Physical based activities for contextual literacy student elementary school

Actividades basadas en la física para la alfabetización contextual de estudiantes de escuela primaria

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Abstract

Introduction: The low quality of learning due to educational inequality in Indonesia contributes to Indonesian students' low literacy skills, as evidenced by the results of the PISA and the Education Report Card from the National Assessment. Literacy learning has yet to be obtained by all students, especially at the basic education level.
Objective: The objectives of this study were (1) to determine the cognitive improvement literacy learning, (2) to determine the activeness of students following literacy learning, and (3) to determine the effect of increasing students competence on learning through the motivation of participants following literacy learning with a contextual approach.
Methodology: This study used a mixed-methods approach and was analyzed using structural equation modeling (SEM).
Results: The finding in this study is that the potential of outdoor activities in the school yard to enhance contextual literacy learning for students was explored. The following are the results of the analysis in this research: 1) Physical based activities can be used to enhance contextual literacy learning for elementary student by providing real-life context for mathematical problem solving; 2) Designing problem-solving activities in the school yard experiences has been shown to improve students' understanding of mathematical literacy concepts and their ability to create appropriate and motivating contexts for problem-solving.
Conclusions: This research contributes to the importance of literacy learning for primary education students with outside the classroom to apply basic, simple, reasoning, and contextual approaches.

Keywords

Contextual approach, literacy skills, physical based activities, student's elementary school.

Resumen

Introducción: La baja calidad del aprendizaje debido a la desigualdad educativa en Indonesia contribuye a las bajas habilidades de alfabetización de los estudiantes indonesios, como lo demuestran los resultados de PISA y el Informe Educativo de la Evaluación Nacional. La alfabetización aún no ha sido alcanzada por todos los estudiantes, especialmente en el nivel de educación básica.
Objetivo: Los objetivos de este estudio fueron (1) determinar la mejora cognitiva del aprendizaje de la alfabetización, (2) determinar la actividad de los estudiantes después del aprendizaje de la alfabetización y (3) determinar el efecto del aumento de la competencia de los estudiantes en el aprendizaje a través de la motivación de los participantes después del aprendizaje de la alfabetización con un enfoque contextual.
Metodología: Este estudio utilizó un enfoque de métodos mixtos y se analizó mediante análisis analítico utilizando modelos de ecuaciones estructurales (SEM).
Resultados: El hallazgo de este estudio es que se exploró el potencial de las actividades al aire libre en el patio de la escuela para mejorar el aprendizaje de alfabetización contextual de los estudiantes. Los siguientes son los resultados del análisis de esta investigación: 1) Las actividades físicas se pueden utilizar para mejorar el aprendizaje de alfabetización contextual para estudiantes de primaria al proporcionar un contexto de la vida real para la resolución de problemas matemáticos; 2) Se ha demostrado que el diseño de actividades de resolución de problemas en el patio de la escuela mejora la comprensión de los estudiantes sobre los conceptos de alfabetización matemática y su capacidad para crear contextos apropiados y motivadores para la resolución de problemas.
Conclusiones: Esta investigación contribuye a la importancia del aprendizaje de la alfabetización en estudiantes de educación primaria fuera del aula para aplicar enfoques básicos, simples, de razonamiento y contextuales.

Palabras clave

Enfoque contextual; alfabetismo; actividades físicas; educación elemental.

Introduction

The quality of education in Indonesia is still worrying, one of which is due to the capitalization of education, which makes educational institutions that dare to guarantee quality education set costly fees that only a handful of people from the middle and upper classes can afford. On the other hand, most educational institutions are still unwilling to improve and have yet to be able to improve higher quality educational services. This fact can be seen from Indonesia's PISA ranking, which is still low compared to Indonesia's human resource potential as one of the countries with the fourth largest population globally. Indonesia's PISA results significantly differ from Singapore's, only above the Philippines and Cambodia. The Education Report Card results align with the 2018 and 2022 PISA results. PISA 2018 math proficiency ranked 71 out of 77 countries (OECD, 2019); by 2022, it ranked 69th out of 81 countries. The low results of PISA 2022 and the education report card encourage all parties to cultivate literacy, science, and numeracy.

Students' literacy and numeracy abilities (Agnello, 2021) are some of the problems that must be studied systematically to improve the quality of education. Education report card data in 2022 from 163.492 SD/equivalent levels at the national level with 3,335,655 students as respondents, the data obtained on reading (Yulianti et al., 2024) shows that literacy and numeracy skills still do not reach the minimum competency. This fact further strengthens the need for strong efforts to condition appropriate, efficient and optimal learning for elementary school students so that they can acquire good literacy skills. Literacy is the ability to apply concepts and skills in everyday life (e.g., at home, at work, in community life, and as a citizen) and interpret information around it (Bellini et al., 2019). Literacy skills are really needed according to the demands of several educational skills in the 21st century, including critical thinking, problem solving, creativity and innovation, decision making, as well as learning and metacognition.

Several interventions in the world of education are needed to improve students' literacy skills. The literacy strengthening strategy is a step or effort to integrate students' literacy abilities in evaluating learning (de Wit et al., 2023). The literacy learning program was well received by the students and program participants, who generally improved their skills by the predetermined objectives (Napoli & Purpura, 2018). In addition to improving skills, literacy education brings other benefits. Learning must be carried out periodically, and knowledge must be gained through internal and external learning. Research by Via and friends (2021) found that the contribution of literacy skills of prospective elementary school student 21.1% were influenced by self-efficacy, while the remaining 79.9% were influenced by other factors not examined in this study (Via et al., 2021). The model developed is contextualized learning (Velani & Retnawati, 2020) and coaching-oriented mentoring (Ziegler & Algra, 2020); the coaching approach is systemic, systematic, and programmed, with reflection and follow-up in classroom learning. As much as 79.9% of skills are influenced by other factors that have yet to be identified, so coaching-oriented mentoring or observation is followed up.

One of the learning conditions considered suitable for elementary school students is outdoor learning activities. Outdoor learning activities can be used to improve mathematics student competence in the context of literacy learning (Kärki et al., 2018). Outdoor mathematics activities have positively impacted students' arithmetic performance and self-regulation skills, indicating the potential to improve mathematics student competency through outdoor teaching (Pérez Brunicardi et al., 2022). Outdoor learning activities can strengthen positive relationships between students, as well as influence their happiness and motivation to continue learning with enjoyment. Outdoor learning activities very effective for implementing learning with a contextual approach. Bullynck (2008) explains that contextual-based learning is an educational process that aims to help students see the meaning of the academic material learned by connecting academic topics with the context of everyday life, namely their personal, social, and cultural contexts. Contextual learning aims to connect students' knowledge with real contexts to build meaningful knowledge (Prastiwi et al., 2019).

In contextual literacy learning, learning activity must be more accustomed to organizing contextual learning activities in problem-solving to strengthen students' literacy competencies. Based on various studies, combining outdoor activities and contextual learning into literacy learning can increase mathematics students' competence. Based on the theoretical insights and empirical evidence presented earlier, this study will focus on the following research question: Is there an improvement in students'

ability in literacy (Cheung et al., 2021) through outdoor learning in the school yard with contextual approaches? How active are the students in the literacy learning with outdoor learning in the school yard with contextual approaches? Is there an effect of improving student competence (Bellini et al., 2019) through the motivation of participants of literacy learning contextual approaches with outdoor learning in the school yard? This study aims to (1) determine the improvement in the ability of students of literacy learning with contextual approaches by outdoor learning in the school yard, (2) determine the activeness of students of literacy learning with contextual approaches by outdoor learning in the school yard, and (3) determine the effect of improving students' competence (Karlen et al., 2023) through the motivation of participants of literacy learning with contextual approaches by outdoor learning in the school yard.

The hypotheses of this study are: (1) there is an increase in the ability of students of literacy learning with contextual approaches by outdoor learning in the school yard; (2) there is activeness of students of literacy learning with contextual approaches by outdoor learning in the school yard; and (3) the motivation of participants of literacy learning with contextual approaches by outdoor learning in the school yard mediates the effect of improving student competence (Gümüş & Kukul, 2023). The results of this study have an impact on improving learning of out class in the school yard through motivation to participate in literacy learning with contextual approaches, which affects improving student literacy skills in Indonesia.

Method

Participants and Data Collection

The experimental research sample is one of the elementary schools in Rembang Regency. The study involved 25 9-year-old elementary school students in grade 3 consisting of 10 male students and 15 female students. Data were obtained through questionnaires and interviews with students after mathematics learning using physical activities in the school yard.

Research Design and Instruments

This research uses mixed methods, namely quantitative methods through questionnaires and qualitative methods through interviews after learning observations. The results of 1 month of observation were followed up to create a literacy learning model with a contextual approach by outdoor learning in the school yard. The instruments developed for mathematics learning activities through physical activities in the school yard are as follows:

Playing Spatial Building

Location : the school yard

Equipment : 30 m raffia rope

Group size : Arrange students into groups of no less than 5

Directions :

1. Have the group select a leader

2. The group leader takes a card containing clue about geometric shape to the teacher

3. Each group makes a certain geometric shape with a raffia rope according to the clue on the first card.

4. The group leader returns the first card to the teacher and takes the second card which contains clue about geometric shape

5. Each group creates a certain geometric shape according to the clue on the second card

6. Repeat the activity as above until each group has made 8 geometric shapes

7. The teacher assesses each group in terms of accuracy and speed in creating spatial structures.

The questionnaire for feedback uses a Likert scale of 1-5 according to the rubric, namely: (1) Expected practice has not been seen in 1 month; (2) Expected practice has begun to be seen at least 1 (one) time in a month; (3) Expected practice is often seen but inconsistent; (4) Expected practice has begun to be seen at least 1-2 times in a month; and (5) Expected practice has begun to be seen at least 3 (three) times and has been seen consistently. In the implementation of the experimental research, feedback was collected on the effectiveness of the implementation of mathematics learning through physical activities in the school yard by ticking the instrument sheet provided with a Likert scale of 1-5 which means 1 (very bad/sufficient/high), 2 (bad/sufficient/high), 3 (doubtful), 4 (good/sufficient/high), and 5 (very good/satisfactory/high).

Analysis Technique

Data analysis uses an integrative approach by integrating formative data analysis into the research process, integrating multiple data sources through observation or literature to discover possible relationships, participating in related theories and a collaborative and reflective process, realizing that the general framework of data analysis is systematic and deliberate, and using the emerging conceptual framework as a guide. Data analysis used a quantitative approach. Multiple-choice answers and simple statistical tests were conducted using Microsoft Excel applications and descriptive statistics. Path analysis using the SEM (Structural Equation Modelling) approach using the SPSS version 25 application and the Lisrel version 8.8 application. SEM involves three activities simultaneously. This is done to enrich and clarify the results explicitly interpreted as close to the actual results. This research data was analyzed using structural equation modeling (SEM) with the Lisrel application, which can be downloaded on the page https://www.ssilive.com/license/lisrel. SEM (Magno et al., 2024) combines confirmatory factor analysis (CFA) with regression analysis, between CFA and path analysis, and a combination of structural and measurement models. SEM can analyze the pattern of relationships between latent variables and their indicators, latent variables with each other, and other measurement errors. SEM can thoroughly explain the relationship between variables in the study and the condition of building a hypothesis model consisting of structural and measurement models in the form of diagrams based on theoretical justification. Qualitative data analysis uses descriptive observations and interviews.

a. Validity and Reliability Test Analysis. The validity test of each indicator item on the questionnaire used was analyzed using the Lisrel version 8.8 application. Indicators are said to be valid if the standardized value is above 0.50 between the indicator and the variable. Reliability tests are carried out for questions that meet the validity test using the results of the Lisrel application. It is said to be reliable if the Construct Reliability (CR) value is > 0.50 or the Variance Extracted (VE) > 0.50 the following equation:

$$\text{CR} = \frac{(\sum \text{Standardized Loading})^2}{(\sum \text{Standardized Loading})^2 + (\sum \text{Measurenment Error})} \text{ and } \text{VE} = \frac{(\sum \text{Std.Loading g})^2}{(\sum \text{Std.Loading g})^2 + (\sum \text{e})} \quad (1)$$

b. Classical Assumption Test Analysis includes a normality test, a multicollinearity test, and a heteroscedasticity test. In SEM, the model is said to be fit if the RMSEA value is <0.05.

c. Direct and indirect effects. Tests of simultaneous and indirect effects are obtained from the confirmatory factor analysis (CFA) output of the Lisrel application. The regression equation must fulfill the following equation:

Structure 1:

$$Z = aX_1 + bX_2 + cX_3 + \delta \ (2)$$

Structure 2:

$$Y = aX_1 + bX_2 + cX_3 + \delta \ (3)$$

Structure 3:

$$Y' = a' X_1 + b' X_2 + c'X_3 + dZ + \delta \ (4)$$

Results

Pressure Distribution

This study was conducted over a month, with participant scores and engagement presented in Table 1.

Table 1. Comprehension test scores, pre-and post-tests, and the percentage of participant activeness

Description	Number of Participants	Lowest Score	Highest Score	Average Score
Pre-test	25	10.00	95.00	55.63
Post-test	25	45.00	100.00	81.43
Comprehension Test	25	40.00	100.00	90.43
Cumulative Average Score	25	33.33	92.33	75.42
Liveliness Percentage (%)	25	88.89	100.00	97.22

Mathematics learning is carried out directly through physical activities in the school yard for a full month guided by the teacher, as shown in Figure 1.

Figure 1. Implementation mathematics learning activities through physical activities in the school yard

The findings in this study were an increase in cognitive literacy learning participants previously obtained from 55.63 (pre-test average value) to 81.43 (post-test average value), or an increase of 25.8 points. The percentage increase is 46.38% from the initial (pre-test average) value. This increase in average score proves that students who participated in literacy learning for a month increased competence related to understanding mathematics learning materials, as shown in Table 1 and Figure 1.

The participant's reactions to the literacy learning model reinforce the second finding above. Participants' responses to applying the learning model reached an average of 4.56 (very high) and an average percentage of 91.22% (perfect). Another response is that the understanding of the material and follow-up literacy learning reached an average of 4.52 (very high) and an average percentage of 90.38 (perfect), according to Table 2. Partially, the highest response was that the learning materials were simple, essential, and contextual (92.38%), and the literacy learning materials were easy to understand (91.90%). This finding proves that student who participated in literacy learning were more willing to provide direct instruction to children in learning followed by observation with a coaching approach rather than disseminating the results to others student (89.52% and 90.00% > 81.10), according to Table 2.

Table 2. Participant understanding and follow-up at school

Description	Total	Total Max	Percentage
Learning materials are easy to understand during learning	193	210	91.90
Learning materials are easy to learn	191	210	90.95
Learning materials are simple, essential, and contextual	194	210	92.38
Learning materials are received with fun	188	210	89.52
The learning media used are simple and easy to obtain	192	210	91.43
The learning media used are easy to apply to learning	191	210	90.95
Learning materials are immediately applied to learning	187	210	89.05
Average score per participant	4.52		
Percentage	90.38		

Another finding in this study is the activeness of the participants in participating in literacy learning from the beginning to the end of the learning, including taking the comprehension test, pre-test, and

post-test, implementing the results of literacy learning mathematics through physical activities in the school yard.

Questionnaire analysis of the influence of student's skills

Based on the questionnaire given to 25 students during observations at school while implementing mathematical literacy learning through physical activities in the school yard, the teacher obtained a summary of the results as presented in Table 3 below.

Table 3. Recapitulation of the average value of each variable

Variable	Total	Average	%
Literacy skill	9	33.14	82.9
Social-Emotional Learning Skill	8	38.60	85.8
Motivation	7	30,12	86.1
Learning with Happiness	16	66.17	82.7

The recapitulation from Table 3 was tested for validity and reliability with the Lisrel 8.8 application as part of SEM (Structural Equation Modelling), obtaining the recapitulation in Table 4.

Table 4. Validity and Reliability Test with Lisrel 8.8 application

Variable	Total	Valid	CR	Result	VE	Result	Decision
Literacy skill	9	9	4.1360	reliable	0.5531	reliable	reliable
Social-Emotional Learning Skill	9	9	3.4144	reliable	0.4803	not reliable	reliable
Motivation	9	7	3.2648	reliable	0.4767	not reliable	reliable
Learning with Happiness	18	17	8.2767	reliable	0.5540	reliable	reliable

The results of Table 4 obtained the value of RMSEA = 0.000<0.050 and declared the model fit. The results were tested again by hiding statements X28, X29, X30, and X55 because the standard solution value was <0.500 with the results of X8, X9, X25, X26, X27, X28, X29, X30, X38, X39 and X55 <0.05 with RMSEA = 0.000<0.500 (model fit). According to Figure 2, the model with existing variables is tested for validity and reliability. Table 4 shows that the variables whose instruments are invalid are social-emotional learning skill (X28), the learning motivation variable (X39 and X30), and the learning with happiness variable (X55). All variables based on the CR (construct reliability) value calculated by equation (1) are literacy skill (4.1360), social-emotional learning skill (3.4144), motivation (3.2648), and learning with happiness (8.2767). The VE (variance extracted) values from the calculation of equation (1) are literacy skill (0.5531) and learning with happiness (0.5540) > 0.500, respectively. As for social-emotional learning skill (0.4803) and motivation (0.767), they are not reliable. The CR and VE values are reliable; the CR value is reliable, and the VE value is not reliable because one of them is reliable. Thus, all variables are reliable and are continued for further calculations to prove the hypothesized model.

The results of the Fit model were further tested without including statements that were less than 0.500 to determine the relationship between improving student skill and learning with happiness through the motivation of students to participate in literacy learning with a contextual approach while proving motivation to attend learning as a mediator with standardized solution results, as shown in Figure 2.

The confirmatory factor analysis (CFA) model approach with the Lisrel application obtained between variables has a causal relationship based on Figure 2 and Figure 3, supported by the results of the syntax output in the Lisrel application. The final SEM model in Figure 2 obtained the following results: the relationship between literacy skill variables and social-emotional learning skill variables (0.50), and the relationship between literacy skill variables and social-emotional learning skill variables (0.38). The hypothesis presented at the beginning of this article is that participants' motivation to participate in literacy learning contextual approach mediates the effect of improving students skill. Based on the analysis and model calculations obtained from the Lisrel application in Figure 2 and Figure 3, the model fits with RMSEA (0.000) and p-value (1,000), which means that empirical data supports the hypothesized relationship between variables.

Figure 3 is a model of the relationship between improving students' skill through students' motivation to participate in literacy learning with contextual approaches and proving motivation to participate in learning as a mediation of the complete standardized solution, as shown in Figure 3.

Figure 2. Model final Structural Equation Modelling (SEM) from Lisrel 8.8.

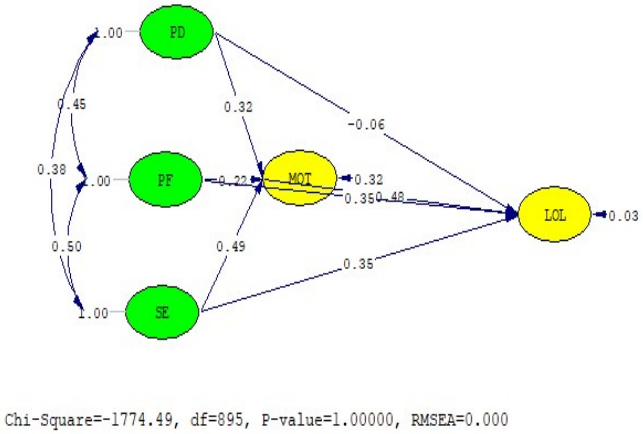
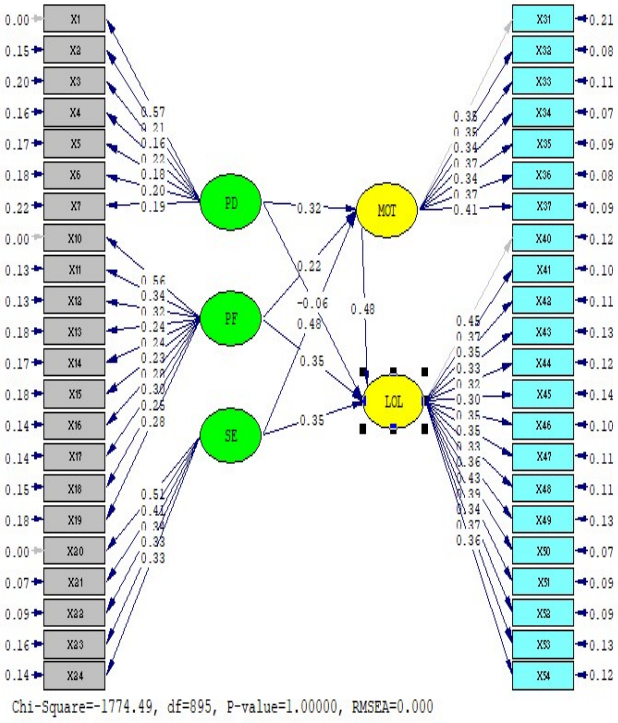


Figure 3. Standardized solution final Structural Equation Modelling (SEM) from Lisrel 8.8.



The result is that the motivation variable to participate in literacy learning is influenced by literacy skill variable (0.32) and social-emotional learning skill variable (0.49). The motivation variable to participate in literacy learning affects the learning with happiness variable by 0.48. Each has a t-count > 1.650, namely literacy skill variable (4.22), and the social-emotional learning skill variable (5.53) for 25 respondents. These results are more excellent learning with happiness influenced by literacy skill variable (-0.006) and social-emotional learning skill variable (0.35) by the calculations in the goodness of fit statistical output in the Lisrel 8.8 application. Indirect effect for literacy skill variable (0.038) and social-emotional learning skill variable (0.054) with t-count of literacy skill variable (-1.66) and social-emotional learning skill variable (6.48).

Calculation of Structural Equations LISREL Estimates (Maximum Likelihood): motivation is directly influenced by literacy skill and social-emotional learning skill variables. The results of that motivation to participate in literacy learning are influenced by literacy skill variable (32%) and socio-emotional learn-

ing skill variable (48%). Other factors influence the rest. Equation (3) means that learning with happiness is influenced by motivation to participate in blended-based literacy learning (48%) and social-emotional learning skill variable (35%). Literacy skill variable has a negative effect of 6.3%, and as much as 1.7% is influenced by other negative variables. Confirmatory factor analysis (CFA) using SEM with the application makes it very easy to find causal relationships or relationships between two variables that influence each other, as shown in Figure 2 and Figure 3, supported by LISREL Estimates (Maximum Likelihood) output. The correlation matrix of the independent variables found that literacy skill is influenced by learning with happiness by 0.45, with a t-value of 6.58. Socio-emotional competence is influenced by learning with happiness by 0.38 with a t-value of 5.16 > 0.50 and literacy skill by 0.50 with a t-value of 7.77 > 0.50, which means the effect is significant.

Discussion

The finding in this study is that students' motivation to participate in literacy learning with contextual approach mediates the effect of improving student's skills. The potential of outdoor activities to enhance contextual literacy learning for mathematics students was explored. The following are the results of the analysis in this research: 1) Outdoor activities can be used to enhance contextual literacy learning for mathematics students by providing real-life context for mathematical problem solving; 2) The use of a variety of existing media outside the classroom has proven beneficial for improving student's skills; 3) Designing problem-solving activities in outdoor field experiences has been shown to improve students' understanding of mathematical literacy concepts and their ability to create appropriate and motivating contexts for problem-solving.

Mathematics is considered by most students as one of the difficult subjects. Therefore, various learning strategies are needed to make learning mathematics easier to understand, fun, and contextual. One of these mathematics learning strategies is learning mathematical literacy through physical activities in the schoolyard. This can be seen that by learning mathematical literacy through physical activities in the schoolyard for a whole month, students can learn mathematics enthusiastically and happily. Learning mathematics through physical activities in the schoolyard while still emphasizing fundamental mathematical concepts and formulas, but contextually and like playing around, makes learning mathematics something that makes children enjoy learning mathematics outdoors. When the teacher is present in the schoolyard with teaching aids, students feel like they are playing but learning mathematics. The learning outcomes that have been running so far are related to the increasing ability of children to catch up in mathematics lessons, as evidenced by the increasingly good grades. This is reinforced by the presence of testimonies of students in literacy learning with very basic, simple, fun and contextual material are a true transformation of education. So far, the primary education level has yet to be given the basic learning students need in the classroom. One of the literacy skills of students is the ability to reason and contextualize. Students feel happy and addicted to learning in class, so they quickly understand what is being taught by the teacher.

The main principle of learning through play is that it must be fun. Learning mathematics using games has several advantages for students, including most games are traditional and part of local culture so that students learn the culture and values implied in the game. Learning mathematics through games outside the classroom is also beneficial for the physical and physical health of students because they are required to be active during the game and is beneficial for the psyche and mental health of students because they feel happy and cheerful personally and feel involved and useful in reaching a consensus with the team to work together to win the game fairly and responsibly. In an academic context, learning mathematics outdoors can provide practical mathematical experiences in a context that is unfamiliar to many children. Some children who have difficulty with mathematics indoors have more positive experiences outdoors (Robertson, 2020) (Robertson, 2020).

The successful implementation of learning and development is highly dependent on motivation (Kim, 2020). Learning mathematical literacy through outdoor games such as schoolyards can increase students' learning motivation. Motivation is a drive or reason that underlies the spirit of doing something and can cause encouragement at learning. Motivation is one factor a student drives and directs behavior (Glover et al., 2021) to meet specific goals such as getting the highest score in completing assignments

or carrying out academic exams, becoming champion in an academic or non-academic competition, achieving graduation, and so on.

Outdoor learning activities make it easier to apply learning based on a contextual approach with concrete objects in accordance with the cognitive development of elementary school students. Outdoor learning activities such as playing are also very fun so they can foster enthusiasm for learning in elementary school students. Outdoor learning activities with a concrete contextual approach can improve elementary school students' literacy skills, for example through playing with ropes, groups of students can make various flat shapes, then teachers can improve students' numeracy skills by teaching them how to calculate the perimeter, area and etc. Learning math through games outside the classroom can also be done by encouraging students to create board games. This is useful for developing their spatial awareness and understanding of geometry as they need to consider precise measurements and accurate layouts (Robertson, 2020)

When learning math through an outdoor game is not going well or the group or children are not really engaged in the game. Ask the children for their ideas on how to make it better. What rules can be adapted or changed? How can they make the game more interesting? This type of creative thinking helps children to see how small changes can make a big difference. This is a useful skill for acquiring algebraic reasoning - making changes and seeing the results of these changes. Looking for patterns and using them to predict outcomes. Learning how to record these changes in a mathematical way. Encourage children to use equations (mathematical sentences) to explain what is happening (Robertson, 2020).

Conclusions

Improving students' mathematics skills with literacy can be achieved if the teacher's ability to teach out of the classroom is genuinely that of a leader in learning who functions as a facilitator, mentor, and coach for students. Teachers can design mathematics learning outside the classroom by inviting students to do physical activities such as making flat shapes. Learning activities outside the classroom like this not only train students' social-emotional skills, but can also improve students' literacy skills through contextual learning with concrete objects and counting activities through various play activities.

This research is limited to math student learning. There are still shortcomings, namely that it limited time to measure the success of increasing student competence, one of which is the increase in grades, understanding, and numeracy skills of students. In the future, there will be research that can capture the results of learning for students from the beginning to the end of the semester after the teacher applies the results of the learning as a whole, either in mathematics or other subjects.

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