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Infusing Islamic financial literacy in mathematics education for Islamic school

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Abstract

Knowledge of financial literacy, including Islamic financial literacy which has been widely used in various financial products, intersects with several domain areas in mathematical concepts, especially in basic arithmetic which requires students to perform basic calculations before making the right financial decisions. This research aims to develop an instructional design of social arithmetic learning using Math-based Islamic Financial Literacy (MIFL) framework for Islamic schools. We develop a Hypothetical Learning Trajectory (HLT) for fostering students' numeracy and Islamic Financial Literacy (IFL) skills by using MIFL framework that involves various Islamic financial problems as context in mathematics tasks. We chose design research as the method for accomplishing our objective. However, we will discuss about task design and a portion of one of the three major phases of design research, namely pilot experiments. We involved three experts to provide suggestions to improve the tasks and six students from an Islamic junior high school participated in this study. We designed three stages of learning activities. Identifying of math-based Islamic financial information, analyzing math-based Islamic financial context, and applying math-based Islamic financial knowledge and understanding for completing the tasks are the three activities. Results indicate that HLT can indeed assist students in acquiring fundamental arithmetic abilities and advance their IFL. To improve the learning trajectory, we added several sub-sections of activities that bridged the understanding of mathematics and IFL.

Keywords: Design Research, Islamic Financial Literacy, Islamic School, Math-based Islamic Financial Literacy

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Some studies (Sawatzki, 2017; Yeo, 2016) have emphasized the importance of including financial education into mathematics education. The OECD (2019) also shows similarities between financial literacy and mathematical literacy in the PISA framework, particularly in basic arithmetic content which requires students to apply their understanding to financial situations. Meanwhile, financial literacy is included in the mathematics learning curriculum in several countries (Pournara, 2007; Sawatzki, 2017), For example, the Australian curriculum known as the Australian Curriculum, Assessment, and Reporting Authority (ACARA) integrates financial literacy in mathematics learning outcomes in number and algebra content in the money and financial mathematics sub-content. This demonstrates that mathematics education can promote in the development of financial literacy skills. Moreover, an OECD (2019) study revealed a strong correlation between financial literacy and mathematical literacy; that is, students who perform well in mathematics usually perform well in a decision making in financial problem which is part

of financial literacy. Savard & Cavalcante (2021) also argue that mathematics is important not only in terms of its basic arithmetic operations for the financial situations, but many elements of mathematics also appear as important variables in understanding the situation such as statistics, probability, measurement, geometry, etc.

If we take a deeper look at the Indonesian curriculum, a small part of financial literacy has been taught through mathematics education, which is about calculating profits, losses, discounts, and bank interest rates. In contrast to the requirements for financial literacy as specified by the OECD (2020b), the learning outcomes of the Indonesian curriculum remain grossly inadequate, for instance the ability to plan and manage finance, and financial landscape. Additionally, financial education is not taught as an independent or integrated subject in Indonesia which spells out in detail the level of achievement that must be achieved by students at each level of education which is contained explicitly in the curriculum. On the other hand, what is more concerning is the low level of financial literacy achievement among students (OECD, 2020a), even when compared to the level of mathematical literacy achievement. Indonesian students were ranked last in the PISA financial literacy domain, out of all participating countries. Consequently, the incorporation of financial literacy into education in Indonesia is essential to be implemented.

In Indonesia, Islamic Financial Literacy (IFL) is part of the financial literacy. The Indonesian government, as is widely known, operates both an Islamic and a conventional economic system. Additionally, the government utilizes a Bank Indonesia-designed Islamic economic development program which strengthens the Islamic economy in the Halal Value Chain where the economic independence of Islamic boarding schools is one of the focuses in the program (Deputy of Economy Indonesian Ministry of National Development Planning, 2018). Among these initiatives is the strengthening of the Islamic economic sector, which includes economic independence in Islamic boarding schools. This highlights the critical need for Islamic financial literacy for Islamic boarding school's residents, especially for the students. Therefore, Islamic financial literacy is included in formal education in Islamic boarding schools. Meanwhile, Piliyanti (2012) emphasized the importance of including Islamic economics in basic education in Islamic secondary schools. However, what we encounter today is the scarcity of research on the development of instructional designs or instruments in mathematics education to integrate the concept of Islamic Economics into mathematics in Indonesia. We believe that adopting an integrated mathematics learning design based on Islamic economic concepts for the purpose of promoting students' IFL will benefit education and learning in Islamic boarding schools as well as in supporting the growth of the Islamic economy in Indonesia.

It is commonly known that not all of aspect of IFL corresponds to mathematical concepts. By investigating the compatibility of mathematical ideas, content of financial literacy, and concept of Islamic economics, we identify the intersection of the IFL domain and mathematics education. We developed the Mathematics-based Islamic Financial Literacy (MIFL) framework to facilitate compliance across financial literacy, mathematics education, and Islamic economic which we have developed in previous studies (see Kusumawati et al., 2021). We built the framework using the topic domain of the (OECD, 2020b) PISA financial literacy framework as a guidance. To be consistent with the mathematical notion, we chose social arithmetic' content, which may be linked with IFL according to the present curriculum. Meanwhile, with regards to Islamic economics, we refer to (Nawi et al., 2018), which limits IFL's association with Islamic banking products. As a result, the framework is limited to particular contexts of banking products. In general, the MIFL capability framework that we have built consists of 4 content domains, namely Money and Sharia Transactions, Planning and Managing Finance using Shariah Products, Risk and Reward of

Shariah Finance Products, and Landscape of Shariah Finance presented in Figure 1. We built a mathematical task utilizing the context of an Islamic banking product based on the framework. Utilizing the MIFL framework-based math tasks, we develop instructional design and evaluations for promoting the students' MIFL skills.

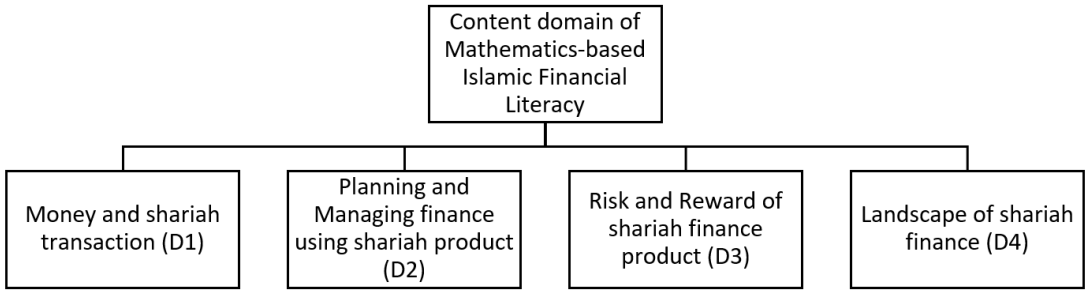

Figure 1. Mathematics-based Islamic Financial Literacy

D1 relates to understanding in monitoring various forms of calculations related to buying and selling transactions and finance based on sharia principles. D2 relates to the ability to utilize income or various other sources to improve financial well-being through various Islamic financial products based on considerations of arithmetic calculations carried out (e.g., Islamic banks, Islamic insurance, etc.). Meanwhile, D3 relates to the understanding that Islamic financial products offered by banks or other Islamic financial institutions have profit and risk factors through which arithmetic calculations are performed. finally, D4 relates to the ability to understand that external factors influence the Islamic financial products used based on arithmetic calculations performed. (e.g., an increase in the price of gold)

In this study, we try to develop a social arithmetic learning design by incorporating elements of Islamic financial literacy through the MIFL framework (which was developed previously) using design-based research methods (Bakker & van Eerde, 2015), which entails developing a Hypothetical Learning Trajectory (HLT) and comparing it to an Actual Learning Trajectory (ALT) through teaching experiment. This research focuses on discussing mathematics assignments and learning designs to integrate Islamic financial literacy in mathematics education so that they can serve as models for teachers or learning design developers who wish to integrate aspects of IFL in learning mathematics and gain an understanding of how IFL skills can be developed through mathematics education.

METHODS

We employ the design-based research method (Bakker & van Eerde, 2015) to create a set of social arithmetic learning activities that incorporate elements of Islamic financial literacy by using MIFL framework. By comparing the HLT to ALT, this work intends to build HLT which is ready to be tested in further studies to produce Local Instruction Theory (LIT) (Gravemeijer, 2004). The testing was conducted in two stages: the pilot experiment and the teaching experiment. The pilot experiment involved 6 students and 1 math teacher at SMP At-Tibyan Pasuruan and the teaching experiment involving three classes at three Islamic boarding schools: SMP Amanatul Ummah Mojokerto, SMP Cahaya Qur'an Lamogan, and MTs Man'baul Hikam Tanggulangin. However, our discussion will be limited to pilot experiment for a three primary phases of the design study. Regarding the internal validity in pilot experiment's retrospective analysis, we used task-oriented analysis to conduct the HLT analysis, as recommended by Bakker and van Eerde (2015). By analyzing student performance on each task (through interviews, observations, and

analysis of student work) in each activity and the percentage of students who can handle the tasks given in each activity, we can evaluate and improve the design at each stage. Additionally, by comparing HLT and ALT, we may decide which section of the activity, based on the students' level of comprehension, deserves review and improvement. The design outcomes presented in this study are restricted to the final HLT that we evaluated during the pilot experiment phase, but not the teaching experiment (Figure 2). One of the reasons that motivates us to focus on the pilot experiment is to better prepare HLT related to the study of MIFL, which is still relatively new, so that the prepared design is truly suitable for students in Islamic boarding schools.

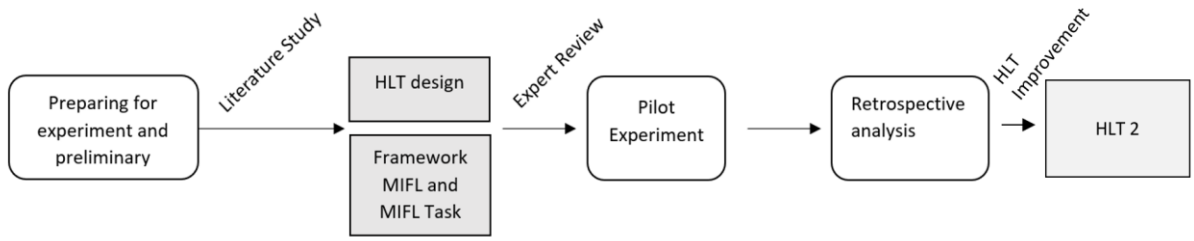

Figure 2. The Research Method

Meanwhile, when developing mathematics tasks using the MIFL framework, we enlisted the assistance of two experts to act as validators and make constructive suggestions, a practitioner of mathematics education specialist (expert 1) and a researcher in the field of numeracy (expert 2). Six eighth-grade junior high school students' work was analyzed to determine the effects of the tasks on Islamic Financial Literacy. Additionally, we asked students to give their first impression of the developed task.

RESULTS AND DISCUSSION

In presenting the results of this study, we divide them into two parts. The first part is preparing for experiment and preliminary design, and the second part is pilot experiment and retrospective analysis. The following part provides an overview of how our study contributes to similar research.

Preparing for Experiment and Preliminary Design

This section will describe how mathematical tasks integrated with IFL were developed using the MIFL framework. See Kusumawati et al (2021) from the study on the development of the MIFL (content domain) framework for further information on our research into the framework's development. Following that, we will describe the initial tasks and HLT that was compiled based on the results of the literature review. Since this is still a preliminary study, we only focus on expert review and student responses to the developed MIFL tasks. The following are comments from reviewers on the tasks developed (see Table 1).

Table 1. Remark from Experts

Remark from Expert 1	Remark from Expert 2
• In general, the tasks presented are quite interesting and expose students to new aspects of the Islamic financial transaction system. The	• Perhaps a brief introductory description of the definition of this term (there are several in Islamic economics) would be preferable, as junior high

following are some suggestions and inputs for improving the task. • Certain financial transaction terms in each item require additional explanation because they may be unfamiliar to students, such as "ratio," "fixed margin," "margin," and "*murabahah*." The notes I added are visible in several sections. • Certain words or phrases can also be substituted for more generic and student-friendly terms. While the items provided are quite interesting, it should be kept in mind that before assigning these tasks to students, the teacher should discuss and introduce the Islamic transaction system or Islamic financial system to them.	school students may not fully comprehend. Thus, the introductory sentence for this term will assist students in comprehending the assignment's meaning. Additionally, the degree of familiarity with the context influences student performance. • Using a line chart in place of a table for certain questions simplifies things for students. • Have junior high school students grasped the concepts of credit and debit? It is preferable if there is a definition for these two terms or for another term that students do not understand.

Expert 1 makes two general remarks. The first concern is with the language's structure, which needs to be improved. Second, a lesson or introduction must be given to students prior to them being assigned math-based Islamic financial literacy tasks. We made language improvements and adjustments in response to the first remark; as a result, students will easily digest it. Concerning the second remark, we completely concur. Students require instruction that fosters their understanding of Islamic financial literacy as a prelude to comprehending the concepts of different types of contracts or Islamic economic products (e.g., *Murabahah*), so that "foreign words" do not become a barrier. Through the discussion section of the introduction, the teacher can introduce students to Islamic economics and the various types of contracts. Expert 2 emphasized a similar point. To avoid inhibiting students, each task should begin with an introductory sentence that clarifies unfamiliar terms or contracts in Islamic economics. Additionally, it is recommended to enhance questions through the addition of graphs or the simplification of tasks.

Meanwhile, we interviewed students regarding their first impression toward the tasks. The average showed interest in MIFL tasks. The following are some students' comments.

"My impression is that I can acquire new material and consider resolving the issue."
"Very intriguing and sufficiently difficult"
"Despite the fact that it's difficult and somewhat blank, I'm constantly challenged to answer questions."

The findings, based on expert and student input, confirm that it is worthwhile to integrate Islamic financial literacy into mathematics education. This can pique students' interest in the various Islamic banking products and the financial mathematics concepts contained within.

The following are revised MIFL tasks for Risk and Reward content of Shariah Banking Product (Figure 3), and of Planning and Managing Using Shariah Product (Figure 4). The tasks presented below are related to gold savings banking products and property finance schemes that require mathematical ability to make sound financial decisions.

Content Risk and Reward of shariah finance product
Context Unit: Savings at a Sharia bank

pure gold is one of the options for investment or long-term savings. However, it still has risks if it is only for short-term investments because the price is volatile.
The following is data on gold price fluctuations (per 1 gram) in the last 10 days.

Date	Price (IDR)
22nd August	825,000
23rd August	834,000
24th August	837,000
25th August	830,000
26th August	832,000
27th August	839,000
28th August	837,000
29th August	837,000
30th August	835,000
31st August	829,000

*Price after rounding to the nearest thousand

Question:

Statement	Is the statement true?
If Ambar buys gold on August 24th and sells it back on August 31st then he has lost more than 1%.	True / False
If Umi buys 5g gold on August 23rd and 7g gold on August 27th then sells all the gold on August 31st, then the loss she gets is less than 1%.	True / False

Figure 3. MIFL Task of Risk and Reward of Shariah Banking Product

In this part, we will briefly outline the intended learning activities for the HLT. The planned learning activities are based on the process domain of the OECD framework and are combined with Islamic economic concepts to enhance students' math-based Islamic financial literacy. We did, however, modify how MIFL and Islamic banking-related knowledge was utilized. The following is a hypothesis of the learning activities we planned and the domain of MIFL task involved in each stage of the activity (Figure 5). Six tasks are provided throughout three learning sessions, which are outlined below. In each activity, we divide it into 4 stages of learning namely, observation of the problem, discussion and material, exploration, and exercise.

Content: Planning and Managing finance using shariah product
Context Unit: Sharia Loans with murabahah contract

One of the property purchase financing schemes (known as KPR) that exist in Islamic banks in Indonesia is *murabahah*, where the bank acts as a third party in the buying and selling process by buying houses in cash from individuals or developers (the property owners) and reselling them to consumers. with a certain fixed margin (profit per year) and can be paid in installments over a specified period of time.

Question:

tenor / payment period	fixed margin (per year)
10 years	12.5 %
15 years	13 %
20 years	13,75 %

Mrs. Umi intends to buy a property by applying for a KPR with BRIS with a tenor of 15 years. If he wants the maximum installment amount of Rp. 3,000,000 per month, then the maximum price of property (KPR loan amount) that Mrs. Umi may choose is …

a. IDR 184,000,000.00 - IDR 187,000,000.00
b. IDR 182,000,000.00 - IDR 185,000,000.00
c. IDR 180,000,000.00 - IDR 183,000,000.00
d. IDR 178,000,000.00 - IDR 181,000,000.00

Figure 4. MIFL Task of Planning and Managing Using Shariah Product

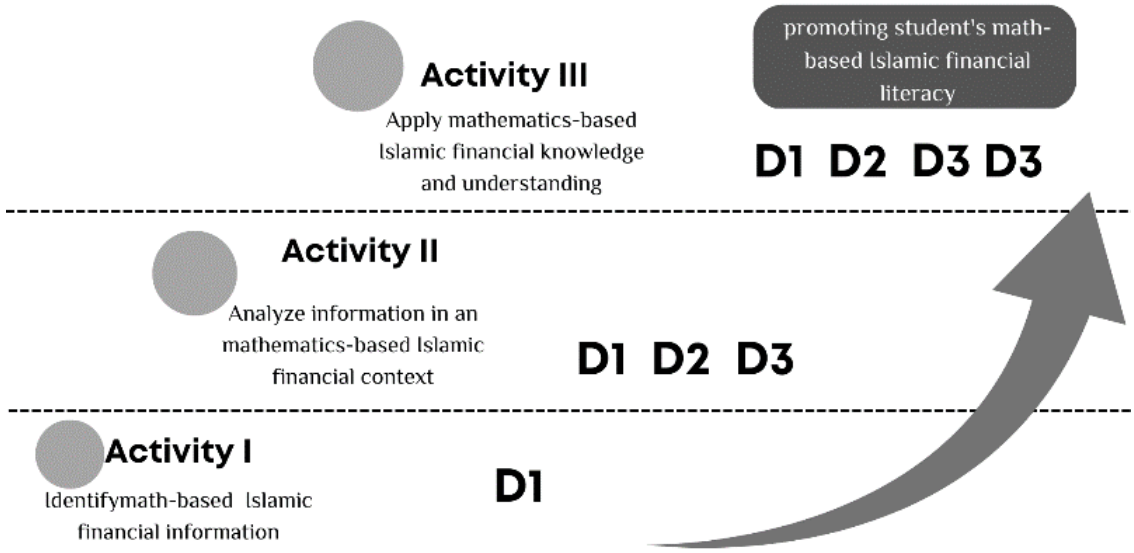

Figure 5. The Learning Activities of HLT

a. Activity I

Students were given arithmetic problems to solve in order to comprehend information about Islamic bank transactions in the first activity. The purpose of this activity is for students to gain an understanding of the data and calculations associated with financial transactions resulting from various transactional types and their calculations in the context of Islamic finance. Students will gain an understanding of the mathematical concepts involved in Islamic financial transactions through this activity. At this stage, students are given a math-based Islamic financial literacy (MIFL) problem that focuses on the process of understanding basic information, various terms in Islamic banking, for example: customer, account mutation, profit sharing, ratios, *mudharabah*, *murabahah* etc. Students are asked to solve these problems according to their initial understanding. In this activity, the tasks involved are limited to D1 content domain. The following is one of the problems in the content domain of money and sharia transactions that we assigned to students in the first activity (Figure 6).

Mr. Fulan is a Bank Syariah Indonesia customer (BSI). The following is a list of his two-month-old account mutations.

Date	Transaction Details	Credit (IDR)	Debit (IDR)	Balance (IDR)
3/2/20	Administration fee		15,000	10,000,000
3/2/20	Profit-sharing	30,000		10,030,000
4/2/20	X Company January Salary	4,500,000		14,530,000
7/2/20	Withdrawal		2,000,000	12,530,000
16/2/20	Transfer Mr. Fulan 0011	500,000		12,230,000

The following is the calculation of profit-sharing for customers.

$$\textbf{Customers' profit-sharing} = \frac{\textit{Balance}}{1000} \times 6.5 \times \textit{nisbah}$$

Nisbah = Percentage of profit-sharing for customers

Determine the amount of the *nisbah* given by BSI to its customers!

Figure 6. Example MIFL Task in Activity I

b. Activity II

Students are presented with arithmetic problems relating to information analysis in the context of Islamic finance in the second activity. The purpose of this activity is for students to analyze data and perform calculations to determine which Islamic financial products are the most profitable. The tasks associated with this activity focus on the D1, D2, and D3 content. At this stage, students are given several MIFL problems in various content domains. It is intended that students can analyze and determine the domain content of an MIFL task, and the mathematical concepts needed to solve it.

The following is an example of a problem we presented to students during the second activity. The following is one of the problems of financial planning and management that we assigned to students in the second activity (Figure 7).

Syariah Mandiri Bank offers two types of homeownership credit programs with *murabahah* contracts. The following is an ad that contains the margin program offered.

Step up program:
8.50% per year (for $1^{st} - 2^{nd}$ year)
10.5% per year (for $3^{rd} - 5^{th}$ year)
14 % per year (for $6^{th} - 20^{th}$ year)

Single price program:
10% per year (for 1–5 year fixed period)
11% per year (for >5–10 year fixed period)
12% per year (for >10–15 year fixed period)
12.5% per year (for >15–20 year fixed period)

Mr. Zailan intends to purchase a house for 200,000,000 IDR and apply for a 15-year installment loan from the Syariah Mandiri bank. Determine which of the two programs is the most profitable for Mr. Zailan!

Figure 7. Example MIFL Task in Activity II

c. Activity III

In the third activity, we provide issues requiring the application of MIFL knowledge or the selection of the best course of action for solve MIFL problems in diverse Islamic financial contexts and MIFL content requiring mathematical skills. This process is reflected in tasks that require problem solving, such as completing elementary arithmetic and evaluating various situations depending on the outcomes of these calculations. At this stage, students carry out problem solving activities for various MIFL content using the knowledge that has been constructed. The task involves in this activity is all MIFL content domains. The following is an example of one of the landscapes of shariah finance topic domain challenges that students were assigned during the last activity (Figure 8).

Mr. Fulan is one of the Bank Syariah Indonesia (BSI) debtors affected by COVID-19 and receives a one-year extension from BSI. The following is information about Mr. Fulan's contract prior to the relaxation of the customer policy.

Customer	: Mr. Fulan
Financing ceiling	: IDR 20,000,000
Bank Margin (per year)	: 8%
Types of contract	: Murabahah financing contracts
Installment period (initial)	: 4 years
Installment Nominal (per month)	: IDR 550,000

If Mr. Fulan has fulfilled her installment obligations to the bank for the previous 24 months, determine the amount of installments per month he must pay for the remaining period!

Figure 8. Example MIFL Task in Activity III

Pilot Experiment and Retrospective Analysis

We will summarize the results of the HLT implementation test in comparison to the ALT in the pilot experiment. This analysis was based on student work, student interviews, instructor interviews, and learning process observations. We compare all data on real learning to HLT-generated scenarios. The following are the findings from a pilot experiment comparing HLT and ALT using task-oriented analysis which restricted to only 6 tasks assigned to all activities (See Table 2).

Table 2. The comparison of HLT conjectures with Actual Learning result based on task completion.

Task	1st	2nd	3rd	4th	5th	6th
2	x			x	x	
1			x			x
0		x				

Note: a "x" signifies how well the HLT corresponded to the actual learning implementation ("0" means for up to 1/3 of the total students completing the task, and "2" for at least 2/3 of the total students completing the task, and 1 for the remainder)

According to the table above, we know that students can successfully complete the assignment in the first activity. According to interviews and discussions with teacher, the difficulties were identified because of their unfamiliarity with certain terms. The following are excerpts from student interviews regarding unfamiliar words related to Islamic banking.

Teacher : "Have you ever looked into social arithmetic in relation to Islamic banking?"
Student 1 : "never."
Teacher : "What are the terms used in the task that you are unfamiliar with?"
Student 1 : "customer, margin, debit, credit, *nisbah* (ratio), tenor."

The responses above are representative of students who face the same difficulty with unfamiliar phrases or words. During the first exercise, students had difficulty grasping unfamiliar Islamic banking words, according to the interview clip above. By offering introductory information and conversations on Islamic finance, we sidestep this limitation. This outcome supports the idea proposed in the initial activity. This initial action focuses on the introduction and assignment of identity for the information of the Islamic banking context.

All students do not successfully finish the second assignment, which focuses on information analysis in an Islamic financial contextual problem (see the task in Figure 7). Each student's comprehension of the task's fixed-period scheme was flawed. They understand that a fixed-period or single price program is equivalent to a step-up program. The following is an example of a student's mistake (Figure 9).

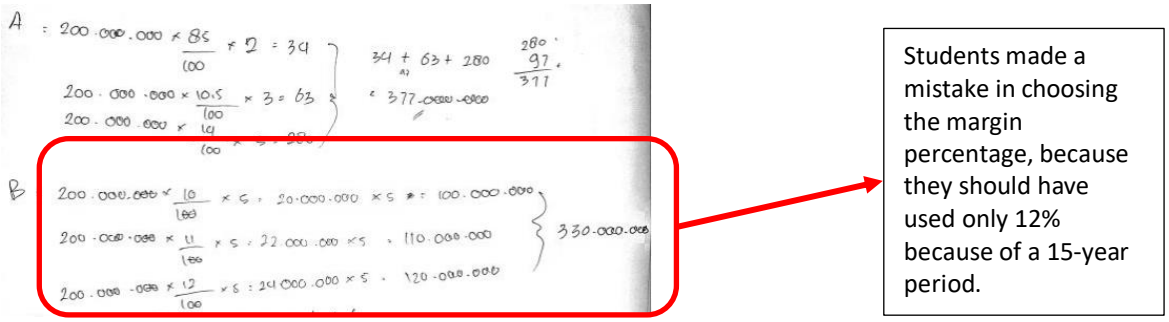

Figure 9. Student's error on task in Activiti II

According to our analysis, this inaccuracy is a result of the usage of symbols to distinguish between the two programs in queries that remain unclear to students. Therefore, we will adapt the second exercise such that pupils do not misinterpret the information provided inside. We will employ a simplified Islamic financial framework to aid students' comprehension. We sustain this activity even though it violates our theory by modifying the task's environment.

The third activity presented students with a variety of problems that required them to apply their Islamic financial knowledge and understanding. We assigned tasks in various content domains during this activity. In this case, we assign two tasks related to planning and management of shariah product content, one task related to risk and reward associated with shariah finance products, and one task related to the landscape associated with shariah finance content. Students are generally capable of finishing all the tasks. The evidence supports our hypothesis. However, field notes reveal that students experienced challenges when converting models to mathematical representations. Figure 10 is some of the documentation that we took during the pilot experiment with students at the At-Tibyan Islamic boarding school (students did not wear school uniforms because data collection occurred outside of school hours).

Figure 10. Documentation of Pilot Experiment Data Collection

The ALT is mostly like the hypothetical trajectory developed in our HLT, both based on task-oriented analysis and the formulated conjecture. However, students face numerous obstacles in transforming presented financial problems into mathematical forms. As a result, we had to make some adjustments, including increasing the discussion of MIFL assignments, providing interventions, and increasing the allotted time for students to construct new knowledge. Regarding the process of solving the tasks, students typically make errors during the formulation and interpretation stages, where their ability to interpret mathematical concepts and contextual problems is challenged. The issue of mathematical literacy is important in this regard. However, we had to make some adjustments to the task

for Activity II. In addition, we noted the students' comments for improving the display of graphics and tables on tasks to make the tasks more comprehensible. In summary, based on the findings of our research, the learning trajectory may be used to improve Islamic financial literacy, which is restricted to the skill that interacts with mathematics.

Based on the data analysis, we generally maintain the HLT that has been compiled. However, we made some minor adjustments. To overcome the limitations of students' knowledge on various Islamic banking terms, among other things, we assign a special task in the first activity that focuses on understanding information that is demonstrated by how to translate various contexts of Islamic banking problems into mathematical form. Meanwhile in the second activity, we provided information regarding MIFL content to students on each given task, so that they could more easily formulate it into mathematical form.

The results from our study also confirm numerous previous studies that reveal a substantial association between numeracy and financial ability (Estrada-Mejia et al., 2016; Skagerlund et al., 2018), even in the field of Islamic financial literacy. This learning strategy is therefore an alternate method for concurrently enhancing two student skills: numeracy and Islamic financial literacy. This may compensate for one of the curriculum's deficiencies in Indonesia, where financial literacy has not yet been incorporated into official education for junior high students. This study suggests there is scope for further improvement in Indonesia's Islamic financial education through formal education, particularly mathematics education in which financial literacy is used as a context. The use of contextual problems helps students improve their mathematical abilities (Doorman & Gravemeijer, 1999). Additionally, the learning design with contextual problem integrated has the potential to enhance students' fundamental mathematical capabilities, such as reasoning, argumentation, and mathematizing (Kusumawati et al., 2022). Numerous studies have demonstrated that contexts can improve students' mathematical comprehension, including historical ones, (Fachrudin et al., 2019; 2020a; 2020b), culture-based context (Samo, Darhim, & Kartasasmita, 2018), Indonesian traditional game (Jaelani et al., 2013) and even in a financial context (Sawatzki, 2017). The other study also confirmed that the use of context also increases students' confidence (Fauzan et al., 2018) and ability in reasoning in learning social arithmetic (Fauzan et al., 2018; Risdiyanti et al., 2019). The incorporation of context in this learning design will familiarize students with the contextual problem they may encounter during the official minimum numeracy competence exam (known as AKM) administered by the Indonesian Ministry of education, culture, research, and technology.

Previously, Yeo (2016) researched the integration of financial literacy into mathematics education by creating a framework in the form of a task matrix that links financial literacy skills consisting of saving, managing, and sharing with general mathematical abilities consisting of content knowledge and strategic knowledge. However, our study complements previous research by concentrating on financial literacy with a particular emphasis on Islamic economics. The study from Yeo (2016) only provides a framework for integrating financial literacy in mathematics education, and our study complements it by providing a learning design and learning trajectory, whilst it has not yet provided the final findings of the learning trajectory in this study because it is still in the pilot phase. However, this study is limited to Islamic financial literacy and is only applied to Islamic schools. This study also supplements the lack of information on how to implement financial education in mathematics at the school level, especially at Islamic boarding schools which is related to Islamic financial literacy. Numerous studies in Indonesia recommend financial education at the school level, as is well recognized (Kafabih, 2020; Laila et al., 2019; Mundir, 2018). Moreover, if we take a wider view, we can see that the study of financial education in schools is also a consideration in other countries (Hartmann et al., 2021; Mccormick, 2009; Salas-Velasco et al., 2021;

Walstad et al., 2010) which can be implicitly concluded that financial education at the school level needs to be given more attention.

According to our study, students believe they gain new insights and become more interested in mathematics because of their experience. Learning new things, especially in financial problem, can help students use their imagination to perform mathematics modelling. As Sawatzki (2017) emphasizes, this will make mathematics more meaningful, enjoyable, and useful for students. This is because they presently face and will continue to encounter financial difficulties in the future. Obviously, this will make students aware of the benefits and applications of mathematics in the actual world. On the other hand, the involvement of Islamic finance issues is one way to improve students' attitudes in learning mathematics. This refers to a study that revealed that there was a relationship between the use of context and an increase in students' self-efficacy (Peranginangin et al., 2019), an increase in students' belief (Yuanita et al., 2018).

Obviously, there are still limitations to this study. The most significant aspect is that it is still a pilot experiment. To produce a better product in the form of local instruction theory in large classes, we recommend conducting additional research on the implementation of HLT that has been developed through teaching experimentation.

CONCLUSION

We conclude that mathematics can help improve the ability of Islamic boarding school students to develop financial literacy. Some aspects of Islamic financial literacy could be encouraged by mathematics learning, including Islamic money and transactions involving numeracy skills, calculating financial planning and management in Islamic finance context, calculating the risks and rewards associated with Islamic financial products, and calculating the Islamic financial landscape. The MIFL capacity could be achieved by a series of three-part of our activities in our HLT. Understanding-required MIFL activities are the focus of our observations on the implementation of this instructional design. If a student does not comprehend a certain phrase, the instructor must integrate learning exercises that will assist them overcome this barrier. In general, the HLT that we designed required little adjustment based on testing during the pilot phase.

In summary, through this hypothetical learning trajectory, students will have the opportunity to acquire mathematics-based Islamic financial literacy skills through three processes, namely identifying information on arithmetic problems in the context of Islamic banking and then translating it in mathematical form, analyzing information from the context of the problem and understanding the content of knowledge in mathematics-based on Islamic financial literacy, and the application of the acquired knowledge.

We recommend that teachers, particularly those in Islamic schools, use the tasks and design from this study to teach social arithmetic. Teachers or other researchers in mathematics can use this research to develop a similar task or learning design that incorporates elements of Islamic financial literacy. As expected, this study summarizes the learning trajectory have the potential effect to increase students' Islamic financial literacy through mathematics education. Finally, we hope to instill an early understanding of Islamic finance to contribute positively to Indonesia's sharia economic development program.

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Declarations

Author Contribution	:	IBK: research coordinator, conceived the design analysis, conceptualization framework. ADF: contribute manuscript editing, review of developed tasks, collected data or analysis tools, and developer of Math-based Islamic financial literacy tasks. RIIP: script reviewer, expert, and concept consultant. Z: expert and concept consultant.
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