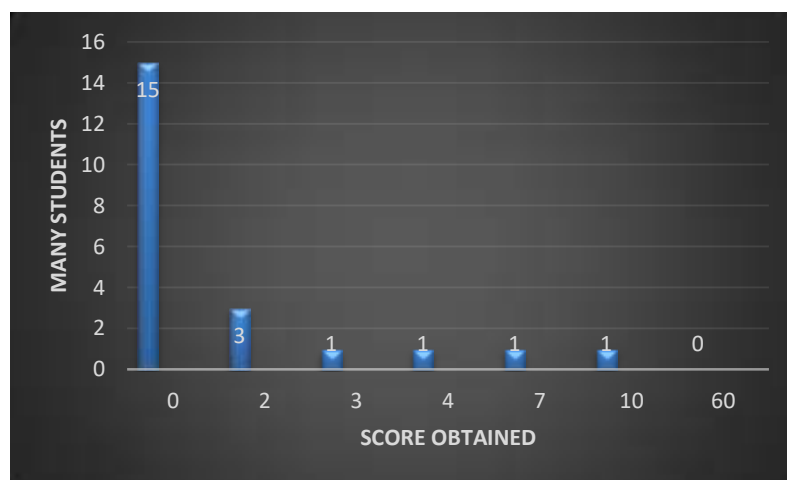


Figure 8. Student Answer Graph on Question Number 6

Based on figure 8 above, information is obtained that almost all students cannot understand and apply their mathematical knowledge to solve problems related to numeracy literacy in the Islamic context of commercial zakat in question number 6 description.

## CONCLUSION

Based on the analysis and discussion results, it can be concluded that from the validation results by four expert validators who were analyzed and calculated with the Aiken's V formula, the validity value was 0.783. These results indicate that the 6 items of numeracy literacy questions with an Islamic context developed in this study have valid values from the material, construct and language aspects. This result is reinforced by the results of empirical validity using data from a limited trial and calculated using the product-moment correlation, a validity value of 0.577 is obtained, and the reliability test using Alpha Cronbach obtained its reliability coefficient is 0.72. Numerical

literacy questions that experts have validated are then tested in a limited trial, and the results show that most students do not understand the developed numeracy literacy questions. This result indicates that students' numeracy literacy skills are still low. Most students are less able to apply their mathematical abilities to solve problems related to zakat, which are packaged in description questions.

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