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Intervention to Increase the Motivation to Learn Mathematics for Children Aged 9–13 Years at Rptra X, West Jakarta

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ABSTRACT
Mathematics learning motivation in elementary school-aged children is an important aspect in supporting their academic achievement. This community service activity aims to improve mathematics learning motivation in children aged 9–13 years through an intervention program based on educational activities at RPTRA X, West Jakarta. As an initial stage, a pre-test was conducted using the Elementary Motivation Scale (ESMS), which had been adapted into Indonesian and validated by experts, to measure learning motivation in reading, writing, and mathematics. The pre-test was conducted on April 13 and 26, 2025, and showed that mathematics learning motivation had the lowest score compared to the other two domains. Based on these results, the intervention program was designed based on Self-Determination Theory (SDT), with an emphasis on enhancing autonomy and using extrinsic motivation through giving rewards as a form of positive reinforcement. The intervention was carried out in four sessions on May 17–18 and May 24–25, 2025, using participatory and contextual approaches to enhance mathematics learning motivation. The evaluation was conducted through a post-test on May 25 and 31, 2025. The analysis focused on 21 children who consistently participated in all activities. The results showed a significant increase in mathematics learning motivation scores, indicated by a decrease in the number of low-motivation children from 15 to 2. These findings indicate that educational activity-based interventions and the application of SDT principles can have a positive impact on improving children's mathematics learning motivation in the RPTRA environment.

INTRODUCTION

Education is a process that aims to develop the potential of human resources through learning activities, where learning motivation plays an important role in determining the success of the process (Jainiyah et al., 2023). However, currently, many students show a lack of motivation in learning (Jainiyah et al., 2023). Research by Rismawati et al. (2020) identified various factors that cause low motivation to learn, such as lack of learning facilities, interests, confidence, peer influence, and health conditions. In addition, Hendrizal (2020) added that monotonous teaching methods, material incompatibility with students' interests, and socioeconomic and cultural backgrounds also affect students' motivation to learn. Moreover, technological advances, feelings of inadequacy in certain subjects, and personal problems with parents and the surrounding environment also exacerbate these conditions (Hendrizal, 2020).

Motivation is the drive that moves a person to act, think, and feel something in a certain way (King, 2016). Motivation-driven behaviors will have energy, clear goals, and take place consistently (King, 2016). In the context of education, motivation can encourage students to be actively involved in the learning process (Izzatunnisa et al., 2021; Khaidir & Suhaili, 2023; Lomu & Widodo, 2018; Suharni, 2021; Yogi Fernando et al., 2024). Uno (2021) explained that learning motivation is an encouragement, both from within and from outside, that students have when participating in the learning process with the aim of bringing about change in their behavior. From this opinion, it can be concluded that learning motivation is an internal and external drive that encourages students to be actively involved in the learning process in order to achieve consistent and directed behavioral change.

Self-Determination Theory or *SDT* is a motivational theory developed by Deci and Ryan (1985 and 1991) with a focus on psychological autonomy, which is the need for individuals to feel in control of their own behavior and decisions. *SDT* distinguishes two main types of motivation, namely intrinsic motivation and extrinsic motivation. Intrinsic motivation arises from feeling pleasure or satisfaction with the activity itself, while extrinsic motivation is driven by a specific goal or reward. Extrinsic motivation includes external regulation and identified regulation. External regulation arises from external factors such as rewards or punishments, whereas identified regulation arises when an individual considers an activity important or beneficial. According to this theory, individuals with intrinsic motivation and identified regulation have a high level of autonomy, while individuals with external regulation have a low level of autonomy.

Based on observations from February 22 to April 12, 2025, at the *Child-Friendly Integrated Public Space (RPTRA)* X, West Jakarta, it was found that children aged 9–13 years have not shown any motivation to learn, especially in mathematics learning. Despite being in an adequate library environment and having the help of a companion, many children prefer to play rather than complete schoolwork, including math assignments. This shows that children do not yet view learning activities, especially mathematics, as something enjoyable.

Based on this description, the community service team designed and implemented an intervention program over four sessions that aimed to increase motivation to learn mathematics through a fun approach for children. This program not only integrates interactive learning activities, but is also accompanied by pre-test and post-test evaluations to objectively measure changes in children's learning motivation levels.

Based on observations that have been made by researchers, it is evident that there is low motivation to learn among children in *RPTRA* X, especially in mathematics subjects. The children view math as a difficult and unpleasant subject.

METHOD

The implementation of this activity is divided into three main stages, namely pre-test, implementation of educational programs, and post-test. The *pre-test* stage was carried out on April 13 and 26, 2025, to obtain an initial picture of participants' learning motivation. The intervention phase was conducted in four sessions on May 17–18 and May 24–25, 2025, using an educational and participatory approach. Furthermore, the evaluation stage through a *post-test* was conducted on May 25 and 31, 2025, to measure changes in learning motivation after the program was implemented.

Table 1. program schedule

No.	Implementation Date	Activities	Time
1.	May 17, 2025	Program Introduction	15 Minutes
		Ice Breaking: Grab the Candy!	15 Minutes
		Introduction to Geometry Materials	10 Minutes
		Find Me!	30 Minutes

No.	Implementation Date	Activities	Time
		The End of the Story, the Beginning of Creation	30 Minutes
		Prize Distribution and Closing	15 Minutes
2.	May 18, 2025	Program Introduction	5 Minutes
		Ice Breaking: Don't Touch the Color!	15 Minutes
		Rainbow Numbers	30 Minutes
		The End of the Story, the Beginning of Creation	30 Minutes
		Prize Distribution and Closing	15 Minutes
3.	May 24, 2025	Program Introduction	5 Minutes
		Ice Breaking: Chain Name	15 Minutes
		Smart Shape	35 Minutes
		Joint Correction	30 Minutes
		Prize Distribution and Closing	15 Minutes
4.	25 May 2025	Program Introduction	5 Minutes
		Ice Breaking: Rujak!	15 Minutes
		Number Puzzle	30 Minutes
		The End of the Story, the Beginning of Creation	30 Minutes
		Prize Distribution and Closing	15 Minutes

In the *pre-test* stage (April 13 and 26, 2025), children were asked to fill out a questionnaire, and 24 children took part in this initial assessment data collection activity. The measurement tool used is The Elementary Motivation Scale (*ESMS*), which has been translated into Indonesian and validated beforehand. *ESMS* consists of 27 statements that are evenly divided to measure learning motivation in three domains, namely reading, writing, and mathematics, with 9 items each. This scale measures three types of motivation: motivation from within (intrinsic), motivation because it considers learning important (identified regulation), and motivation because of external motivation (external regulation). The process of filling out the *pre-test* questionnaire was carried out in one special session, with an estimated duration of around 30–45 minutes. The facilitator team guided the children in understanding the content of the statements and how to answer them.

The implementation of the program on the first day (May 17, 2025) was focused on building a familiar and fun atmosphere while introducing basic mathematical concepts, especially geometric shapes. The goal of this session was to awaken the children's early interest in mathematics through a light-hearted approach. A total of 25 children attended with enthusiasm. The activity began with an *ice breaking* game to create a comfortable atmosphere, then continued with searching for geometric shapes in surrounding objects, such as circles on clocks or triangles on the roof of a house. After that, children were invited to represent the shapes in creative drawings they made themselves. Even though this activity was math-themed, children did not feel like they were learning something difficult, because the atmosphere was relaxed and full of interaction. Some children even appeared impatiently waiting for their turn to show their results.

The second day (May 18, 2025) aimed to practice basic numeracy skills through fun visual activities. The main focus of this session was to make children feel more confident in solving addition and subtraction problems through the medium they like, namely drawing and coloring. On the second day of the implementation, 37 children attended, and even some who are usually passive began to open up more. The activity was opened with a color game that required concentration. Then, the children were given a worksheet containing counting problems integrated by the facilitator. They had to solve the problem first to know what color to use in each part of the image. This activity not only stimulated calculating ability but also encouraged perseverance and attention to detail. The activity continued with a free drawing session based on the results of dice rolling, which was still related to the concept of numbers. The atmosphere during the activity was lively, cheerful, and full of enthusiasm. Children helped each other, shared colored pencils, and encouraged one another.

The third day of the activity (May 24, 2025) aimed to hone children's logic and strengthen mathematical problem-solving skills through multi-level practice questions. The children were challenged to think more systematically while maintaining a fun learning atmosphere, and 22 children attended this session. The children began to work on the logic problems provided by the facilitator. Worksheets contained math problems packaged in the form of “shape codes” such as circles, squares, and stars that represented certain values. They were asked to solve problems of addition and subtraction between shapes, which were created in three different levels, ranging from simple problems to those requiring combination and strategy. The children looked serious but still happy and enthusiastic in participating in the program. Some appeared so focused that they worked on the problems with great spirit, even asking first if they felt unsure or doubtful. This activity encouraged them to really try to understand and formulate the logic of the calculations.

The fourth day of activities (May 25, 2025) aimed to train cooperation in groups and the ability to develop problem-solving strategies together. The activities opened with challenging group games, where they were required to complete a number challenge, and the children had to devise an addition or subtraction operation whose results corresponded to the target number mentioned by the facilitator. They discussed with each other, tried different combinations, and strategized. In a healthy competitive atmosphere, children learned that discussing and working together could help them solve problems faster and more accurately. Unfortunately, on the fourth day, the weather was unfriendly, resulting in only eight children attending from the previous total number of participants. Even so, the eight children who were present continued to participate in the activity with enthusiasm and high energy, even from the beginning of the session. After the activity was completed, the facilitator distributed questionnaires again for the children to fill out the *post-test* using the *ESMS* instrument, the same as the one used during the *pre-test*. The completion of this was facilitated by the team. However, because the number of children present was much lower than the total number of participants during the *pre-test*, the team decided to schedule additional *post-test* sessions so that the data collected would be complete.

Additional *post-tests* were held on May 31, 2025, and most participants who were previously absent were able to participate and complete the *post-test* well. By collecting data twice through this questionnaire, program evaluation data became more complete and accurate. This *post-test* was an important part for observing changes in the level of motivation to learn mathematics after participating in four interactive and fun activity sessions. The results of the *pre-test* and *post-test* will later be compared as a basis for evaluating whether this program succeeded in having a positive impact on participants.

Figure 1. Second Day Intervention (18 May 2025)

Figure 2. Intervention Day Four (May 25, 2025)

RESULTS AND DISCUSSION

This community service activity began with the measurement of children's learning motivation at RPTRA X using *The Elementary Motivation Scale* (ESMS) instrument, which has been adapted into Indonesian. This instrument measures three domains of learning motivation, namely reading, writing, and mathematics, with the aim of obtaining an initial idea of which areas need further attention.

The number of participants varies in each session because RPTRA is a public space with open participation. *The pre-test* was attended by 24 children, the first intervention session by 25 children, the second session by 37 children, the third session by 22 children, the fourth session by 8 children, and *the post-test* was attended by 21 children. The data analysis was focused on 21 children who participated in a complete series of activities, starting from *pre-test*, four intervention sessions, to *post-test*. All participants analyzed were female consisting of 4 9-year-old children with a percentage of 19.0%, 4 10-year-old children with a percentage of 19.0%, 3 11-year-old children with a percentage of 14.3%, 9 children aged 12 years with a percentage of 42.9%, and 1 child aged 13 years with a percentage of 4.8%. This group is the basis for evaluating the effectiveness of the program.

Table 2. ***Overview of Participants by Age***

Age	Frequency	Percentage
9	4	19.0%
10	4	19.0%
11	3	14.3%
12	9	42.9%
13	1	4.8%
Total	21	100.0%

To find out which domain of learning motivation is the lowest, an analysis of *the pre-test results* was carried out using the ESMS instrument which measures three domains, namely *reading*, *writing*, and *mathematics*. The researcher conducted a series of statistical analyses of the data that had been obtained. The following are the results of data analysis, starting from the reliability test of the measuring instrument, the data normality test, the Friedman test to see the difference between dimensions, and the Durbin-Conover follow-up test to find out the specific differences between dimensions.

Table 3. ***Reliability Test***

	Mean	SD	Cronbach's α
scale	3.14	0.498	0.825

Based on the results of the reliability test shown in Table 3, *The Elementary Motivation Scale* (ESMS) instrument has a Cronbach's Alpha value of 0.825, this value is above the minimum limit of 0.70 ($\alpha > 0.70$) (Tavakol & Dennick, 2011), so it can be concluded that the measuring tool is able to provide reliable results.

Table 4. ***Normality Test***

	Total_R	Total_W	Total_M
N	21	21	21
Missing	970	970	970
Mean	29.3	31.5	24.0
Median	28	31	19
Standard deviation	4.31	4.61	10.3
Minimum	24	20	13
Maximum	38	40	45
Shapiro-Wilk W	0.912	0.942	0.798
Shapiro-Wilk p	0.059	0.243	<0.001

The normality test using Shapiro-Wilk (Table 4) showed that the data for the *reading* (Total_R) and *writing* (Total_W) dimensions had p-values of 0.059 and 0.243, respectively, which means that the data were normally distributed ($p > 0.05$). In contrast, the data on *the mathematics* dimension (Total_M) showed a p< value of 0.001, which means that the data was not normally distributed. Therefore, further analysis was carried out using Friedman's non-parametric test (Boakye & Yao, 2016; Ghasemi & Zahediasl, 2012).

Table 5. ***Friedman Test***

X^2	df	p
13.0	2	0.002

The *Friedman test* was conducted to find out if there was a significant difference between the three dimensions of motivation to learn mathematics, namely *reading*, *writing*, and *mathematics*. The results of *the Friedman* test (Table 4) show a *chi-square* value (χ^2) of 13.0 with degrees of freedom (df) = 2 and p = 0.002 ($p < 0.05$). This shows that there are significant differences between the three dimensions (Navarro et al., 2022).

Table 6. ***Uji Pairwise Comparisons (Durbin-Conover)***

			Statistic	p
Total_R	-	Total_W	1.83	0.074
Total_R	-	Total_M	2.38	0.022
Total_W	-	Total_M	4.22	<0.001

The Durbin-Conover *follow-up test* (Table 6) was performed to determine the specific differences between the dimensions. The results showed that, there was no significant difference between *the dimensions of reading* and *writing* (p = 0.074), there was a significant difference between the dimensions *of reading* and *mathematics* (p = 0.022), and there was a significant difference between the dimensions *of writing* and *mathematics* ($p < 0.001$). Thus, it can be concluded that the motivation to learn mathematics is the lowest compared to the other two domains.

Based on the results of *the pre-test analysis*, it is known that the motivation to learn mathematics is the lowest compared to the other two domains. These findings became the basis for the design of an intervention program focused on increasing motivation to learn mathematics. After all intervention sessions were carried out, evaluation through *post-tests* was carried out to assess the effectiveness of the program. The results of *the paired sample t-test* analysis showed a significant increase in the mathematics learning motivation score after the intervention was carried out.

Tabel 7. ***Paired Samples T-Test***

								95% Confidence Interval	
			statistic	df	p		Effect Size	Lower	Upper
Total_M_Pre	Total_M_Post	Student's t	-4.38	20.0	<0.001	Cohen's d	-0.956	-1.47	-0.429

Table 8. ***Descriptive***

	N	Mean	Median	SD	HERSELF
Total_M_Pre	21	24.0	19	10.32	2.25
Total_M_Post	21	33.6	35	5.57	1.22

The average math motivation score in the *pre-test* was M = 24.0, SD = 10.32, while in the *post-test* it increased to M = 33.6, SD = 5.57. This difference is statistically significant, t(20) = -4.38, p <.001, which suggests that the program has a noticeable impact on increased mathematical motivation. An effect size (Cohen's d) of -0.956 indicates a large effect, which means the program has a strong influence on the increase in participants' mathematical motivation. In addition, the 95% confidence interval of the mean difference ranged from -1.47 to -0.429, which reinforces the belief that there was a consistent improvement in scores after the program.

CONCLUSION

The community service program at *RPTRA* X effectively increased motivation to learn mathematics among children aged 9–13 years, as shown by an 86.7% improvement in motivation. The intervention involved educational activities and was measured using The Elementary Motivation Scale (*ESMS*), with a significant decrease in participants with below-average motivation, from 15 to 2 children. The program not only enhanced cognitive skills but also supported psychological well-being through rewards and teamwork development. However, obstacles such as limited access to technology and irregular attendance were encountered. To improve future implementations, it is suggested to prepare a detailed activity schedule, communicated clearly to participants and parents, to ensure consistent attendance. Additionally, adjusting the activities to participants' preferences, such as offering prizes like stationery or snacks for all, can create a more inclusive and engaging learning environment, fostering greater participation.

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