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Original Article

Learning Obstacle: Students' Numeracy Learning in Arithmetic Materials for the Design Needs of an Al-Qur'an-Based E-Module

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Abstract
This research is motivated by the low numeracy skills of students in the arithmetic sequence and series material, which is one of the important indicators in mathematical literacy. The aim of this research is to identify learning obstacles in students' understanding of arithmetic sequence and series concepts as a basis for developing an Al-Qur'an-based e-module. The method used is Didactical Design Research (DDR) with prospective analysis, metapedadidactic, and retrospective stages. The results showed that students experienced difficulties in understanding the concept of number operations, the relationships between concepts, and their application in everyday life. The Al-Qur'an-based e-module is designed to integrate spiritual values into mathematics learning, thus expected to increase motivation and holistic conceptual understanding. The implication of this research is the need for developing contextual learning media that supports the improvement of numeracy while simultaneously forming the religious character of students.

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Learning Obstacle, Numeracy Skills, Arithmetic Sequences and Series, E-module, Al-Qur'an, Didactical Design Research.

1. Introduction

Numeracy skills in the arithmetic sequences and series material include understanding number patterns, general formulas, and the application of these concepts in solving contextual problems. According to Andzin et al. (2024), the Realistic Mathematics Education (RME) approach assisted by Augmented Reality (AR) technology can improve students' numeracy understanding by connecting the concept of arithmetic sequences and series to real-world contexts, such as the structure of Borobudur Temple. Additionally, Azma (2024) shows that the use of electronic worksheets based on computational thinking skills is effective in strengthening students' conceptual understanding and numeracy. In line with this, Nafisah (2023) also emphasizes the importance of mathematical connection skills—the ability to connect mathematical concepts to real situations—as a key factor in developing numeracy in the arithmetic sequences and series material. Thus, the development of numeracy in this material depends heavily on contextual, innovative, and integrative approaches to the real world.

Numeracy skills are very important for students to master because they allow students to understand and apply mathematical concepts in everyday life, such as in financial planning or scheduling recurring activities. Particularly in the arithmetic sequences and series material, students can see the relevance of these concepts in various real-life situations, such as calculating installments or total savings over a certain period (Qolbi et al., 2022). In addition, numeracy skills also help students develop critical thinking and analytical skills, and increase their confidence in solving mathematical problems (Rahmawati et al., 2023). According to Megarani et al. (2024), numeracy competence not only supports academic success, but also prepares students to face practical challenges in their lives, with arithmetic sequences and series concepts that are applicable to solving everyday problems such as budget planning or structural design.

Students' inability to master numeracy skills results from various interrelated factors, both from psychological, pedagogical, and environmental aspects. Mathematics anxiety and low self-efficacy have been proven to hinder numeracy achievement by reducing students' motivation and confidence in completing

mathematical tasks (Luh et al., 2024). Teacher competence also plays an important role, where low quality of teaching negatively impacts students' numeracy understanding (Sukarya & Isnurani, 2023). Negative attitudes toward mathematics, such as the view that mathematics is difficult and unenjoyable, also hinder numeracy development (Wardat et al., 2023).

The low mastery of students' numeracy skills in the arithmetic sequences and series material is caused by various interrelated factors. One of them is mathematics anxiety which negatively affects students' learning performance (Aan Putra & Yulanda, 2021). Teaching methods that are still traditional and lack interactivity further worsen students' conceptual understanding of this material (Kurniawan et al., 2023). Social factors such as family background, lack of learning support at home, and low motivation also make significant contributions to students' learning difficulties (Permata et al., 2021). In addition, many students experience misconceptions about basic arithmetic concepts, making it difficult to understand patterns and formulas in sequences (Lin, 2022). Therefore, a more contextual, interactive learning approach supported by a positive learning environment is needed to improve students' numeracy skills.

The Al-Qur'an-based e-module learning media has been proven to improve students' numeracy skills because it is able to integrate religious values with mathematical concepts in a contextual and meaningful way. Research in the last five years shows that this approach not only improves students' conceptual understanding and problem-solving skills, but also fosters learning motivation and active engagement in the learning process (Sapti et al., 2023). E-modules that connect Al-Qur'an verses with mathematical material make learning more relevant, especially in Islamic educational environments, and have proven to be valid, practical, and effective in improving students' numeracy literacy (Hidayati et al., 2022). Overall, the combination of spiritual motivation, interactive multimedia, adaptive feedback, and contextual values from the Al-Qur'an significantly supports the improvement of students' numeracy.

The Al-Qur'an-based learning model is an educational approach that makes the Al-Qur'an the main source in the teaching and learning process, with the goal of forming students who are faithful, pious, and able to apply Islamic values in life. This model integrates reading, memorizing, understanding, and practicing the Al-Qur'an in various forms of learning. The Al-Qur'an memorization learning model developed by Thaha et al. (2021) emphasizes internal and external representation through systematic stages to improve memorization retention. Meanwhile, Affandi et al. (2021) introduced a digital thematic learning model to strengthen students' religious understanding through technology. In addition, the PRADAEC model consisting of seven learning stages has proven effective in improving Al-Qur'an Hadith learning outcomes while reinforcing religious moderation (Ely Mufidah et al., 2022). Thus, this model not only emphasizes cognitive and affective aspects, but is also adaptive to technological developments and socio-religious contexts.

Al-Qur'an-based research in the last five years has shown positive contributions to improving students' numeracy skills. According to Jalaludin et al. (2024), there is a correlation between Al-Qur'an memorization and the mathematical abilities of pesantren students, while Ikrimah (2021) shows that improved Al-Qur'an memorization ability correlates significantly with mathematical reasoning. The development of mathematics modules integrating Al-Qur'an and Hadith values by Choirudin et al. (2021) also contributed to improving students' mathematical understanding and forming their religious character. Overall, this approach offers an effective alternative strategy for improving numeracy literacy among Muslim students.

From the description above, it can be concluded that numeracy skills in the arithmetic sequences and series material play an important role in equipping students with critical thinking skills and practical applications in everyday life. However, various obstacles such as mathematics anxiety, misconceptions, low motivation, and a lack of contextual approaches cause students' numeracy mastery to remain low. To address these problems, learning innovations are needed that are not only contextual and interactive, but also laden with religious values. Therefore, the objective of this study is to develop and analyze the effectiveness of an Al-Qur'an-based mathematics e-module in improving students' numeracy skills in the arithmetic sequences and series material.

2. Method

Data collection in this study was conducted at SMA Negeri 1 Lohbener with the participation of one mathematics teacher, one vice principal, and one Grade XI student who had studied arithmetic sequences and series material previously. Data were collected through field observations and interviews.

Interviews were conducted with the teacher, student, and vice principal to gather information about the implementation and students' understanding of the material.

The final stage of the research was the development of an Al-Qur'an-based e-module tailored to the results of the learning obstacle identification. According to Banda & Nzabahimana (2021), the process of designing learning media must be oriented toward the real needs of learners in order to improve learning effectiveness. In addition, according to Trif-Boia (2022), initial media trials are very important to evaluate the feasibility and impact on student learning outcomes. Thus, the developed e-module is expected to overcome numeracy learning obstacles in arithmetic material while effectively and contextually integrating Al-Qur'an-based learning principles.

Data were analyzed using an interactive qualitative approach consisting of data reduction, data presentation, and conclusion drawing (Rampin & Rampin, 2021). The analysis process was assisted by ATLAS.ti 23 software which supports systematic coding of interview and observation data (Williamson et al., 2025). Data categories were then reflected against the learning obstacle framework and integration of relevant Al-Qur'an verses to support spiritual values in numeracy learning (Agustina Rahayu et al., 2024). Thus, the analysis results serve as the basis for designing an e-module that is adaptive to students' needs.

Table 1
Student Interview Indicators

No.	Dimension	Question Indicator	Number of Questions
1	Students' understanding of arithmetic sequences and series material	Students' ability to explain concepts and solve problems related to arithmetic sequences and series	4
2	Students' numeracy skills in arithmetic sequences and series material	Students' ability to apply numeric concepts to solve contextual arithmetic sequences and series problems	4
3	Students' responses to learning arithmetic sequences and series material	Students' attitudes, interests, and responses toward learning arithmetic sequences and series material	4

Table 2
Teacher Interview Indicators

No.	Dimension	Question Indicator	Number of Questions
1	Method of delivering arithmetic sequences and series material	- Appropriateness of delivery methods to student characteristics - Clarity of explanation of sequences and series concepts - Use of examples and illustrations in teaching the material	4
2	Difficulties in teaching arithmetic sequences and series material	- Difficulty understanding the concept of sequences and series - Obstacles in explaining formulas and patterns - Difficulty providing appropriate exercises	4
3	Experience using teaching media	- Experience using learning media (video, teaching aids) - Effectiveness of media in supporting student comprehension - Ease of access to learning media	4
4	Experience using e-modules	- Ease of use of e-modules - Quality of content in e-modules - Student motivation in using e-modules	4

Table 3

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Field Notes Indicators

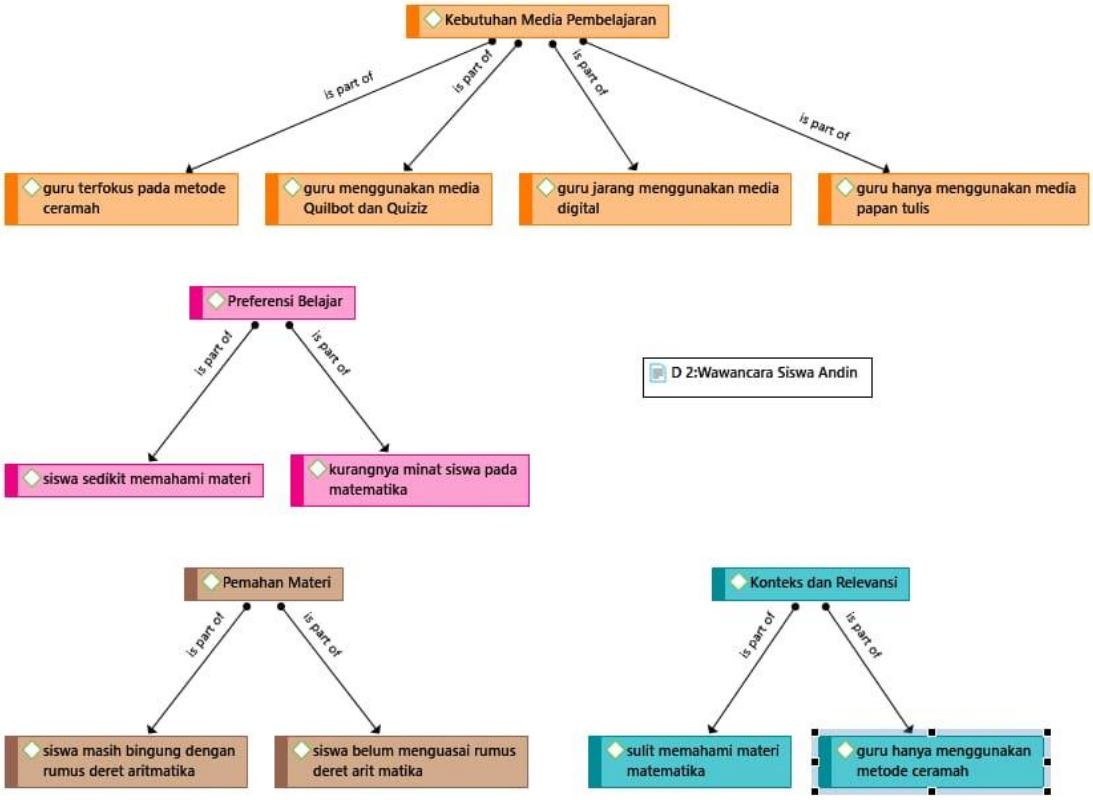
No.	Dimension	Question Indicator	Number of Questions
1	Curriculum used	- Alignment of curriculum with national standards - Availability of curriculum documents - Implementation of curriculum in learning - Flexibility of the curriculum	4
2	Learning tools	- Availability of lesson plans (RPP) and syllabi - Clarity of learning objectives - Alignment of material with core competencies - Availability of media and student worksheets (LKPD)	4
3	Teacher resources	- Teachers' academic qualifications - Mastery of subject matter and pedagogy - Ability to use technology - Involvement in training	4
4	School conditions	- Availability of facilities and infrastructure - Support for a conducive learning environment - School leadership - Parental involvement in education	4

3. Results and Discussion

Results

1) Students

This interview was conducted at SMAN Lohbener in Grade X, with a student named Andin who had previously received arithmetic sequences and series material in class. The interview aimed to explore more deeply the obstacles in numeracy learning, particularly in this material, as well as student learning preferences. The interview results are presented in the form of a concept map using Atlas.ti as follows:
Figure 1.
ATLAS.ti Results – Student



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Based on the interview results with the student depicted in the concept map, several obstacles were found in learning the arithmetic sequences and series material. One of the main aspects that became a barrier is the unoptimized need for learning media. Teachers tend to focus on the lecture method, using blackboard media, and rarely utilize digital media to the fullest. Although there are attempts to use media such as Quillbot and Quizizz, these have not been able to fully address students' learning needs, particularly in terms of student engagement and understanding of the material.

Student learning preferences also show challenges, such as a lack of interest in mathematics and a low level of student understanding. This affects students' difficulty in mastering basic concepts, especially the formulas of arithmetic series. Students still feel confused and have not well understood the concepts due to a learning approach that is less varied and less relevant to their context. The limitation of an approach that relies solely on the lecture method further reinforces the obstacle of bridging the material with students' real lives.

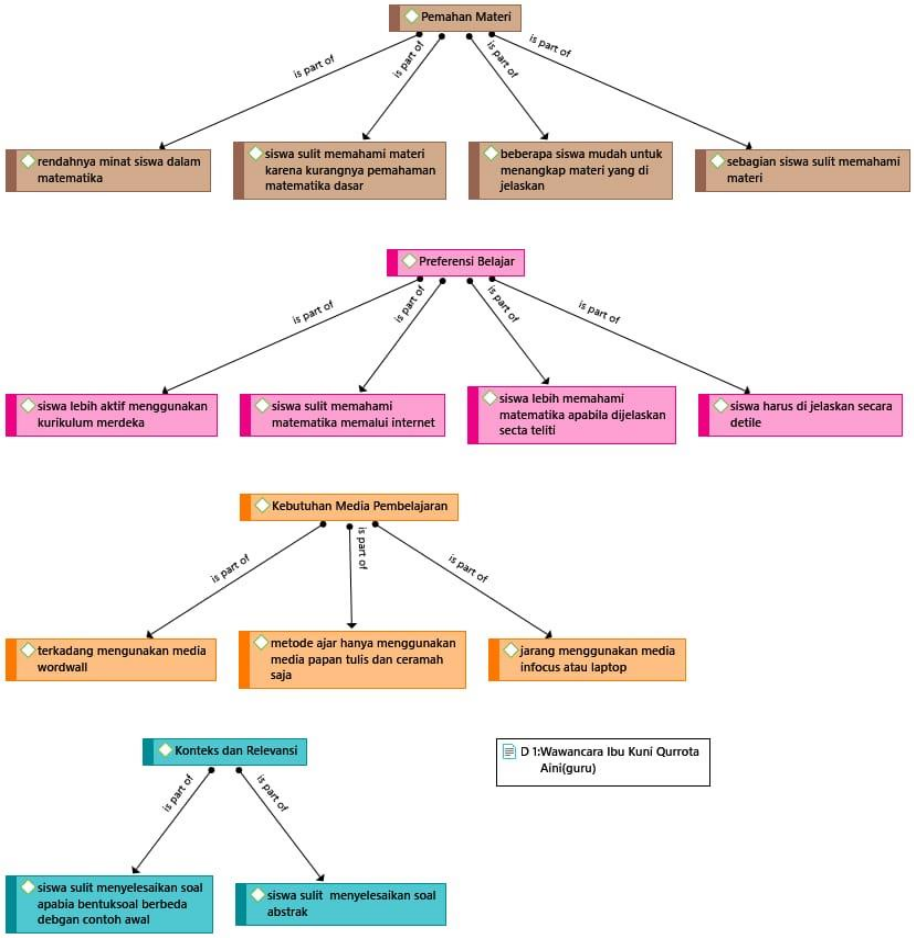
In general, these obstacles indicate the need for innovation in learning design, particularly through the development of an Al-Qur'an-based e-module that can integrate spiritual values with a contextual numeracy approach. This research aims to identify students' learning obstacles in learning arithmetic sequences and series, as a basis for designing relevant, engaging, and meaningful digital learning media, so as to improve students' understanding and interest in mathematics.

2) Teacher

This interview was conducted to gather more in-depth information about the mathematics learning difficulties experienced by students in senior high school. The interview was conducted at SMAN 1 Lohbener where Mrs. Kuni Qurota Aini teaches, with students who had previously received mathematics material, particularly in the context of basic concept understanding, use of learning media, and their learning preferences. The interview results are presented in the form of a concept map using Atlas.ti as follows:

Figure 2

ATLAS.ti Results – Teacher



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Based on the interview results with the teacher, it was found that one of the main obstacles in learning numeracy skills in the arithmetic sequences and series material is the still-low understanding of the material. Several factors that influence this condition include students' low interest in mathematics, lack of mastery of basic concepts, and the inability of some students to absorb the teacher's explanations. Although some students can understand easily, most still show difficulty in absorbing the arithmetic material being taught.

Furthermore, in terms of learning preferences, students tend to be more active when learning follows the Merdeka curriculum and when material is delivered in a detailed and thorough manner. However, students experience difficulty learning through internet media and need detailed, direct explanations from the teacher. This obstacle is further compounded by the limitations of the learning media used, such as the dominance of lecture and blackboard methods and the infrequent use of interactive media such as projectors or laptops. Media such as Wordwall are only occasionally used.

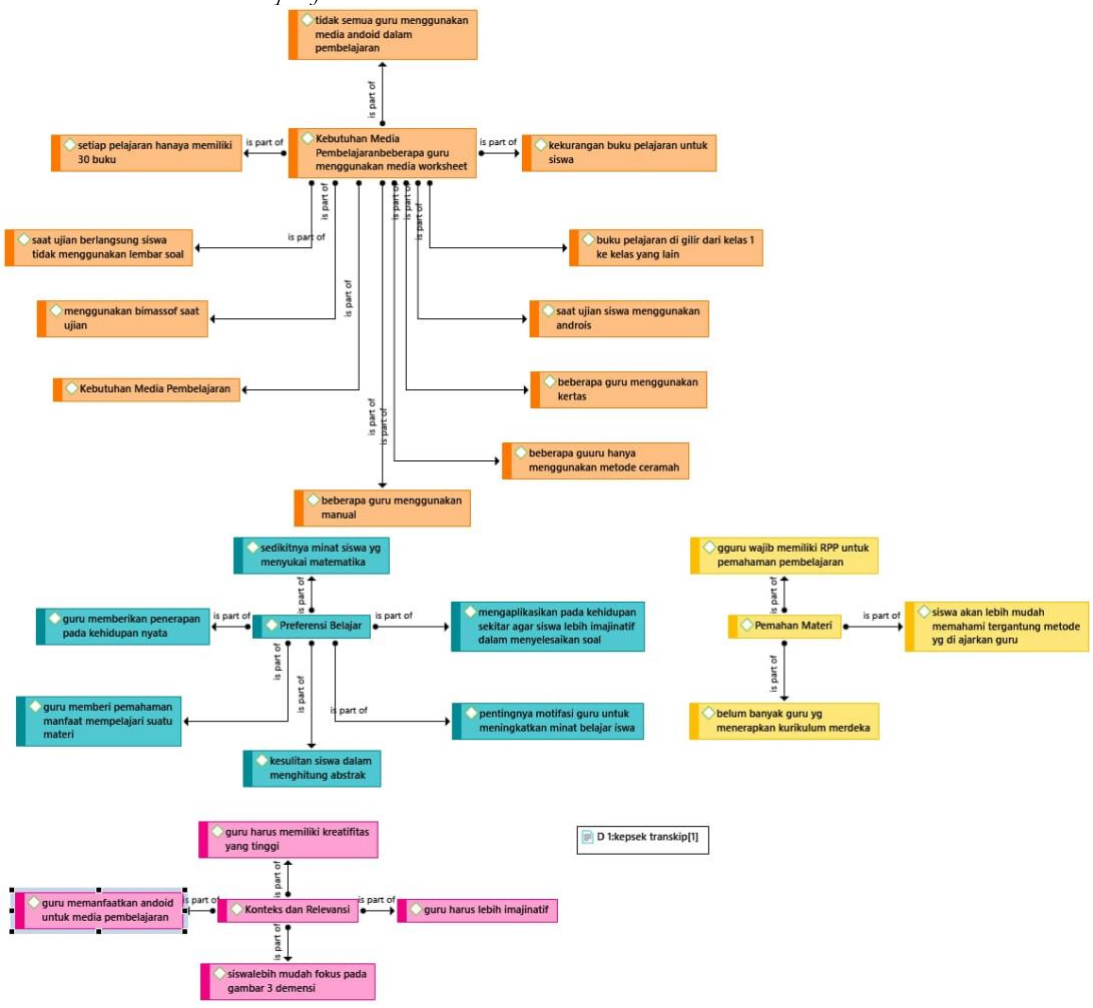
Other findings include students' difficulty in connecting the material to real-life contexts and relevance, as well as an inability to solve problems that are different in form from previous examples or that are abstract in nature. Based on these obstacles, this research aims to design an Al-Qur'an-based e-module that not only helps improve students' numeracy skills in arithmetic sequences and series, but also addresses the obstacles of understanding, learning preferences, and learning media limitations more comprehensively.

3) Vice Principal for Curriculum

The interview was conducted in one of the teachers' rooms at the school, with the Vice Principal as the interview subject. The interview aimed to gather information related to the need for learning media, student learning preferences, and students' understanding of mathematics material. The interview results are presented in the form of a concept map using Atlas.ti as follows:

Figure 3

ATLAS.ti Results – Vice Principal for Curriculum



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Based on the interview results with the vice principal visualized in the diagram, several obstacles were found in numeracy learning, particularly in the arithmetic sequences and series material. One of the main problems is the lack of availability and utilization of relevant learning media. Not all teachers use Android-based media or worksheets; some still rely on lecture methods and manual media. In addition, the availability of textbooks is limited and uneven across classes, making it difficult for students to access material independently.

Other problems arise from student learning preferences that tend to be low in interest toward mathematics. This is caused by students' difficulty in understanding abstract concepts and the lack of application of the material in real-life contexts. Teachers are expected to be able to provide motivation and understanding of the benefits of learning mathematics so that students become more interested. Approaches that connect mathematics to everyday life are considered important so that students become more imaginative and able to easily solve problems. Unfortunately, not many teachers implement the Merdeka curriculum to the fullest to support this contextual approach.

These findings point to the urgency of designing more contextual and religious learning media, namely through an Al-Qur'an-based e-module. The purpose of this research is to design a digital medium that not only improves students' numeracy understanding in arithmetic sequences and series material, but also fosters learning interest through an ethnomathematics approach and integrated spiritual values, as part of the solution to the identified learning obstacles.

Discussion

1) Students

Based on the student interview results visualized in the diagram, several obstacles were found in learning arithmetic sequences and series material. The main obstacle lies in the unoptimized need for learning media, where teachers still predominantly use the lecture method and conventional media such as blackboards, and rarely utilize more interactive digital media. This impacts students' low learning preferences toward mathematics, as evidenced by the lack of interest and understanding of the material. As a result, students experience difficulty in understanding the formulas of arithmetic series, and feel confused in applying them in problems. The context and relevance of learning are also deemed insufficient, which further worsens students' understanding of numeracy material.

These findings are consistent with results from international research in the last five years, such as the study by White (2019), which shows that the integration of interactive digital media in mathematics learning can improve students' conceptual understanding and engagement in the learning process. In the context of numeracy learning, the use of technology-based and contextual media such as educational games, e-modules, or simulations, has been proven capable of bridging the gap between abstract material and students' real learning experiences. In addition, the research by Wang et al. (2022) emphasizes the importance of personalizing learning media according to students' learning styles to overcome *learning obstacles*, which is also found in this interview.

Based on the research title *"Learning Obstacle: Students' Numeracy Learning in Arithmetic Sequences and Series Material for the Design Needs of an Al-Qur'an-Based E-Module,"* it can be concluded that the designed e-module needs to consider the learning obstacles faced by students, both in terms of media, methods, and context. This e-module must contain a contextual approach based on Al-Qur'an values as a reinforcement of the relevance of the material to students' real lives, and use interactive digital media appropriate to their learning characteristics. Thus, it is hoped that this e-module will be able to serve as a solution to effectively and meaningfully improve students' numeracy skills.

2) Teacher

Based on the interview results with Mrs. Kuni Qurrota Aini, a mathematics teacher, several learning obstacles were found in students' numeracy skills in arithmetic sequences and series material. These obstacles include aspects of material understanding, learning preferences, the need for learning media, and the context and relevance of problems. Many students experience difficulties due to low interest, lack of basic understanding, and the need for detailed and systematic explanations. In addition, the use of learning media is still very limited to conventional methods such as lectures and blackboards, while digital media such as projectors or laptops are rarely used. This condition further complicates students in solving abstract or different forms of problems from initial examples.

These findings are consistent with various international research in the last five years that highlights the importance of contextual and technology-based approaches in mathematics learning. For example, research by Hoerunnisa et al. (2019) emphasizes that the use of digital interactive e-modules can significantly improve motivation and understanding of mathematical concepts. Similarly, the study by Akçay et al. (2021) shows that student engagement increases when material is presented visually and relevant to everyday life. In addition, a learning approach that integrates religious values such as Al-Qur'an verses has also been proven to strengthen students' affective aspects toward the subject, as demonstrated by the study of Azzuhro & Salminawati (2023) in an Islamic-based educational environment.

Based on the research title "Learning Obstacle: Students' Numeracy Learning in Arithmetic Sequences and Series Material for the Design Needs of an Al-Qur'an-Based E-Module," it can be concluded that this obstacle analysis becomes an important foundation in designing an e-module that is not only interactive technologically, but also contextual and spiritual. By understanding student obstacles from various aspects, the Al-Qur'an-based e-module can become a more effective and comprehensive learning solution, while supporting the Merdeka Curriculum in improving students' numeracy competence through an integrative, engaging, and meaningful approach.

3) Vice Principal for Curriculum

Based on the interview results with the vice principal visualized in the concept map, various obstacles were found in students' numeracy learning in arithmetic sequences and series material. One of the main obstacles is the limitation of learning media used by teachers, such as using only lecture methods, manual methods, or limited worksheets, and minimal use of digital media such as Android. In addition, the limited number of textbooks and the non-use of problem sheets during exams also worsen student understanding. This is compounded by students' low interest in mathematics, triggered by the lack of application of concepts in real life and less imaginative learning methods.

The obstacles faced by this school are consistent with findings from the study by Thomson & Hillman (2019) which shows that the use of interactive digital media can significantly improve mathematical concept understanding. Another study by Boaler et al. (2022) also emphasizes the importance of context-based and exploratory learning approaches to improve students' numeracy literacy. On the other hand, the study by Ina V.S. Mullis et al. (2021) shows that reliance on lecture methods without contextual media can hinder the development of students' abstract understanding in mathematics.

Based on these findings and linked to the research title "Learning Obstacle: Students' Numeracy Learning in Arithmetic Sequences and Series Material for the Design Needs of an Al-Qur'an-Based E-Module," it can be concluded that the main obstacle lies in the lack of teacher creativity in designing contextual learning and minimal technology integration. Therefore, the design of an Al-Qur'an-based e-module has the potential to be a solution that not only strengthens numeracy understanding through a contextual-religious approach, but can also increase student interest in learning through imaginative and spiritually and educationally relevant media.

4. Conclusion

The main goal of this research is to obtain a comprehensive picture of students' numeracy difficulties as a basis for designing an e-module that not only meets academic needs, but is also integrated with spiritual values through an Al-Qur'an-based approach. By understanding students' points of difficulty, the developed e-module is expected to become a more contextual, meaningful, and inspiring learning medium. The implications of this research indicate the importance of a contextual and religious approach in the mathematics learning process, particularly in the arithmetic sequences and series material. The integration of Al-Qur'an values in the e-module design is able to provide a holistic learning nuance, which not only emphasizes cognitive aspects, but also shapes students' character and spirituality. In addition, the results of this research provide important input for teachers and learning media developers to pay more attention to the conceptual and affective obstacles faced by students, and encourage the birth of value-based learning media innovations that are appropriate to the cultural and religious context of learners.

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