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Peer observation, self-assessment, and circuit learning: Improving critical thinking and physical fitness in physical education

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ABSTRACT

Learning, which focuses on higher-level thinking skills, can be applied in the physical education curriculum through games and sports, movement education, and outdoor education. This study aims to produce a learning model that effectively improves the physical fitness and critical thinking skills of students. Purposive sampling was used in selecting research sample members in which 308 (M: 153 and F: 155) fifth-grade students participated in this study. Two groups were selected as research subjects divided into small groups for the first stage test (N: 123; M: 56; F: 67; Average age: 10.82) and large groups for the second stage test (N: 185; M: 97; F: 88; Average age: 10.70). Five indicators of critical thinking skills were measured through a critical thinking skills instrument. Meanwhile, the indicators of physical fitness tests include BMI, Sit and Reach, Sit-Up, Trunk Lift, and PACER 20-M. The results showed that physical education, oriented towards peer observation carried out during the learning process, self-assessment carried out by students, and packed in the circuit learning method is proven to improve critical thinking skills and physical fitness.

Keywords: physical education; critical thinking; physical fitness; peer observation; self-assessment; circuit learning

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INTRODUCTION

Critical thinking has become an important issue or theme in education recently. This theme has become a movement in education because it is an essential element for everyone to succeed in life. Critical thinking is an academic competency similar to reading and writing so that its interests are likely the same as those of others. Concerning this, the experience of critical thinking using motion (in physical education) can be defined as a fast way to stimulate higher-level thinking skills of students who are challenged to examine and create solutions to movement problems given by the teacher (Blitzer, 1995; Cleland & Pearse, 1995; Dupri, Risma, & Nazirun, 2020; Johnson, 1997; Schwager & Labate, 1993). Learning, which focuses on higher-level thinking skills, can be applied in the physical education (PE) curriculum through games and sports, movement education, and outdoor education.

Some studies similarly show that the amount of time spent learning PE at school has no detrimental effect on more academic subjects and may even improve academic achievement (Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Hillman, Castelli, & Buck, 2005). PE has a unique role compared to other subjects because through PE learning, students can orchestrate the development of cognitive and affective aspects in harmony and balance, as well as develop their physical and/or psychomotor aspects. Statements often appeared in this discourse (teacher deliberations, discussions, seminars, research journals, scientific magazines, and books) claim that PE plays a vital role in developing affective, cognitive, and psychomotor aspects. PE provides

students more opportunities to be physically active while studying at school (Strong et al., 2005), and has many benefits, including developing motor skills, improving physical fitness and self-esteem, reducing the level of risk factors for heart disease and obesity, and maintaining and/or improving students' academic achievements (Trudeau & Shephard, 2005).

However, one of the problems in the PE learning process is the lack of teacher attention to aspects other than psychomotor, such as the cognitive aspect, which includes critical thinking skills. Children's habit of doing various activities without knowing what their goals are and why they do them might appear because of a lack of information from the educators. Children have an innate desire to play. Thus, one of the ways to develop critical thinking skills is through play (Kamarulzaman, 2015). McBride (2016) believes that students should be placed in situations where there is a cognitive mismatch or mental dissatisfaction; therefore, students will be motivated to request more information and find solutions. When students are involved in this situation, their cognitive function will be "forced" to think critically, such as comparing, differentiating, making conclusions, and testing their hypotheses (Mawer, 2012). Keeley & Fox (2009) argues that before giving an impact on academic achievement, physical activity or fitness is expected to give an impact on several potential mechanisms; for example, specific high-level cognitive abilities such as concentration, memory, decision making, alertness, and quick thinking.

Critical thinking skills are developed in physical education through a learning environment which encourages experiences that lead students to answer questions given by the teacher, and inspires students to ask questions, develop solutions, challenge ideas, reflect, and suggest reasonable and defensible decisions, and develop personal and social skills (McBride, 1991; McPeck, Mawer, & McBride, 2014). The physical education learning environment can be enriched by involving students in selecting learning materials, challenging activities, and providing support with social interactions with sufficient learning time to optimize the opportunities for learning, creative thinking, problem-solving, and critical thinking.

Ryall (2010) defines critical thinking as "the ability to think rationally and reflectively, making verbal assessments based on what is done which will give an overview of the best desired results." Critical thinking is an organized process that involves mental activities such as problem-solving, decision making, analysis, assumptions, and inquiry. The characteristics used to reveal critical thinking can involve (1) the ability to distinguish relevant and irrelevant information; (2) being productive in providing solutions; (3) being capable of concluding information quickly and accurately; (4) being capable of identifying the truth of new information; and (5) being capable of asking complex questions. These characteristics have the same position, so the fulfillment of these types of characteristics does not become a problem in determining critical thinking skills, but the number of obtained scores can differentiate one person's level of critical thinking ability (very critical, critical, less critical, and not critical).

Besides, physical fitness has several components, which can be grouped into two aspects, namely (1) physical fitness related to health; and (2) physical fitness related to skills (Hastie & Martin, 2006; Pangrazi & Dauer, 1979). The components of physical fitness related to health consist of body composition, cardiorespiratory endurance, flexibility, muscular endurance, and muscular strength. Meanwhile, the components of physical fitness related to skills embrace agility, balance, coordination, power, speed, and reaction time (Lacy & Williams, 2018; Wuest & Bucher, 2015). In this study, physical fitness is measured as the learning outcome is physical fitness components related to health.

Whilst Ekici (2011) argues that the planning of physical education learning can include all areas of intelligence and can create an interesting learning context, the abilities applied through the physical education learning process can be heterogeneous. Concerning this, Martin & Morris (2013) describe the integration of the concept of multiple intelligence with a sports education model, and explain how the concept of multiple intelligence helps physical education teachers to overcome differences in student learning interests. Based on these explanations, the purpose of this study is to produce a learning model effective to be used in physical education to improve the physical fitness and critical thinking skills of the students.

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METHOD

Procedures

This study is development research followed up with tests using an experimental design (pretest and posttest design). The research procedures can be seen in Table 1.

Table 1. Research process

Process	Activity	Result
Analysis	Problem Identification	Goal setting for the development of learning models
Design	1. Determining learning plan 2. Determining research instruments 3. Determining research subjects	1. Validated lesson plan 2. Determining research instruments 3. Determining research subjects
Development	Creating learning syntax/steps	Determining learning syntax/steps
Implementation	Testing on educational units	1. Research data 2. Students' comments
Evaluation	1. Research data interpretation 2. Learning activity revision	Learning model prototype

Participants

Purposive sampling was used in selecting the sample members with the following criteria. (1) The number of students in one study group is relatively the same, (2) the number of students is categorized as "Normal" based on the assessment of the PDPJOI (Indonesian Physical Education and Sports Database), and (3) students have implemented the 2013 Curriculum. The subjects of this study were fifth-grade elementary school (ES) students. Two groups were used as research subjects which later were divided into small groups for the first stage test (N: 123; M: 56; F: 67; Average age: 10.82) and a large group for the second stage test (N: 185; M: 97; F: 88; Average age: 10.70).

Data collection/Instrument

The instruments used to obtain research data in this study were Formative Class Evaluation (FCE), critical thinking skills tests, and physical fitness tests. The FCE questionnaire has been declared valid and reliable (Hasegawa, Takahashi, Urai, & Matsumoto, 1995) to measure the effectiveness of PE learning based on four components, which are results, motivation, methods, and cooperation (Suroto & Takahashi, 2005). The FCE questionnaire was filled out by students shortly after the lesson (Table 2).

Table 2. The category of formative class evaluation (FCE) component values

Component	Item	Category				
		Very Good	Good	Fair	Poor	Very Poor
Result	1. Memorable Experience	3.00-2.62	2.61-2.29	2.28-1.90	1.89-1.57	1.56-1.00
	2. Skills	3.00-2.82	2.81-2.54	2.53-2.21	2.20-1.93	1.92-1.00
	3. Knowledge	3.00-2.85	2.84-2.59	2.58-2.28	2.27-2.02	2.01-1.00
	Component Value	3.00-2.70	2.69-2.45	2.44-2.15	2.14-1.91	1.90-1.00
Motivation	4. Seriousness	3.00	2.99-2.80	2.79-2.56	2.55-2.37	2.36-1.00
	5. Fun	3.00	2.99-2.85	2.84-2.60	2.59-2.39	2.38-1.00
	Component Value	3.00	2.99-2.81	2.80-2.59	2.58-2.41	2.40-1.00
Methods	6. Immediate Learning	3.00-2.77	2.76-2.52	2.51-2.23	2.22-1.99	1.98-1.00
	7. Study Effort	3.00-2.94	2.93-2.65	2.64-2.31	2.30-2.03	2.02-1.00
	Component Value	3.00-2.81	2.80-2.57	2.56-2.29	2.28-2.05	2.04-1.00
Cooperation	8. Attitude to Friend	3.00-2.92	2.91-1.71	2.70-2.46	2.45-2.25	2.24-1.00
	9. Learn to Cooperate	3.00-2.83	2.82-2.55	2.54-2.24	2.23-1.97	1.96-1.00
	Component Value	3.00-2.85	2.84-2.62	2.61-2.36	2.35-2.13	2.12-1.00
Final Values		3.00-2.77	2.76-2.58	2.57-2.34	2.33-2.15	2.14-1.00

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The instrument for critical thinking skills is valid and reliable to measure the level of critical thinking of students aged 10-12 years with a validity value of 0.511-1.000 and reliability of 0.719. Besides, five kinds of tests were used to measure the physical fitness of students. Namely: (a) Body Mass Index (BMI); (b) sit and reach; (c) sit-up for 30 seconds; (d) trunk lift; and € The PACER; a 20-meter Multistage Shuttle Run. The physical fitness test is a series of tests; therefore, all test items must be carried out sequentially, continuously, and without interruption. Content validity was used as the basis for using physical fitness test instruments, while the reliability values of the physical fitness instruments are presented in the following Table 3.

Table 3. Reliability values of the physical fitness test

PFT Indicator	Value Reliability		
	Number	Male	Female
BMI	1.000	1.000	1.000
Sit and Reach	0.959	0.971	0.946
Sit-Up	0.994	0.995	0.991
Trunk-Lift	0.992	0.995	0.987
PACER 20-M Run	0.997	0.997	0.996

Table 4. Validation results of learning instruments

Innovation Descriptions	Lesson Plan 1			Lesson Plan 2			Lesson Plan 3			Lesson Plan 4		
Validators	*AR*	*ARST*	*SA*	*AR*	*ARST*	*SA*	*AR*	*ARST*	*SA*	*AR*	*ARST*	*SA*
Class management minimized the number of off-task students	3	3	4	3	3	3	3	4	4	3	4	4
There are variations of movement/task given by the teacher	4	4	4	3	4	4	2	3	3	2	4	4
In teaching and learning activities, higher order thinking is taught on purpose, and this study focuses on critical thinking	3	3	3	3	3	3	3	3	3	3	3	3
In teaching and learning activities, physical fitness is taught on purpose	4	4	4	4	4	4	4	4	4	3	3	3
There are evaluations of the cognitive component (critical thinking) in the form of Authentic Assessment, Self-Assessment, and/or Peer Observation	4	4	3	3	4	4	3	4	4	3	3	3
Sum	18	18	18	16	18	18	15	18	18	15	15	15
Mean	4	4	4	3	4	4	3	4	4	3	3	3
Total Mean		4			4			4			3	

Note: Grade 1: very low; 2: low; 3: high; 4: very high

Data analysis

Data description related to the number of research samples was given the N symbol, and then the average of the data was calculated. Besides, pretest and posttest data differences were calculated to determine the delta. Before testing the hypothesis, it was necessary to test the normal distribution model that was used as a guide to whether the sample comes from a normally distributed population. In addition, the variance of the two populations needs to be identified if they were homogeneous (equal in size) or not. These two things are commonly referred to as the normality test and the homogeneity test of the data. both are usually done to find out what statistics will be used later (parametric or non-parametric statistics). If the data is proven to be normal and

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homogeneous, the paired sample T-test will be used to show the impact of student learning outcomes before and after the learning model is applied. However, if the data is not normally distributed and/or homogeneous, then the Mann-Whitney U test was used to show the impact of student learning outcomes before and after the learning model application. Data analysis was performed using IBM SPSS Statistic Version 24.

The first step was to ensure that the lesson plan is validated by experts to be applied to research subjects. Table 4 describes the validation results of learning instruments to ensure that the learning is focused on improving students' critical thinking skills and physical fitness. The validators were three experts in PE.

Table 4 shows that the lesson plans that have been prepared based on the learning objectives of improving physical fitness and critical thinking, have been validated and found that they can be applied to each educational unit that has been determined as the research subject.

FINDING AND DISCUSSION

Finding

Before testing the research hypothesis, a prerequisite test was carried out to obtain what statistics would be used in testing the research data. Normality and homogeneity tests were carried out to find out what statistical tests would be used. Based on the normality and homogeneity test, the data to be tested were normally distributed and homogeneous (p-value > α= 0,05), meaning that the statistics to be used were parametric statistics, and paired sample t-tests.

The next testing was then carried out at three elementary schools, including SDN Sumobito I, SDN Sumobito III, and SDN Talunkidul I. The paired sample t-test results in Table 5 demonstrate that there are significant differences in critical thinking skills before and after the learning model application.

Table 5. Paired sample T-test results for the critical thinking skills in first stage testing

	Elementary School	T	p-value*	Conclusion
Critical Thinking Skills	SDN Sumobito I	5.881	0.000	Significant
	SDN Sumobito III	8.653	0.000	Significant
	SDN Talunkidul I	8.810	0.000	Significant

**p = <0.05*

Besides, the paired sample T-test results in Table 6 show that in general, there are significant differences between the data taken before and those gathered after the application of the innovative learning model, except for the BMI component at SDN Talunkidul I [t = -0.570; p = 0.572 (<0.05)].

The second stage testing was carried out in five elementary schools, which includes SDN Sepanjang II, SDN Kedungturi, SDN Sambibulu, SDN Wonocolo II, and SDN Geluran III. The Paired Sample T-test results in Table 7 display the findings that there are significant differences in students' critical thinking skills before and after the innovative learning model was applied.

The paired sample T-test results in Table 8 show that in general there are significant differences between the results before and after the innovative learning model application, except for the BMI component in each school, the sit and reach component of SDN Sambibulu [t = 1,988; p = 0.054 (<0.05)] and trunk lift components of SDN Geluran III [t = 1,745; p = 0.090 (<0.05)].

Learning effectiveness was investigated during the learning process, in addition to the content validity test which was carried out before the learning process. The assessment was carried out in the form of FCE questionnaires which were filled out by students shortly after class. In general, according to the opinions of students in the first stage test, the effectiveness of the learning model was good (16.6% in the Very Good category and 83.3% in the good category), and in the second stage test, the effectiveness of the learning model was Good (40% in the Very Good category and 60% in the good category).

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Table 6. Paired sample T-test of physical fitness in the first stage testing

School	PFT Indicator	T	p-value*	Conclusion
SDN Sumobito I	BMI	4.766	0.000	Significant
	Sit and Reach	7.667	0.000	Significant
	Sit-Up	6.124	0.000	Significant
	Trunk Lift	5.738	0.000	Significant
	PACER 20-M	3.868	0.001	Significant
SDN Sumobito III	BMI	2.319	0.024	Significant
	Sit and Reach	6.948	0.000	Significant
	Sit-Up	9.528	0.000	Significant
	Trunk Lift	14.123	0.000	Significant
	PACER 20-M	6.397	0.000	Significant
SDN Talunkidul I	BMI	-0.570	0.572	Not significant
	Sit and Reach	6.268	0.000	Significant
	Sit-Up	8.389	0.000	Significant
	Trunk Lift	4.968	0.000	Significant
	PACER 20-M	3.506	0.001	Significant

**p = <0,05*

Table 7. Paired sample T-test of critical thinking skills in the second stage testing

School	T	p-value*	Conclusion
SDN Sepanjang II	10.093	0.000	Significant
SDN Kedungturi	6.358	0.000	Significant
SDN Sambibulu	8.479	0.000	Significant
SDN Wonocolo II	7.855	0.000	Significant
SDN Geluran III	7.818	0.000	Significant

**p = <0.05*

In Table 9, according to the opinions of students in general, the effectiveness of the learning model is Good (16.6% in the Very Good category and 83.3% in the good category).

According to the opinions of students as displayed in Table 10, the learning model is Good in terms of its effectiveness (40% in the Very Good category and 60% in the good category).

Discussion

One of the most important contributions to the effectiveness of the learning model is planning (Gower, 2010; Metzler, 2017). Planning is usually carried out before the learning process begins. The contents of the planning are the learning objectives to be achieved, the allotted time, the motion tasks that will be given to students, class settings, and the evaluation of student learning outcomes.

The main learning activities were administering motion tasks using the circuit learning model, monitoring the performance of the motion tasks, providing feedback, and carrying out peer observation. First, PE teachers demonstrated the movement learners should perform, and then they gave motion tasks to students. The teachers were allowed to do their demonstrations, from simple and easy to more complex movements. The motion tasks had to be explained briefly and clearly, and students could perform them individually or in groups. Students were challenged to come up with unique solutions to the motion tasks, create new versions of the game, and think about problems related to fitness and health. Students tended to think critically but only in an environment which specifically designed to encourage the nature of critical thinking (McBride,

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1999). When the cognitive domain is more systematically explored, many students will find new interests and curiosity for PE (Woods & Book, 1995).

Table 8. Paired sample T-test of physical fitness in the second stage testing

Schools	*PFT Indicator*	*T*	*p-value**	Conclusion
SDN Sepanjang II	BMI	-1.107	0.275	Not significant
	Sit and Reach	13.241	0.000	Significant
	Sit-Up	2.641	0.012	Significant
	Trunk Lift	7.658	0.000	Significant
	PACER 20-M	5.070	0.000	Significant
SDN Kedungturi	BMI	-0.038	0.970	Not significant
	Sit and Reach	11.315	0.000	Significant
	Sit-Up	2.965	0.006	Significant
	Trunk Lift	2.808	0.009	Significant
	PACER 20-M	3.255	0.003	Significant
SDN Sambibulu	BMI	2.023	0.050	Not significant
	Sit and Reach	1.988	0.054	Not significant
	Sit-Up	6.308	0.000	Significant
	Trunk Lift	7.121	0.000	Significant
	PACER 20-M	8.714	000	Significant
SDN Wonocolo II	BMI	1.950	0.059	Not significant
	Sit and Reach	4.820	0.000	Significant
	Sit-Up	4.761	0.000	Significant
	Trunk Lift	4.743	0.000	Significant
	PACER 20-M	3.039	0.004	Significant
SDN Geluran III	BMI	-1.506	0.141	Not significant
	Sit and Reach	4.542	0.000	Significant
	Sit-Up	2.783	0.000	Significant
	Trunk Lift	1.745	0.090	Not significant
	PACER 20-M	3.654	0.001	Significant

**p = <0.05*

In this learning model, motion tasks using a circuit learning model were assigned to students. Circuit learning is the provision of motion tasks to students with a learning setting in which it consists of several series of motion tasks to minimize off-task (students who do not do motion tasks or wait for their turn). The teachers also gave a specific time limit to the students for doing the tasks. Monitoring was generally carried out by the teachers to ensure whether all the students had performed motion tasks as instructed and ensure that no students were off task. Specific monitoring was carried out by the teacher to observe certain students who need special attention. Feedback was given based on the results of monitoring and questions that arose from students related to the difficulties experienced in carrying out the motion tasks. Feedback was given in general or specific to a certain challenge. General feedback was given to correct students' mistakes in general, while specific feedback was given to provide detailed corrections to students or certain groups according to the mistakes they made. Ideally, with feedback, all students could be aware of the mistake level existing in their movements. Meanwhile, peer observation is an observation technique by asking students to observe each other regarding the motion tasks to achieve the desired competence.

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Table 9. FCE results in the first stage test

School Name	Components	1st Meeting	2nd Meeting	3rd Meeting	4th Meeting
SDN Sumobito I	Result	2.87	2.893	2.89	2.89
	Will	2.8	2.82	2.84	2.88
	Method	2.32	2.32	2.44	2.48
	Teamwork	2.6	2.64	2.72	2.72
	Mean	2.65	2.67	2.72	2.74
	Criteria	Good	Good	Good	Good
SDN Sumobito III	Result	2.68	2.68	2.68	2.76
	Will	2.95	2.95	2.95	2.95
	Method	1.92	2.06	2.21	2.23
	Teamwork	2.98	2.98	2.98	2.98
	Mean	2.63	2.67	2.70	2.73
	Criteria	Good	Good	Good	Good
SDN Talunkidul I	Result	2.77	2.78	2.82	2.906
	Will	2.68	2.72	2.72	2.769
	Method	2.50	2.55	2.60	2.641
	Teamwork	2.92	2.92	2.92	2.974
	Mean	2.72	2.74	2.77	2.82
	Criteria	Good	Good	Very Good	Very Good

The closing activities of the developed learning model were cooling down, reflecting on students' experiences, evaluating the learning process and outcomes using authentic assessment and self-assessment techniques, and giving appreciation and following up. The most difficult part of the assessment process came from the complexity and diversity of students' character, in which they were expected to achieve learning outcomes in the cognitive, psychomotor and affective domains. Green (2008) argues that, in general, the notion of assessment is the involvement of a set of information in its implementation to determine and convey objectives. At this stage, authentic assessment and self-assessment techniques were harnessed in the evaluation process. Authentic assessment is an assessment that is carried out comprehensively to assess the input, process, and output of learning. Meanwhile, self-assessment is an assessment carried out by students in a reflective way to compare their relative position with the predetermined criteria.

To carry out the learning process properly, teachers, therefore, must be equipped with the learning syntax or steps with full awareness so that the learning objectives can be achieved (Humphries, 2014). From the point of view of the environment and learning management system, the development of this learning model was to "add" assignments in the form of circuit learning so that it could provide opportunities for students to keep moving and minimize the off-task in the PE learning process. In carrying out these motion tasks, students were also required to conduct peer observation where students discern each other's motion tasks.

Concerning the authentic assessment, one of its characteristics as identified by (Lund, 1997) is that authentic assessment is required by students to be able to demonstrate higher-order thinking skills. The authentic assessment provides opportunities for students to apply the concepts they have learned. After assessing the students regarding the knowledge of the rules and strategies, authentic assessment can help students understand how to apply them in real situations (daily). Trianto (2010) further adds that there are six characteristics of authentic assessment, namely: (1) it is carried out during and after the learning process; (2) it can be used for formative or summative; (3) what is measured is skill and performance, not remembering facts; (4) it is continuous; (5) it is integrated; and (6) it can be used as feedback. In addition, the assessors in authentic assessment can be either teachers or students in the same class (peers).

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Table 10. FCE results in the second stage test

School Name	Components	1st Meeting	2nd Meeting	3rd Meeting	4th Meeting
SDN Sepanjang II	Result	2.742	2.742	2.783	2.8
	Will	2.95	2.95	2.95	2.95
	Method	1.988	2.088	2.1	2.325
	Teamwork	2.975	2.975	3	3
	Mean	2.66	2.69	2.71	2.77
	Criteria	Good	Good	Good	Very Good
SDN Kedungturi	Result	2.717	2.737	2.778	2.798
	Will	2.939	2.939	2.939	2.939
	Method	2.045	2.227	2.318	2.53
	Teamwork	2.97	2.97	2.97	2.97
	Mean	2.67	2.72	2.75	2.81
	Criteria	Good	Good	Good	Very Good
SDN Sambibulu	Result	2.738	2.817	2.921	2.937
	Will	2.952	2.952	2.952	2.952
	Method	1.964	1.988	2.167	2.405
	Teamwork	2.976	2.976	3	3
	Mean	2.66	2.68	2.76	2.82
	Criteria	Good	Good	Good	Very Good
SDN Wonocolo II	Result	2.735	2.838	2.906	2.906
	Will	2.949	2.949	2.949	2.949
	Method	1.987	2.192	2.346	2.59
	Teamwork	2.974	2.974	2.974	2.974
	Mean	2.66	2.74	2.79	2.85
	Criteria	Good	Good	Very Good	Very Good
SDN Geluran III	Result	2.778	2.889	2.889	2.981
	Will	2.944	2.944	2.944	2.944
	Method	2.319	2.347	2.458	2.528
	Teamwork	2.972	2.972	2.972	3
	Mean	2.75	2.79	2.82	2.86
	Criteria	Good	Very Good	Very Good	Very Good

Cleland (2016) found that the ability of children to make different movement patterns was significantly improved when they used critical thinking learning strategies. McBride & Bonnette (1995) likewise found a substantial increase in the critical thinking scores of boys after they participated in activities that required group collaboration and critical thinking. Learning that supports critical thinking is the one which uses questioning techniques that require students not only to repeat information (memorize), but also to analyze, synthesize, and evaluate information to solve problems and make decisions (think) (Snyder & Snyder, 2008). Because critical thinking is a mental habit that necessitates students to think about their thinking and improving processes, it requires higher order thinking skills, not to memorize data or undertake what they read or were told without thinking critically (Sanders & Moulenbelt, 2011).

Critical thinking has its position in the psychomotor (motion) domain. In this regard, PE learning can provide a supportive environment for students to learn how to think critically. Cleland (2016) describes an enriched learning environment in PE as involving student choices, challenging and meaningful activities within the development zone of students, and providing

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supportive social interaction with sufficient time for learning – thus optimizing the opportunity for creative thinking, problem-solving, and critical thinking.

The purpose of PE is to maintain and improve the physical fitness of students. A quality PE program has the potential for (at least) four unique contributions to the lives of students: (1) daily physical activity, (2) personal physical fitness level, (3) competency development in various physical and sports skills, and (4) necessary knowledge for an active and healthy lifestyle (Darst & Pangrazi, 2006). In addition, physical fitness is an important indicator of the health status of children and teenagers, and of course a good predictor of health status in life (Cvejić et al., 2013). In the PE teaching and learning process, the most important thing is to maximize the participation of students. This can happen if the learning environment supports students to feel safe, and comfortable, not feel tense and anxious, and be respected by the teachers.

Besides, there is a positive relationship between physical fitness and cognitive abilities. These results can be explained by both physiological and psychological mechanisms (Chomitz et al., 2009), where physical activity stimulates the development of brain tissue (Studenski et al., 2006), improves circulation, increases blood flow to the brain, maintains the level of norepinephrine and endorphins which together will reduce stress, raises mood, stimulates a sense of calm after exercise, and possibly improves academic performance (Taras, 2005; van Praag et al., 2014). In addition, a high level of physical fitness allows a relationship with children's neurocognitive processes improvement (Hillman et al., 2005), and additional physical activity can improve the "active" behavior of students at school (Mahar et al., 2006). These are supported by the research results conducted by (Wittberg, Northrup, & Cottrel, 1998) which indicate that there is a significant relationship between aerobic exercise and general fitness training on academic ability. The point is, when students think, the brain needs substances to carry out thinking activities. With excellent physical abilities, these needs can be met.

CONCLUSION

This research shows that a well-designed learning process that pays attention to the learning objectives will facilitate students to learn and develop properly. The results showed that PE learning, oriented towards peer observation carried out during the learning process, self-assessment carried out by students, and packed in the circuit learning method is proven to improve the critical thinking skills and physical fitness of students. The best place to train thinking and problem-solving skills is probably schools. Schools have become a miniature of social life, while the classroom atmosphere is a laboratory for solving problems of real life. A good learning model meets at least three criteria, which are validity, practicality, and effectiveness. Validity is obtained if the contents of the developed learning model are in accordance with learning objectives. Practicality is obtained if the learning model is usable. Effectiveness is obtained when developed learning models produce results following the predetermined goals. Cognitive and psychomotor domains in this learning can also facilitate students in their affective domains.

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