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STUDENTS' SELF-CONFIDENCE IN KNISLEY MATHEMATICS LEARNING WITH A CONSTRUCTIVIST APPROACH

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ABSTRACT Self-confidence among students majoring in Mathematics Education (Tadris Matematika) is a crucial aspect, given that they are future mathematics teachers. Observations reveal that 50% of second-semester Mathematics Education students at IAIN Kerinci exhibit low self-confidence, as evidenced by their difficulties in clearly defining problems. They also tend to lack ideas, struggle to eliminate inefficient alternatives, and face challenges in selecting the ideal options. Additionally, they often fail to recognize the impact of the solutions they choose. Therefore, a learning model that can enhance students' self-confidence is needed, such as the Knisley mathematics learning model with a constructivist approach. This study aims to examine the effect of the Knisley mathematics learning model with a constructivist approach on the self-confidence of Mathematics Education students at IAIN Kerinci. The study employed a quantitative method with an experimental approach. The population consisted of 34 second-semester Mathematics Education students at IAIN Kerinci. The instrument used was a self-confidence questionnaire. The results showed that the self-confidence of students who participated in the Knisley mathematics learning model with a constructivist approach was higher than that of students who followed the conventional learning model. Thus, the application of the Knisley mathematics learning model with a constructivist approach has a positive impact on the self-confidence of Mathematics Education students at IAIN Kerinci.

Keywords: self-confidence, knisley mathematics learning, constructivism

ABSTRAK Self-confidence mahasiswa jurusan Tadris Matematika merupakan aspek krusial, mengingat mereka adalah calon guru matematika. Berdasarkan observasi, ditemukan bahwa 50% mahasiswa Tadris Matematika semester II di IAIN Kerinci memiliki self-confidence yang rendah, yang tercermin dari kesulitan mereka dalam mendefinisikan masalah dengan jelas. Mereka juga cenderung kekurangan gagasan, mengalami kesulitan dalam mengeliminasi alternatif yang kurang efisien, serta kesulitan menentukan pilihan atau opsi yang ideal. Selain itu, sering kali mereka tidak menyadari dampak dari solusi yang mereka pilih. Oleh karena itu, diperlukan model pembelajaran yang mampu meningkatkan self-confidence mahasiswa, yaitu model pembelajaran matematika Knisley dengan pendekatan konstruktivisme. Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran

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matematika Knisley dengan pendekatan konstruktivisme terhadap self-confidence mahasiswa jurusan Tadris Matematika IAIN Kerinci. Penelitian ini menggunakan metode kuantitatif dengan pendekatan eksperimen. Populasi penelitian adalah mahasiswa Tadris Matematika semester II IAIN Kerinci yang berjumlah 34 orang. Instrumen yang digunakan adalah angket self-confidence. Hasil penelitian menunjukkan bahwa self-confidence mahasiswa yang mengikuti model pembelajaran matematika Knisley dengan pendekatan konstruktivisme lebih baik dibandingkan dengan self-confidence mahasiswa yang mengikuti model pembelajaran konvensional. Dengan demikian, terdapat pengaruh positif penerapan model pembelajaran matematika Knisley dengan pendekatan konstruktivisme terhadap self-confidence mahasiswa jurusan Tadris Matematika IAIN Kerinci.

Keywords: kepercayaan diri, pembelajaran model knisley, kontruktivisme

INTRODUCTION

At the university level, particularly in mathematics departments, a deep understanding of mathematical concepts is essential. In addition to testing cognitive abilities, students often face psychological challenges, especially regarding their confidence in their mathematical skills. This lack of confidence can have serious consequences, lowering motivation, reducing active participation in the learning process, and ultimately impacting overall academic performance. Andayani and Amir (2019) stated that self-confidence is a crucial aspect for individuals and is one of the prerequisites for developing activities and creativity to achieve optimal learning outcomes. Martyanti (as cited in Trisnawati, 2015) also noted that success in learning mathematics tends to be higher in individuals with a high level of self-confidence. Therefore, this issue is not only related to understanding mathematical concepts but also involves psychosocial aspects that influence students' overall learning experience.

Self-confidence is crucial for students in the Mathematics Education department, particularly because they are future teachers. Rahman & Nisa (2020) define self-confidence as a positive attitude in which a person feels they have the skills or abilities to form positive judgments about themselves and their environment. Good self-confidence not only affects the quality of their teaching but also plays a significant role in forming positive relationships with their students. A confident mathematics teacher can effectively overcome challenges in delivering material and inspire students' motivation through strong role modeling and interpersonal skills. This aligns with the role of teachers, which is not only limited to transferring knowledge but also includes serving as motivators to enhance students' academic achievements (Manizar, 2015). Therefore, self-confidence is not just a personal attribute but a key element in shaping an effective and influential mathematics teacher.

An interview with a lecturer from the Mathematics Education (Tadris Matematika) program at IAIN Kerinci revealed that some students still have low self-confidence. This was evident when they attempted to solve problems, where they struggled to

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clearly define the issues, had few ideas, found it difficult to eliminate inefficient alternatives, were unable to make ideal choices, and were not fully aware of the consequences and impacts of the solutions they chose. Alawiyah (2022) states that individuals with good self-confidence exhibit confidence and assertiveness in solving various academic problems. Conversely, students with low self-confidence tend to be more vulnerable to feelings of pessimism when facing life experiences (Yulianto et al., 2020). As a result, their learning motivation is hindered, which negatively affects their academic readiness, making them less prepared to become competent mathematics teachers in line with the vision and mission of the Mathematics Education program at IAIN Kerinci.

To address this issue, a learning model that can enhance students' self-confidence is needed, such as the Knisley Mathematics Learning Model with a constructivist approach. This model consists of four stages: first, the lecturer acts as a storyteller, and students formulate new concepts based on their prior knowledge (concrete-reflective); second, the lecturer acts as a guide, and students analyze and compare concepts (concrete-active); third, the lecturer acts as a resource person, and students solve problems using logic (abstract-reflective); and finally, the lecturer acts as a coach, and students apply concepts to solve problems (abstract-active) (Ginting et al., 2024). This model is engaging because it actively involves both lecturers and students, with different roles at each stage. The advantage of this model is that it fosters student engagement, creating a meaningful learning process (Sunanti et al., 2017).

The constructivist approach supports students in understanding mathematical concepts and allows for holistic and contextual learning, empowering them to actively construct knowledge (Mulyati, 2016). Constructivist theory emphasizes that lecturers act as facilitators, while students are responsible for constructing their knowledge (Aditya et al., 2012). Supardan (2016) adds that learners actively construct their knowledge, with social interaction playing a key role in this process. Riyanto & Siroj (2011) also state that group discussions can enhance students' reasoning skills and mathematical achievement.

Previous research has shown that the Knisley Mathematics Learning Model supports success in mathematics learning, especially in improving mathematical connections and students' self-confidence compared to conventional or expository models. This study explores the self-confidence of students as future mathematics teachers using Knisley Mathematics Learning Model with a constructivist approach and analyzes its impact on their self-confidence.

METHODS

This study employs a quantitative research approach with an experimental design. The experimental method is used to observe the effects of a treatment and the influence of the independent variable on the dependent variable (Sugiyono, 2009).

The research design applied is "The Static Group Comparison: Randomized Control Group Only Design." In this design, there are two groups: the experimental group and the control group. The experimental group receives the treatment using the Knisley Mathematics Learning Model with a constructivist approach, while the control group does not receive this treatment. After the treatment, both groups are given a questionnaire to measure the students' self-confidence.

The population in this study consists of 34 second-semester students from the Mathematics Education (Tadris Matematika) program at IAIN Kerinci, with 17 students in class A and 17 students in class B. Since the total number of students is fewer than 100, the entire population was used as the research sample, known as total sampling (Sugiyono, 2009). Class A was designated as the control group, which received conventional teaching methods, while class B was designated as the experimental group, which received instruction through the Knisley Mathematics Learning Model using the constructivist approach. The teaching was conducted in a Trigonometry course focusing on trigonometric functions, with a total of four sessions (8 credit hours). After four sessions using the Knisley Mathematics Learning Model, a fifth session was dedicated to administering the self-confidence questionnaire to both groups.

The instrument used in this study is a self-confidence questionnaire, consisting of 10 positive and 10 negative questions, administered at the end of the sixth session. To ensure the quality of the questionnaire, it was validated by two lecturers from the Mathematics Education Department at IAIN Kerinci. Revisions were made based on the validators' feedback, and the questionnaire was then tested on fourth-semester students in class A of the same department. The test results were analyzed to determine the validity and reliability of the questionnaire, with validity calculated using the product-moment correlation formula, and reliability calculated using Cronbach's Alpha formula.

Data analysis was conducted using hypothesis testing with a t-test to examine the difference in means between the control and experimental groups (Lestari & Yudhanegara, 2018). Before the t-test, normality testing was performed using the Kolmogorov-Smirnov test, and homogeneity testing was conducted using the Bartlett test to ensure that the data were normally distributed and had homogeneous variances. Data processing and analysis were carried out using SPSS version 26, along with manual calculations.

FINDING AND DISCUSSION

The results of the questionnaire trial demonstrated the validity of each item and the overall reliability of the instrument. First, the validity of the instrument was calculated using the Product Moment correlation formula with the assistance of SPSS 26, where all 20 items were found to be valid since their rhitung values were

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greater than the rtabel value. With df = (N-2) = 18, the rtabel value was 0.4438. The validity results for each item are as follows:

Table 1 Validity of Questionnaire Items

Item number	r count	r table	Validity
1	0.696	0.4438	Valid
2	0.761	0.4438	Valid
3	0.845	0.4438	Valid
4	0.915	0.4438	Valid
5	0.765	0.4438	Valid
6	0.906	0.4438	Valid
7	0.652	0.4438	Valid
8	0.848	0.4438	Valid
9	0.835	0.4438	Valid
10	0.906	0.4438	Valid
11	0.845	0.4438	Valid
12	0.915	0.4438	Valid
13	0.764	0.4438	Valid
14	0.779	0.4438	Valid
15	0.835	0.4438	Valid
16	0.906	0.4438	Valid
17	0.849	0.4438	Valid
18	0.779	0.4438	Valid
19	0.845	0.4438	Valid
20	0.779	0.4438	Valid

The reliability of the questionnaire was calculated using the Alpha Cronbach formula with SPSS 26, resulting in a reliability coefficient of 0.974, indicating that the questionnaire has very high reliability since the value lies between 0.80 and 1. Next, the questionnaire results for the experimental and control classes are as follows:

Table 2 Average Percentage of Self-Confidence Questionnaire Scores

Self-Confidence Indicator	Percentage (%)	
	Control Class	Experiment Class
Confidence in one's own ability	42,31 %	59,74 %
Acting independently	54,06 %	58,82 %
Having a positive self-concept	46,73 %	57,84 %

Self-Confidence Indicator	Percentage (%)	
	Control Class	Experiment Class
Courage to express opinions	40,32 %	55,21 %
Average	45,85 %	57, 90%

Based on the average percentage of the self-confidence questionnaire scores presented in the table above, it is clear that students taught using the Knisley Mathematics Learning Model exhibited higher self-confidence than those taught using conventional methods.

For normality testing using the Kolmogorov-Smirnov test with SPSS 26, the significance values for both classes were greater than the significance level of 0.05, with 0.052 for the experimental class and 0.325 for the control class, indicating that the data for both groups are normally distributed. Homogeneity testing using the Bartlett test with SPSS 26 resulted in a significance value of 0.701, which is greater than the alpha value of 0.05, confirming that both groups have homogeneous variances. Hypothesis testing using the t-test with SPSS 26 revealed that the significance (2-tailed) value was 0.000, which is less than the significance level of 0.05. This indicates a significant effect of the Knisley Mathematics Learning Model with a constructivist approach on the self-confidence of Mathematics Education students at IAIN Kerinci.

Students' self-confidence improved because the Knisley Mathematics Learning Model with a constructivist approach encourages active participation throughout the learning process. In the first stage, the lecturer explains the concepts figuratively, based on the students' prior knowledge. In the second stage, the lecturer guides and motivates students within their groups to explore, experiment, measure, and compare, enabling them to distinguish the new concept from the previous one and identify its characteristics. The third and fourth stages encourage students to develop discipline and structure in creative problem-solving activities. These four stages are vital in helping students build their understanding. The learning process focuses on activating students to develop attitudes, skills, and knowledge through direct experience (Soraya et al., 2022).

In this learning process, students are encouraged to express their opinions and are trained to share information obtained through the construction of discovered concepts. Students also become accustomed to constructing their knowledge to find solutions and strategies for solving mathematical problems that require precise analytical processes. This aligns with Purwasih's (2015) view that self-confidence grows through a learning process that emphasizes critical thinking and analysis in finding independent solutions to mathematical problems. Furthermore, the interactions during the learning process—both between lecturers and students and among students themselves—foster students' ability to express their opinions

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confidently and respect others' viewpoints. Throughout the learning process, students were visibly active and enthusiastic in expressing their opinions and challenging their peers, confident in their ability to find solutions to mathematical problems. Therefore, it can be concluded that the implementation of the Knisley Mathematics Learning Model with a constructivist approach has a direct impact on developing students' self-confidence in mathematics learning.

The learning process in the control class was predominantly led by the lecturer. At the beginning of the lesson, the lecturer presented the learning objectives, followed by delivering information and material through lectures. Interaction during the learning process was limited to small discussions between the lecturer and students regarding unclear points. Students were not actively involved in constructing their understanding of new concepts or finding solutions to the problems presented.

Moreover, students were not encouraged to express their opinions or share their thoughts on the given problems, as all information sources came from the lecturer. If there were any concepts or steps that students did not understand, the lecturer would explain them directly. The lack of student confidence in their abilities was evident when they were reluctant to attempt solving practice problems and preferred to wait for other students to finish or for the lecturer's explanation. This is consistent with Walgio's opinion (Purwasih, 2015), which states that self-confidence can be fostered by creating a democratic learning environment where individuals are trained to express their opinions in front of the class, promoting social interaction and independent thinking.

In the experimental class, the lecturer used the Knisley Mathematics Learning Model with a constructivist approach. This model encourages students to be actively involved in the learning process (Ma'rifah, 2021). Students were encouraged to express their opinions on solutions or strategies for solving mathematical problems, which helped build their confidence in their abilities, thus indirectly promoting the development of self-confidence among students.

In contrast, in the control class, the learning process was centered on the lecturer, who played a dominant role in delivering information related to the material. Students, as passive recipients of information, were not actively involved in finding appropriate solutions or strategies for analyzing problems, as everything was explained by the lecturer. This approach led to a lack of confidence in their abilities, as they were not trained to act independently in decision-making or to express their opinions due to fear of being wrong. Therefore, it can be concluded that using an appropriate teaching method will foster self-confidence in students. This is consistent with Trisnawati's (2015) assertion that self-confidence can be developed through social interaction between students and teachers.

CONCLUSIONS AND RECOMMENDATIONS

Based on the research findings and data analysis, it can be concluded that the implementation of the Knisley Mathematics Learning Model with a constructivist approach has a significant impact on increasing the self-confidence of students in the Mathematics Education (Tadris Matematika) program at IAIN Kerinci. The results of the hypothesis test, conducted using the t-test with the assistance of SPSS 26, show that the obtained significance value is less than 0.05, indicating a significant difference between the experimental class, which received the Knisley Mathematics Learning Model treatment, and the control class, which used conventional teaching methods. The average self-confidence questionnaire scores reveal that students in the experimental class experienced a higher increase in self-confidence compared to those in the control class. This finding confirms that the constructivist approach in the Knisley Mathematics Learning Model successfully creates a learning environment that supports the development of students' self-confidence through active engagement in the learning process, concept exploration, and independent problem-solving.

The success of the Knisley Mathematics Learning Model in enhancing self-confidence not only positively impacts students' mastery of mathematical concepts but also prepares them as more confident future teachers. Therefore, this learning model is relevant not only academically but also in shaping students' professional competencies. For future research, it is recommended that researchers expand the study to include other psychological factors, such as self-efficacy, which are also important in learning and in the formation of teacher candidates' character. Further research on self-efficacy could provide more comprehensive insights into how learning approaches like the Knisley Mathematics Learning Model can be more effective in shaping competent and confident future mathematics teachers, thereby improving the overall quality of education.

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