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The Influence of the Mikir Learning Model & Drill Method on Students' Mathematical Argumentation Ability

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ABSTRACT

This study aims to analyze the effect of the MIKiR and Drill learning models on the argumentation skills of students at MTs Hifzil Qur'an Medan. This research used a quantitative approach with a posttest-only design. The population consisted of 216 students categorized into high, medium, and low Mathematical Initial Ability (MIA) groups. Using a non-probability sampling technique, the sample size totaled 110 students, with 34 students in the conventional group, 39 students in the MIKiR group, and 37 students in the Drill group. The data were analyzed using descriptive analysis, following prerequisite testing with a two-way ANOVA test. The results showed that both the MIKiR and Drill learning models had a significant effect in improving the argumentation skills of MTs Hifzil Qur'an Medan students, with the average scores of the MIKiR group (79.10) and the Drill group (79.46) being higher than those of the conventional group (73.38).

Key Word *Argumentation Ability, Mathematical Initial Ability (MIA), MIKiR, Drill.*

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INTRODUCTION

The outbreak of Coronavirus Disease 19 (Covid-19), which struck Indonesia for approximately a year and a half, has caused significant damage across all sectors, particularly in the field of education. As of January 2022, many regions, especially the city of Medan, have entered level 2, allowing schools and Islamic boarding schools (pesantren) to conduct face-to-face learning while strictly adhering to health protocols. During the pandemic, schools intending to hold in-person learning must comply with government-recommended health protocols. These include implementing a limited face-to-face learning system, with classes conducted at 50% capacity, and enforcing the 3M protocols: wearing masks, maintaining physical distance, and washing hands with soap. However, the situation differs for pesantren. According to regulations issued by the Ministry of Religious Affairs, several requirements

must be met for pesantren to conduct 100% face-to-face learning during the pandemic: 1) Establishing a Covid-19 task force, 2) Providing facilities that comply with health protocols, 3) Ensuring the pesantren is Covid-19 safe, proven by a certificate from the Covid-19 task force or local government, and 4) Ensuring that leaders, managers, teachers, and students are in good health, supported by a health certificate from local healthcare facilities. One pesantren that has implemented face-to-face learning in accordance with government regulations is Ma'had Tahfizhil Qur'an. The health protocols followed by Ma'had Tahfizhil Qur'an include: 1) Providing health protocol facilities such as masks, sinks, and hand soap, 2) Periodically spraying classrooms and other facilities with disinfectant, 3) Requiring students to be vaccinated, and 4) Displaying health message banners to encourage compliance with health protocols, proper sneezing and coughing etiquette, and more. These measures help ensure that the environment remains clean and sterile, minimizing the risk of Covid-19 transmission among students. Ma'had Tahfizhil Qur'an oversees various educational institutions, one of which is Madrasah Tsanawiyah Hifzil Qur'an. The learning process at Madrasah Tsanawiyah Hifzil Qur'an is conducted face-to-face while strictly following government health protocols. In the learning process, teachers have made many modifications to adapt to the conditions of the pandemic, which is essential given that learning during the pandemic differs significantly from pre-pandemic times. In Madrasah Tsanawiyah Hifzil Qur'an, many adjustments have been made, such as reducing class time by 5 minutes per lesson and limiting classroom capacity to 50%. The teaching methods used by teachers are also varied. Based on observations conducted by the researcher on October 12, 2021, it was found that teachers at MTs. Hifzil Qur'an often modified their teaching methods, especially in mathematics lessons. Some methods identified by the researcher include discussions, mind mapping, Realistic Mathematics Education (RME), and showing mathematics learning videos with the help of an Infocus projector. However, according to the researcher's observations, these efforts have not yet yielded optimal results, particularly regarding students' ability to understand, argue, and express their opinions when asked to explain proof-related problems, either individually in front of the class or in group discussions.

An argument can be considered important in mathematics when it is connected to logical thinking, which is evident when constructing a proof. A proof is a series of logical arguments that demonstrate the truth of a statement, which can be achieved through explanation. This explanation aims to help readers, listeners, or viewers understand the truth of what is being conveyed. Strong argumentation skills significantly impact the process of constructing

mathematical proofs. One branch of mathematics that heavily relies on proof and argumentation is geometry. Geometry is often disliked by students, as shown by research from Sunardi and Yudianto (2015), where the results from 82 research samples indicated that students' geometry scores were low, with an average score of less than 60. Ahmad Faruq (2014) also supported this finding, showing in his research that 62.5% of students experienced difficulties in constructing proofs to solve problems in geometry. Mutohar (2016) confirmed this as well, stating that poor understanding of the concepts of similarity and congruence leads to errors in problem-solving. Similarly, Retnosari (2017) explained that the ability to argue when explaining similarity and congruence among pre-service teachers at Sanata Dharma University Yogyakarta was still low. According to the National Council of Teachers of Mathematics (2000), argumentation in proof is essential at every educational level, and they recommend: first, students should recognize reasoning and proof as fundamental aspects of learning mathematics; second, students should reexamine mathematical conjectures; third, students should develop and evaluate arguments and proofs; and fourth, students should select and use various types of reasoning and methods of proof. The low ability in constructing proofs results in poor argumentation skills, a situation that is also found at MTs. Hifzil Qur'an. Based on the results of an observation conducted by the researcher on October 15, 2021, where a test on geometry material was administered, it was found that the average percentage of students who answered the test correctly was 66.67%. However, the percentage of students able to correctly state a conjecture, explanation, or conclusion (claim) was only 50.00%. Furthermore, the percentage of students who could provide supporting data or justification for their answers (evidence) was 10.00%. The percentage of students who could express the basic assumptions linking explanations and data was only 6.67%. Additionally, 33.00% of students were unable to answer correctly.

The results of this initial mathematical ability test will also become a focus for the researcher, to determine whether students with strong initial mathematical abilities are aligned with strong argumentation skills, or whether the opposite is true.

RESEARCH METHOD

This research uses a quantitative approach with a posttest-only research design. The population consists of 216 students categorized into high, medium, and low levels of initial mathematical ability (IMA). Using a non-probability sampling technique, the total sample size for this study is 84 students, divided

into three groups: 28 students in the conventional group, 28 students in the MIKiR group, and 28 students in the Drill group. The data were analyzed using descriptive analysis, preceded by prerequisite testing through a two-way ANOVA test.

RESULTS AND DISCUSION

The following is the researcher's documentation of the observation regarding the initial test and students' answers related to proving similar plane figures.

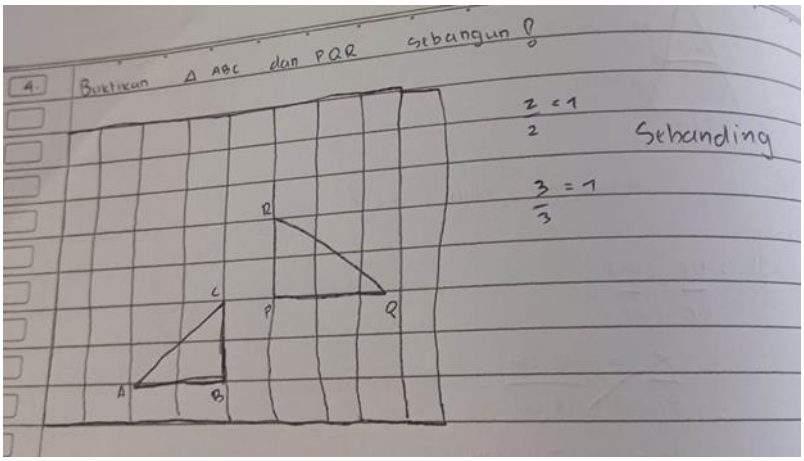

Figure 1.
Initial Test Documentation

From the example answers above, researchers can conclude that students' argumentation skills are not yet optimal. The following are the scores obtained by 30 students in table form:

Table 1.
Initial Argumentation Ability Results

No	Answer Assessment	Number of Students	Percentage
1	Provided a Claim	15 Students	50%
2	Provided Evidence with Data	3 Students	10%
3	Provided Evidence with Data and Supporting Arguments	2 Students	6.67%
4	Incorrect Answer	10 Students	33%

From these data, the researcher concludes that students' reasoning and proof abilities, as an implication of their argumentation skills, are still considered low. Likewise, students' creativity in providing arguments remains low. According to Hartatiana (2011), the abilities that students must learn and master during the mathematics learning process in class are not only about

solving problems but also about learning to argue systematically. The argumentation referred to here involves being able to explain how to understand proofs, how to prove, and how to decide on the correct methods or solutions in problem-solving. Argumentation skills require good reasoning abilities to ensure that the arguments presented are of high quality. Reasoning ability is just as crucial in today's era. According to Whitenack & Yackel (2006), argumentation skills are closely related to reasoning ability, because without reasoning, students cannot develop strong argumentation skills. In the era of the 4.0 revolution, where information flows rapidly from various sources, including print and digital media, strong reasoning abilities are essential, especially to filter between true information and misinformation or hoaxes. The overwhelming flow of information, particularly from social media, demands strong reasoning skills to prevent individuals from being misled or even entangled in legal problems. With good reasoning abilities, students are expected to be able to choose correct and acceptable information while rejecting false or misleading information. Considering the importance of these skills, there is a need for a learning model that can train students' argumentation skills in mathematics learning.

In this context, the researcher considers that the MIKiR learning model (Experiencing, Interaction, Communication, Reflection) can be a suitable mathematics learning model to train students' reasoning and argumentation abilities. Moreover, in its implementation, MIKiR can serve as a bridge between the abstract concepts of mathematics and the real world. This can be done through stages where students are encouraged to investigate how they know that their solution to a problem is correct. At this stage, students are invited to think and translate their understanding of the given problem into mathematical forms, either directly or indirectly. This stage is called the Experiencing stage, where students are asked to observe and perform activities.

The second stage requires students to directly express their thoughts regarding the solution to a given problem and write them on paper, followed by discussing their ideas in small groups, thus initiating a reasoning process. As a result, argumentation skills are also developed. This phase is called the Interaction, Communication, and Reflection stage.

The process of developing argumentation skills also requires high creativity to enhance students' learning abilities in formulating arguments for each problem or task given. Therefore, a method to achieve this goal is necessary. Roestiyah (2012) defines the drill method as a teaching technique involving repeated practice activities, where students achieve higher levels of dexterity and skill than what was initially learned. The researcher considers

that the drill method can be applied to train students to become more proficient in argumentation. By providing structured practice, it is hoped that students' skills in delivering high-quality arguments will improve.

Thus, students' argumentation abilities are highly dependent on the learning models that focus on improving their argumentation skills, and regular practice is needed to raise their ability to argue effectively. The MIKiR learning model and the drill method can be considered solutions to address this issue. In line with these solutions, students will also be given an initial mathematical ability test. Shodikin (2015) explains that students with low initial ability will find it more difficult to acquire new knowledge and relate it to their previous knowledge. Meanwhile, students with high initial ability tend to find it easier to absorb new information and connect it to what they already know. Therefore, measuring students' initial mathematical abilities is necessary to ensure that the research produces deeper and more measurable results for each student sampled in this study.

Discussion

In this study, the researcher first conducted a Mathematical Initial Ability (MIA) test on the students who would be used as research samples. This test aimed to determine the students' initial understanding levels, categorized as high, medium, and low MIA. After administering the test, the researcher analyzed the results and then applied different learning models to the sample classes. The researcher had already prepared learning instruments tailored to each specific learning model.

Furthermore, the researcher prepared a set of questions intended to assess students' mathematical argumentation abilities. These questions had been previously tested on grade X students at MA Tahfizhil Qur'an, Yayasan Islamic Centre Sumatera Utara, who had already learned about similarity and congruence. Based on the results of this trial, the researcher performed tests for validity and reliability, and analyzed the difficulty and discrimination indices to ensure the questions were appropriate and suitable for measuring students' argumentation skills.

Following this, the researcher applied the conventional learning method in class IX-2, the MIKiR learning model in class IX-5, and the drill method in class IX-6. Subsequently, the researcher conducted normality and homogeneity tests on the results of the learning model applications, obtaining data through SPSS software that showed the results were normally distributed and homogeneous. The researcher then performed a two-way ANOVA test to answer the study hypotheses. The results are as follows:

The first hypothesis test concluded that Mathematical Initial Ability (MIA) influences students' mathematical argumentation skills. Why is this the case? Based on the researcher's observations, providing mathematical initial ability questions allowed students to form an early understanding of the material to be taught. Through these questions, students were also able to express their initial opinions about the subject. However, their ability to express opinions was still not adequate, as shown by the average initial ability test scores of about 60–62. This means that while they could form opinions, they had not yet mastered the skill of presenting arguments properly and effectively.

The second hypothesis test concluded that the type of learning model influences students' mathematical argumentation ability. Why does this happen? According to the researcher's observations, every model applied had an effect on students' argumentation skills, but different models produced different results in terms of students' abilities. This can be seen in this study: students taught through the conventional method achieved an average score of 73.38, those taught with the MIKiR learning model scored an average of 79.10, and those taught using the drill method achieved an average of 79.46.

This proves that the MIKiR and drill learning models produced better results compared to the conventional method. According to the researcher's observation, the MIKiR model stimulated students to actively express their opinions through peer interaction, personal learning experiences, and communication supported by teacher guidance and reflection, which helped students reinforce what they had learned and strengthen their argumentation skills.

Similarly, the drill method also had a positive effect on students' argumentation abilities, as good communication between teachers and students and structured practice helped sharpen students' ability to formulate arguments. Meanwhile, in the conventional method, students mainly received lectures about the subject matter, resulting in monotonous learning and a lack of positive space for students to develop their argumentation skills.

The third hypothesis test concluded that there is no interaction between Mathematical Initial Ability (MIA) and the learning model in influencing students' mathematical argumentation skills. Based on the researcher's analysis, students' initial mathematical ability scores did not consistently align with their argumentation ability scores within the applied learning models. In other words, a student with low initial ability could achieve an argumentation score equal to that of a student with medium initial ability.

For example, under the MIKiR learning model, a student named Faizah Ulima had a MIA score of 40 points (low MIA category), while another student,

Fiki Masrura, had a MIA score of 70 points (medium MIA category). However, both students achieved an argumentation score of 75 under the MIKiR model application. This demonstrates that there was no interaction between initial mathematical ability and learning models in influencing students' mathematical argumentation skills. Further details can be seen in the following tables and graphs:

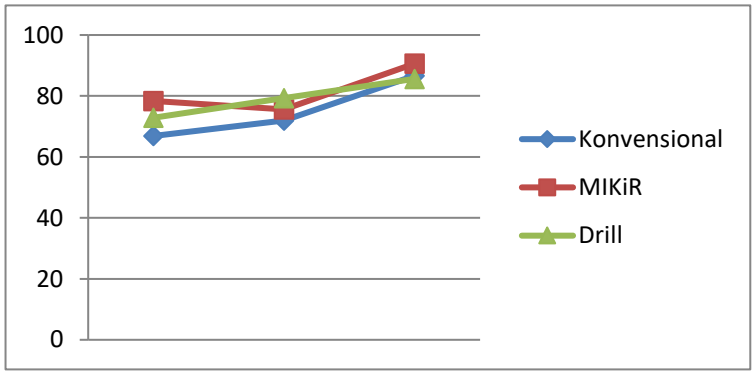

Figure 2.
MIKiR Learning Model Graph

CONCLUSION

The results of this study can be concluded that the MIKiR learning model and the drill method have a more significant influence on the mathematical argumentation ability of grade IX students of MTs. Hifzil Qur'an in the 2021-2022 academic year. This conclusion can be proven by looking at the average value of students' argumentation ability. The MIKiR and drill learning models have higher results than the results of argumentation ability using conventional methods. The MIKiR learning model and the drill method obtained average values of 79.10 and 79.46 respectively, while the conventional method obtained an average value of 73.38.

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