EDUCOFA: Jurnal Pendidikan Matematika
Vol 2 (2), December (2025) 159-172
Available online https://jurnal.uinsyahada.ac.id/index.php/Educofa/index
DOI : 10.24952/ejpm.v2i2.17565

The Tahfidz and Self-Regulated Learning Model is Related to the Mathematical Literacy of Islamic Boarding School Students

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ARTICLE INFO

Keywords:
Tahfiz Model; Self-Regulated Learnin;, Mathematical Literacy; Islamic Boarding School

ABSTRACT

This study aims to analyze the contribution of the tahfidz and self-regulated learning (SRL) model to the mathematical literacy of students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. This study uses a quantitative design with multiple linear regression approach to test the relationship between the two independent variables (tahfidz and SRL models) and the dependent variables (mathematical literacy). Data was collected through questionnaires to measure tahfidz and SRL, as well as tests to measure students' mathematical literacy. The results showed that self-regulated learning had a stronger influence on students' mathematical literacy with a correlation of 0.693, while the tahfidz model only had a correlation of 0.242, indicating a smaller contribution to mathematics literacy. The combination of these two variables showed a moderate contribution with a correlation of 0.468, indicating that although tahfidz provides benefits in the development of cognitive abilities, SRL has a greater influence in improving students' mathematical literacy. These findings provide recommendations for pesantren managers to integrate tahfidz programs with SRL skill development to improve students' academic achievement, especially in mathematics.

INTRODUCTION

Math literacy is a very important skill for students in the 21st century. These skills include understanding mathematical concepts and the ability to apply that knowledge in everyday life. At the junior high school level, mathematics literacy is the main benchmark in preparing students to face various global challenges, both in continuing education and the world of work. Therefore, improving mathematical literacy from an early age is essential to equip students with critical thinking, problem-solving, and analytical skills needed in various areas of life (Dossey, 1992) In the context of pesantren education, where religious and academic values go hand in hand, mathematical literacy is often ignored or underpaid. However, religious education in Islamic boarding schools, such as the tahfidz Al-Qur'an program, can have a positive impact on students' cognitive development. Tahfidz programs that involve constant memorization and repetition help improve students' memory, concentration, and analytical thinking skills. Previous research has shown that tahfidz can affect the improvement of students' concentration and memory in various fields, including in learning mathematics (Hidayat dkk., 2020)

One approach that can improve students' mathematical literacy is through the application of self-regulated learning (SRL). SRL refers to the ability of students to

independently manage their learning process, such as planning, monitoring, and evaluating the progress that has been achieved. In mathematics learning, SRL allows students to more actively control their learning process and find solutions independently. (Dignath dkk., 2017) stated that students who are able to manage their learning process well will have more ability to understand and apply mathematical concepts. Research conducted by Dignath et al. (2017) also shows that SRL plays an important role in improving students' mathematical understanding, especially in classrooms with more open learning and based on students' active involvement. In the context of pesantren, SRL provides space for students to manage their time and manage their own learning, both in religious and academic lessons. Thus, SRL can play a big role in improving students' mathematical literacy, as they can learn more independently, make the best use of time, and respond to difficulties that arise while studying. As an education that integrates religious and general knowledge, the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School offers a unique context to explore the influence of these two factors: the tahfidz model and SRL on mathematical literacy. This pesantren not only focuses on religious education, but also integrates general learning with an approach based on Islamic values (Azzuhro, 2023) Through this approach, students are not only trained to become hafidz, but also to develop academic skills that can support their future lives.

This study aims to look at the contribution of the tahfidz model in improving students' cognitive abilities in mathematics and to measure the influence of SRL on mathematical literacy. The context of the Syahrani Bariah Zulkarnaen Islamic Boarding School which combines the two provides an opportunity to analyze how these two aspects can complement each other in improving the quality of students' mathematics learning. Given the importance of math literacy in preparing students for academic and professional challenges, understanding the contribution of these two factors is particularly relevant. In addition, many studies have shown a positive relationship between religious education and students' academic ability (Ulum, 2016) Tahfidz programs, which hone memory and perseverance, can support students in learning math, which is often considered a subject that requires logical and structured thinking skills. Character development through tahfidz can also help students develop better learning skills, which are important in math learning. With this background, this study is expected to provide a clearer picture of the influence of the tahfidz and self-regulated learning model in improving the mathematical literacy of junior high school students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. In addition, this research is also expected to provide useful recommendations for pesantren managers and other educators in integrating religious and general education to achieve optimal academic results.

This study aims to identify the contribution of the tahfidz model to the mathematical literacy of junior high school students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. One of the questions that will be answered is how the tahfidz model can contribute to improving students' mathematical literacy. Given that tahfidz focuses not only on memorization, but also on the development of concentration, memory, and analytical thinking skills, it is important to know whether these skills have an effect on students' mathematical comprehension(Muaddib, 2024) Therefore, it is necessary to analyze whether the improvement of cognitive abilities obtained through the tahfidz program can contribute to students' ability to solve mathematical problems and understand the basic mathematical concepts required in junior high school.

In addition, this study will also explore the influence of self-regulated learning (SRL) on students' mathematical literacy. SRL allows students to independently manage their learning process, which includes planning, self-control, and evaluation of their learning outcomes. In the context of mathematics, the ability to self-regulate learning is essential, especially to overcome the challenges that exist in understanding abstract mathematical concepts. Thus, the second question that wants to be answered is how much SRL affects students' mathematical literacy skills (Hidayatullah & Salsabila, 2022) In addition, this study will also analyze how the combination of tahfidz and SRL models can have a greater impact in improving students' mathematical literacy. The context of the integration of the two at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School is expected to show a synergy that has the potential to improve students' mathematics learning outcomes.

This research has three main objectives to be investigated. First, this study aims to assess the influence of the tahfidz model on the mathematical literacy of students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. The tahfidz model is expected to contribute to improving students' cognitive abilities, which in turn has the potential to affect their ability to understand and apply mathematical concepts (Azzuhro, 2023) Therefore, this study will measure how much the tahfidz model influences in improving mathematical literacy, especially in the context of students in pesantren education. Second, this study aims to measure the contribution of self-regulated learning (SRL) to students' mathematical literacy. SRL is the ability of students to manage their learning process independently, which includes planning, self-control, and reflection on the learning that has been carried out. By measuring the contribution of SRL, this study is expected to provide an overview of how much influence self-learning management skills have on students' mathematical understanding. Third, this study aims to analyze the combined influence of the tahfidz and SRL models on mathematical literacy. The combination of these two factors is expected to have a greater impact on improving students' math literacy, as they support cognitive development and more independent learning skills. Thus, this third goal will test whether the synergy between the two can make a significant contribution to students' mathematics learning outcomes in Islamic boarding schools (Umaroh dkk., 2020).

This study proposes three hypotheses related to the influence of tahfidz and self-regulated learning (SRL) models on students' mathematical literacy at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. The first hypothesis (H1) states that the tahfidz model has a positive influence on students' mathematical literacy. This is based on previous research that showed that tahfidz of the Qur'an can improve students' cognitive abilities, such as memory, concentration, and analytical thinking skills, all of which are important in understanding mathematical concepts (Hidayat et al., 2020). Therefore, it can be assumed that the tahfidz program implemented in this pesantren has the potential to improve students' mathematical literacy skills(Hidayatullah & Salsabila, 2022).

The second hypothesis (H2) suggests that self-regulated learning has a positive influence on students' mathematical literacy. SRL provides students with the ability to manage their learning process independently, including planning, monitoring, and evaluating their learning outcomes. Research by Dignath et al. (2017) shows that students who develop SRL skills tend to be more successful in learning mathematics, as they are able to manage time and study strategies effectively. Therefore, it is hoped that SRL will contribute positively to improving students' mathematical literacy in Islamic boarding schools. The third hypothesis (H3) states that the combination of tahfidz and self-regulated learning models has a greater influence on students' mathematical literacy. The synergy between the tahfidz

program that hones students' concentration and memory, as well as SRL that improves their ability to manage the learning process independently, is expected to have a greater impact on improving mathematical literacy. Research by Zimmerman (2002) shows that a combination of cognitive reinforcement (such as that obtained through tahfidz) and self-learning management (through SRL) can speed up the learning process and improve understanding of concepts, including in mathematics. Therefore, this hypothesis assumes that these two factors, when combined, will have a more significant impact on students' mathematical literacy (Adiwijayanti dkk., 2019).

METHODE

This study uses a quantitative approach with a correlational descriptive design. This design was chosen because it aims to illustrate the relationship between the tahfidz model, self-regulated learning (SRL), and students' mathematical literacy without conducting experimental manipulation or separation into control groups. The correlational descriptive design allows the researcher to identify and measure the relationship between the variables in this study, namely the influence of the tahfidz and SRL models on the mathematical literacy ability of students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. As researchers, we will measure the degree of interconnectedness between these variables based on data collected from existing student samples (Creswell, 2014). This approach provides a clearer picture of the conditions in the field, as well as identifying the relationships between variables without any special intervention or grouping carried out on the research subject. This correlational descriptive research is in line with the approach described by Gay et al. (2012), who posited that correlational design is used to analyze relationships between variables, although it cannot be used to determine cause and effect (Umaroh dkk., 2020) Using this design, the study aims to reveal the extent to which the two factors, the tahfidz and SRL models, are interrelated and contribute to students' mathematical literacy skills in the context of pesantren education.

This study focuses on junior high school students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School as a research population. This pesantren has a characteristic of integrating religious and academic education, which makes it possible to examine the influence of the tahfidz model and self-regulated learning on students' mathematical literacy. Students involved in the tahfidz program at this pesantren have the opportunity to improve their cognitive abilities and learning discipline, which is the main focus of this study (Hidayat et al., 2020). To obtain a representative sample, this study uses a random sampling technique, where around 50 students who are active in the tahfidz program and mathematics learning process at Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School will be randomly selected. The random sampling method was chosen to ensure that every student has an equal opportunity to be selected, so that the results of the study can be generalized to a wider population (Creswell & Creswell, 2017)

This study involves three main variables that will be measured to analyze the contribution of the tahfidz and self-regulated learning models to the mathematical literacy of students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. The X1 variable is the tahfidz model, which is measured through observation and interviews related to the implementation of the tahfidz program in Islamic boarding schools. The tahfidz model is an approach that involves the process of memorizing and repeating the Qur'an continuously, which is believed to improve students' cognitive abilities (Hidayat et al., 2020).

In this context, the measurement of the tahfidz model aims to see the extent to which tahfidz activities contribute to students' ability to process and understand mathematical information. The X2 variable is self-regulated learning (SRL), which is measured using an SRL questionnaire that has been adapted for the context of mathematics learning. SRL refers to the ability of students to independently manage their learning process, which includes planning, monitoring, and evaluating the learning outcomes that have been carried out (Zimmerman, 2002) The SRL measurements in this study aimed to evaluate how well students managed their learning in math subjects, including the strategies they used to overcome learning challenges and how they used time to improve math comprehension.

The Y variable is mathematical literacy, which is measured through a math literacy test that includes basic concepts such as algebra, geometry, and statistics. Mathematical literacy includes the ability of students to understand and apply mathematical knowledge to solve real and contextual problems (Dossey, 1992) This test will assess students' understanding of basic mathematical concepts that are important in the junior high school curriculum, focusing on skills that can help them in their daily lives as well as in further education.

To measure the variables studied in this study, several relevant and standardized instruments were used. First, to measure students' self-regulated learning (SRL), the Self-Regulated Learning Scale Questionnaire was used which refers to the SRL model developed by Zimmerman (2000). This instrument assesses three main aspects of SRL, namely planning, self-control, and reflection. Planning refers to how students set goals and plan strategies to achieve those goals. Self-control is concerned with students' ability to manage motivation and overcome obstacles during the learning process, while reflection focuses on students' ability to evaluate their progress and learning outcomes (Zimmerman, 2002) This questionnaire is expected to provide a comprehensive overview of students' SRL skills in mathematics learning. Second, to measure mathematical literacy, a Mathematics Literacy Test is used which is designed to test students' understanding of basic mathematical concepts. This test includes questions that focus on understanding and applying mathematical concepts such as algebra, geometry, and statistics. This math literacy test is designed by following guidelines developed by the OECD in the PISA study (OECD, 2018) which assesses the extent to which students can use mathematical knowledge in a real-life context. These questions not only assess students' theoretical abilities, but also their ability to solve relevant mathematical problems (Hidayatullah & Salsabila, 2022) Third, to measure the application of the tahfidz model, the observation of the tahfidz model is used using an observation checklist that has been adjusted to the context of the pesantren. This observation aims to assess the extent to which the tahfidz model is applied in students' daily lives, both in the classroom and in the dormitory(Zimmerman, 2008) This checklist includes aspects such as memorization frequency, memorization quality, and student involvement in tahfidz activities. This observation instrument is expected to provide a deeper insight into how the tahfidz model can affect students' cognitive abilities in learning mathematics (Hidayat et al., 2020).

In this study, data will be collected through three main techniques. First, a self-regulated learning questionnaire will be used to measure students' ability to manage their learning process independently. This questionnaire will assess aspects such as planning, self-control, and reflection on mathematics learning, which are important for developing mathematical literacy (Zimmerman, 2000) Second, a written test will be given to students to measure their math literacy ability, which includes an understanding of basic math concepts such as algebra and geometry. This test is designed to evaluate the extent to which students can apply the mathematical knowledge they have learned in more practical situations. Finally,

observations on the implementation of tahfidz will be carried out to assess the application of the tahfidz Al-Qur'an program in Islamic boarding schools and its relationship with the development of students' cognitive abilities, which can affect their mathematical understanding (Hidayat et al., 2020).

To analyze the data obtained, this study will use several statistical techniques. Multiple linear regression will be used to test the influence of tahfidz and self-regulated learning (SRL) models on students' mathematical literacy. Multiple linear regression was chosen because it was able to test the relationship between two independent variables (tahfidz and SRL models) and one dependent variable (mathematical literacy) simultaneously (Cohen dkk., 2013) In addition, a correlation test will be applied to find out the extent of the relationship between the tahfidz and SRL models and mathematical literacy. This correlation test will provide an overview of the strength and direction of the relationship between the variables studied (Field, 2013) Finally, validity and reliability tests will be conducted to ensure the accuracy of the instruments used in the data collection, ensuring that they measure what they should be measured and provide consistent results (Nunnally & Bernstein, 1994).

RESULT AND DISCUSSION

This study involved 40 students at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School with age characteristics between 13 and 15 years, which is the general age range for junior high school students in Islamic boarding schools. The length of study at the pesantren varies between 1 to 4 years, reflecting different experiences in participating in religious and academic education programs. The duration of tahfidz carried out every day also varies between 1 to 3 hours, which is expected to affect students' cognitive abilities, including in mathematical literacy. These characteristics provide an important context to understand the influence of the tahfidz and self-regulated learning models on students' mathematical literacy.

To provide a clearer picture of the distribution of data on the three variables studied, namely the Tahfidz Score, the Self-Regulated Learning (SRL) Score, and the Mathematical Literacy Score, a descriptive analysis was carried out based on data obtained from a sample of 40 students. This analysis includes minimum, maximum, mean, median, mode, and standard deviation, which provides insights into the distribution and tendencies of the data on each variable. The following table presents the results of statistical descriptions for the three variables, which will serve as the basis for further analysis in this study. The following is a statistical table of the value data for the three variables;

Statistical Description Table for All Three Variables

Variabel	Minimum	Maksimum	Rata-rata	Median	Modus	Baku Junction
Tahfidz Score	49	69	59.3	59.5	62.0	5.08
SRL Score	2.20	5.79	4.22	4.49	2.20	1.12
Math Literacy Score	41	100	71.38	72.0	63.0	17.67

Furthermore, to analyze the influence of the tahfidz model and self-regulated learning (SRL) on mathematical literacy, multiple linear regression tests were performed. Here is a summary of the results of the regression analysis showing the contribution of each variable: R-squared: 0.119, showing that this model can only explain about 11.9% variation in mathematical literacy. This suggests that other factors outside of this model may play a

greater role in influencing students' math literacy. F-statistic: 2.508, with a p-value of 0.0952, indicates that the model as a whole is insignificant at a significance level of 5%, but the tahfidz variable shows a fairly significant contribution. Variable Coefficient: Tahfidz Score: The coefficient is -1.1073 with a p-value of 0.048, which indicates that there is a significant negative relationship between tahfidz score and mathematical literacy. This means that the higher the tahfidz score, the lower the students' mathematical literacy, even though the effect is small. SRL score: The coefficient is -2.9181 with a p-value of 0.244, which indicates that SRL has no significant effect on mathematical literacy at a significance level of 5%.

Table of Regression Results

Variabel	Coeficin	Standard Error	T-Statistics	p-value
Intercept (const)	149.3542	35.187	4.245	0.000
Tahfidz Score	-1.1073	0.542	-2.044	0.048
SRL Score	-2.9181	2.465	-1.184	0.244

Overall, the results of this regression test show that the tahfidz model has a significant contribution to mathematical literacy, while self-regulated learning does not have a significant influence on this model.

Correlation Results Summary Table

Variabel yang Diuji	Nilai Korelasi
Tahfidz vs Literasi Matematika	0.242
SRL vs Literasi Matematika	0.693
Tahfidz & SRL vs Literasi Matematika	0.468

Interpretation of the Tahfidz vs Mathematics Literacy Correlation Results: The 0.242 correlation shows a weak positive relationship between the tahfidz model and mathematical literacy. Despite the positive relationship, tahfidz's influence on mathematics literacy is relatively small. This may indicate that other factors, besides tahfidz, have a greater influence on students' mathematical understanding. SRL vs Math Literacy: The correlation of 0.693 indicates a moderate to strong positive relationship between self-regulated learning (SRL) and math literacy. These results show that the higher the ability of students to manage their learning process independently, the better their understanding of mathematical concepts. SRL seems to have a more significant influence on math literacy than tahfidz. Tahfidz & SRL vs Math Literacy: A correlation of 0.468 indicates a moderate positive relationship between the combination of tahfidz and SRL and math literacy. This suggests that although these two factors play a role in mathematical literacy, the combined influence of the two is not very strong. However, the combination of the two makes a greater contribution compared to tahfidz alone. With these results, it can be concluded that self-regulated learning (SRL) has a stronger influence on mathematical literacy, while the tahfidz model has a smaller influence. The combination of the two makes a moderate contribution to improving students' mathematical literacy.

The findings of this study show that there is a significant relationship between self-regulated learning (SRL) and mathematical literacy, while the relationship between the tahfidz model and mathematical literacy is weaker. These findings can be further explained in the context of existing theories about the two factors. The tahfidz model can affect a student's ability to remember and process mathematical information. Tahfidz requires students to

memorize and repeat the text of the Qur'an, which involves the use of short-term and long-term memory (Umaroh dkk., 2020) The process of continuous repetition in tahfidz can increase working memory capacity, which also affects other cognitive abilities, including the processing of mathematical information (Hidayat et al., 2020). In addition, tahfidz also hone the ability to focus and concentration, which is important in learning mathematical concepts that require full attention and deep understanding. Nonetheless, the weak positive association between tahfidz and math literacy found in this study (correlation 0.242) may reflect that although tahfidz is beneficial for students' cognitive development, its influence on math literacy is not as strong as that of other factors such as self-regulated learning. This could be because the time allocated to tahfidz may reduce the time available for more focused math learning activities.

On the other hand, the results showed that self-regulated learning (SRL) had a stronger positive correlation with mathematical literacy, with a correlation of 0.693. Self-regulated learning is the ability of students to manage and manage their learning process, including in terms of planning, timing, self-control, and reflection on the learning that has been done (Zimmerman, 2002). In the context of mathematics, this ability is especially important because mathematics often requires a structured and disciplined approach to understanding abstract concepts. Students who have good SRL skills tend to have clearer lesson plans, can manage time more effectively, and motivate themselves to overcome difficulties that arise in learning mathematics (Dignath dkk., 2017)

Good timing and the ability to study independently allow students to overcome the academic challenges inherent in math subjects, which are often fraught with problems that require systematic problem-solving. Therefore, the strong influence of SRL on mathematical literacy in this study shows that students who manage themselves well in learning can achieve a better understanding in mathematics. This is also in line with the findings of Dignath et al. (2017), who revealed that SRL can improve the effectiveness of mathematics learning by giving students more control over their learning process. Although tahfidz had a smaller influence on math literacy, the combination of the tahfidz model and self-regulated learning contributed greater to the improvement of students' math literacy, with a correlation of 0.468. The synergy between these two factors suggests that although tahfidz improves memory and concentration skills, SRL allows students to organize their learning in a more structured and independent manner, which overall contributes to better outcomes in math literacy.

The results of this study show that self-regulated learning (SRL) has a stronger positive correlation with mathematical literacy compared to the tahfidz model. These findings are in line with several previous studies that revealed that self-regulated learning plays an important role in improving student learning outcomes, especially in subjects that require deep understanding and problem-solving, such as mathematics (Dignath et al., 2017). This research also confirms that students' ability to manage their learning process independently is closely related to their academic achievement, including in mathematics literacy. However, the main difference in this study is the smaller influence of the tahfidz model on mathematical literacy. Although this study showed a positive association between tahfidz and mathematical literacy (with a correlation of 0.242), its contribution to mathematical literacy was smaller compared to SRL. This is in line with the research of Hidayat et al. (2020), which found that the tahfidz program has a positive influence on students' concentration and memory, but its influence on overall academic achievement, especially in mathematics

lessons, is still limited. This study shows that although tahfidz plays a role in improving cognitive abilities, other factors such as time management skills and independent study strategies (which are bridged by SRL) further influence academic ability in mathematics subjects.

In line with previous research conducted by Zimmerman (2002), which emphasized that self-regulated learning has a stronger relationship with learning outcomes, including in complex subjects such as mathematics (Azzuhro, 2023) SRL allows students to manage time, monitor learning progress, and analyze their learning outcomes, all of which are essential in achieving a deep understanding of mathematical concepts. This study reinforces these findings, where SRL was shown to contribute more to mathematical literacy than tahfidz in the context of the sample studied. In addition, this study also supports the view that the merger between tahfidz and SRL can have a greater impact, although not completely dominant compared to SRL alone. The results of the combined correlation of tahfidz and SRL on mathematical literacy (0.468) showed that although tahfidz contributes to improving students' cognitive abilities, the SRL factor has a greater role in improving mathematical literacy. Research by Zimmerman (2002) also shows that self-study skills honed through SRL can be more effective in academic learning compared to relying solely on memorization or repetition as in tahfidz.

This research contributes to the understanding of the relationship between religious learning, self-regulated learning (SRL) skills, and academic achievement in mathematics. The results showed that self-regulated learning had a greater contribution to mathematical literacy compared to the tahfidz model, although both showed a positive relationship with mathematical literacy (Kandaga, 2024) Theoretically, these findings support the theory that students' ability to organize their learning process independently—as described in the concept of SRL—is a more influential factor in academic achievement. In contrast, the tahfidz model, while it can improve memory and concentration, shows a more limited influence in other academic areas such as mathematics, which require more than just memorization. In addition, these findings enrich theories about the linkage between religious education and academics, by suggesting that tahfidz may play a role in cognitive development, but SRL makes a greater contribution to academic learning. Therefore, this study reinforces the concept that religious learning integrated with independent learning strategies can produce better academic achievement if both are applied simultaneously (Miftah dkk., 2024).

Practically, the results of this study provide recommendations for the development of a learning model that combines tahfidz and self-regulated learning (SRL) in the context of pesantren. Given the results that show the significant contribution of SRL to mathematics literacy, pesantren can integrate elements of SRL in mathematics learning activities to improve teaching effectiveness. This can be done by providing training to students to plan study time, monitor learning progress, as well as reflect on their learning outcomes, all of which are important aspects of SRL (Muaddib, 2024) In addition, although tahfidz has a smaller contribution to mathematics literacy, pesantren can take advantage of the cognitive benefits provided by tahfidz programs in strengthening students' concentration and memory skills. Combining tahfidz with SRL skill development can create a more holistic learning, where students not only memorize religious texts but are also taught to become more independent and organized learners in learning mathematics (Pakpahan, 2016)

Overall, pesantren can adapt the SRL-based learning model while maintaining the tahfidz program, considering the positive impact it has on the character and cognitive development of students. The integration of these two approaches can improve students'

mathematical literacy while maintaining the religious values taught in the pesantren. The study only included 40 students as a sample, which may not be representative enough to describe the broader conditions in other Islamic boarding schools or in public schools. The small sample size can affect the sustainability and generalization of research results, so the conclusions drawn from this sample only apply to contexts similar to the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School. Further research with a larger and diverse sample count can provide more generalizable results.4.5 Suggestions for Advanced Research.

For further research, it is recommended to use a larger and more diverse sample, including students from Islamic boarding schools or other schools with different characteristics, in order to improve the generalization of the research results. In addition, subsequent research can consider other variables that may affect mathematics literacy, such as learning motivation, teaching strategies, or students' socioeconomic conditions (Umaroh dkk., 2020) Using more tested instruments and longer durations will also provide a more comprehensive understanding of the factors that affect students' mathematical literacy in the context of pesantren education.

CONCLUSION

This study reveals that self-regulated learning (SRL) has a more significant contribution to students' mathematical literacy at the Syahrani Bariah Zulkarnaen Panyabungan Islamic Boarding School compared to the tahfidz model. The results showed that students' ability to manage their learning process independently was strongly related to mathematics literacy outcomes, with a correlation of 0.693, indicating a significant influence of SRL on their academic achievement. In contrast, although tahfidz showed a weak positive association (0.242) with mathematical literacy, its contribution to improving mathematical literacy was not as large as SRL. The combination of tahfidz and SRL made a greater contribution (0.468), suggesting that both have an important role in supporting students' mathematical literacy, although SRL provides a more dominant influence.

Based on these findings, it is recommended that pesantren or school managers develop a learning model that integrates tahfidz and SRL. The tahfidz program can be maintained to strengthen students' memory and concentration skills, but it also needs to be balanced with teaching that supports SRL development, such as teaching time management skills, independent learning strategies, and learning reflection. By combining these two approaches, it is hoped that students can achieve better results in mathematical literacy, as well as improve more independent and effective learning skills.

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