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THE EFFECT OF PROBLEM-BASED LEARNING ORIENTED WITH TRADITIONAL GAMES ON STUDENTS LEARNING OUTCOMES VIEWED FROM HAND-EYE COORDINATION

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Abstract. The current study aimed at investigating the effect of problem-based learning oriented with traditional games on students learning outcomes viewed from hand-eye coordination. Quasi-experimental was used as a research design since the current study was conducted in the form of quantitative research. The research setting was SDN 6 Batubulan, Gianyar, Bali. There were 40 of fifth-grade students that were involved as a research sample. They were selected by using simple random sampling. They were divided into control and experimental group by using order vairing technique. The data were obtained by conducted pretest and posttest. The performance test and written test were conducted during the pretest and posttest. The test rubrics were used as research instruments. The data were analysed by using inferential analysis (Two-Way ANOVA and Independent Sample T-test) with the assistance of SPSS 25. The results indicated that there was an impact on students' learning outcomes due to their hand-eye coordination ability and the implementation problem-based learning oriented with hand-eye coordination.

Keywords: Hand-eye coordination; Learning outcomes; Traditional games; Problem-based learning

INTRODUCTION

Learning outcome is strongly defined as a reflection of students' learning process in which it is influenced by students' motoric ability. It is proved on how the learning outcomes gained by the students in physical education or sport class considering that body movement or psychomotor becoming the main aspect to determine about the success of learning process (Amiariasti et al., 2024; Dharmadi et al., 2021; Lesmana, 2023). It is mentioned that physical education concerning students' body movement to influence their emotional stability, mindset, and their life style through many physical activities provided in the learning process (Haris, 2018; Septri et al., 2023; Yasir et al., 2022). Teachers obtain students' cognition, psychomotor, and affection from physical activities which are taught in a systematic manner (Bile et al., 2021; Wijaya et al., 2022) Pangestu et al., (2021) argue that physical education is recognized as an integral part of education aiming at developing students' social skills, critical thinking, and character by concerning on their body movement. Therefore, the learning outcome not only shows students' cognitive progress but it is more complex and inseparable with students' psychomotor and affection as occurs in physical education (Alsyabri, 2021;Lesmana & Rokhyati, 2020;Sanova et al., 2022).

Physical education teacher tends to have more responsibilities in encouraging students since this subject concerns on students' cognition and motoric ability (Dharmadi et al., 2022; Pratama et al., 2021; Tegeh et al., 2020). Physical education is taught as a compulsory subject in elementary schools where the teachers initially establish students' basic movement or techniques in which it directly reflects their cognition or comprehension on what they learning (Ertanto et al., 2021; Lesmana et al., 2022). Manipulative basic movement is one of materials commonly taught for physical education learning process in many elementary schools which requires high comprehension and practical movement (Ginting et al., 2022; Mahyuddin & Sudirman, 2021; Pangestu et al., 2021) Teachers are supposed to enhance students in understanding the theoretical of manipulative basic movement before it is practically implemented by the students (Wijaya et al., 2022). It is important since this movement becoming the basis to conduct or practice other sports such as; badminton, volley, basketball, baseball, etc (Setiawan et al., 2020; Tegeh et al., 2020; Wijaya, 2022). It is suggested that the physical teachers are supposed to concern more on students' understanding and psychomotor to achieve an optimal learning outcome (Pangestu et al., 2020; Wijaya & Kanca, 2019).

Furthermore, a successful learning outcome is frequently obtained from students performance in manipulative basic movement (Khairi et al., 2023; Parwata et al., 2023; Rachman et al., 2020; Taroreh & Wijaya, 2020). Although, it is categorized as an initial body movement learnt by the elementary schools, many challenges also occurred during its implementation (Lestari et al., 2021; Padmawan et al., 2024). The preliminary observation shows that the fifth-grade students at SDN 6 Batubulan facing difficulty in achieving the passing grade score of manipulative basic movement. They are struggling in practicing hand-eye coordination. Teacher mentions that 40% of fifth-grade students cannot achieve the passing grade which is 75. They are failed in passing the test for their cognition or knowledge and cannot achieve the standard of performance test. It indicates that the fifth-grade students not having an optimal learning process since 40% of students still gain low learning outcomes.

Hand-eye coordination is regarded as a foundation in practicing the manipulative basic movement in which it is a dominant hand and eye movement for passing and catching technique in many sports (Satardi et al., 2023; Sulistiadinata & Purbangkara, 2020). It is argued that hand-eye coordination is underpinned by students' cognition in which it is processed through a visual input of using hands' proprioception guiding the eye (Sakthivel & Vaithiyanathan, 2022). Mahmudin et al., (2025) define hand-eye coordination as an ability of gazing the eye with hand movement effectively in order to achieve an accurate movement of passing the target direction. It is added that hand-eye coordination is a reference to assess students' manipulative basic movement (Arisandi & Indahwati, 2023). Therefore, the progress of students' manipulative basic movement can be obtained from their hand-eye coordination.

Regarding to the current problem found at SDN 6 Batubulan, the teacher can take an action based on what is proposed in Merdeka curriculum. The current curriculum provides a flexibility for the physical education teachers to conduct a learning process increasing students' ability in variating the basic movements through the utilization of games (Made et al., 2023). The involvement of games is a trend in educational field, there are many various kinds of games are adapted with the implementation of innovative teaching strategy. Currently, traditional game is integrated with an innovative learning strategy to teach students in physical education. One of them is problem-based learning oriented with traditional games. Massive researches explore the existence of problem-based learning oriented with traditional games not only in physical education but in a broaden way. Azhari (2022) has revealed that the problem stimulation in problem-based learning helping students to critically think about the information that they gather from the traditional games. It directly improves students' learning outcomes. Another study shows that students' collaboration is improved from the process of problem-solving and group work in the traditional games (Imama et al., 2021). Fauzi et al., (2023) add that traditional games significantly improve students' ability in practicing basic body movement through the physical activity in traditional games since it has been familiar for them in which they frequently play the games outside of the school. The problem orientation provided in problem-based learning improves students' critical thinking which affects their cognition as well (Imama et al., 2021). Those indicate that problem-based learning oriented with traditional games established both students' psychomotor and cognition relevant to the purpose of physical education.

However, further investigation is still required to find out a deeper insight on the implementation of problem-based learning oriented with traditional games in overcoming the problem occurs in physical education. Many researches have shown the effectiveness of the integration between problem-based learning and traditional games in educational field, but major of the mentioned studies investigating its effectiveness in a general point of view. Since the resent problem occurs due to students' hand-eye coordination, the current study is conducted to investigate the effect of problem-based learning oriented with traditional sport on students learning outcomes viewed from hand-eye coordination at SDN 6 Batubulan. It aims at exploring the effect given on the students' learning outcomes manipulative basic movement determined on their hand-eye coordination.

METHOD

Quantitative approach was used in the current study by adapting quasi-experimental model particularly the design of level 2x2 treatment. The setting was SDN 6 Batubulan by involving fifth-grade students. There were 40 of them involved as a research sample in which they were selected by using simple random sampling technique. Then, they were divided into control and experimental group with Order Vairing

Technique. The data were collected through pretest and posttest. Pretest was conducted to the control and experimental group when they were taught by using problem-based learning only. Then, the posttest was conducted after the experimental group was given a treatment (problem-based learning oriented with traditional games) meanwhile the control group was given a test without any treatment. The students' learning outcomes on manipulative basic movement was obtained by using the performance test and their hand-eye coordination was obtained by using written test adapted from TKSI KEMENDIKBUD. The collected data were analysed with inferential statistic analysis. Two-Ways ANOVA was selected as the quantitative analyses with the assistance of SPSS.25.

RESULTS AND DISCUSSION

RESULTS

The data collected from pretest and posttest were analysed for the perquisite tests, such as; normality test and homogeneity test. The results were presented as follows.

The Normality Test Result

The data were considered as normal if the significant value was higher than 0.05. The data were categorized as presented in table 1.

Table 1. The Normality Test Result

Data Groups		*Kolmogorov-Smirnov*			α	Information
		Statistic	*df*	*Sig.*		
Gain score of Data Normality	A_1	.151	20	.200	.05	Normal
	A_2	.165	20	.156	.05	Normal
	B_1	.122	20	.200	.05	Normal
	B_2	.149	20	.200	.05	Normal
	A_1B_1	.246	10	.087	.05	Normal
	A_1B_2	.206	10	.200	.05	Normal
	A_2B_1	.184	10	.200	.05	Normal
	A_2B_2	.228	10	.152	.05	Normal

Notes:

A_1 = Experimental group

A_2 = Control group

B_1 = Group with high hand-eye coordination ability

B_2 = Group with low hand-eye coordination ability

A_1B_1 = Experimental group with high hand-eye coordination ability

A_1B_2 = Experimental group with low hand-eye coordination ability

A_2B_1 = Control group with high hand-eye coordination ability

A_2B_2 = Control group with low hand-eye coordination ability

Table 1 showed that the data related to the learning outcome of manipulative basic movement in experimental group was normal since the data had a significant value of .200. The students' learning outcomes in manipulative basic movement gained from control group also had a normal distribution with a significance of .156. The data of students' hand-eye ability both the high and low abilities were normally distributed with the significant value .200. In addition, the data of experimental students with high hand-eye coordination ability was normal with the significant value .087. The data of experimental students with low hand-eye coordination was normal as well with the significance of .220. The result was similar to the control students with high hand-eye coordination ability whose data were normally distributed with the significance of .200. Lastly, the control students with low hand-eye coordination ability gained normal data with the significance of .152. All the data were normally distributed considering that their significant values were higher than .05.

The Homogeneity Test Result

The data were also checked for homogeneity, if the significant value was higher than .05, then the data were homogenous. The result was presented in Table 2.

Table 2. The Homogeneity Test Result

The Normalized *Gain Score*	*Levene Statistic*	*df1*	df2	Sig.	α	Note
The learning outcomes among the students (experimental and control)	2.665	1	38	.111	.05	Homogeneous
The learning outcomes between students with high hand-eye coordination ability and the students with low hand-eye coordination ability	2.641	1	38	.112	.05	Homogeneous
The learning outcomes who were taught with problem-based learning oriented with traditional games and their hand-eye coordination ability	.897	3	36	.452	.05	Homogeneous

Table 2 showed that there were three groups of data tested for finding the homogeneity. The learning outcomes between students who were taught with problem-based learning (control group) and the students who were taught with problem-based learning oriented with traditional games (experimental group) were homogeneous with the significance .111. Meanwhile, the learning outcomes between the students who had high hand-eye coordination ability and the students who had low hand-eye coordination were homogeneous with the significant value of .112. In addition, the learning outcomes of the students who were taught with problem-based learning oriented with hand-eye coordination ability were homogeneous with the significance of .452. Those data were homogeneous considering that the significance was higher than .05.

The Hypothesis Test Result

Hypothesis testing was conducted by using Two-Ways ANOVA. The result was presented in Table 3.

Table 3. The Result of Two-Ways ANOVA

Tests of Between-Subjects Effects					
Dependent Variable: *Gain score* normalized learning outcomes					
Source	*Type III Sum of Squares*	*df*	*Mean Square*	F	*Sig.*
Learning Model	.042	1	.042	5.323	.027
Hand-Eye Coordination	.066	1	.066	8.498	.006
Model pembelajaran* Koordinasi mata tangan	.242	1	.242	30.938	.000
Error	.281	36	.008		
Total	.128	40			
Corrected Total	.631	39			

The result of Two-Ways ANOVA answered the formulated hypotheses in the current study which were elaborated as follows.

Hypothesis 1

The first hypothesis proposed in this study was “there was an effect of the learning outcomes of basic manipulative movements between students who join problem-based learning oriented with traditional games and the students who were taught with conventional problem-based learning. Based on the summary of the two-way ANOVA presented in table 3, the F statistic value was obtained at 5.323 with a significance level of .027, which was smaller than .05. It indicated that there was an effect contributed to the learning outcomes of basic manipulative movements between students who joined the problem-based learning model oriented with traditional games and the conventional problem-based learning model.

Hypothesis 2

The second hypothesis proposed in this study was “there was an interactional effect between the learning model and hand-eye coordination on the learning outcomes of basic manipulative movements”. Based on the summary of the Two-Ways ANOVA presented in table 3, the F statistic value was obtained at 30.938 with a significance level of .000 which was less than .05. It meant that there was an interactional effect between the learning model and hand-eye coordination on the students’ learning outcomes of basic manipulative movements.

Hypothesis 3

The third hypothesis in the current study was obtained from the result of independent-samples t-test as presented in table 4 below.

Tabel 4. The Result of Independent Sample T-Test of The Students’ Hand-Eye Coordination Ability

		t-test for Equality of Means				
		t	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*
Assess learning outcomes	*Equal variances assumed*	5.948	18	.000	.220	.037
	Equal variances not assumed	5.948	17.963	.000	.220	.037

Based on table 4, the t statistic value was 5.948 with a probability value (p) .000. The probability value (p) < 0.05. This showed that there was an effect given to the learning outcomes of basic manipulative movements between students with high hand-eye coordination who joined the problem-based learning oriented with traditional games and those who joined the conventional problem-based learning model. The mean difference value of .220 indicated that the average learning outcomes of basic manipulative movements in the experimental group were greater than the control group. It was concluded that the students’ learning outcomes of basic manipulative movement who were taught by problem-based learning oriented with traditional game were higher than the students’ who were taught by conventional problem-based learning.

Hypothesis 4

The hypothesis 4 was also tested by using independent sample t-test analysis in which the result was presented in Table 5.

Table 5. t-test for Equality of Means

		t-test for Equality of Means				
		t	*df*	*Sig.* (2-*tailed*)	*Mean Difference*	*Std. Error Difference*
Learning Outcomes	*Equal variances assumed*	-2.170	18	0.044	-0.091	0.042
	Equal variances not assumed	-2.170	14.273	0.047	-0.091	0.042

Based on table 5, the t-statistic value was -2.170 with a probability value (p) of the t-test on equal variances assumed of .044. The probability value (p) <0.05. This revealed that there was an influence of the learning outcomes of basic manipulative movements between students with low hand-eye coordination who joined the problem-based learning oriented with traditional games and those who joined the conventional problem-based learning. The mean difference value was -.091. It revealed that the average learning outcomes of basic manipulative movements in the experimental group were smaller than in the control group. It indicated that the students who had low hand-eye coordination taught by problem-based learning oriented with traditional games achieved lower learning outcomes than the students with low hand-eye coordination taught by conventional problem-based learning.

DISCUSSION

The current study had revealed that there was an effect contributed by problem-based oriented with traditional games on students' learning outcomes in manipulative basic movement. This finding supported the existence of traditional games in physical education. Many studies had revealed the same findings. It revealed that traditional games improved students' learning motivation in physical education (Wipradana & Lesmana, 2021). The traditional games adapted into the learning model brought significant impact on students' learning process in which it was proven by the different learning outcomes gained by the students in experimental and control group. The students who were taught by problem-based learning oriented with traditional games achieved higher learning outcomes in manipulative basic movement than the students who were taught with conventional problem-based learning. It indicated that the students had better physical development when they were taught with traditional games. It was similar to the finding of previous study showing that traditional games increased students' physical development (Wijaya, 2022; Dharmadi et al., 2022).

Another finding showed that the hand-eye coordination influencing students' learning outcomes in manipulative basic movement. It was revealed from the interactional effect given from hand-eye coordination ability and problem-based learning oriented with traditional games on students' learning outcomes. It supported the role of hand-eye coordination as the foundation of basic movements in physical education (Mahyuddin & Sudirman, 2021: Karim, 2020). However, the current study was limited on investigating another factor influenced students' hand-eye coordination ability and the learning model of problem-based learning since it was also found that students with low hand-eye coordination who were taught with problem-based learning oriented with traditional games ability achieving lower learning outcomes than students with low hand-eye coordination taught by conventional problem-based learning Mahyuddin & Sudirman, 2021;Setiawan et al., 2020).

The current finding implicated the existence of problem-based learning oriented with traditional games in the educational field. This present study provided a broaden insight on the implementation of problem-based learning oriented with traditional learning was effective on students' cognition improvement. It was strengthened by the result during the posttest of students' manipulative basic movement in the form of written test. Students had a better understanding. It was relevant to several studies that students' understanding, critical thinking, and knowledge (Fajriah & Metryadi, 2024) This study directly strengthened the role of hand-eye coordination as an underpinning aspect of basic movement in many supports that had been explored by other researchers (Bakhtiar et al., 2020; Munafiatun & Agung, 2023). Therefore, it practically supported the implementation of problem-based learning oriented with traditional games.

CONCLUSIONS

The current study draws conclusions based on the elaborated findings above, such as; 1) there is an effect contributed by problem-based learning oriented with traditional games on students' learning outcomes in manipulative basic movement, 2) there is an interactional effect contributed by students' hand-eye coordination ability on students' learning outcomes in manipulative basic movement, 3) the students' with high hand-eye coordination ability who are taught by problem-based learning oriented with traditional games had better learning outcomes than the students' who are taught by conventional problem-based learning, and 4) the students with low hand-eye coordination who are taught by problem-based learning oriented with traditional games have lower learning outcomes than the students' who were taught by conventional problem-based learning. Further research is suggested to explore the factors influencing the implementation and the correlation between hand-eye coordination with the learning model in a more specific way since the current study is limited due to the investigation on other variables that may have an impact on the students' learning outcomes in manipulative basic movements.

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