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# Feasibility of mathematics questions based on Minimum Competency Assessment (MCA) numeracy in Indonesia

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**Abstract**

The Program for International Student Assessment (PISA) places Indonesian students in the lowest position. The solution is that Indonesia must develop PISA-based mathematics questions, namely the Minimum Competency Assessment (MCA) numeracy. This research aims to test the feasibility of MCA numeracy-based mathematics questions. This research uses a formative evaluation model. The research subjects were 40 students. Data were analyzed descriptively. Data collection techniques through observation, tests, and document analysis. The research results showed that understanding mathematics was 80%, the ability to apply mathematics was 76.8%, and mathematical reasoning ability was 72.4%. The conclusion is that MCA numeracy-based mathematics questions are worthy of being used as questions to increase competency. It is recommended that teachers use mathematics questions whose suitability has been tested so that learning objectives can be achieved optimally.

**Keywords:** feasibility; mathematics questions; minimum competency assessment; numeracy.

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## 1. Introduction

Mathematics is one of the basic subjects taught at all levels of education. Mathematics is one of the key aspects of the education curriculum in Indonesia (Efendi & Hsi, 2020). The aim of teaching mathematics in various countries is for students to have mathematical thinking skills (Albaqawi, 2023). Mathematics lessons are important because mathematics can help students think mathematically so that students can understand and master mathematical concepts, skills, and techniques needed to solve everyday problems. Mathematics can increase the accuracy of analysis and clarity in reasoning (Albaqawi, 2023; Yayuk et al., 2020). Mathematics can improve students' ability to understand shapes, symbols, tables, images, and words in mathematics.

The Program for International Student Assessment (PISA) is a survey to assess mathematical literacy. PISA results show that Indonesian students' mathematics achievement is in the lowest ranking (Lestari et al., 2021; Sagala & Andriani, 2019). This ranking illustrates that Indonesian students have relatively low mathematics competence (Dahlan et al., 2020; Kusuma et al., 2017). Based on this, the Indonesian Ministry of Education has replaced the national exam and developed the mathematics questions used by PISA, namely MCA numeracy (Mujahidah et al., 2023; Noviantini et al., 2023). Numeracy MCA-based mathematics questions are the minimum mathematical competencies that students must possess in order to support understanding, solve problems, and make decisions in everyday life (Budiastuti et al., 2023; T. Handayani et al., 2023; Rusli et al., 2024).

Researchers have examined the importance of students having mathematical competencies, such as research by Fisher, which states that interactive technology-based games in learning environments can improve mathematical competence (Fisher et al., 2018). The influence of mathematics achievement based on numeric competence and self-efficacy (Hwang, 2020). Mathematics skills can improve critical thinking in everyday life (Jain & Rogers, 2019). The development of adequate mathematical competence is a sustainable development target (Bellini et al., 2019). The influence of practical computer-based learning on mathematical understanding and reasoning (Nurjanah et al., 2020). Mathematical self-concept as supporting numeracy competency abilities through board games (Andika et al., 2019). Prabowo, in his research, stated that learning numeracy can improve students' mathematical competence (Prabowo et al., 2018). Multimedia-based play in learning numeracy can improve students' mathematical competence (Rohendi, 2019). Students' numeracy competency can be improved through traditional games (Samad et al., 2021).

Based on the explanation above, it is necessary to develop appropriate mathematics questions so that they can measure students' mathematical competence. The results of observations in the field are that there are still many teachers who do not understand how to develop MCA numeracy-based mathematics questions that can measure students' mathematical competence (Widiatsih et al., 2020). Students are also not used to working on MCA numeracy-based mathematics questions (Widiatsih et al., 2020). Teachers have not been able to develop numeracy questions in the classroom learning process (Agussuryani et al., 2022). This is one of the causes of students not having mathematical competence (Abdullah et al., 2020; Handayani et al., 2021; Ramadhan et al., 2019). When taking tests, students often experience difficulties in analyzing information because of their inability to conclude and present facts to support it (Miterianifa et al., 2021).

As a newly introduced form of assessment, the Indonesian Ministry of Education provides education and training to schools regarding technical and various types of MCA numeracy questions (Dintarini et al., 2022). The government provides training in understanding MCA theory to teachers through online training. Implementing MCA ensures teachers are prepared by having access to appropriate facilities and infrastructure. Field observations show that not all teachers are able to take part in training independently. Limited facilities and infrastructure also affect students' ability to access practice questions, so that many teachers still do not understand how to make questions using MCA numeracy (Dintarini et al., 2022). Therefore, there are still many teachers who write mathematics questions without MCA numeracy guidelines. This is supported by various studies where the majority of teachers still do not understand and master how to create mathematics questions characterized by MCA numeracy (Agussuryani et al., 2022; Widiatsih et al., 2020).

This is understandable because the MCA-based curriculum is still relatively new. Teachers' ability to develop students' mathematics questions based on MCA numeracy is still very low. More than 78% of teachers have not been able to develop MCA numeracy-based mathematics questions due to the new curriculum system in schools. The research also found that 53.2% of students in East Java had never done mathematics questions based on MCA numeracy. Research shows that the factor causing the low level of mathematics tests is that some students think that the MCA numeracy questions are not appropriate to the material studied in class. Apart from that, students' ability to work on mathematics problems is still below the minimum completeness criteria (M. Handayani et al., 2021; Syaifuddin, 2020). This causes students to lack mathematical competence (Abdullah et al., 2020; Handayani et al., 2021; Ramadhan et al., 2019). The results of class observations show that students'

mathematics scores are still below the set standard, namely 75, which means students do not yet have mathematical competence (Miterianifa et al., 2021).

Teachers must familiarize students with solving MCA numeracy-based mathematics problems to improve their competence (Lin et al., 2017). To support students' understanding of MCA numeracy-based mathematics problems, teachers can apply learning strategies to solve mathematical problems with story problems in personal, social and cultural, as well as scientific contexts. Teachers can also apply problem-based learning models, project-based learning, contextual learning, and the like (Szabo et al., 2020). Therefore, there is a need to increase the development of MCA numeracy-based mathematics questions so that students can improve their mathematics competence. Students often have difficulty analyzing information because they are unable to draw conclusions and do not understand the supporting facts presented (Miterianifa et al., 2021).

There is a gap between expectations and reality. It is hoped that the development of MCA numeracy-based mathematics questions can improve students' mathematical competence, but in fact the majority of teachers are not accustomed to developing numeracy-based MCA mathematics questions. This causes students' mathematical competence to be low. The urgency of this research is that with the feasibility of MCA numeracy-based mathematics questions, it is hoped that students' mathematical competence will increase so that students can compete internationally and learning objectives can be achieved optimally. The novelty of this research is that there are still few researchers who have researched the feasibility of MCA numeracy-based mathematics questions, which lead to increasing students' mathematical competence. In addition, MCA numeracy-based mathematics questions have not been optimally developed by most schools as material for evaluating mathematics learning.

## 2. Methods and Materials:

### 2.1. *Research design*

This research is research with development (R&D). The research development design used was formative evaluation from Martin Tessmer, namely self-evaluation, expert review, one-to-one, and small group (Zulkardi & Kohar, 2018). The resulting product is MCA numeracy-based mathematics questions that are feasible and able to describe students' mathematical competence.

### 2.2. *Participant*

This research involved high school students in Surabaya, Indonesia. 16 year old student. Students have different mathematical abilities. The research subjects consisted of educational evaluation experts, one-to-one trials with 3 students, small group trials with 12 students and field trials with 25 students.

### 2.3. *Procedures*

This research procedure consists of two main stages, namely the preliminary stage and formative evaluation. The preliminary study stage consists of the teacher and student needs analysis stage as well as the initial design stage (prototyping), while the formative evaluation stage consists of self-evaluation, expert review, one-to-one and small group, and field testing.

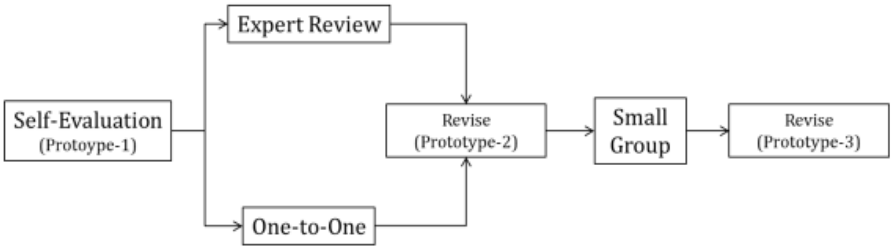
#### 2.3.1. *Preliminary Stage*

The preliminary stage is the stage of analyzing the needs of teachers and students. The next step is to look at the competence of mathematics teachers based on MCA numeracy. Then determine the place and research subject and coordinate with the teacher and school that will be used as a place of study. Next is the design stage, namely creating initial questions (initial prototype). The initial prototyping stage involved compiling MCA numeracy-based mathematics problems. The design process continued with analysis of the questions through focus group discussion (FGD) (Setiyani et al., 2024). Based on the focus group discussion, the design plan is equipped with other supporting instruments, such as assessment rubrics, etc.

#### 2.3.2. *Formative Evaluation Stages*

The formative evaluation stages are self-evaluation, expert review, one-to-one, and small group. Next, a field test was carried out involving students. The field test aims to reveal the impact of the MCA numeracy-based mathematics test on students' mathematics competence. In Figure 1, the design flow for developing mathematics questions is presented.

**Figure 1.**
*Formative Evaluation Chart*




Based on the design flow above, detailed data collection techniques at each stage are presented in Table 1.

**Table 1.**
*Stages, Activities and Products in Formative Evaluation*

| Stages | Activity | Product |
|---|---|---|
| Self-Evaluation | Designing mathematics problem texts by considering the characteristics of mathematics questions, paying attention to the form of the problem, level of content, context, and cognitive abilities. | Prototype-1 (Grid, Question and Answer Script) |
| Expert Review | At this stage, prototype-1 is handed over to an educational evaluation expert as a validator. The validation process focuses on aspects of content, construct, and language suitability. | Prototype-2 |
| One-to-one | At this stage, prototype-2 was distributed to three students with different abilities. Interviews were conducted to obtain information regarding the readability of mathematics questions. | Prototype-2 (Grid, question script, and valid answers) |
| Small Group | In prototype-2 it was given to 12 students with different abilities. Students are given answer sheets to find out the usefulness and time efficiency of mathematics question papers. | Prototype-3 (Grids, question scripts and answers that are valid and practical) |

### 2.3.3. *Data collection technique*

This research's data collection techniques include validation sheets, interview sheets, and student response questionnaires. The validation sheet was created using a Likert scale with the criteria: 4 (very suitable), 3 (suitable), 2 (less suitable), and 1 (not suitable). Competency analysis in the development of MCA numeracy-based mathematics questions is as follows:

**Table 2.**
*Analysis competency based on MCA framework*

| MCA Aspect | Numeracy task components |
|---|---|
| Content | • Numbers, including representation, sequence properties, and operations on various types of numbers (counts, whole numbers, fractions, decimals).<br>• Algebra, including equations and inequalities, relations and functions (including number patterns), as well as ratios and proportions.<br>• Measurement and geometry, including recognizing flat shapes and using volume and surface area in everyday life. Also assess students' understanding of measuring length, weight, time, volume, and discharge, as well as area units using standard units.<br>• Data and uncertainty, including understanding, interpreting, and presenting data and opportunities. |
| Cognitive | • Comprehend, comprehend facts, procedures, and mathematical tools.<br>• Application, being able to apply mathematical concepts in real, routine situations.<br>• Reasoning, reasoning with mathematical concepts to solve non-routine problems |

| | |
|---|---|
| Context | • Personal, related to personal interests.<br>• Socio-Cultural, related to individual interests, culture, and social problems.<br>• Scientific, related to scientific issues, activities, and facts, both those that have been carried out and those that are futuristic. |

Source: (Purnomo et al., 2022)

#### 2.3.4. *Data analysis techniques*

Data analysis was carried out by analyzing validation results by experts, one-to-one, small group and field tests and used to revise questions created by researchers. Data were analyzed using qualitative descriptive methods to describe the results of each development stage in this research. The results of data analysis are then used to determine whether there is an influence of MCA numeracy-based mathematics questions on mathematics competence?

## 3. Results /Findings

### 3.1. *Introduction*

Observations made by researchers on the mathematics questions tested in class revealed that as many as 3 mathematics teachers had not used MCA numeracy-based mathematics questions. Thus, the questions developed by the mathematics teacher were not able to measure students' mathematical competence. This is because the curriculum with MCA numeracy is still relatively new, so teacher competence in developing MCA numeracy-based mathematics questions is low. On the other hand, students are not yet familiar with MCA numeracy-based mathematics questions. Based on the results of interviews with mathematics teachers, information was obtained that the students who would be the research targets were 25 students with high, medium, and low abilities. The next stage is to design an initial prototype of mathematics questions consisting of closed and open question types by measuring students' cognitive levels.

### 3.2. *Formative Evaluation*

#### 3.2.1. *Self Evaluation Stage*

The initial prototype of MCA numeracy-based mathematics questions developed in this research consisted of 10 questions. Mathematics questions consist of content, context, and cognitive level. The content of mathematics questions is divided into numbers, algebra, measurement and geometry, as well as data and opportunities (Noviantini et al., 2023; Yuniarti et al., 2024). The context of mathematics problems consists of personal, socio-cultural, and scientific. The cognitive level in counting consists of understanding, application and mathematical reasoning (Yuniarti et al., 2024). The product of the self-evaluation is the initial question paper (Prototype-1). Table 2 explains the development of mathematics questions based on the cognitive aspects of MCA numeracy.

**Table 3**.
*Analysis cognitive competency based on MCA framework*

| Cognitive Level | Indicators of mathematical competence | Number of questions |
|---|---|---|
| Mathematical understanding | understand mathematical facts, procedures, and tools | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, |
| Application of mathematics | able to apply mathematical concepts in real, routine situations | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, |
| Mathematical reasoning | reasoning with mathematical concepts to solve non-routine problems | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, |

Table 4 explains the development of mathematics questions based on the MCA numeracy content aspect.

**Table 4.**
*Analysis content based on MCA framework*

| Content Competency | Counting indicators | Number of questions |
|---|---|---|
| Number | representation, sequence properties, and operations on various types of integers, whole numbers, fractions, decimals | 1, 2, 4, 8 |
| Algebra | equations and inequalities, relations and functions, number patterns, and ratios and proportions. | 3, 5, 9, 10 |

| | | |
|---|---|---|
| Measurement and geometry | recognize flat shapes using volume and surface area, measuring length, weight, time, volume and discharge, and area units. | 7 |
| Data and opportunities | understand, interpret, and present data and opportunities | 6 |

Table 5 explains the development of mathematics questions based on the MCA numeracy context aspect

**Table 5.**
*Analysis context based on MCA framework*

| Context Questions | Indikator konteks berhitung | Number of questions |
|---|---|---|
| Personal | related to personal interests | 1, 2, 5, 7 |
| Socio-cultural | related to interests between individuals, cultural and societal issues. | 3, 5, 6, 8 |
| Scientific | related to problems, activities and scientific facts, both those that have been carried out and those that are futuristic in nature | 9, 10 |

### 3.2.2. *Expert Review Stage*

At this stage, the text of question 1 (prototype-1) is submitted to the expert reviewer as a validator. The validation process focuses on aspects of content, construct, and language suitability. The validation of the question script (prototype-1) was a mathematics expert teacher from a secondary school in Indonesia. In developing this question, an expert reviewer validates each problem in the question paper based on the assessment characteristics of content, construction, and language. The product of the expert review is question paper 2 (prototype-2). Next, question 2 (prototype-2) will be tested at the one-to-one stage. Table 6 explains aspects of assessing mathematics questions.

**Table 6.**
*Characteristics of the prototype of the instrument based on focus group discussions*

| **Assessment focus** | **Assessment criteria** |
|---|---|
| Content assessment | • Questions can be used to assess problem solving competency<br>• The options in multiple choice questions are appropriate<br>• Questions can be used to assess mathematical competence<br>• The questions allow the subject to discover mathematical relationships/models/patterns or generalizations<br>• Questions can be solved using various solution strategies<br>• Questions according to students' cognitive development<br>• The content is in accordance with the current mathematics curriculum for students as research subjects |
| Construction Assessment | • Questions allow the subject to use mathematical competence to solve them<br>• Questions allow the subject to connect content and context in finding mathematical relationships/models/patterns or generalizations<br>• Questions can be solved using various solution strategies<br>• The questions consist of: short essay, description, multiple choice, True False, and matching<br>• Questions are prepared using sufficient information to solve thema |
| Language Assessment | • The questions are prepared using good and correct Indonesian language rules<br>• Formulate the problem using words or sentences that the subject can understand<br>• The sentences in the questions do not give rise to multiple interpretations |

The assessment is validated by experts based on the assessment criteria as above following the assessment guidelines used as follows

**Table 7.**

*Expert validation scoring guidelines*

| Score | Evaluation Criteria |
|---|---|
| 1 | The statements in the descriptor do not match |
| 2 | The statement in the descriptor is not appropriate |
| 3 | The statements in the descriptor are appropriate, but need improvement before use |
| 4 | The statements in the descriptor are very appropriate, and no changes need to be made |

Table 8 explains the results of expert review validation based on the assessment guideline criteria above

**Table 8.**
*Expert review results*

| Assessment focus | Assessment criteria | Score Number | | | | | | | | | | Mean | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| Content assessment | Content can be used to assess problem-solving competency | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3,9 | 97,5 |
| | Content has problem characteristics | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 3 | 3,8 | 95 |
| | Content can be used to assess mathematical competency | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |
| | The content allows subjects to discover mathematical relationships | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 97,5 |
| | Problems can be solved using various resolution strategies | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |
| | Problems according to students' cognitive development | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |
| | The content is in accordance with the current mathematics curriculum | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 3,8 | 95 |
| **Total** | | 28 | 27 | 28 | 28 | 27 | 28 | 27 | 26 | 28 | 27 | 27,4 | **97,86** |
| Construction Assessment | Problems allow subjects to use mathematical competence to solve them | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |
| | Problems allow subjects to connect content and context in discovering mathematical relationships | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |
| | Problems can be solved using various resolution strategies | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |
| | The questions are prepared using sentences that do not give rise to multiple interpretations | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |
| | Problems are structured using sufficient information | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | to solve them | | | | | | | | | | | | |
| **Total** | | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | **100** |
| Language Assessment | The questions are prepared using good and correct grammar | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3,9 | 97,5 |
| | Formulation of the problem uses words or sentences that the subject can understand | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3,9 | 97,5 |
| **Total** | | 8 | 8 | 8 | 7 | 8 | 8 | 7 | 8 | 8 | 8 | 7,8 | **97,5** |
| **Total score** | | 56 | 55 | 56 | 55 | 55 | 56 | 54 | 54 | 56 | 55 | 55,2 | **98,57** |

Based on the results of expert validation, the development of MCA numeracy-based mathematics questions obtained an average score of 98.57% as an initial test with very feasible criteria. This score is a content feasibility assessment component with an average score of 97.86%, a problem construction feasibility assessment component with an average score of 100%, and a problem language feasibility assessment component with an average score of 97.5%. The results of the expert review and one-to-one are used to revise the questions. The students were asked to work on the questions as well as review the mathematics problems that had been designed. The results of students' work and reviews were analyzed by researchers for revision. The question text was then revised to be tested again with a wider group of participants.

### 3.2.3. *One-to-one Stage*

At the one-to-one stage, question script 2 (prototype-2) was tested on three students with different abilities. Interviews were conducted to obtain information regarding the readability of MCA numeracy-based mathematics questions. Student work results and reviews are analyzed for revision. At the one-to-one stage, a product is produced in the form of question script -3 (prototype-3) and will be tested on more students, namely the small group stage.

### *3.2.4. Small Group Stage*

At the small group stage, question script 2 (prototype-2) was tested in small groups involving 12 students with different abilities. Students are given answer sheets to find out the usefulness and time efficiency of the numeracy question paper. The product of the small group is question paper 3 (Prototype-3). Question 3 (prototype-3) will be tested on more students, namely the field test stage.

### *3.2.5. Field Test Stage*

The field test phase was carried out at school involving 25 students. The time used to work on 10 questions is 90 minutes (2 x 45 minutes). In table 9, the percentage of mathematical ability for each question is presented.

**Table 9.**
The percentage of students' numeracy skills on each test instrument

| | Numeracy Skills (%) | | | |
|---|---|---|---|---|
| Instrument number | mathematical understanding | Mathematics Application | mathematical reasoning | Average% |
| 1 | 92 | 88 | 80 | 86,7 |
| 2 | 84 | 92 | 76 | 84 |
| 3 | 96 | 80 | 84 | 86,7 |
| 4 | 84 | 84 | 68 | 78,7 |
| 5 | 80 | 92 | 76 | 82,7 |
| 7 | 76 | 80 | 92 | 82,7 |
| 8 | 100 | 80 | 76 | 85,3 |
| 9 | 92 | 84 | 88 | 88 |
| 10 | 96 | 88 | 84 | 89,3 |
| Average% | 80 | 76,8 | 72,4 | **76,4** |

Students' mathematics ability scores are grouped into; very low, low, medium, high and very high categories. Table 10 explains the percentage of students' mathematics competency scores.

**Table 10.**

*Distribution of students' numeracy skills*

| Student scores | frequency | percentage | Category |
|---|---|---|---|
| 86 - 100 | 10 | 40 | Very high |
| 71 - 85 | 7 | 28 | High |
| 56 - 70 | 6 | 24 | Moderate |
| 41 - 55 | 2 | 8 | Low |
| 0 - 40 | 0 | 0 | Very low |
| Total | 25 | 100 | |

Source: (Kurniawan et al., 2018)

## 4. Discussion

The results of research on the development of MCA numeracy-based mathematics questions have proven to be very suitable for use as tests and can improve students' mathematical competence. This research is supported by several previous studies, such as: Research conducted by Maidah et al. states that teachers who use mathematics questions can increase students' high-level mathematics thinking competence (Maidiyah et al., 2023). The research entitled "Development of Infographic-based Minimum Competency Assessment (MCA) for high school students in Medan City" is very feasible and can improve student learning outcomes (Nasution et al., 2021). The feasibility of developing MCA numeracy in numbers, geometry, & measurement material can increase student competence (Santy & Mutaqin, 2023). The feasibility of ethnomathematics MCA has the potential effect of increasing student competence (Oktiningrum & Wardhani, 2023). Research by Purnomo et al. concluded that the development of MCA numeracy shows an influence on students' mathematical competence (Purnomo et al., 2022). This is in line with research conducted by Zana et al., which states the importance of cognitive suitability (Zana et al., 2024). Several studies reveal that traditional teacher-centered teaching makes little contribution to improving competency in learning outcomes (Harrison, 2013). The need for student-centered learning and making students active in learning will make students' understanding of mathematical concepts and competence develop (Mursalin et al., 2018; Nurjanah et al., 2020).

The results of this development research show that the questions are valid, practical, and feasible. The validity of the question items is obtained from the expert review stage and face-to-face through formative evaluation. At the same time, the practicality of the questions is obtained from the small group stage. The practicality of this question can be seen when students can understand the question and respond to the question. Thus, prototype testing gains practicality on students with different abilities in small-scale groups. Practicality tests are carried out to see to what extent the questions developed can be used practically by students. On this basis, this question can be said to be practical (Risnawati et al., 2019). The feasibility of developing this question can be seen from the results of the review by evaluation experts. The validation expert in this development research is a mathematics education lecturer at Surabaya State University. Based on the responses, the expert review suggested improvements in question development. Questions with criteria are very suitable if the expert review score is above 91.75% (Purnomo et al., 2022; Sarwanto et al., 2020). So it can be concluded that the development of this question with a score of 98.57% is a very feasible question.

Mathematical competence requires high mathematical reasoning abilities (Setiyani et al., 2024). Overall, the average percentage of students who display mathematics competence is 76.4%. Mathematical competency means that students must be able to solve a problem using appropriate strategies and be able to use various methods accurately and efficiently to calculate a problem (May, 2020). Students will be able to master complex problems by using good reasoning skills (Purnomo et al., 2022). Developing students' creative thinking is very important considering the increasingly high level of complexity of problems in all aspects of modern life (Mursalin et al., 2018).

## 5. Conclusion

The procedure for developing MCA numeracy-based mathematics questions is structured based on two main stages, namely the preliminary stage and the formative evaluation stage. The preliminary study stage consists of the teacher and student needs analysis stage as well as the initial design stage (prototyping), while the formative evaluation stage consists of self-evaluation, expert review, one-to-one, and small group, and field testing. The results of the expert review evaluation show that the MCA numeracy-based mathematics questions are very feasible. In the field test, MCA numeracy-based mathematics questions had an influence on increasing students' mathematical competence. This research concludes that the development of students' numeracy MCA is

categorized as feasible, valid, and practical, so that it can measure students' mathematical abilities. The implications of the results of this research can provide an overview of the importance of developing MCA numeracy-based mathematics questions in increasing students' mathematical competence. It is recommended that teachers develop MCA numeracy-based mathematics questions to improve students' mathematical abilities so that learning objectives can be achieved optimally..

**Ethical Approval**: This research was conducted in compliance with all ethical guidelines.

**Conflict of Interest**: The author declares that there is no conflict of interest.

## 6. Recommendations/Future directions

It is recommended that teachers develop MCA numeracy-based mathematics questions to improve students' mathematical abilities so that learning objectives can be achieved optimally.

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