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The Effect of RME-Learning Trajectory on Mathematical Reasoning Ability and Self-Efficacy in Learning Statistics Using Congklak Games

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Abstract

This research aims to determine whether there is an effect of learning trajectory with the traditional congklak game context on mathematical reasoning ability in terms of self-efficacy. This study adopts a quasi-experimental approach using a 2 × 3 factorial design. The target population included all eighth-grade students at SMP Negeri 2 Wonogiri. The research employed cluster random sampling, selecting learners from two classes. The data collection techniques used were documentation, self-efficacy questionnaire, and mathematical reasoning abilities test. This study employed a data analysis approach that involved a two-way analysis of variance. The results of the hypothesis testing concluded that (1) learners who were taught using an RME-based learning trajectory with the traditional congklak game context showed better mathematical reasoning abilities compared to those taught through direct learning in statistics; (2) learners with high self-efficacy have better mathematical reasoning abilities than those with moderate or low self-efficacy, while learners with moderate self-efficacy showed better mathematical reasoning abilities than those with low self-efficacy; (3) there was no significant interaction observed between the treatment and self-efficacy regarding learners' mathematical reasoning abilities.

Keywords: learning trajectory, mathematical reasoning ability, RME, self-efficacy, statistics.

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INTRODUCTION

Mathematics plays a crucial role in enhancing an individual's intellectual abilities by sharpening skills in logical reasoning, spatial perception, analysis, and abstract thinking. This is one of the reasons for making mathematics a compulsory subject starting in elementary school through senior high school. The goal of teaching mathematics in schools extends beyond teaching mere calculations and formula usage, it seeks to develop strong mathematical reasoning and analytical skills that can be applied to solve real-life problems. This aligns with the 2013 curriculum content standards contained in Permendiknas No. 22 of 2006. These standards emphasize that one of the goals of learning mathematics is to be able to use reasoning to understand patterns and properties, perform mathematical manipulations to form generalizations, construct proofs, and explain mathematical concepts and statements.

From that perspective, mathematical reasoning is one of the important abilities that learners need to acquire when learning mathematics. Mathematical reasoning is an individual's ability to link various kinds of problems into an idea or thought to be able to solve mathematical problems (Mason et al., 2010). Despite the fact that mathematical reasoning is one of the important abilities that learners need to acquire, it's been observed that learners' mathematical reasoning abilities are generally low at present, and this is a global issue (NCTM, 2014).

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The fact that teachers do not actively include their students in the learning process during class is one of the causes of students' low mathematical reasoning abilities (Burais, Iksan, & Duskri, 2016). Monotonous learning methods from time to time can lead to boredom and decreased interest in learners in learning. According to information gathered from interviews with math teachers at SMP Negeri 2 Wonogiri, the learning model that is often applied in class is direct learning. Arends (2013) explains that direct learning is intended to increase mastery of skills and factual knowledge that can be taught through a progressive, step-by-step sequence of activities. In direct learning, a teacher considered as a source of knowledge and dominates class. Learners are typically less involved in the learning process since they primarily listen, pay attention, and record teacher explanations. So, student learning activities limited to remembering information, repeat what they have mastered, and ask the teacher about lesson material that they do not understand.

To develop learners' mathematical reasoning abilities, it is necessary to have effective teaching strategies. These methods should involve choosing and applying tasks that promote reasoning and understanding abilities through meaningful discussions about mathematical concepts. This approach aims to develop procedural fluency by building upon a strong conceptual understanding (NCTM, 2014). Several studies, including demonstration lessons (Herbert et al., 2015; Vale et al., 2017); peer team learning (Herbert & Bragg, 2021); and workshop learning (Hilton, Hilton, Dole, & Goos, 2016), have been carried out to improve understanding of mathematical reasoning.

With this in mind, one of the learning approaches that can be utilized to improve learners' mathematical reasoning abilities is Realistic Mathematics Education (RME). RME is a learning approach that places a strong emphasis on the application of learning trajectories in its instructional design. Learning trajectory refers to the depiction of the cognitive process and learning progression in a specific mathematical subject, facilitated by a sequence of educational tasks intended to generate anticipated cognitive processes or actions (Clements & Sarama, 2009).

The inherent characteristics of RME include use of context, use of models in progressive mathematics, use of learners' constructed results, interactivity, and intertwinment (Wijaya, 2012). The context in question can be in the form of games, the use of teaching aids, or other situations that are familiar to learners. One of the local contexts that can be used as part of the RME design is traditional games. The use of traditional games as a context for learning mathematics aims to invite learners to maintain local wisdom, make learners more motivated in learning mathematics, and make learning activities more meaningful (Afriansyah, 2020).

The use of context in RME is used by learners in informal activities to find or construct informal mathematical concepts, then learners connect informal mathematical concepts with formal mathematics (Lisnani & Asmaruddin, 2018). Based on this, RME is a mathematics learning approach that involves learners directly in the learning process. Learners are directly involved in the discovery and construction of informal mathematical concepts through experimental activities by utilizing something learners already know. In addition, learners are also directly involved in formal mathematical discoveries which are obtained by associating experimental results with mathematical concepts so that they can bridge learners to find mathematical concepts (definitions, steps, or formulas). Through these activities, learners are trained to improve their mathematical reasoning abilities.

Statistics is one of the mathematical learning topics studied in class VIII of junior high school, which focuses on enhancing students' mathematical thinking abilities. The statistical concepts taught at this level are data analysis techniques, determining the mean, mode, median, and distribution of data. In this regard, the application of RME utilizing learning trajectories with the traditional congklak game context is very suitable for achieving the expected competencies. This can be explained through the five characteristics of RME. First, the use of the traditional congklak game context in learning statistics. This context was chosen because it can be used to visualize concepts in statistics. Data in statistics can be visualized using congklak seeds, and lots of data can be visualized with lots of congkak holes.

Second, the use of the model creates a link between concrete-level mathematics obtained in informal activities by utilizing congklak games towards formal-level mathematical knowledge such as finding formulas for the mean, mode, median, range, quartiles, and interquartile ranges. Learners can improve their ability to submit conjectures related to the problems they encounter and develop their mathematical manipulation skills by conducting experiments using the congklak game. This will help learners work at the concrete-level of mathematics and identify mathematical concepts from given problems. Connecting concrete mathematics (informal concepts) to formal mathematics through activities can develop learners' abilities in obtaining solutions or gathering evidence from given problems. It also fosters skills in making generalizations from specific problem-related concept findings to general concepts.

Third, concerning the use of work results, learners are encouraged to explore diverse strategies during learning activities aimed at discerning meanings, definitions, and formulas for statistical measures including mean, mode, median, range, quartiles, and interquartile range. The outcomes and constructions derived from learners' work serve as a basis for developing concepts in statistical material. Fourth, the realistic mathematics approach to learning is implemented through a group system, encouraging learners to engage with their peers to uncover concepts within the statistics curriculum. Furthermore, the learning process involves multidirectional interaction during classroom discussions. The last characteristics involves learners making connections between the results from the congklak game experiments and the development of the general formulas for mean, mode, median, range, quartiles, and interquartile range.

The following is an instance of how the traditional congklak game can be utilized in statistics learning. In the learning trajectory to find the average concept, as seen in Figure 1, learners are tasked with rearranging congklak seeds so that each hole contains an equal number of seeds. Initially, the seeds are arranged differently in each hole, requiring learners to use the provided instructions to rearrange them strategically. These activities are designed to help learners grasp the concept of the mean and derive its general formula. While on the learning trajectory to find the mode concept, which can also be seen in Figure 1, learners begin by placing congklak seeds into holes based on a specified number. Subsequently, they identify holes containing an equal number of seeds and record this data in a table provided in their worksheet. By analyzing the table, learners determine the value (number of congklak seeds) that appears most frequently, which represents the mode of the dataset. This activity aims to help learners grasp the definition of mode in a dataset and also realize that there can be multiple modes in a dataset.

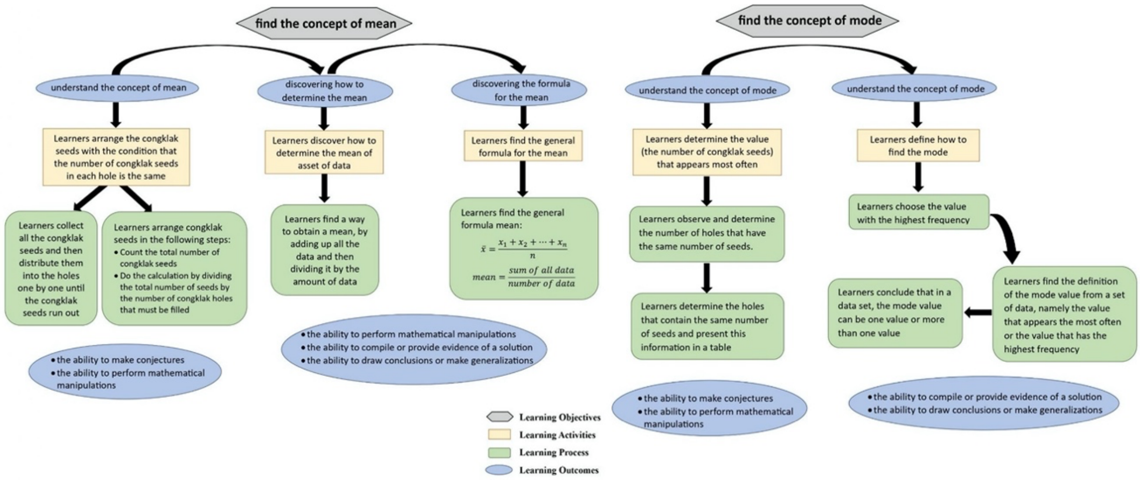

Figure 1. Learning Trajectory of the Mean and Mode Concepts

In the learning trajectory looking for the concept of median, as shown in Figure 2, learners are asked to arrange the congklak seeds into the holes in the order of fewest to most seeds. Afterward, they need to figure out the number of seeds in the middle hole. This task involves dividing the game area into two sections. These activities aim to help learners understand the concept of the median and grasp the general formula for calculating it.

On the other hand, learners are asked to perform relatively simple activities in the learning trajectory of finding the concept of range, which is also depicted in Figure 2: they must arrange the congklak seeds into the holes in the order of fewest to most seeds and then calculate the difference between the number of seeds in the last and first holes. By completing these activities, learners can grasp the concept of range, understand its meaning, and find the formula for calculating range.

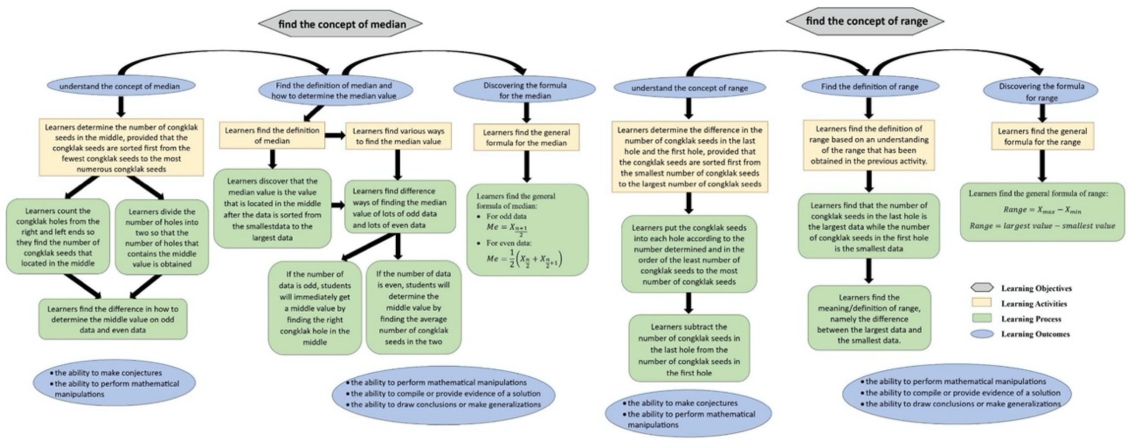

Figure 2. Learning Trajectory of the Median and Range Concepts

In the learning trajectory to find the concept of quartiles as seen in Figure 3, learners are asked to arrange the congklak seeds into the holes in order from the least to the most. Afterward, they identify the value (the number of seeds) that sits at the midpoint (Q_2). Following this, learners determine the Q_1 and Q_3 values, which are the middle values of the data that are to the left and right of the Q_2 value. This activity aims to help learners comprehend the concept of quartiles, understand the meaning of quartiles, and learn the steps involved in calculating quartiles values.

Learners continue their quartile value determination tasks as part of the learning trajectory to discover the concept of interquartile range which is also depicted in Figure 3. They are asked to calculate the difference between the middle value of the data that are to the left and right of the Q_2 value. This activity aims to help learners comprehend the concept of the interquartile range, enabling them to define its meaning and apply the general formula for calculating it.

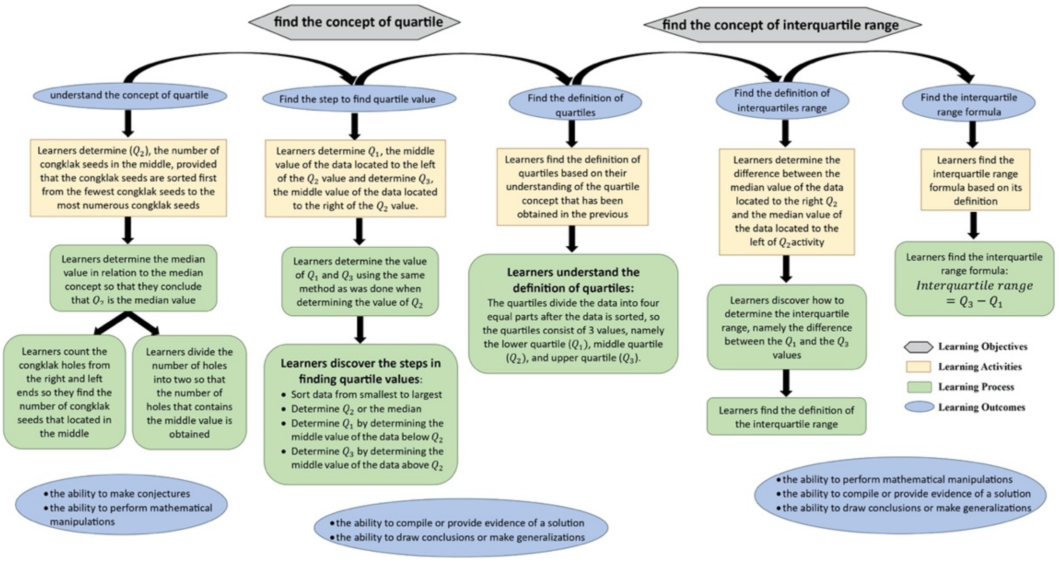

Figure 3. Learning Trajectory of the Quartiles and Interquartile Range Concepts

In the process of learning mathematics, alongside cognitive aspects, affective aspects are also crucial for achieving success in learning. Mathematical self-efficacy is one of the affective aspects that has a significant impact on learners' mathematical reasoning abilities. Bandura (1999) describes self-efficacy as an individual's belief in their own capability to complete tasks and achieve specific goals, which influences their future behaviors. Mathematical self-efficacy refers to a learners' belief in their capability to solve mathematical problems. Self-efficacy influences an individual's cognitive processes, actions, and strategies for attaining specific goals. Learners with good self-efficacy will be braver in facing every problem carefully, persistently, and not easily giving up (Somawati, 2018). Therefore, strong self-efficacy is needed in learners so they can achieve success in learning Mathematics.

Based on the explanation above, this study aims to investigate whether there are differences in learners' mathematical reasoning abilities across classes handled with the RME-based learning trajectory within the traditional congklak game context compared to direct learning. Then to determine whether learners' mathematical reasoning abilities at high, moderate, and low self-efficacy differ from one another. Moreover, to look for any interactions between the treatment and learners' self-efficacy towards learners' mathematical reasoning abilities.

RESEARCH METHOD

This study took place at SMP Negeri 2 Wonogiri among eighth-grade students during the academic year 2022/2023. The target population included all eighth-grade students at SMP Negeri 2 Wonogiri. The research employed cluster random sampling, selecting learners from two classes: one designated as the experimental group and the other as the control group. The experimental group underwent an RME-based learning trajectory with the congklak traditional game context, while the control group experienced direct learning.

This study adopts a quasi-experimental approach using a 2 × 3 factorial design, as shown in Table 1. The study's dependent variable is the level of mathematical reasoning ability. Meanwhile, the independent variables include the type of treatment and the level of mathematical self-efficacy.

Table 1. Research design

Treatment (A)	**Self-Efficacy (B)**		
	High (b_1)	**Moderate (b_2)**	**Low (b_3)**
Direct Learning (a_1)	(ab_{11})	(ab_{12})	(ab_{13})
RME-Based Learning Trajectory (a_2)	(ab_{21})	(ab_{22})	(ab_{23})

Different methods like documentation, questionnaires, and tests were employed for data collection. Documentation was utilized to collect data like midterm scores for the second semester of the 2022/2023 academic year, which were then used to assess the initial ability balance between the control and experimental classes. Questionnaires were used to collect information on learners' mathematical self-efficacy levels, while tests were employed to gather data on learners' mathematical reasoning abilities specifically in statistics learning. The design of learners' mathematical reasoning ability tests is based on several indicators, namely: submitting conjectures, performing mathematical manipulations, compiling or providing evidence of a solution, and drawing conclusions or making mathematical generalizations.

This study employed a data analysis approach that involved a two-way analysis of variance (ANOVA) with unequal sample sizes, followed by the post-ANOVA test using the Scheffe test. Additionally, for the prerequisite test, the analysis of variance included the Kolmogorov-Smirnov for assessing normality and the Levene test for evaluating homogeneity.

RESULTS AND DISCUSSION

Results

Before experimenting, the experimental requirements were tested using a balance test. The data utilized for the balance test was derived from the midterm evaluation scores in mathematics during the second semester of the 2022/2023 academic year.

Table 2. Independent samples t-test results of the midterm evaluation scores

Class	N	Mean	t-value	Sig. (2-tailed)
Control	32	62.78	0.255	0.800
Experimental	30	61.40		

Table 2 shows that the mean for the control class was 62.78, while the mean for the experimental class, it was 61.40. The data has been tested, to be normally distributed and has a homogeneous variance. Then a t-test was conducted at a significance level of 0.05, resulting in a significance value (sig.) of 0.800, which is greater than 0.05. The calculated t-value was 0.255 which indicates that there was no significant difference in the initial states between the control and experimental classes, hence they showed similar features and were therefore found to be relevant for the study.

This study involved analyzing learners' self-efficacy questionnaires to categorize them into high, moderate, and low self-efficacy groups. Following the analysis, learners from both the control and experimental classes were identified within these three categories of self-efficacy levels.

Table 3. Grouping learners' self-efficacy

Categories	Classes	
	Control	**Experiment**
High	9 learners	7 learners
Moderate	16 learners	17 learners
Low	7 learners	6 learners

Table 3 showed that most learners were in the moderate category. The rationale was that a majority of learners responded to the self-efficacy questionnaire with uncertainties, disagreement to positive statements, or strong agreement and agreement to negative statements.

In this research, statistics learning was carried out over 4 meetings, the control class received direct learning while the experimental class followed a RME-based learning trajectory with congklak traditional game context. Then, both classes were given a test that measured learners' mathematical reasoning abilities. The test outcomes underwent examination through a two-way analysis of variance test at a significance level of $\alpha = 0.05$. The normality and homogeneity tests' results indicate that the prerequisites for carrying out the two-way analysis test are met.

Table 4. Two-Way Variance Analysis Test Results

Source	df	Mean Square	F	Sig.	Conclusion
Treatment (A)	1	735.482	4.290	0.043	significant
Self-Efficacy (B)	2	4097.920	23.901	0.000	significant
Interaction (AB)	2	204.580	1.193	0.311	not significant

According to Table 4's data, the treatment variable's significance value (sig.) was 0.043, which falls below 0.05. This implies a significant difference in the way the treatment affected the learners' mathematical reasoning abilities. To determine which treatment has a better impact, it suffices to examine the marginal mean since there are only two treatments. The mean of mathematical reasoning ability between rows, between columns, and between cells are presented in Table 5.

Table 5. Marginal Mean

Treatment	Self-Efficacy			Marginal Mean
	High	Moderate	Low	
Direct Learning	81.67	57.50	50.00	62.66
RME-based Learning Trajectory	87.29	71.82	52.50	71.57
Marginal Mean	84.13	64.88	51.15	

According to Table 5, the experimental class has a higher marginal mean of 71.57 compared to the control class, which has a marginal mean of 62.66. This suggests that utilizing the learning trajectory within the traditional congklak game context results in improved mathematical reasoning abilities compared to direct learning.

Furthermore, regarding the self-efficacy variable, the test outcomes displayed in Table 4 show that the significance value (sig.) is 0.000, falling below 0.05. This suggests significant variations in how different levels of self-efficacy affect learners' mathematical reasoning abilities. The Scheffe test was used in a multiple comparison analysis with a significance level of 0.05 to determine which level of self-efficacy had the most significant impact. Table 6 presents the results of the Scheffe test.

Table 6. Scheffe test results

H_0	Sig.	Decision
$\mu_{.1} = \mu_{.2}$	0.000	$H_{0.1,2}$rejected
$\mu_{.1} = \mu_{.3}$	0.000	$H_{0.1,3}$ rejected
$\mu_{.2} = \mu_{.3}$	0.009	$H_{0.2,3}$ rejected

According to the findings in Table 6, it is obtained: (1) $H_{0.1,2}$ is rejected, indicating that there was a significant difference in mathematical reasoning abilities between learners with high self-efficacy and those with moderate self-efficacy. Table 5 shows that the marginal mean of high self-efficacy is 84.13 higher than moderate self-efficacy with a marginal mean of 64.88. This leads to the conclusion that learners with high self-efficacy have better mathematical reasoning abilities than those with moderate self-efficacy; (2) $H_{0.1,3}$ is rejected, indicating that there are differences in mathematical reasoning abilities between learners with high self-efficacy and those with low self-efficacy. The marginal mean of 84.13 for high self-efficacy notably exceeds the marginal mean of 51.15 for low self-efficacy. Therefore, it can be concluded that learners with high self-efficacy have better mathematical reasoning abilities compared to those with low self-efficacy; (3) $H_{0.2,3}$ is rejected, indicating that there are differences in mathematical reasoning abilities between learners with moderate self-efficacy and those with low self-efficacy. Observing the marginal means in Table 5, where the moderate self-efficacy marginal mean of 64.88 surpasses the low self-efficacy marginal mean of 51.15, it can be concluded that learners with moderate self-efficacy have better mathematical reasoning abilities compared to those with low self-efficacy.

Upon further analysis of the findings presented in Table 4, the interaction between the treatment and self-efficacy yielded a significance value (sig.) of 0.311, which exceeds 0.05. This indicates the absence of interaction between treatment type and self-efficacy level regarding learners' mathematical reasoning abilities.

Discussion

The finding of this research shown that the application of RME-based learning trajectory with the context of the traditional congklak game enhanced learners' mathematical reasoning ability more than direct learning. This research's discovery aligns with the findings of a study conducted by Fauzan and Sari (2018), indicating that learners taught using RME have better mathematical reasoning abilities compared to those undergoing direct learning methods. Amir, Urrohmah, and Andriani's (2021) research outcomes similarly demonstrated that there were variations in in how learners' mathematical reasoning abilities improved when utilizing the RME approach versus direct learning. The RME approach given to the experimental class had a positive and better effect on learners' mathematical reasoning ability.

This can occur due to the implementation of RME-based learning trajectory within the traditional congklak game context, which encourages learners to independently discover mathematical concepts. Consequently, learners are less likely to forget these concepts when solving problems. Each activity is designed in informal activities through experiments with congklak games and formal activities by linking informal mathematics with formal mathematics. During this activity, learners play an active role in constructing knowledge by utilizing their abilities through various learning task. By engaging in a structured learning trajectory, learners can express various ideas through experiments to solve problems given to understand the concepts of mean, mode, median, range, quartile, and interquartile range. The experimental results obtained were used by learners to find the definitions and the general formulas for mean, mode, median, range, quartiles, and interquartile range.

Learners' activities construct informal mathematical concepts through experiments using the congklak game, which can train learners' skills in submitting conjectures related to the problems encountered, and can train learners' abilities to perform mathematical manipulations to find mathematical concepts from given problems. In the activity of linking informal mathematical concepts to formal mathematics, it can train learners' skills in obtaining solutions or compiling evidence from a given problem as well as training skills in making generalizations from concept findings related to specific problems to general concepts. In addition, the activities carried out in learning with RME-based learning trajectory by utilizing the congklak game can provide variations in learning so that the learning process is not monotonous which has a positive impact on learners' mathematical reasoning abilities. This corresponds with Wibowo's (2017) assertion that the RME approach is an effective strategy for enhancing learners' mathematical reasoning abilities.

The significant difference confirmed in mathematical reasoning abilities between levels of self-efficacy (high, moderate, low) in this research reveals that the levels of self-efficacy had effect on learners' mathematical reasoning ability. This supports earlier findings (Amir, Urrohmah, & Andriani, 2021; Ashari, Mulyono, & Mariani, 2021), which have revealed the significant effect of self-efficacy levels on learners' mathematical reasoning abilities.

Learners with high self-efficacy have better mathematical reasoning abilities than learners with medium and low self-efficacy. Meanwhile, learners with moderate self-efficacy have better mathematical reasoning abilities compared to those with moderate and low self-efficacy. Similarly, learners with moderate self-efficacy have better mathematical reasoning abilities than those with low self-efficacy. High self-efficacy learners will feel challenged with complex math problems, leading to exploratory activities to get the right answers. Conversely, learners with low self-efficacy have a tendency to give up more easily when faced with a complex problem because they think they cannot solve these mathematical problems. Therefore, learners with high self-efficacy will have mathematical reasoning abilities high too. Hadiat and Karyati (2019) provide support for this, stating that higher levels of self-efficacy will lead to improved mathematical reasoning skills. Learners who have good self-efficacy will encourage themselves to reach their goals and have faith in their own abilities. In this case, if learners have good self-efficacy towards mathematics, then they will have confidence that they can understand mathematics well and motivate themselves to get good learning outcomes.

The non-significant interaction of the treatment (direct learning and RME-based learning trajectory with traditional congklak game context) and self-efficacy in this research is in line with previous researches (Agustiana, Supriadi, & Komarudin, 2019; Amir, Urrohmah, & Andriani, 2021), which have shown that self-efficacy does not seem to interact with the application of learning approaches to produce results on learners' mathematical reasoning abilities. This implies that whether learners' self-efficacy is high or low, it doesn't affect how the learning approach impacts their mathematical reasoning abilities, and vice versa. Suprapto (2018) provides evidence for this, stating that if two or more independent variables have a significant effect on the dependent variable independently, then there was no interaction.

CONCLUSION

The data analysis results led to several conclusion: (1) learners who were taught using an RME-based learning trajectory with the traditional congklak game context showed better mathematical reasoning abilities compared to those taught through direct learning in statistics; (2) learners with high self-efficacy have better mathematical reasoning abilities than those with moderate or low self-efficacy, while students with moderate self-efficacy showed better mathematical reasoning abilities than those with low self-efficacy; (3) there was no significant interaction observed between the treatment and self-efficacy regarding learners' mathematical reasoning abilities.

Based on these results, there are several suggestions from the authors which are summarized as follows: (1) to improve learners' mathematical reasoning abilities, mathematics teachers are advised to use RME-based learning trajectory with the context of the traditional congklak game in learning statistics; (2) when conducting learning activities, teachers are also encouraged to consider the affective aspect of learners such as their self-efficacy.

REFERENCES

Afriansyah, E. A., Herman, T., Turmudi, T., & Dahlan, J. A. (2020). Mendesain Soal Berbasis Masalah Untuk Kemampuan Berpikir Kritis Matematis Calon Guru. *Mosharafa: Jurnal Pendidikan Matematika*, 9(2), 239- 250.

Agustiana, N., Supriadi, N., & Komarudin, K. (2019). Meningkatkan kemampuan penalaran matematis dengan penerapan pendekatan bridging analogy ditinjau dari self-efficacy. *Inovasi Pembangunan: Jurnal Kelitbangan*, 7(1), 61-61.

Al Ashari, S. R., Mulyono, M., & Mariani, S. (2021). The Ability of Mathematical Reasoning and Self Efficacy Students in Learning Project Based Learning Assisted Moodle. *Unnes Journal of Mathematics Education Research*, 10(2), 220-226.

Amir, M. Z., Urrohmah, A., & Andriani, L. (2021). The Effect of Application of Realistic Mathematics Education (RME) Approach to Mathematical Reasoning Ability Based on Mathematics Self Efficacy of Junior High School Students in Pekanbaru. *Journal of Physics: Conference Series*, 1776 (1). https://doi.org/10.1088/1742-6596/1776/1/012039

Arends, R. I. (2013). *Belajar untuk Mengajar*. Edisi 9 buku 2. Jakarta: Salemba Humanika.

Bandura, A., Freeman, W. H., & Lightsey, R. (1999). *Self-efficacy: The exercise of control*. New York: W. H. Freeman and Company.

Burais, L., Ikhsan, M., & Duskri, M. (2016). Peningkatan Kemampuan Penalaran Matematis Peserta Didik Melalui Model Discovery Learning. *Jurnal Didaktik Matematika*, 3(1), 77-86.

Clements, D. H & Sarama, J. (2009). *Learning And Teaching Early Math: The Learning Trajectories Approach*. New York: Routledge.

Depdiknas. (2006). *Permendiknas No 22 Tahun 2006 Tentang Standar Isi*. Jakarta: Depdiknas.

Fauzan, S., & Sari, R. M. M. (2018). Upaya Meningkatkan Kemampuan Penalaran Matematis dengan Pendekatan Realistic Mathematic Education Pada Siswa Kelas VII SMPN 1 Karawang Barat. *Prosiding Sesiomadika*, 1(1b).

Hadiat, H. L., & Karyati, K. (2019). Hubungan Kemampuan Koneksi Matematika, Rasa Ingin Tahu dan Self-Efficacy dengan Kemampuan Penalaran Matematika. *Jurnal Riset Pendidikan Matematika*, 6(2), 200-210. http://dx.doi.org/10.21831/jrpm.v6i2.26552

Herbert, E., & Bragg, L. A. (2021). Elementary Teachers' Planning for Mathematical Reasoning Through Peer Learning Teams. *International Journal for Mathematics Teaching and Learning*, 22 (1), 24-43. https://doi.org/10.4256/ijmtl.v22i1.291

Herbert, S., Vale, C., Bragg, L. A., Loong, E., & Widjaja, W. (2015). A Framework For Primary Teachers' Perceptions of Mathematical Reasoning. *International Journal of Educational Research*, 74, 26-37. https://doi.org/10.1016/j.ijer.2015.09.005

Hilton, A., Hilton, G., Dole, S., & Goos, M. (2016). Promoting Middle School Students' Proportional Reasoning Skills Through an Ongoing Professional Development Programme for Teachers. *Educational Studies in Mathematics*, 92(2), 193-219.

Lisnani, L., & Asmaruddin, S. N. (2018). Desain Buku Ajar Matematika Bilingual Materi Bangun Datar Menggunakan Pendekatan PMRI Berkonteks Kebudayaan Lokal. *Mosharafa: Jurnal Pendidikan Matematika*, 7(3), 345- 356.

Mason, J., Burton, L., & Stacey, K. (2010). *Thinking mathematically*. Pearson Education

The National Council of Teachers of Mathematics. (2009). *Focus In High School Mathematics: Reasoning and Sense Making*. Reston, VA: National Council of Teacher of Mathematics.

Somawati, S. (2018). Peran Efikasi Diri (Self Efficacy) terhadap Kemampuan Pemecahan Masalah Matematika. *Jurnal Konseling Dan Pendidikan*, 6(1), 39-39. https://doi.org/10.29210/118800

Suprapto, E. (2015). Pengaruh Model Pembelajaran Kontekstual, Pembelajaran Langsung dan Motivasi Berprestasi Terhadap Hasil Belajar Kognitif. *INVOTEC*, 11(1).

Vale, C., Widjaja, W., Herbert, S., Bragg, L. A., & Loong, E. Y. K. (2017). Mapping Variation in Children's Mathematical Reasoning: The Case Of 'What Else Belongs?'. *International Journal of Science and Mathematics Education*, 15(5), 873-894. https://doi.org/10.1007/s10763-016-9725-y

Wibowo, A. (2017). Pengaruh Pendekatan Pembelajaran Matematika Realistik Dan Saintifik Terhadap Prestasi Belajar, Kemampuan Penalaran Matematis Dan Minat Belajar. *Jurnal Riset Pendidikan Matematika*, 4(1), 1. http://dx.doi.org/10.21831/jrpm.v4i1.10066

Wijaya, A. (2012). *Pendidikan Matematika Realistik*. Graha Ilmu.

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