

ORIGINAL ARTICLE



Development of Students' Creativity through Learning Models in Physical Education during the Covid-19 Pandemic

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ABSTRACT

Background. Physical education learning in the era of the COVID-19 pandemic has a remarkable impact on students' creativity. **Objectives.** This study aims to determine the effect of applying the inquiry and discovery models in online physical education learning to develop high school students' creativity. **Methods.** The multiple treatment and control with the pre and post-test procedure were used, while the samples were second-grade students in physical education learning of Senior High School in Bandung, consisting of 3 groups with 30 members each selected using random cluster sampling. The sample consists of 2 experimental and one control group. Experimental groups 1 and 2 received the inquiry and discovery learning model, respectively, while the control group received the conventional for 16 meetings each. Data collection was carried out by filling out a creativity questionnaire through a Google form before and after treatment. **Results.** The inquiry model has no difference in the average value of creativity compared to the discovery model's class ($p=0.066$). In contrast, the inquiry and discovery models have a different average creativity value than the class using the conventional/control model ($p=0.001$). **Conclusions.** There is no difference in increasing creativity between the inquiry and discovery models. Although the results of the Bonferroni test showed no difference in the mean value of invention in the inquiry model and the discovery model, when compared to the control group, the inquiry model was more effective.

KEYWORDS: *Learning Model, Inquiry, Discovery, Creativity, Physical Education Learning, Online Learning.*

INTRODUCTION

The Covid-19 pandemic has caused resistance to the educational world, forcing teachers to adopt methods and forms of learning consistent with current conditions (1), such as distance or online learning (2). Consequently, teachers and students must prepare adequate facilities and infrastructure such as laptops, cellphones, the internet, and others (3). This learning method is divided into two, namely synchronous, which occurs face-to-face at the same time as conferences, and asynchronous, happening at different times using a learning management system

(4). Furthermore, during the pandemic, the online learning situation is a challenge for teachers because they need to achieve educational goals and develop 21st-century skills, one of which is creativity (5). To improve the students' creativity, teachers must select and apply an approach that can directly stimulate students' creative skills.

The study conducted by Suardana et al. showed that applying the guided inquiry learning model in Natural Sciences improved students' creative skills (6). Also, Kadir et al. reported that

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the open inquiry approach in learning mathematics could develop students' creative thinking skills (7). At the same time, Suwandari et al. applied the discovery learning model to 5th-grade elementary school students (8). Rahman (2017) showed that discovery learning could promote creative thinking skills among physics students, while Laksono found that the inquiry learning model improved creative attitude skills compared to the expository model (9). These results indicate that students' creative skills can be improved by applying the inquiry and discovery learning model. However, the method of online learning in sports and physical health education to improve students' creative skills has not been investigated.

This study relates to applying the inquiry and discovery models in online learning of physical education to improve the creative ability of high school students. Both models are widely used in natural science learning but are rarely applied in physical education. The inquiry process is unconsciously often carried out in daily life and the context of sports, such as observation, experiment, classification, hypotheses development, inference, design, planning, and others for use in investigations (10). Meanwhile, the discovery learning model requires students to find knowledge in several stages, starting with stimulation, problem statements, data collection and processing, verification, and generalization (11). From the perspective of the learning steps, these two models have something in common; namely, students must personally find out the concepts and theories that are relevant and needed in the learning process (12). Based on these similarities, this study aims to determine the effect of both models on creativity and identify the one with the most significant influence on increasing students' creative skills in online Physical education learning in high school.

MATERIALS AND METHODS

Study methods. This study used a multiple treatment and control method with a pre-test (13) to determine the effect of learning model implementation on students' creative skills in Physical Education Learning. A total of 3 groups were used, namely two experimental and one control. The experimental group received inquiry and discovery learning, while the control group received the conventional learning model treatment. A pre-and post-test was conducted before and after the treatment, respectively.

Participants. The participants were second-grade students of Senior High School in Bandung City, West Java, Indonesia. The technique used was random cluster sampling, where three classes out of 9 were randomly selected to be sampled, namely types X A, X B, and X C (14). Subsequently, random sampling was also conducted to determine the experimental group and the control. Based on the results, classes C and B were selected as experimental groups 1 and 2, while class A was chosen as the control with the number of students consisting of 33, 34, and 36, respectively.

Given that this study requires online learning facilities and infrastructures such as mobile phones or laptops and a good internet network, all participants were asked to fill out a consent form before the implementation. A total of 3 students in the experimental group 1 were not willing because of constraints on facilities and infrastructure, four students in the experimental group 2 were not ready because of facilities and infrastructure constrained 3 and 1 was due to illness. Six students in the control group were also unwilling because facilities and infrastructure were constrained 2, 2 were sick, and two did not fill out the agreement form. Therefore, the number of willing samples from each class was the same, namely 30 people. Based on gender, the distribution of the samples in experimental groups 1 and 2 and the control group consisted of males and females with 13 and 17, 12 and 18, and 11 and 19, respectively. In more detail, the sample filtering flow is shown in [Figure 1](#).

Procedure. The study was carried out for 16 weeks consisting of a pre-test in the first week, followed by the treatment once a week starting from the second to the fifteenth week, and the post-test in the sixteenth week. The pre-and post-test used a creativity questionnaire distributed through a Google form. The treatments given to each group were as follows: the experimental groups 1 and 2, as well as the control group, received the inquiry and discovery, as well as conventional learning models, respectively. All the study procedures were carried out online, including filling out questionnaires on pre-test and post-test through the google form and learning model treatments which were carried out synchronously through zoom meetings and asynchronously with google classroom.

Study Instruments. Data collection was carried out using a creativity questionnaire developed in this

study with the guidance of (15), which classified creativity into two, namely aptitude and non-aptitude. Tests to measure invention include facility or cognitive characteristics and non-aptitude or affective traits (16). A total of 60 items with a 5-point Likert scale were selected as the questionnaire instruments, with five categories of aptitude creativity, including fluidity (fluency), flexibility, originality (authenticity), elaboration (details), and evaluation (assessment). In contrast, the five categories of non-aptitude include curiosity, imagination, being challenged by diversity, daring to take risks, and appreciation. After the calculation using Cronbach alpha, the reliability value of the questionnaire was found to be 0.91.

Data Analysis. Data analysis in this study used the ANCOVA test with the pre-test value as a covariate using SPSS version 27. All ANCOVA assumption tests are satisfied. It is indicated by the value of the Kolmogorov-Smirnov test results showing the pre-test data of 0.149 and the post-test data of 0.200 ($p\text{-value} > 0.05$), which can be

concluded that each datum is in the experimental class (Inquiry and Discovery) and control class is usually distributed. The variance of homogeneous data from the homogeneity of variance test results with Levene's test shows 0.169 ($p\text{-value} > 0.05$). The last assumption that must be met before using the ANCOVA test is a linear relationship test between the covariate and dependent variable; the result is significant ($p=0.001$), which indicates that the covariate and the dependent variable have a linear relationship to meet the assumptions of ANCOVA.

RESULTS

Table 1 shows the pre-test and post-test results and the difference between the creativity of the experimental and control groups. The analysis results obtained using an independent t-test showed that the gain score of the experimental groups 1 and 2 increased by 25.70 and 16.32, respectively, while the control group improved by 2.82.

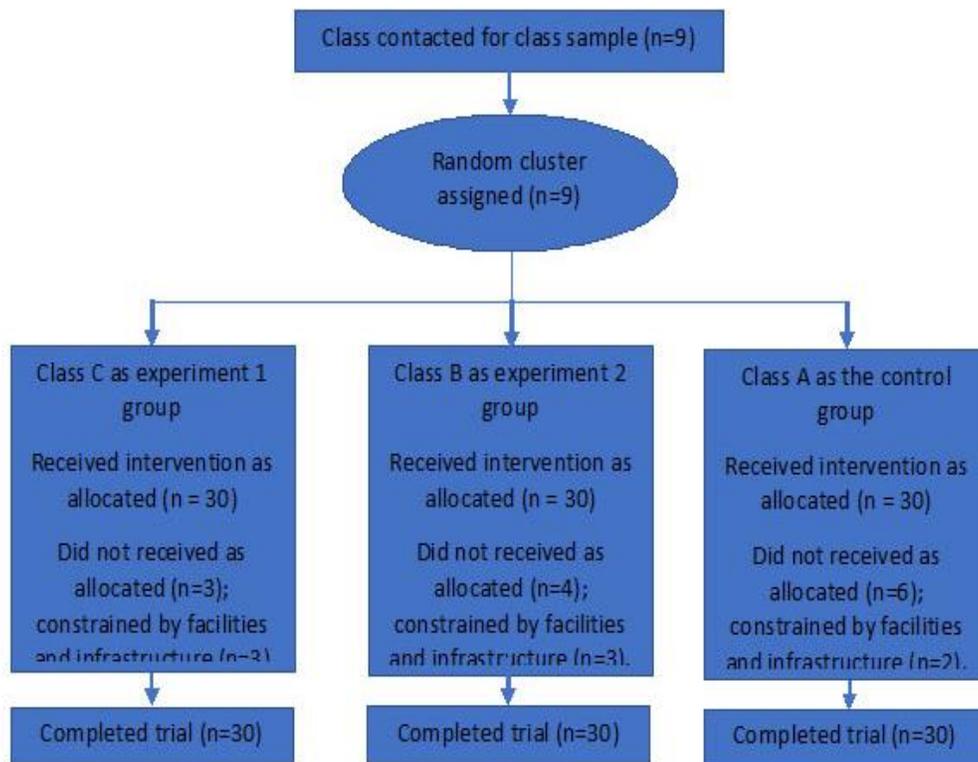


Figure 1. The flow of class samples in this study

Table 2 shows that students' creativity scores higher in the class that uses the Inquiry learning method, with an average creativity score of 108.8, while the class with the lowest creativity score is

in the control class, which uses conventional learning methods with a creativity score of 95.

Table 3 shows a significant effect ($P=0.001$), which means that at least one teaching method has a different average creative value. Furthermore, a

Bonferroni test was performed to determine which groups have different creative values. The results can be seen in Table 3.

Table 4 shows that the class that uses the Inquiry method does not have a difference in the average value of creativity compared to the class that uses the Discovery method. In contrast, the class that uses the Inquiry method has a difference in the average value of invention

compared to the class that uses the conventional/control method and the class that uses the Inquiry method. There was a difference in mean creativity among those using the Discovery method compared to the class using the conventional/control method to find out which learning model has more effect can be seen in Figure 2.

Table 1. Description of Statistics Results for Creativity Measurement

Group	N	Pre-test		Post-test		Gain	
		Mean	SD	Mean	SD	Mean	SD
Experiment 1 (Inquiry)	30	82.82	3.83	108.52	3.46	25.70	5.74
Experiment 2 (Discovery)	30	86.94	3.35	103.26	5.52	16.32	6.40
Control	30	82.90	4.08	85.72	1.92	2.82	2.05

Table 2. Post-Test scores of students' creativity based on class/learning method

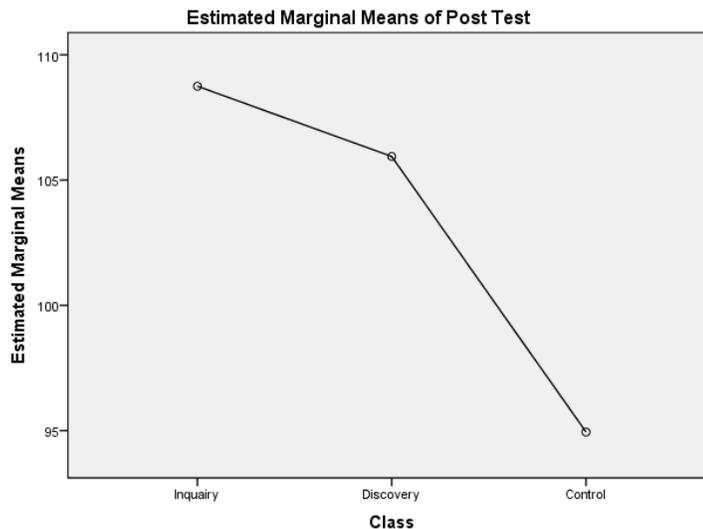
Learning Models	Post-test		Std. Deviation	Grand Mean
	Mean (Min-Max)			
Inquiry	108,8 (103-117)		3,2	103,2
Discovery	105,8 (97-117)		4,8	103,2
Control	95 (87-104)		4,4	103,2

Table 3. Analysis of the difference in the average creativity score

Type III Sum of Squares	df	Mean Square	F	p-value
3101,6	2	1550,8	88,6	0,001

Table 4. Pairwise Comparisons based on class/learning method

Class	Mean Difference (I-J)	SE	p-value	95% CI (min-max)
Inquiry				
Discovery	2.8	1.2	0.066	-0.1 – 5.7
Control	13.8	1.0	0.001	11.2 – 16,4
Discovery				
Inquiry	-2.8	1.2	0.066	-5.7 – 0,1
Control	11.0*	1.2	0.001	8.0 – 14.0
Control				
Inquiry	-13.8	1.0	0.001	-16.4 - -11.2
Discovery	-11.0*	1.2	0.001	-14.0 - - 8,0



Covariates appearing in the model are evaluated at the following values: Pre Test = 84,10

Figure 2. The effectiveness of each teaching method

Figure 2 shows that the Inquiry learning method has a higher effectiveness level than other learning methods. Therefore, it can be concluded that, despite the results of the Bonferroni test, there is no difference in the mean values of students' creativity in the classes using the inquiry learning model and the discovery learning model. However, compared to the control class or classes that use conventional learning models, the Inquiry learning model is more effective.

DISCUSSION

This study was conducted to implement an online-based inquiry and discovery learning model for developing students' creativity in Physical Education learning during a pandemic. The complexity of the teachers' role in promoting students' creativity has been described in many studies (17). Inquiry and discovery learning models applied in physical education learning during the COVID-19 pandemic have the same effect on increasing creativity. The characteristics of the two models are almost the same. Both are student-centered learning and give complete freedom to students to search, try, and analyze to conclude the problems given by the teacher related to learning materials. This shows that the inquiry learning model for one semester can increase students' creativity. These results are consistent with Rodríguez et al. (2019), which examined the development of students' creativity by using the inquiry model for learning in the biomedical field (18), and Razali et al. (2020), which examined the development of creativity using the inquiry model in science learning in high school (19). Similarly, the results show that the discovery learning model can increase students' creativity.

This is in line with Syolendra and Laksono (2019), which assessed students' creativity using the discovery model for learning chemistry in high school (9), and Dupri, Nazirun, and Candra (2021), which investigated the effect of the discovery learning model on the creative thinking ability of high school students in learning physical education (20). The discovery learning process directs students to find their knowledge conveyed in learning. The series of activities in discovery learning involves all students' abilities maximally to search, investigate systematically, critically, and logically to find their knowledge, attitudes, and skills as a form of behavior change (21). Applying the inquiry learning model and the discovery model in physical education, which is passed through several stages, can support the development of

student creativity because creativity can be developed, one of which is through freedom.

Many learning models are used for learning physical education (22). The advantages of the inquiry approach in the learning process can help students develop readiness and mastery of skills in cognitive processes (23). Through the inquiry model, students can gain new knowledge and knowledge individually or individually so that it can be easily understood and settled in their thinking patterns. The inquiry model can also provide opportunities to develop and advance according to the abilities or interests of each student. The discovery learning model's advantages can help students develop readiness and mastery of skills in cognitive processes (20). In addition, students can gain knowledge and renewal individually or individually so that it is easy to understand and settle in the pattern of thought. The inquiry and discovery models have suggested models be applied in physical education learning. This study shows that the inquiry model has more influence on student creativity in physical education learning when compared to conventional learning models (control group). So that when the teacher uses the inquiry and discovery learning model, it is expected to provide attractive, varied, challenging learning so that students will be enthusiastic to follow the learning process.

CONCLUSION

There is no difference in increasing creativity between the inquiry and discovery models. Although the results of the Bonferroni test showed no difference in the mean value of creativity in the inquiry model and the discovery model, when compared to the control group, the inquiry model was more effective. The limitations of this study are that it does not measure aspects of IQ and motivation that are felt to affect creativity. In addition to using the inquiry and discovery models in physical education learning, recommendations for further research are to involve aspects of IQ and motivation to enhance student creativity further.

APPLICABLE REMARK

- The information obtained in this study can be used as a reference to develop students' creative potential in learning physical education during the COVID-19 pandemic.
- Furthermore, the results obtained can be helpful for Physical Education teachers and the government

carry out physical education learning activities with inquiry and discovery learning models during the COVID-19 pandemic.

CONFLICT OF INTEREST

There was no conflict of interest concerning the study carried out.

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