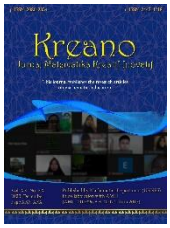
UNNES JOURNALS

*Kreano*, Jurnal Matematika Kreatif-Inovatif
Volume 16, number 2, 2025, pp. 462-480



# The Effect of E-Module with Zakat Context on Students' Mathematical Communication Skills on Numbers

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**Abstract**

The limitations of mathematical communication skills and the lack of experience in applying mathematics to everyday life, including worship-related problems, result in poor mathematical communication skills and a lack of student independence. Applying E-modules in the context of zakat can be one solution to address this problem. This study aimed to examine whether the mathematical communication skills of students using an e-module with a zakat context on numbers were better than those of students not using the e-module. This quantitative study employed a posttest only control group design. The sample consisted of two classes from a junior high school in Banda Aceh, Indonesia, selected using a simple random sampling technique. The samples consisted of 65 students, divided into an experimental group of 33 students and a control group of 32 students. Data collection was conducted by administering a test of mathematical communication skills. The results show that the mathematical communication skills of students using the e-module with the zakat context were better than those of their counterparts. The interactive e-modules support student independence and develop students' mathematical communication skills. Further research should be conducted to support the development of more effective and user-friendly online learning platforms for mathematics learning.

**Keywords**: E-Module; Mathematical Communication Skills; Zakat Context.

| *Information of Article* | |
|---|---|
| *Subject classification* | *97U50 Computer assisted instruction and programmed instruction* |
| *Submitted* | *3 July 2024* |
| *Review Start* | *19 March 2025* |
| *Round 1 Finish* | *21 May 2025* |
| *Round 2 Finish* | *12 September 2025* |
| *Accepted* | *29 December 2025* |
| *Scheduled online* | *31 December 2025* |
| *Similarity Check* | *16%* |

***Abstrak***

*Keterbatasan penyelesaian masalah kemampuan komunikasi matematis dan kurangnya pengalaman dalam menyatakan matematika di kehidupan sehari-hari termasuk masalah ibadah menyebabkan rendahnya kemampuan komunikasi matematis dan kurangnya kemandirian siswa. Salah satusolusi yang dapat dilakukan guru adalah menerapkan E-modul dengan konteks zakat. Tujuan dari penelitian ini adalah untuk mengkaji apakah kemampuan komunikasi matematis siswa yang menggunakan e-modul dengan konteks zakat pada materi bilangan lebih baik dibandingkan dengan siswa yang tidak menggunakan e-modul. Penelitian ini merupakan penelitian kuantitatif menggunakan posttest only control group design. Sampel dalam penelitian ini terdiri atas dua kelas dari salah satu SMP di Banda Aceh yang dipilih melalui teknik simple random sampling. Sampel penelitian ini terdiri atas 65 siswa, yaitu 33 siswa pada kelas eksperimen dan 32 siswa pada kelas kontrol. Teknik pengumpulan data menggunakan tes kemampuan komunikasi matematis yang diperoleh melalui posttest. Hasil penelitian menunjukkan bahwa kemampuan komunikasi matematis siswa yang menggunakan E-modul dengan konteks zakat lebih baik dari siswa yang tidak menggunakan e-modul. Oleh karena itu, E-modul dengan konteks zakat merupakan sebuah media pembelajaran interaktif untuk menunjang kemandirian siswa serta membangun kemampuan komunikasi matematis siswa. Penelitian selanjutnya diharapkan mampu memberikan kontribusi dalam dunia pendidikan terkait pengembangan platform pembelajaran online yang lebih efektif dan mudah digunakan.*

## INTRODUCTION

Education in the current digital era has undergone significant social changes, reflected in the integrated relationship between mathematics and information and communication technology (ICT) (Jeong & González-Gómez, 2020). In learning mathematics, students need to communicate their ideas through expressions (mathematical communication) (Kurniawan & Kuswandi, 2021). Mathematical communication is a key component in learning mathematics (NCTM, 2000). It is also in line with the content standards for secondary education units in Permendiknas No. 22 of 2006, which stipulate that one of the objectives of learning mathematics is to convey ideas using symbols, tables, diagrams, or other forms to interpret problems or phenomena.

Smieskova (2017) argued that mathematical communication ability can foster creativity and motivation in students learning mathematics. Communication ability are a crucial component for enabling students to solve mathematical problems, particularly those related to real-life contexts (Otoo et al., 2018; Teledahl, 2017). One way to develop these skills is through presentations, explanations, and arguments, which are fundamental forms of mathematical communication that encourage students to share ideas, exchange perspectives, and engage in mathematical reasoning (Otoo et al., 2018). However, in practice, the mathematical communication skills of junior high school students remain significantly underdeveloped (Rustam & Ramlan, 2017). Research also indicates that Indonesian students generally demonstrate poor mathematical communication skills, particularly in number-related topics (Rohid et al., 2019).

Students' mathematical communication skills in fractions are also poor (Islami et al., 2022). In addition, students' limited skills to accurately comprehend problems, difficulties in expressing problems in their own words, the lack of variety in teaching media to support mathematical communication, and students' low levels of learning independence all contribute to their weak mathematical communication skills (Anam et al., 2020; Wardani et al., 2022; Islami et al., 2022). Therefore, it is necessary to develop technology-based learning media, such as e-modules, to enhance students' mathematical

communication skills, particularly in the context of fractions.

E-modules are instructional media developed using software, incorporating visual illustrations, audio, video, and other features (Winatha & Abubakar, 2018). E-modules enable asynchronous learning, allowing students to progress at their own pace, making them a popular choice among modern learners for optimizing and reinforcing learning (Clark & Mayer, 2023; Logan et al., 2020). E-modules are digital modules containing text, images, or both, and include electronic materials with relevant reproductions to support the learning process (Stalini & Kurniawan, 2022). Digital modules have the potential to enhance students' learning independence, as their use is not limited to the classroom (Setiyani et al., 2020). In addition, e-modules provide opportunities for content repetition, ease of access, flexibility, and improved conceptual understanding (Sleddens et al., 2016). Thus, e-modules can facilitate the mathematics learning process, making it more practical and effective.

E-modules can also enhance students' Pancasila profile to achieve the goals of national education and support the character-strengthening program, as outlined in the first dimension, namely faith, devotion to God Almighty, and noble character (Irawati et al., 2022). This can be realized by integrating the Islamic context into learning. E-modules associated with Islamic values and science not only produce individuals who are skilled in science and technology but also have a high religious awareness to face current digital developments (Diani et al., 2021).

Mathematics is not only to develop students' skills in cognitive aspects (transfer of knowledge) but also to instill or transfer good moral values (Darling-Hammond et al., 2020). The integration of Islamic values and culture into mathematics learning represents a key objective of Islamic education in Aceh Province, as outlined in Aceh Qanun No. 5 of 2008. Mathematics learning integrated with Islamic values will convey the impression of Islamic learning, enhance intellectual and spiritual intelligence, and introduce the relationship between mathematics and Islamic values to students (Haqiqi et al., 2022). Integrating the Islamic context can lead to the development of good character. Character values instilled in mathematics learning are useful for constructing aspects of knowledge and skills relevant to everyday life (Fitriyani & Kania, 2019). One of the Islamic contexts that can be integrated into mathematics learning is the concept of zakat.

Zakat holds more social values than other recommendations in Islam and is a priority in improving the welfare of Muslims (Al-Utsaimin, 2008). According to Law Number 23 of 2011 on the Management of Zakat, zakat refers to a portion of wealth that must be distributed by individuals or entities meeting specific criteria to those eligible to receive it in accordance with Islamic principles. The objectives and implementation procedures of zakat in Islam are guided by the principles of faith, comprehensiveness and justice, productivity, rationality, freedom, ethics, and proportionality. The Qur'an explicitly mandates zakat as a religious obligation, stating: "And establish prayer and give Zakat and obey the Messenger -that you may receive mercy" (Qur'an, 24:56). Zakat is a manifestation of the Islamic economic system, applying the principle of justice. A well-targeted implementation of zakat can be the key to creating a more just and prosperous society. In addition, studying the context of zakat will increase students'

understanding of religious obligations and faith, shape character and morals, strengthen solidarity and social care, and implement Islamic values in everyday life.

This relevance becomes even more apparent when situated within the broader framework of global development. The 2030 Agenda, initiated by all UN member states, addresses global issues and challenges through 17 Sustainable Development Goals (SDGs) and 169 indicators, aiming to achieve a balance between social, environmental, and cultural aspects (United Nations Educational, 2014). These 17 SDGs call for urgent action by all countries, both developed and developing, within a global partnership (United Nations, 2018). This article specifically highlights SDG 1, focusing on global economic reform, given that poverty eradication is the top priority on the UN's list of SDGs to be achieved globally. The UN has set 7 targets and 14 indicators for SDG 1, accessible through the SDG Tracker (2018). They show that one in five people in developing countries still lives on less than $1.90 per day, with millions more living just above the threshold. Efforts to end poverty must be accompanied by strategies that include improved access to healthcare education, reduced inequality, and sustainable economic growth (United Nations, 2018).

In this context, zakat plays a strategic role. Zakat is one of the primary instruments in the Islamic economic system, emphasizing justice and social welfare. By distributing zakat effectively and targeting the right beneficiaries, social inequality can be reduced, and the quality of life, especially for vulnerable communities, can be improved. Therefore, integrating the concept of zakat into mathematics education not only enriches the learning context but also instills religious and social values that are relevant to both SDG 1 (No Poverty) and SDG 4 (Quality Education).

Specifically, one of the main targets of SDG 4 (Target 4.6) is to ensure that all adults achieve basic literacy skills, including reading and mathematics. The emphasis on quality education is strongly supported by alarming global data (Logachev et al., 2021), which reveals that 258 million children are out of school and 617 million youth, despite being enrolled, do not possess basic literacy and numeracy skills. This highlights the critical role of SDG 4, which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all in supporting the achievement of other SDG targets, including poverty eradication.

To support these goals, several studies have been conducted on the development of mathematics learning tools. For instance, Setiyani et al. (2020) demonstrated that digital modules can enhance students' learning independence, as their use is not confined to the classroom. Similarly, Logan et al. (2020) found that incorporating e-learning modules enables students to engage more effectively with the content and take a more active role in their learning. In a different context, research by Purwati et al. (2018) examined the integration of Islamic values into teaching materials, revealing that students in science education programs integrated with Islamic values achieved higher average learning outcomes than those in programs without such integration.

However, there remains a lack of research specifically investigating the impact of e-module use on students' mathematical communication skills in the context of zakat. This study contributes to mathematics education by exploring the development of learning tools that integrate both digital technology and

contextual religious values to enhance students' mathematical communication skills. Specifically, the development of a zakat-based e-module serves not only as a learning resource but also as a means of incorporating Islamic values into mathematics education. Therefore, it is essential to investigate the impact of e-modules incorporating a zakat context on students' mathematical communication skills in number-related topics. The purpose of this study was to examine the mathematical communication skills of students using an e-module with a zakat context on number. The research question was how does the use of e-modules with a zakat context influence students' mathematical communication skill on number?

## METHOD

This quantitative study employed a true experimental design to determine how a treatment affects the results of a study by controlling certain conditions (Creswell, 2014). The study employed a posttest-only control group design to evaluate the effect of treatment on the experimental group, without a pretest. The research design is presented in Figure 1, where O1 and O2 are posttests; X is the implementation of the e-module, E is the Experimental class, and C is the Control class.

| Group | Treatment | Posttest |
|---|---|---|
| E | X | $O_1$ |
| C | - | $O_2$ |

*Figure 1.* Research Design

The samples were selected using a simple random sampling technique without looking at the level of the population. The sample of this study consisted of 65 students, comprising one experimental class (33 students) and one control class (32 students) from one junior high school in Banda Aceh, Indonesia. The control class used standard student worksheets with zakat context, while the experimental class used e-modules containing Live Worksheets and prompt videos with zakat context.

The e-module with the context of zakat for numbers was developed by all of the authors of this manuscript, who are also members of the Realistic Mathematics Education Research Center at Universitas Syiah Kuala. Figure 2 presents the components of the e-module used in the study.

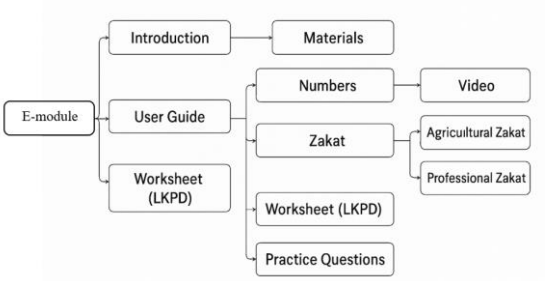



*Figure 2.* Components of the E-Module with Zakat Context for Numbers

Figure 2 presents the components of the e-module with a zakat context for numbers. It consists of key components, such as an introduction, user guide, learning materials, interactive worksheets, and practice questions. The content includes numbers and zakat, which covers agricultural zakat and professional zakat, accompanied by videos. This structure promotes effective learning by integrating textual content, visual elements, and interactive features, making it highly suitable for digital-based Islamic and mathematics education. The e-module with the context of zakat was also validated by experts in mathematics education and Islamic studies, experts in mathematics education and technology, as well as mathematics teachers from integrated Islamic schools and junior high schools. E-modules with the context of zakat can be accessed through the

https://getmath.id/ web using mobile phones, laptops or PCs connected to the internet. GetMath was developed by the Realistic Mathematics Education Research Center, Universitas Syiah Kuala. The e-module with a zakat context used in this study was not only equipped with clear usage instructions but also integrated with Liveworksheet activities that could be accessed through embedded QR codes (Figure 3). These QR codes were included in the e-module and strategically placed in each subtopic, allowing students to instantly access interactive digital exercises simply by scanning the codes using a smartphone or other compatible devices. It also contained prompt videos and zakat videos (Figure 4), student worksheets in Liveworksheet (Figure 5) and practice questions.

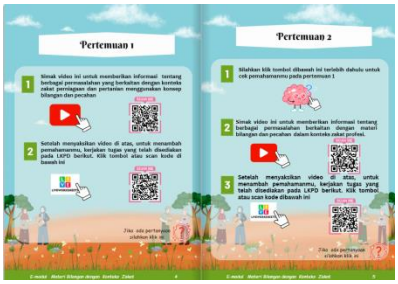



*Figure 3.* E-Module Menu


*Figure 4.* Video Display in E-Module

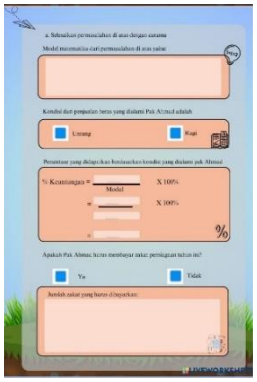


*Figure 5.* Liveworksheet Display in E-Module

The instrument used was a paper-based test designed based on the concept of mathematical communication skills integrated with an Islamic context and in accordance with the indicators of mathematical communication skills. The indicators of mathematical communication skills used in this study were developed by combining those proposed by NCTM (2000) and Sumarso (2010). Notably, the first indicator from NCTM aligns with the second indicator from Sumarmo, as do their respective second and third indicators. The resulting combined indicators and corresponding assessment items are presented in Table 1.

Table 1. Indicators of Mathematical Communications Skill Problems

| Indicator | Questions |
|---|---|
| Explaining mathematical ideas, situations and relationships in writing with real objects, images, graphs and algebra. | 1 |
| Use mathematical terms, symbols and structures to present ideas and describe relationships from situation models | 2 |
| Interpret and evaluate mathematical ideas from problems in writing. | 3 |
| Express everyday events in mathematical language or symbols. | 4 |

Table 1 shows the mapping of indicators of mathematical communication skills and the

corresponding questions that assess each indicator. Each indicator represents an essential aspect of students' skills in communicating mathematical ideas and situations, both in written and symbolic forms, and relating them to the context of zakat. The test items assessing students' mathematical communication skills can be found in Appendix 1.

The mathematical communication test items have been through the validity test stages on 65 students. The results of the question validity test are presented in Table 2.

Table 2. Validity Test of Students Mathematical Communication Test

| Item | Item–Total Correlation | Interpretation |
|---|---|---|
| 1 | 0.548 | Valid |
| 2 | 0.778 | Valid |
| 3 | 0.846 | Valid |
| 4 | 0.842 | Valid |

Table 2 shows that the mathematical communication skill test items met the validity criteria. Furthermore, the results of the item reliability test are presented in Table 3.

Table 3. Reliability Statistics

| Cronbach's Alpha | N of Items |
|---|---|
| .762 | 4 |

Table 4. Learning Materials and Activities with Zakat Context

| Session | Content | Learning Activities |
|---|---|---|
| 1 | • Solve problems related to transactions in business zakat using the concept of fractions.<br>• Identify the relationship between percentages in the context of business and agricultural zakat. | The learning activity begins with a discussion of the business zakat that Mr. Ahmad must pay over a year, followed by zakat from agricultural enterprises that have reached the Nisab threshold. This activity aims to explore students' prior knowledge of fractions and percentages. The Islamic value integrated into this activity is: "For crops irrigated by rainwater, natural springs, or groundwater, the zakat is 10%, and for crops irrigated using human labor, the zakat is 5%" (Narrated by Bukhari). |
| 2 | • Solve problems related to professional zakat using the concept of fractions<br>• Accurately identify percentage relationships in the context of professional zakat | The learning activity begins with a discussion of professional zakat to be paid after one year. This activity is intended to train students in performing addition and subtraction of fractions. The Islamic values integrated into this activity are:<br>"O you who have believed, spend from the good things which you have earned and from that which We have produced for you from the earth. And do not aim toward the defective therefrom, spending [from that] while you would not take it [yourself] except with closed eyes. And know that Allah is Free of need and Praiseworthy" (QS Al-Baqarah: 267) and<br>"Take, [O Muhammad], from their wealth a charity by which you purify them and cause them to increase, and invoke [Allah's blessings] upon them" (QS At-Taubah: 103). |
| 3 | • Solve problems related to quantities and percentages accurately | The learning activity begins with a discussion of profit and loss percentages, followed by calculating the exact percentage values. The Islamic values integrated into this activity are:<br>"Woe to those who give less [than due], those who, when they take a measure from people, take in full. But when they give by measure or by weight to them, they cause loss" (QS Al-Muthaffifin: 1–3), and the hadith from 'Abdullah bin 'Umar (may Allah be pleased with him), who reported that the Messenger of Allah (peace be upon him) said:<br>"A trustworthy and honest Muslim trader will be (gathered) with the Prophets, the truthful, and the martyrs on the Day of Judgment." |

Table 3 shows the reliability test results (α = 0.762), indicating that the four items have adequate reliability. This means that the items demonstrate good internal consistency in measuring students' mathematical communication skills.

The research was conducted in three meetings, during which we discussed how to calculate trade zakat, agricultural zakat, and professional zakat using the concepts of numbers and fractions, as detailed in Table 4.

Data collection was conducted using a mathematical communication skill test with a zakat context, comprising four questions validated by mathematics education and Islamic contexts experts and teachers at the research site. The test was conducted on students after learning to examine whether the mathematical communication skills of students using the e-module with a zakat context on numbers were better than those of students not using the e-module. The initial step in analyzing posttest data on students' mathematical communication skills was conducting a normality test. When students' posttest scores were not normally distributed, a non-parametric statistical test, the Mann-Whitney test, was performed.

## RESULT AND DISCUSSION

### Results

The posttest results of the experimental and control classes are presented in Table 5.

Table 5. Posttest Data of the Experimental and Control Classes

| | Posttest Score | |
|---|---|---|
| | Experimental Class | Control Class |
| Maximum Score | 100 | 87.55 |
| Minimum Score | 43.25 | 37.5 |
| $\bar{x}$ | 68.53 | 46.06 |
| $s^2$ | 278.03 | 88.51 |
| $s$ | 16.67 | 9.41 |

Table 5 shows that the maximum and minimum scores in the experimental class were better than those in the control class. The variance ($s^2$) and standard deviation (s) in the experimental class were also greater than those in the control class. These results indicate that the posttest scores of the experimental class were widely dispersed around the mean, as evidenced by a large range between the highest and lowest values. In contrast, the posttest scores in the control class were more closely clustered around the mean.

The data normality test using SPSS revealed that the posttest data in the experimental class were normally distributed ($p = 0.200$), but not in the control class (p = 0.00). Consequently, the data was analyzed using a non-parametric statistical test, namely the Mann-Whitney test, and the results are presented in Table 6.

Table 6. Mann Whitney Test

| | Posttest Scores |
|---|---|
| Mann-Whitney U | 103.000 |
| Wilcoxon W | 631.000 |
| Z | -5.634 |
| Asymp. Sig. (2-tailed) | .000 |

The results in Table 6 indicate that the mathematical communication skills of students using the e-module with a zakat context is better than that of those using the teaching module with a zakat context ($p = 0.005$). These statistical findings are visually supported by the data presented in Figure 6, showing the distribution of students' posttest scores in the experimental and control classes.

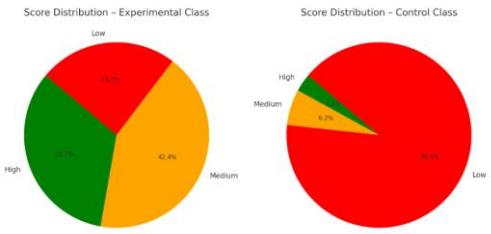



*Figure 6.* Distribution of Students' Posttest Scores in the Experimental and Control Classes

Figure 6 presents a pie chart showing the distribution of students' posttest scores in the experimental and control classes. The experimental class shows a more balanced distribution, with 33.3% of students in the high category, 42.4% in the medium category, and only 24.2% in the low category. In contrast, the control class is dominated by students with low scores, accounting for 90.6%, while only 6.2% are in the medium category and 3.1% in the high category. This comparison suggests that the implementation of the e-module with a zakat context in the experimental class was effective in enhancing students' mathematical communication skills, as indicated by the significantly higher proportion of students in the medium and high categories compared to the control class.

The effectiveness of the e-module is further supported by Figure 7, which presents a bar chart comparing the number of students who satisfied and did not satisfy the Minimum Criteria for Mastery Learning (KKM).

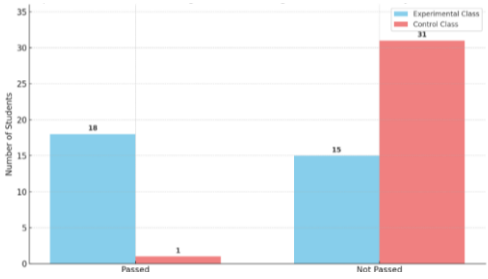
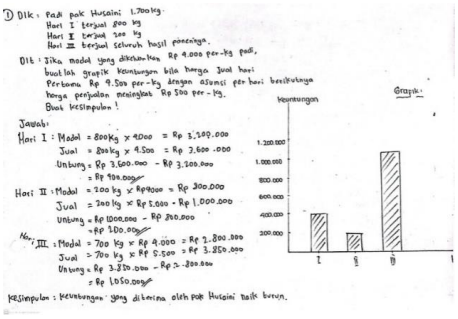



*Figure 7.* Bar Chart Comparing the Number of Students Who Satisfy the Minimum Criteria of Mastery Learning (KKM).

Figure 7 presents a bar chart comparing the number of students who met and did not meet the minimum mastery criterion (KKM ≥ 75) between the two groups. In the experimental class, 18 students achieved the KKM, whereas only one student in the control class met this benchmark. Thus, the number of students who achieved mastery in the experimental class was 18 times greater than in the control class. This finding suggests that the use of the e-module had a significant positive impact on students' learning achievement.

Furthermore, the effectiveness of the e-module is reflected not only in the score achievement but also in the quality of students' responses to the given problems. In the experimental class, responses from four students (SE1, SE2, SE3, and SE4) were selected for analysis based on their answers to mathematical communication questions. For instance, Figure 8 displays the response of one student from the experimental class (SE1) to the first problem.



Known: Rice weight 1.700kg
Day 1 sold 800kg
Day 2 sold 200kg
Day 3 sold out

Asked: If the initial capital is IDR 4,000, draw a profit graph assuming the selling price is IDR 4,500 on the first day and increases by IDR 500 each subsequent day. Based on the graph, write your conclusion.

Solution
Day 1: profit = IDR400,000.00
Day 2: profit = IDR200,000.00
Day 3: profit = IDR1,050,000,-

Conclusion: The profit obtained by Mr. Husaini fluctuates

*Figure 8.* The Students Answer (SE1) to the First Problem

Figure 8 illustrates that the student was able to comprehend and process contextual information into comprehensive mathematical representations. The student successfully identified the given information (rice weight, purchase price, and daily selling price), accurately calculated the daily profit, presented the profit data in a graph, and concluded that the profit was fluctuating. This indicates that the student has mastered the aspect of mathematical communication, specifically explaining mathematical ideas, situations, and relationships in written form using real objects, images, graphs, and algebra (Indicator 1).

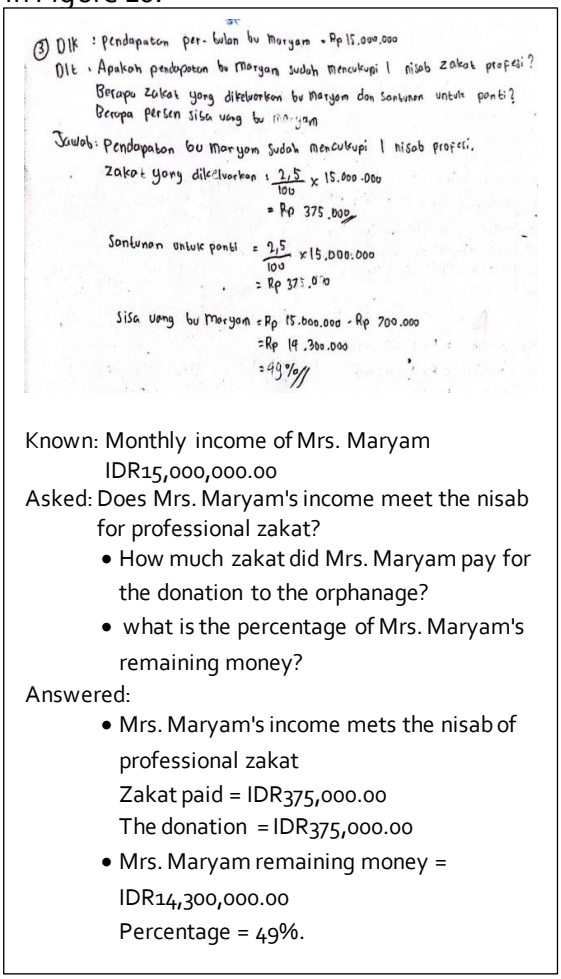
The response of another student from the experimental class (SE2) to a mathematical communication question involving the calculation of the remaining rice after paying zakat and analyzing whether the business entity "CV Shadaqah" (the name of a company) made a profit or loss is presented in Figure 9.

Known: Remaining harvest = 18 x nisab of agricultural zakat with capital IDR 104,000,000,-
The selling price is IDR7,000/kg.
Asked: Determine the amount of price remaining after paying zakat and analyze whether is a profit or loss along with the percentage
Solution:
Profit: IDR47,200,000,-
Percentage: 0.45%

*Figure 9.* The Student's Answer (SE2) to the Second Problem

Figure 9 shows that the student successfully determined that after paying zakat from the harvest, a profit of IDR 47,200,000 remained, representing a profit percentage of 0.45% from the initial capital. This indicates that the business activity resulted in a small profit, and the student was able to correctly analyze the profit-loss condition. The student also demonstrated mastery of the second indicator of mathematical communication skills, namely the appropriate use of mathematical terms and symbols to model and solve contextual problems related to zakat.

The response of student SE3 to the mathematical communication question related to a trade transaction is presented in Figure 10.



Known: Monthly income of Mrs. Maryam IDR15,000,000.00
Asked: Does Mrs. Maryam's income meet the nisab for professional zakat?
- How much zakat did Mrs. Maryam pay for the donation to the orphanage?
- what is the percentage of Mrs. Maryam's remaining money?

Answered:
- Mrs. Maryam's income mets the nisab of professional zakat
  Zakat paid = IDR375,000.00
  The donation = IDR375,000.00
- Mrs. Maryam remaining money = IDR14,300,000.00
  Percentage = 49%.

*Figure 10. The student's answer (SE3) to the third problem*

Figure 10 shows that the student made an error in determining the comparison value or used the remaining total money as a percentage of an

incorrect reference value. The correct percentage of the remaining money should be around 95%, not 49%, indicating a mistake in either the written response or the calculation. Nevertheless, overall, the student demonstrated the skills to interpret and evaluate mathematical ideas from a given problem in written form, in accordance with the third indicator of mathematical communication skills.

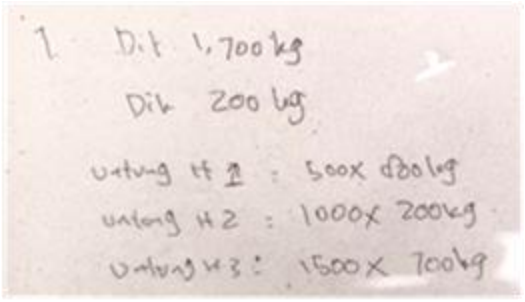
The response of student SE4 to the mathematical communication problem related to profit and loss is presented in Figure 11.

Known: Mr Ahmad bought 10 boxes of apples for IDR2,000,000
On each box, it says the gross weight is 30kg
The weight of each box without apples is 2kg
Mr Ahmad got a 5% discount
Asked: Did Mr. Ahmad experience a profit or a loss?
What is the percentage?
Solution:
Discount = IDR100,000,-
Purchase price = IDR1,900,000,-
Selling price = IDR1,990,000,-
Profit : IDR90,000,-
Percentage : 4.7%

*Figure 11*. The Student's Answer (SE4) to the Fourth Problem

Figure 11 shows that the student was able to interpret a simple trade scenario mathematically. From the purchase of 10 boxes of apples for IDR2,000,000, and after receiving a 5% discount, Mr. Ahmad paid only IDR 1,900,000. After selling all the apples for a total of IDR 1,990,000, he earned a profit of IDR 90,000 (approximately 4.7% in profit). This solution demonstrates that the student was able to relate mathematical concepts such as discount, net weight, and percentage to real-life contexts, in accordance with the fourth indicator of mathematical communication skills: expressing real-world events in mathematical language or symbols.

Nevertheless, some students were still unable to fully solve problems related to mathematical communication. In the control class, responses from four students (SC1, SC2, SC3, and SC4) were selected for analysis based on the mathematical communication problems. For example, Figure 12 presents the response of one student from the control class (SC1) to the first problem.



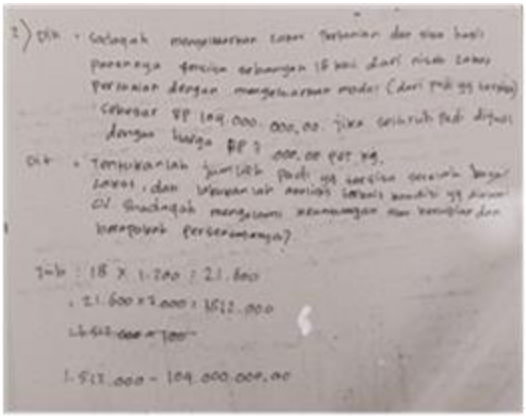

Known: 200kg
Asked :1.700kg
Solution:
Profit Day 1: 500 x 800 kg
Profit Day 2 : 1000 x 200 kg
Profit Day 3 : 1500 x 700 kg

*Figure 12*. The Student's Answer (SC1) to the First Problem

Figure 12 illustrates that the student attempted to express mathematical ideas in written form. However, there were still errors in the explanation. This indicates that the student did not meet the first indicator, namely, explaining mathematical ideas, situations, and relationships in writing using real objects, images, or algebraic forms.

The response of student SC2 to the mathematical communication problem

involving the calculation of the remaining rice after paying zakat and analyzing whether the business entity "CV Shadaqah" experienced a profit or a loss is presented in Figure 13.

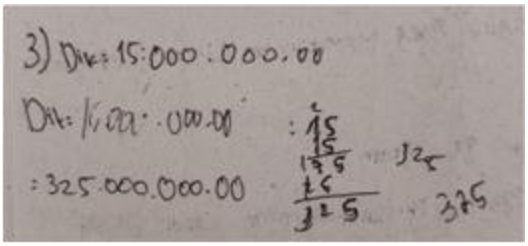


Known: CV Sadaqah pays agricultural zakat and the remaining harvest is 18 times the agricultural zakat nisab by spending capital (from the remaining rice) of IDR104,000,000.00. Jika seluruh padi dijual dengan harga IDR7,000,00/kg
Asked : determine the amount of rice remaining after paying zakat and conduct an analysis related to the conditions experienced by "CV. Shadaqah", whether it is making a profit or loss and what the percentage
Solution:
18 x 1,200 = 21,600
21,600 x 700 = 1,512,000
1,512,000 – 104,000,000

*Figure 13.* The Student's Answer (SC2) to the Second Problem

Figure 13 reveals that the student employed a logical and systematic calculation strategy, beginning with identifying the amount of rice remaining after zakat, calculating the total sales value, and then comparing it with the capital to determine the profit margin. This strategy was employed to illustrate mathematical ideas; however, its application was still inaccurate. This indicates that the student has not fully met the second indicator, namely: using mathematical terms, symbols, and structures to model mathematical situations or problems.

The response of student SC3 to the mathematical communication problem related to a trade transaction is presented in Figure 14.

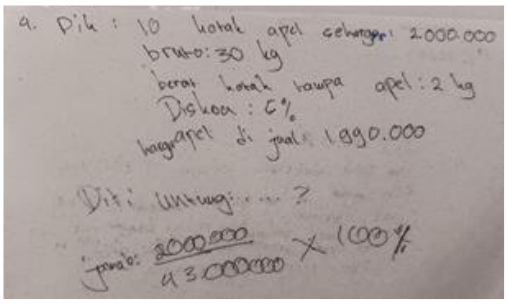


Known: 15,000,000.00
Asked :1,500,000.00
Solution: 325,000,000.00

*Figure 14. The Student's Answer (SC3) to the Third Problem*

Figure 14 illustrates that the student attempted to interpret mathematical ideas from the given problem. However, the interpretation was inaccurate. This indicates that the student did not meet the third indicator, namely the skills to interpret and evaluate mathematical ideas from a problem, either orally or in writing.

The response of student SC4 to the mathematical communication problem related to profit and loss is presented in Figure 15.



Known: 10 boxes of apples for the price of IDR2.,000,000
Bruto: 30 kg
Box weight without apples: 2kg
Apples price: IDR1,990,000
Asked: profit
Solution:
2,000,000 x 100%
43,000,000

*Figure 15. The Student's Answer (SC4) to the Fourth Problem*

Figure 15 shows that the student did not accurately calculate the actual profit, and the formula used was not appropriate for the given context. Although the students made an effort to understand the contextual situation (buying and selling), they were not accurate in performing the calculations related to discounts and profits. This indicates that the student did not meet the fourth indicator, namely, expressing real-world events in the form of mathematical language or symbols.

The presentation of student answers from the control class in the results section aims to provide a comprehensive comparison between two instructional approaches: the interactive e-module with a zakat context used in the experimental class and the conventional worksheet used in the control class. This presentation serves to highlight differences in learning outcomes, particularly in students' mathematical communication skills, and to demonstrate the effectiveness of the intervention. By including responses from the control class, the analysis becomes more robust, and the argument for the effectiveness of the zakat-based e-module in enhancing students' mathematical communication is strengthened. It provides a clearer picture of how and why the intervention had a positive impact on students' performance and understanding.

## Discussion

Based on the results of this study, students' mathematical communication skills using the e-module with a zakat context in numbers were better compared to those not using it. As shown in Table 1, the experimental class achieved higher maximum and minimum posttest scores, further supporting the positive impact of the e-module. This finding is also reinforced by the data in Figure 6, which shows that the proportion of students in the medium and high categories was significantly greater than in the control class. Compared to previous studies, the findings of this research highlight a more comprehensive impact of the e-module with a zakat context on students' mathematical communication skills. Teaching materials based on an Islamic context are deemed suitable for use in the learning process and, as supplementary tools, have the potential to enhance students' mathematical understanding (Ulpah & Novikasari, 2020). The mathematical communication skills of students in the control class were lower than those in the experimental class. This discrepancy can be attributed to the absence of e-modules incorporating the zakat context in the control class, where instruction relied solely on Student Worksheets and the teacher's limited explanation of zakat. In contrast, students in the experimental class had access to e-modules with zakat-related content both during and outside class hours, enabling them to deepen their conceptual understanding of zakat and practice problem-solving through the exercises provided in the e-module. E-modules can motivate students through their features, including illustrations, videos, audio and animation (Rochsun & Agustin, 2020). In addition, based on students' answer sheets, it can be concluded that some students have achieved the desired indicators and more engaged in learning Yeh et al (2019), exciting learning materials can increase students' interest and success in learning mathematics. Learning assisted by interactive e-modules encourages students to be more engaged in the learning process and understand the material better (Larsari et al., 2023), which in turn increases their

scores in mathematical communication skills (Weylin et al., 2023).

Research by Logan et al. (2020) demonstrated that e-modules enhance student engagement with learning content and promote active participation in the learning process. Similarly, the developed video-based e-modules have proven effective as innovative and student-friendly instructional materials, integrating technology to support 21st-century learning (Nabayra, 2020). These e-modules enable students to learn independently at home through video content, thereby allowing classroom time to be used more effectively for interactive, meaningful, and productive learning activities.

In addition, Haqiqi et al. (2022) also argued that mathematics teaching materials integrated with Islamic values will be more interesting for students as they can simultaneously learn mathematics and religious values for daily life. It also leads students to achieve knowledge (cognitive), understanding and application of Islamic values (Fitriyani & Kania, 2019). This aligns with Subaidi (2020), who stated that integrating character education into learning based on Islamic values enhances students' cognitive and affective engagement. Integrating mathematics learning with Islamic values can cultivate students who are not only academically proficient but also possess strong moral character and integrity. Such integration fosters a deeper understanding of both mathematical concepts and Islamic principles while simultaneously enhancing students' spiritual and intellectual intelligence.

In addition, the integration of zakat into mathematics learning also contributes to the achievement of the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty) and SDG 4 (Quality Education). Zakat, as mandated in the Qur'an (Surah An-Nur: 56), aims to reduce inequality and support social welfare. By understanding zakat mathematically, students are indirectly taught to appreciate the socio-economic function of zakat and to connect their knowledge with real-world problem-solving. The relevance to SDG 1 is clear: zakat can serve as an instrument to eradicate poverty and reduce economic disparities (United Nations, 2018). At the same time, the use of high-quality e-modules supports the call of SDG 4 for inclusive and equitable education and promotes the development of basic numeracy skills—a competency still lacking in 617 million children and adolescents around the world (Logachev et al., 2021).

Therefore, the e-module with a zakat context is a relevant alternative in mathematics learning, as it not only facilitates teachers in delivering the material but also fosters Islamic character in students. Learning activities that include visualizations have been proven to be more effective than traditional methods, such as reading textbooks or listening to conventional teacher explanations. Overall, the findings of this study indicate that the use of the e-module with a zakat context not only enhances students' cognitive skills in mathematical communication but also promotes a more contextual and meaningful understanding aligned with life values. These findings underscore the importance of developing digital learning media that incorporate cultural and religious contexts to enhance the quality of mathematics education in the digital era.

**Implication of Research**

E-module with zakat context is an alternative interactive learning media

that supports students' independence in learning and can foster students' mathematical communication skills.

### Limitation

This study is limited to examining the effect of e-modules with a zakat context on students' written mathematical communication skills in number-related topics, particularly fractions. One limitation encountered was that students access the videos in the e-module simultaneously experienced disruptions in learning concentration. Further research is recommended to explore the implementation of such e-modules in other mathematical topics, as well as in diverse educational settings and regions.

## CONCLUSION

In conclusion, the mathematical communication skills of students using the e-module with zakat context is better than those of students who did not use the e-module. The experimental class consistently demonstrated better outcomes than the control class in various aspects, including higher posttest scores in students' mathematical communication skills, a greater number of students achieving the Minimum Criteria of Mastery Learning (KKM), and more diverse and complete responses across all mathematical communication indicators. In addition, students in the experimental class showed deeper conceptual understanding and stronger skills in interpreting, representing, and evaluating mathematical problems in real-world contexts, particularly those related to zakat. These findings are reinforced by qualitative analysis of students' written responses and a broader distribution of students in the medium and high achievement categories.

The success of the e-module is attributed to its interactive features, such as videos, animations, and contextual Islamic content, which effectively enhance student motivation, engagement, and independent learning. This approach aligns with previous research that supports the role of digital learning media integrated with religious values in enhancing mathematical understanding and promoting student character development. More importantly, these findings also suggest that integrating zakat into mathematics learning contributes to achieving the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty) and SDG 4 (Quality Education), by fostering socio-economic awareness and promoting inclusive, value-based education. Therefore, the zakat-based e-module is not only a pedagogically effective learning tool but also a meaningful educational innovation that bridges mathematics, technology, and Islamic values in supporting both academic achievement and character development in students. In addition, it opens up new opportunities for culturally relevant pedagogy that resonates with students' identities and lived experiences, fostering deeper engagement with the learning material. Further research is encouraged to contribute to the field of education by supporting the development of more effective, accessible, and user-friendly online learning platforms.

## ACKNOWLEDGEMENT

We would like to thank Universitas Syiah Kuala (USK) for financing this research (Grant Number: 22/UN11.2.1/PT.01.03/PNBP/2023). We also extend our gratitude to all participants involved in this study.

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***Appendix 1. Research Instrument***

Mathematical Communication Skills Test Questions

Name:

Class:

Instructions:

a. Begin with Basmallah.

b. Answer the questions below using problem-solving steps.

c. Pray before starting the test.

d. Do your best. Start with the questions you find easiest, then move on to the more difficultones.

e. Check your answers before submitting.

Information:

- The nisab for agricultural zakat is 5 wasaq = 650 kg (of rice) or 1,200 kg (of unhusked rice). The zakat rate per harvest is 10% if irrigated by rain or river, and 5% if irrigated through artificial means (which incur costs).
- The nisab for professional zakat is the equivalent of 85 grams of gold, which is approximately IDR 85,000,000 per year or IDR 7,083,000 per month, with a zakat rate of 2.5%.
- The nisab for business zakat is also equivalent to 85 grams of gold (IDR 85,000,000), with a zakat rate of 2.5%, and must have reached one haul (a full Hijri year).

Questions:

1. Mr. Husaini is a successful Muslim farmer. He always pays his agricultural zakat before selling his harvest. After paying zakat, 1,700 kg of rice remains. On the first day, Mr. Husaini manages to sell 800 kg of rice. On the second day, he sells 200 kg, and on the third day, he sells the remainder of his harvest. If his capital cost is IDR 4,000 per kg of rice, create a profit graph assuming the selling price is IDR 4,500 per kg on the first day and increases by IDR 500 per kg each following day. What conclusion can you draw from the graph?
2. CV. Shadaqah is an agricultural business focusing on glutinous rice farming using an irrigation system. After harvesting, CV. Shadaqah pays zakat and is left with 18 times the agricultural zakat nisab. The company's total capital investment from the remaining rice is IDR 104,000,000. If all the rice is sold at IDR 7,000 per kg, determine the amount of rice left after zakat and analyze whether CV. Shadaqah made a profit or a loss, and what percentage it represents.
3. Mrs. Maryam is an employee at a private company with a monthly income of IDR 15,000,000. She always fulfills her obligation to pay zakat, and she donates the same amount to a local orphanage. a) Does her income meet the nisab for professional zakat? If so, explain how you would calculate the zakat she must pay and the donation to the orphanage. b) What percentage of her income remains?
4. Mr. Ahmad is a very honest fruit vendor. He plans to buy 10 boxes of apples for IDR 2,000,000. Each box is labeled as having a gross weight of 30 kg, while each empty box weighs 2 kg. As part of a "Blessed Friday" promotion, Mr. Ahmad

receives a 5% discount. He plans to resell the apples for a total of IDR 1,990,000. Based on this scenario, determine whether Mr. Ahmad will make a profit or a loss. What is the percentage of that profit or loss?