www.ijemst.net

The Impact of Applying Scientific Learning with Conventional Learning on Creativity and Physical Education Learning Outcomes of High School Students

Mesnan
Medan State University, Indonesia

Nimrot Manalu
Medan State University, Indonesia

Amir Supriadi
Medan State University, Indonesia

To cite this article:

Mesnan, Manalu, N., & Supriadi, A. (2023). The impact of applying scientific learning with conventional learning on creativity and physical education learning outcomes of high school students. *International Journal of Education in Mathematics, Science, and Technology (IJEMST), 11*(6), 1582-1596. https://doi.org/10.46328/ijemst.3832

International Journal of Education in Mathematics, Science and Technology

2023, Vol. 11, No. 6, 1582-1596 https://doi.org/10.46328/ijemst.3832

The Impact of Applying Scientific Learning with Conventional Learning on Creativity and Physical Education Learning Outcomes of High School Students

Mesnan, Nimrot Manalu, Amir Supriadi

Article Info

Article History

Received:
05 January 2023
Accepted:
26 September 2023

Keywords

Scientific learning
Conventional learning
Creativity

Abstract

This research aims to see the influence of scientific and conventional learning on the creativity and learning outcomes of physical education students in high school. This experimental research uses test instrument techniques for learning outcomes and questionnaires for creativity, with a 2x2 factorial ANOVA research design. The number of samples was 50 people for the scientific learning group and 40 for the conventional learning group, and the sampling technique used *cluster random sampling.* Before carrying out an analysis of variance (ANOVA), first carry out the analysis requirements, namely the normality test and homogeneity test. Next, the two-way ANOVA test was used at a significance level of α of 0.05 and continued with the Scheffe test at a significance level of α = 0.05. The research results show that 1). There are differences in the influence of conventional and scientific learning on creativity; 2). There are differences in the effect of conventional learning and scientific learning on physical education learning outcomes; 3). There are differences in the influence of conventional and scientific learning on creativity and physical education learning outcomes; 4). There is an interaction between the influence of conventional learning and scientific learning on creativity and physical education learning outcomes.

Introduction

Education is an *integral part* of development. The education process cannot be separated from the development process (Imran Akhmad, 2022; Supriadi et al., 2022). Development is directed and aims to develop human resources and development of the economic sector, each of which is interrelated and takes place simultaneously (Bulkani et al., 2022). National Education implemented by the Indonesian nation covers all areas of life, one of which is the field of education (Anwar, 2005). The goal of national development in the field of education is an effort to brighten the life of the nation and improve the quality of Indonesian people in creating a society that is faithful and devoted to God Almighty, has noble character, personality, discipline, works hard, is challenging and responsible, independent, intelligent and skilled as well as physically and mentally healthy (Akhmad, 2016).

National education functions to develop capabilities and shape dignified national character and civilization in the context of educating the nation's life, aiming at developing the potential of students to become human beings who believe and fear God Almighty, have a noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens (Dewi et al., 2023; Dewi & Verawati, 2021; Mesnan, 2021) Efforts to improve the quality of education are continuously carried out conventionally and innovatively. Education is expected to be able to produce quality *output* ((Endriani et al., 2022). From the various characteristics of the incoming *input and how education can produce* sound and quality *output* (Endriani et al., 2022), All of these are tasks of education that cannot be ignored. In fact, this is not only a task assigned to teachers but also the task of parents (Dewi & Faridah, 2022). So, to produce quality *output,* there must be cooperation between teachers and parents in educating their students. Through educational efforts, the qualities of an intelligent, creative, and independent young generation can be realized. However, in reality, students' creativity is developing slowly, and learning media use needs to be improved because the education system always depends on educators. (Bakhtiar, 2014) said that learning carried out by teachers in Indonesia is generally still teacher-centered due to inadequate understanding and a learning paradigm that needs to follow the actions taken. The impact is that students need to be more enthusiastic about achieving high learning outcomes. Students lack critical behavior, and even the way of thinking to come up with creative and innovative ideas seems slow (Putro et al., 2013)

Currently, the problem of student learning creativity has received significant attention from the government with the improvement of the educational curriculum which focuses more on student activity in learning so that it can develop student learning creativity. However, the implementation in schools still needs to be more apprehensive. Learning still tends to be *conventional* and centered on educators, which hinders the growth and development of students' learning creativity. A concrete example is an evaluation system that places too much emphasis on correct and incorrect answers without paying attention to the reasons for the answers, where students are only required to give correct answers without explaining the reasons and opinions for the answers given. It is hoped that Indonesian people who graduate from various levels of formal education, in this case especially the general secondary education (SMU) level, should have the following characteristics or profiles, including: "Have good reasoning (in studying curriculum material, be creative, have initiative and have responsibility.") and reasoning as the emphasis" (Mustafa & Dwiyogo, 2020)

Now, two curriculum models are used at the senior high school unit level (SMA), namely the 2006 education unit curriculum (KTSP) and the 2013 curriculum. The 2013 curriculum is synonymous with scientific learning. *Scientific* learning is also called scientific learning, in which the learning process can be compared to a scientific process that involves observation or observation to collect data. For this reason, the 2013 curriculum mandates values in *scientific learning* in the learning process. Scientific learning is a bridge to developing students' attitudes, skills, and knowledge. Later indicators of achievement of success are expected to be more productive, creative, innovative, effective, and happy to learn. This statement is in accordance with the view (Tuzzin et al., 2015), which states that: "Indicators of successful implementation of the 2013 curriculum for students are more productive, creative, innovative, effective, and more happy to learn." From this opinion, one indicator of success in scientific learning is that students become more creative in achieving their learning outcomes.

Another effort made by the government to improve the quality of education is by formulating and carrying out the Education *Revolution* 4.0. Education 4.0 is a change in direction from a manual education system to a system of the industrial era and digital technology, as well as innovation in the field of education. This situation is in accordance with what is said (Fitriady et al., 2020): "Education 4.0 requires dynamic and modern transdisciplinary curriculum management". Achieving this is more challenging than turning the palm because it requires digital technology in teaching and learning. So that the transfer of knowledge and technology can be carried out continuously (*continuously*) without always having to face to face in class (*face to face)*. In other words, learning material can be delivered to students at any time without being limited by space and time. The government has made efforts to innovate in the world of education, including improving the curriculum, where the curriculum is a forum that will determine the direction of education. The success or failure of an education depends on the curriculum used. In the educational process, the curriculum plays a vital role in creating a reliable, creative, innovative, and responsible generation. Like the body, the curriculum is the heart of education. For this reason, it is necessary to change the curriculum under current developments and needs.

Research Urgency

Several schools that use the K13 curriculum for Physical Education learning in these schools use a student-centered learning process, such as in SMA Negeri 3 and 4. Students are more active and move according to the instructions given by their teacher. Meanwhile, there are still many teacher-centered learning *processes* in SMA Negeri 1 and SMA Negeri 2. The methods are still limited to lecture, command, and teacher-student discussion. The teacher teaches directly and coherently, gives examples/demonstrations to students, and then students practice *conventional learning*. The implementation of such learning can have an unfavorable impact on students. Students become passive and need the opportunity to express their ideas or ideas in the learning process.

Meanwhile, observations in several private schools show that most of the learning process is one-way, where the teacher is still the center of learning. Students are still required to imitate and carry out movements according to what the teacher exemplifies. For some contextual material, this learning is not suitable to be applied. Physical Education learning should lead to the inculcation of concepts and processes. However, in reality, the Physical Education learning activities often encountered place more emphasis on the results obtained. The learning provided does not provide opportunities for students to *explore* and *elaborate* on the material being studied; it also provides opportunities for students to *actualize* abilities through learning provided by the teacher. This situation causes the learning process to be less effective, and students still need to be more creative in generating new ideas in learning.

Seeing the reality that occurs in the field, so far the methods used by educators in the classroom learning process have only focused on the "*Teacher Centered*" pattern so that students' active role is not optimal. Even though it is clear that in the learning process, students must also play an active role so that the learning objectives can be absorbed by students optimally, and it is hoped that the learning outcomes that will be achieved will be what is expected by the teacher and students. Two factors that influence student learning outcomes are *internal* and *external*. One of the *external factors* that influences student learning outcomes is the learning process. Teachers

usually teach using *conventional learning* only. Students become bored, sleepy, and passive, only listening and making modest movements. *Progressive* teachers dare to try new things that can improve teaching and learning activities to increase student learning outcomes.

It is suspected that the lack of precise learning and the low creativity of students in Public and Private High Schools in Medan City also resulted in low Physical Education learning outcomes for students. Supporting the implementation of learning is creativity. However, education in schools is more oriented towards the development *of intelligence* (intelligence) than the development of creativity, while both are equally important for achieving success in learning. Groups of students with high creativity have the same learning outcomes as groups with relatively high *intelligence.* High creativity will make it easier for students to understand the material being studied, so learning outcomes will also be high.

Conventional teacher-centered learning has failed to solve problems in learning and failed to improve students' critical thinking skills. *Conventional* learning is too simple and creates short knowledge that only emphasizes the dimensions of cognitive processes. During the learning process, teachers also often apply learning methods that are less varied and still consider themselves as learning centers, namely *conventional learning*. Even though such a paradigm is no longer relevant, it is time for students to be invited to be active as learners. Students need to be allowed to develop other intelligences so that later, they can have ideas and ideas in solving problems that arise. Therefore, this problem needs to be overcome by making changes. These changes include choosing appropriate learning strategies to increase students' abilities and active participation. It takes a change in the teacher's learning model so that the teacher can motivate students, changing learning to be student-centered (*Student Centered Learning*) to increase students' abilities, interest, and active participation in learning activities.

All of this is aimed at following the learning achievement objectives that the government has set through the Indonesian National Qualifications Framework (KKNI) for senior high school level, which is equivalent to level 2 (two), the contents of which are as follows:

1. *specific* task, using tools, information, and work procedures that are commonly used, and demonstrating performance with measurable quality under the direct supervision of his/her superior.
2. Have basic operational knowledge and *factual knowledge* in a specific field of work to choose available problem solutions for problems that commonly arise.
   Responsible for own work and can be given the responsibility of guiding others

From the descriptions and drawings regarding the targets and achievements for the senior high school level, each graduate student must have the abilities and expertise in accordance with the demands of the Indonesian National Qualifications Framework (KKNI) determined by the government where the estuary will culminate in graduates who are ready to use with the expertise and abilities by the demands of developments in market demand and needs, especially the 21st century.

Some of the studies that became a comparison in the research that the author tried to offer included (Astiani et al., 2019), and concluded that the learning outcomes of students who applied the SFE-type cooperative model were higher than those of students who applied the STAD type. After testing the hypothesis with a significant level

(α=0.05), the calculated t value > table was obtained, 1.782819 > 1.67469. The results showed a significant difference between the experimental class I using the SFE-type cooperative learning model and the experimental class II using the STAD type (Megawati & Fitrayati, 2017). Concluding from the results of the data analysis, it was concluded that there were differences in student learning outcomes in the experimental class, which had a higher average compared to the control class. The ANOVA test shows an F value of 55.409 and a significant value of 0.000, which means a significance value (0.000) <0.05 means it is significant at 0.05. So, it can be concluded that there is a significant difference in the average learning outcomes of experimental and control class students. Thus, the scientific learning approach influences student learning outcomes and is recommended to be applied in learning to improve student economic learning outcomes. (Alamsyah, 2016) The results of data analysis for three cycles show that: (1) the implementation of the teacher in managing learning reaches an achievement percentage level of 84% or is in the "very good" category (2) student activities participating in learning reach the "effective" category (3) student creativity shows 100% creative students, (4) student learning outcomes in the cognitive domain with an average grade of 84, the attitude domain with an average of 88, and the psychomotor domain with an average of 81 with the complete category, and individual completeness reaches 92% with the "complete" category, (5) Student responses in participating in learning reach a "positive" level or in the category (Happy, New, Interesting, and Yes).

Based on the discussion of research results and data analysis, it can be concluded that there is an increase in creativity and student learning outcomes in applying the scientific approach. Harnanik (2014) concluded that students learning creativity with a scientific learning approach in cycle I was 59% with sufficient criteria, an increase of 16% with high criteria in cycle II, and an increase of another 6% with high criteria in cycle III. Completeness of learning outcomes in cycle I was 69%, increased by 15% in cycle II, and another 10% in cycle III. The average percentage of creative products in cycle I was 67% with sufficient criteria, an 8% increase with high criteria, and another 8% increase with high criteria in cycle III. From the research results and discussion of the hypotheses, it can be concluded that there are differences in the effect of applying conventional progress in scientific learning and learning in Physical Education and Physical Education learning outcomes (Wicaksono & Bangun, 2019). This finding shows a direct effect difference between conventional learning and scientific learning on Physical Education and Physical Education learning outcomes, where the application of scientific learning is higher than that of conventional learning towards student creativity and learning outcomes. That is the interaction between the application of conventional learning and scientific learning on creativity and Physical Education learning outcomes. This result shows an interaction between applying conventional learning and scientific learning of creativity and learning of Physical Education results (Sinulingga et al., 2023). The results of this study show the following: 1) There are differences in the effect of learning on creativity and learning outcomes, and 2) There is an interaction between the effect of learning on creativity and Physical Education learning outcomes. The findings of this study indicate that the application of scientific learning is more effective in achieving Physical Education learning outcomes than conventional learning approaches. From several relevant studies reviewed by previous research, the authors are interested in testing the hypothesis related to the impact of applying scientific learning with conventional learning on creativity and physical education learning outcomes in senior high schools in Medan.

Method

In the experimental design with a 2x2 *factor design*, two groups are randomly selected and then given *a pretest* to determine the initial state and whether there is a difference between the experimental and control groups (Sugiyono, 2010). This study used two groups of subjects and was randomly selected, assuming they had the same characteristics. The group is a group of Public High Schools that use the application of *scientific learning* (K-13) and a group of Private High Schools that use the application of *conventional learning*. *The pretest* was given to both groups to find out the initial results. The test used for creativity is in the form of a questionnaire, and initial data on student learning outcomes is obtained from report card data in odd semesters. Meanwhile, *the post-test* is carried out at the end of the semester. The material provided is adapted to the ongoing learning scenario. With this design, we will compare the effect of applying *conventional learning* and *scientific learning* on creativity and Physical Education learning outcomes, which are explained in the following table:

Table 1. ANOVA 2 x 2 Factorial Design

Study Group (A) / **Impact (B)**	**Conventional (A_1)**	**Scientific (A_2)**
Creativity (B_1)	A_1B_1	A_2B_1
Learning Outcomes (B_1)	A_1B_2	A_2B_2
Total	A_1	A_2

In this research, research variables are divided into three types: *independent* (free) and *dependent* (bound) variables. *Independent* variables in Indonesian are also called independent variables, which influence or cause changes or the emergence of *dependent* (bound) variables (Sugiyono, 2010). The independent variable in this study is the treatment in learning that uses the application of *conventional* and *scientific learning*. The *dependent (bound)* variable is a variable that is influenced or is a consequence of the existence of the independent variable (Sugiyono, 2010). This study's *dependent variable* is divided into creativity and Physical Education learning outcomes. Data analysis techniques are carried out using the applied method after the data is collected. Data analysis is a crucial part of research activities because, in this step, conclusions from the research will be obtained. After collecting data, the next step is to organize and perform data analysis to achieve the research objectives that have been formulated. In this study, researchers used quantitative data analysis techniques, namely data that can be realized with numbers obtained from the field. This quantitative data was analyzed by researchers using statistics. The analysis used was a two-way ANOVA analysis where prior to carrying out the analysis of variance (ANOVA), a requirements analysis test was first carried out, namely, (1) normality test, (2) homogeneity test, and (3) hypothesis test.

Results

This research has four variables: the dependent variable is creativity and learning outcomes, the independent variable is the group applying scientific learning with samples, namely State High Schools 1 and 2, and the group

applying conventional learning to Private High Schools. After following a series of programmed learning processes by dividing two groups, namely the group of students taught by applying scientific learning and the group applying conventional learning, creativity data and learning outcomes were obtained as scores, which were used and analyzed from the average. Each group has students of State Senior High Schools 1 and 2 and groups applying conventional learning to Private High Schools 1 and 2. Then, using the data obtained, the data descriptions of each variable are calculated. Calculations were performed using SPSS 17.0, the results of which can be seen in the summary description of the data in Table 2:

Table 2. Data Description

Impact	**Learning Group**		**Total**
	Conventional	**Scientific**	
Creativity	Σ = 9232	Σ = 10873	N = 90
	n = 40	n = 50	$\underline{X} = 156{,}98$
	$\underline{X}_1 = 156{,}47$	$\underline{X}_1 = 157{,}41$	$S = 15{,}705$
	$S_1 = 14{,}81$	$S_1 = 16{,}526$	
	$S_1^2 = 21939$	$S_1^2 = 273{,}1$	
Learning outcomes	Σ = 9062	Σ = 10873	N = 90
Physical education	n = 40	n = 50	$\underline{X} = 155{,}74$
	$\underline{X}_2 = 153{,}59$	$\underline{X}_1 = 157{,}58$	$S = 14{,}379$
	$S_2 = 16{,}47$	$S_1 = 12{,}14$	
	$S_2^2 = 271{,}21$	$S_1^2 = 147{,}36$	

Normality Test

Normality testing is one of the analytical requirements that must be fulfilled to be done more efficiently and smoothly if the variables studied follow a particular distribution. Before making a decision based on theory, it is necessary first to check the normality of the distribution, whether at the significance level, which in this study is > 0.05, the research has a normal distribution. The data normality test is intended to determine whether or not the distribution of each research variable is normal. Data were analyzed with the help of SPSS version 17.0, which can be seen in the attachment.

Table 3. Kolmogorov-Smirnov Data Normality Test

No.	**Learning Group**	**t-count**	**t-table**	**Information**
1	Conventional Learning and Scientific Learning on Creativity	0.168	0.05	Normal
2	Conventional Learning and Scientific Learning on Physical Education Learning Outcomes	0.554	0.05	Normal
3	Conventional Learning and Scientific Learning on Creativity and Learning Outcomes	0.127	0.05	Normal

Homogeneity Test

The normality test is one of the analytical requirements that must be met so that it can be easier and smoother when the variables studied follow a specific distribution. Before making a decision based on theory, it is necessary to check the normality of the distribution first, whether at a significant level in this study > 0.05, so the research is normally distributed. Data normality testing is intended to determine whether each research variable's distribution is normal. Data were analyzed with the help of SPSS version 17.0.

Table 4. Kolmogorov -Smirnov Data Normality Test

No.	Group Learning	t-count	t-table	Information
1	Conventional Learning and Scientific Learning on Creativity	0.168	0.05	Normal
2	Conventional Learning and Scientific Learning on Physical Education Learning Outcomes	0.554	0.05	Normal
3	Conventional Learning and Scientific Learning on Creativity and Learning Outcomes	0.127	0.05	Normal

Hypothesis Test

Two Way Analysis of Variance (ANOVA) Test (TWO WAY Analysis of Variance)

Analysis of variance is used to test hypotheses regarding the difference between two or more means. The difference index uses variance via the F ratio (Moerianto et al., 2020). Furthermore, this two-way analysis of variance with interaction is a comparative hypothesis test for k samples (more than two samples) which are correlated with influencing factors. In this case, two-way ANOVA tests many sample groups involving more than one *dependent variable.* The aim is to determine whether there is a significant influence between the variables of applying *conventional* and *scientific learning* to creativity and Physical Education learning outcomes. The results of data processing will be presented using SPSS 17.0 as follows:

Two-Way ANOVA Test (2x2)

For the row factor, namely the impact variable 0.4308 > 0.38, rejecting H_0 and H_a is accepted, so it can be concluded that there is a significant influence between creativity and Physical Education learning outcomes. For the column factor, namely the learning group variable, 1.6989 > 0.38 rejects H_0, so H_a is accepted, and it can be concluded that there is an influence between the scientific learning group and the conventional learning group. For column and row factors or the third hypothesis, 0.6558 > 0.38 rejects H_0, so H_a is accepted, and it can also be concluded that there is an interaction between the scientific learning group and the conventional learning group on creativity and Physical Education learning outcomes (see Table 5-7).

Table 5. Conventional Learning and *Scientific* Learning on Creativity and Learning Outcomes

Impact	Learning	Means	Std. Error	95% Confidence Intervals	
				Lower Bound	Upper Bound
Creativity	Scientific	157.406	1.811	154.013	161.147
	conventional	156.470	1.811	153.839	160.973
Physical Education Learning Outcomes	Scientific	156.475	1.959	152.617	160.332
	conventional	153.593	1959	149.736	157.451

Table 6. Tests of Between-Subjects Effects

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	630.539 [a]	3	210.180	.928	.428
Intercept	6212912.643	1	6212912.643	27445.273	.000
Impact	384.580	1	384.580	1.699	.194
Learning	116.568	1	116.568	.515	.474
Impact * Learning	148.443	1	148.443	.656	.419
Error	57046398	252	226.375		
Total	6316430.000	256			
Corrected Total	57676938	255			

a. R Squared = .011 (Adjusted R Squared = -.001)

Table 7. Average Comparison

IMPACT	**Learning Groups**		**Total Average**
	Scientific (A1)	**Conventional (A2)**	
Creativity (B1)	157.41	156.47	313.88
Learning Outcomes (B2)	156.47	153.59	311.17
Total Average	314.99	310.06	625.05
Average Treatment	157.50	155.03	156.26

Advanced Test

Follow-up tests are carried out if, in the data processing carried out, there is interaction. In this case, the follow-up test was carried out using the Scheffe test because the number of samples for each group differed. The data processing used SPSS 17.0. For the State High School 1 group, creativity was obtained with an average of 156.61 and SD = 19.513, and Physical Education learning outcomes obtained an average of 155.03 and SD = 13.71. with n = 36. Meanwhile, creativity was obtained for the State High School 2 group with an average of 158.27 and SD

= 12.743. On average, physical Education learning outcomes were obtained at 169.36 and SD = 9.601 with n = 33. Next, for the School group, Private High School 1 obtained creativity with an average of 156.00 and SD = 12.558, Physical Education learning outcomes obtained an average of 153.15 and SD = 14.325 with n = 27. Meanwhile, creativity was obtained for the Private High School 1 group with an average of 159.53 and SD = 13.725. Physical Education learning outcomes obtained an average of 155.74 and SD = 14.379 with n = 32.

Discussion

Conventional Learning and Scientific Learning on Creativity

Based on the results of the data analysis, there is a significant difference between the application of scientific learning and conventional learning on creativity, where the application of scientific learning is superior to the application of conventional learning. This finding is in accordance with the results of research conducted by Oktaviani (2019), where the results of the discussion are that there is a higher influence of the scientific approach compared to the conventional approach on students' critical thinking. Based on this, Ha is accepted, and Ho is rejected. This result aligns with the statement regarding advances in information technology improving training performance (Priyambada et al., 2022). Conventional learning (Sanjaya & Rediani, 2022) states that firstly, it is done by conveying the material verbally (lectures/orally). Secondly, the presented lesson material is usually ready-made (data, facts, and concepts that must be memorized) so that students are not required to be creative. The learning process is expected to reveal the subject matter being taught, so this learning is often called teacher-centered.

Scientific learning stimulates active students to develop, discover, and investigate the problems or questions the teacher gives to make the results meaningful and stored in the students' long-term memory. In another sense, students are placed as the center of information. This activity is intended to end the learning process, which is carried out to strengthen students' knowledge by directing students and providing feedback on the learning outcomes process (Hanan et al., n.d.). Through the explanation of the theory, the application of conventional learning and scientific learning can increase student creativity, where the application of scientific learning is better than the application of conventional learning to student creativity.

Conventional Learning and Scientific Learning on Physical Education Learning Outcomes

Based on the results of the data analysis that has been carried out, there is a significant difference in the influence of the application of conventional learning and scientific learning on creativity and physical education learning outcomes, where the average value of Physical Education learning outcomes in the application of scientific learning is higher than the value of Physical Education learning outcomes in the application of conventional learning. These results are in accordance with research conducted by Yuntoto (2015) that the difference in student learning outcomes shows that scientific learning is higher when compared to conventional learning. Scientific learning will encourage students to search for the information they need themselves. They do not get information from teachers alone, but they can obtain information from various sources so that scientific learning will make students more active and independent. This result is in accordance with the opinion of Fadilah and Wibowo (2018),

who state that what students learn and obtain in scientific learning is done with their senses and minds so that they experience it directly in the process of gaining knowledge. Meanwhile, in applying conventional learning, students tend to be listeners. They will only be listeners of the teacher's explanation and note down things they consider important. Learning will only be teacher-centered; students are not required to express their opinions actively. Students are also not encouraged to find existing problems themselves and solve them, making learning boring. Based on this theoretical explanation, applying conventional learning and scientific learning can improve students' Physical Education learning outcomes, where the application of scientific learning is better than the application of conventional learning on students' Physical Education learning outcomes.

Conventional Learning and Scientific Learning on Physical Education Creativity and Learning Outcomes

Based on the results of the data analysis that has been done, it can be concluded that there is a significant difference between the application of conventional learning to scientific learning on creativity and Physical Education learning outcomes, where the application of scientific learning is superior to conventional learning. This study proves that the application of scientific learning is more effective than the application of conventional learning. In implementing conventional learning, students only listen to explanations from the teacher, so the material they receive is only memorized and usually only lasts for a short time. In scientific learning, teachers only act as facilitators, so students must learn actively individually and in groups to understand, search for, and solve problems. Curiosity to solve problems makes students highly creative, so this concept is already attached not only as memorization, which can improve student learning outcomes.

This finding is in accordance with research conducted (Ulfah, 2016), whose results showed that "there is an influence on learning outcomes and creativity of students with high and low scientific attitudes. It is also essential to pay attention to changes in age and physiological characteristics that can influence training models (Akhmad et al., 2023). Through the explanation of this theory, it can be concluded that applying conventional learning and scientific learning can increase students' creativity and physical education learning outcomes, where applying scientific learning is better than applying conventional learning for students' creativity and physical education learning outcomes. Good learning certainly has an optimal impact, just like a coach can condition an athlete to perform optimally (Sujarwo et al., 2023).

Interaction of the Effect of Application of Conventional Learning and Scientific Learning on Physical Education Creativity and Learning Outcomes

Per the results of the data analysis that has been carried out, the findings in this research show an interaction between the application of scientific learning and conventional learning on creativity and Physical Education learning outcomes. Next, we get that Ho $_{is}$ rejected and Ha $_{is}$ accepted. There is an interaction between applying scientific and conventional learning to creativity and Physical Education learning outcomes. This research proves that using appropriate learning applications supported by good creativity will improve students' Physical Education learning outcomes. Then, the learning evaluation process uses measuring instruments to determine learning outcomes (Suhartini et al., 2023; Dedy et al., 2016). In learning, students will be more free to develop

themselves, find new things, and work with other students. Apart from that, if students have good creativity, they will always get good learning results followed by more liking and being challenged by new things. Students can improve their learning outcomes by applying appropriate learning and supported by good creativity.

However, this result does not follow the results of research conducted (Ashadi, 2014), which stated in his research that "there is no interaction between scientific learning and demonstration methods on students' learning achievement and creativity." This research explained that interaction did not occur because the distribution of learning achievements and creativity of students with high and low attitudes was uneven. From the results of this theory, the application of conventional learning and scientific learning can increase students' creativity and physical education learning outcomes, where there is an interaction between the application of conventional learning and scientific learning. This interaction occurs because the average number of each variable is not the same, which is found in data processing. It can also be explained regarding game-based learning models that can provide increased learning outcomes for students (Ritonga et al., 2022).

Conclusion

From the results of the research hypothesis and discussion of the results of the research, it can be concluded that:

1. There are differences in the effect of applying conventional and scientific learning on creativity. This finding shows a difference in the direct influence between the application of conventional learning and scientific learning on creativity, where the application of scientific learning is higher than the application of conventional learning on students' creativity.
2. Conventional learning and scientific learning on Physical Education learning outcomes show that there is a difference in the direct influence between the application of conventional learning and scientific learning on Physical Education learning outcomes, where the application of scientific learning is higher than the application of conventional learning on students' Physical Education learning outcomes.
3. Conventional learning and scientific learning on creativity and Physical Education learning outcomes show that there is a difference in the direct effect of conventional learning and scientific learning on physical education creativity and learning outcomes, where the application of scientific learning is higher than the overall application of conventional learning on students' creativity and physical education learning outcomes.
4. Interaction between the application of conventional learning and scientific learning on creativity and Physical Education learning outcomes shows an interaction between the application of conventional learning and scientific learning on creativity and Physical Education learning outcomes.

Recommendations

Based on the results of the research carried out, it is hoped that it will be able to be developed further to add scientific sources that have many innovations in the application of *conventional learning and scientific* learning to creativity and physical education learning outcomes so that teachers can apply learning strategies that are the way teachers teach it following the objectives of learning physical education itself.

Acknowledgments

Thanks to the physical education teachers who have played a role in this research and to the research members who have helped complete this research. Hopefully, this research can be used as scientific material for teaching physical education learning.

References

Akhmad, I. (2016). Standar kompetensi mata pelajaran pjok. *Kemendikbud Direktorat Jenderal Guru Dan Tenaga Kependidikan*, 1–8.

Akhmad, I., Dewi, R., Suprayitno, & Priyambada, G. (2023). The Effect of Quick Strength Training on the Agility and Leg Power of Futsal Junior Athletes. *International Journal of Human Movement and Sports Sciences*, *11*(2), 477–483. https://doi.org/10.13189/saj.2023.110227

Alamsyah, N. (2016). Penerapan Pendekatan Saintifik Untuk Meningkatkan Kreativitas Dan Hasil Belajar Siswa Dalam Mata Pelajaran Ipa. *Jurnal Pendidikan*, *1*.

Anwar, M. H. (2005). Pendidikan Jasmani Sekolah Dasar Sebagai Wahana Kompensasi Gerak Anak. *Jurnal Pendidikan Jasmani Indonesia*, *3*(1), 45–53. https://journal.uny.ac.id/index.php/jpji/article/view/6171

Ashadi, K. (2014). Implementasi Fisiologi Olahraga pada Olahraga Prestasi. *Hotel Horison Ultima Jl Green Boulevard*, *65125*(2), 59. www.healthyperformance.co.uk,

Astiani, F., Bahar, A., & Amir, H. (2019). Perbandingan Pembelajaran Saintifik Menggunakan Model Kooperatif Tipe Student Fasilitator And Explaining (Sfe) Dan Student Teams Achievement Division (Stad) Terhadap Hasil Belajar Kimia. *Jurnal Pendidikan Dan Ilmu Kimia*, *3*(1), 25–33.

Bakhtiar, S. (2014). Strategi Pembelajaran, Lokasi Sekolah, Dan Kemampuan Gerak Dasar Siswa Sekolah Dasar. *Jurnal Ilmu Pendidikan*, *20*(2), 127–133. https://doi.org/10.17977/jip.v20i2.4608

Bulkani, Fatchurahman, M., Adella, H., & Andi Setiawan, M. (2022). Development of animation learning media based on local wisdom to improve student learning outcomes in elementary schools. *International Journal of Instruction*, *15*(1), 55–72. https://doi.org/10.29333/iji.2022.1514a

Dedy, R., Budiman, A., & Pd, M. (2016). Developing Learning Media Based On Augmented Reality (Ar) To Improve Learning Motivation. *Journal of Education, Teaching and Learning*, *1*, 89–94.

Dewi, R., & Faridah, E. (2022). Method and Motivation in Teaching Elementary School Students to Throw and Catch the Ball. *Al-Ishlah: Jurnal Pendidikan*, *14*(3), 3507–3516. https://doi.org/10.35445/alishlah.v14i3.1635

Dewi, R., & Verawati, I. (2021). The Effect of Manipulative Games to Improve Fundamental Motor Skills in Elementary School Students. *International Journal of Education in Mathematics, Science and Technology*, *10*(1), 24–37. https://doi.org/10.46328/ijemst.2163

Dewi, R., Verawati, I., Sukamton, A., Hakim, H., Burhaein, E., & Lourenço, C. C. V. (2023). The Impact of Basic Motion Activities on Social Interaction in Elementary School Students. *International Journal of Human Movement and Sports Sciences*, *11*(1), 143–151. https://doi.org/10.13189/saj.2023.110117

Endriani, D., Sitompul, H., Mursid, R., & Dewi, R. (2022). Development of a Lower Passing Model for Volleyball Based Umbrella Learning Approach. *International Journal of Education in Mathematics, Science and*

Technology, *10*(3), 681–694. https://doi.org/10.46328/ijemst.2508

Fadilah, M., & Wibowo, R. (2018). Kontribusi Keterampilan Gerak Fundamental Terhadap Keterampilan Bermain Small-Sided Handball Games. *Jurnal Pendidikan Jasmani Dan Olahraga*, *3*(1), 60.

Fitriady, G., Sugiyanto, & Sugiarto, T. (2020). Gelanggang Pendidikan Jasmani Indonesia. *Gelanggang Pendidikan Jasmani Indonesia*, *3*(2), 82–90. http://journal2.um.ac.id/index.php/jpj

Hanan, R. A., Fajar, I., Pramuditya, S. A., & Noto, S. (n.d.). *Desain Bahan Ajar Berbasis Augmented Reality pada Materi Bangun Ruang Bidang Datar*.

Harnanik. (2014). Pendekatan Pembelajaran Saintifik Untuk Meningkatkan Kreativitas Dan Hasil Belajar Materi Kegiatan Produksi Pada Siswa Kelas Vii D Smpn 1 Winong. *Jurnal Pendidikan Ekonomi Dinamika Pendidikan*, *IX*(2), 115–120.

Imran Akhmad, S. H. R. D. A. S. (2022). The Effects of Learning Strategies on Senior High School Students' Motivation and Learning Outcomes of Overhead Passing in Volleyball. *International Journal of Education in Mathematics, Science and Technology*, *10*(2), 512–527. https://doi.org/10.46328/Ijemst.2291

Megawati, Y., & Fitrayati, D. (2017). Pengaruh Penerapan Pendekatan Saintifik Terhadap Hasil Belajar Siswa Pada Materi Koperasi Kelas X Iis Di Sman 2 Mejayan Madiun. *UNESA*, *1*(2), 1–6.

Mesnan, M. (2021). The Influence of Organizational Culture and Work Motivation on the Performance of Physical Education Teachers in Medan High Schools. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, *4*(1), 432–440.

Moerianto, E., Valianto, B., & Dewi, R. (2020). *Influence Game Method and Interest on the Basis of Motion of Learning Skills State Run SDN 105345 Sidodadi*. *23*(UnICoSS 2019), 158–161.

Mustafa, P. S., & Dwiyogo, W. D. (2020). Kurikulum Pendidikan Jasmani, Olahraga, dan Kesehatan di Indonesia Abad 21. *JARTIKA Jurnal Riset Teknologi Dan Inovasi Pendidikan*, *3*(2), 422–438.

Oktaviani, Y. (2019). Meningkatkan Hasil Belajar Siswa Melalui Pembelajaran Kooperatif Pada Pembelajaran Tari Di Kelas Viii 5 Smpn 25 Padang. *E-Jurnal Sendratasik*, *7*(3), 15–23.

Pande Made Dharma Sanjaya, & Nyoman Rediani, N. (2022). Pembelajaran Berbantuan Video Model Latihan Renang Gaya Bebas terhadap Penguasaan Gaya Bebas dan Kecepatan Renang Siswa Sekolah Dasa. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *6*(2), 297–305. https://doi.org/10.23887/jppp.v6i2

Priyambada, G., Prayoga, A. S., Utomo, A. W. B., Saputro, D. P., & Hartono, R. (2022). Sports App: Digitalization of Sports Basic Movement. *International Journal of Human Movement and Sports Sciences*, *10*(1), 85–89. https://doi.org/10.13189/saj.2022.100112

prof. dr. sugiyono. (2010). prof. dr. sugiyono, metode penelitian kuantitatif kualitatif dan r&d. intro (PDFDrive).pdf. In *Bandung Alf* (p. 143).

Putro, S. E., Rinawati, A., & Muh, U. (2013). Pengaruh Kinerja Guru Terhadap Motivasi Belajar Siswa. *Jurnal Cakrawala Pendidikan*, *5*(2), 278–289.

Ritonga, D. A., Damanik, S., Damanik, S. A., Suprayitno, & Priyambada, G. (2022). Development of Learning Variations to Improve Basic Jumping Skills and Play Approaches of Elementary School Students. *International Journal of Education in Mathematics, Science and Technology*, *10*(2), 360–371. https://doi.org/10.46328/ijemst.2246

Sinulingga, A., Bangun, S., & Wicaksono, Y. (2023). Is Scientific Learning Better Than Conventional Learning

on Creativity and Student Learning Outcomes? *Journal Coaching Education Sport*, *4*(1), 45–58.

Suhartini, B., Sujarwo, & Priyambada, G. (2023). Development of Tool for Evaluation of Motor Perception Activity Learning of Students with Intellectual Disabilities. *International Journal of Education in Mathematics, Science and Technology*, *11*(5), 1313–1327. https://doi.org/10.46328/ijemst.3582

Sujarwo, Nopembri, S., Kriswanto, E. S., Priyambada, G., Shun, J. M. T., & Mahardhika, N. A. (2023). Cultural Differences and Coaching Styles of Physical Education Teachers in Hong Kong and Indonesia. *International Journal of Education in Mathematics, Science and Technology*, *11*(3), 683–694. https://doi.org/10.46328/ijemst.3241

Supriadi, A., Mesnan, M., Akhmad, I., Dewi, R., & Suprayitno, S. (2022). The Effect of Learning Manipulative Skills Using Ball Thrower Learning Media on the Ability to Throw and Catch the Ball in Elementary School Students. *International Journal of Education in Mathematics, Science and Technology*, *10*(3), 590–603. https://doi.org/10.46328/ijemst.2441

Tuzzin, M., Moraes, D., Debiasi, H., Carlesso, R., Cezar, J., Rodrigues, V., Bonini, F., Reinhart, K. O., Vermeire, L. T., Practices, M., Keeling, C. D., Mook, W. G., Tans, P. P., Iqbal, M. M., Akhter, J., Mohammad, W., Shah, S. M., Nawaz, H., Mahmood, K., … Dialo, T. (2015). Improved cassava variety handbook. *Soil and Tillage Research*. https://doi.org/10.1590/S0100-06832009000400003

Ulfah, M. (2016). Penerapan model project based learning pada pokok bahasan optik geometri untuk meningkatkan prestasi belajar peserta didik kelas X MIA 3 SMAN 2 …. In *Penerapan model project based learning pada pokok ….*

Wicaksono, S. A., & Yunis Bangun, S. (2019). Comparison of the Effect of Scientific and Conventional Learning on the Creativity and Learning Outcomes of Physical Education Student. *4th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2019)*, *384*(2).

Yuntoto, S. (2015). Pengembangan Aplikasi Android Sebagai Media Pembelajaran Kompetensi Pengoperasian Sistem Pengendali Elektronik Pada Siswa Kelas Xi Smkn 2 Pengasih. *Desy Fatmawati*, *september*, 1–8.

Author Information

Mesnan
https://orcid.org/0000-0001-9011-229X
Medan State University
Jalan Willem Iskandar Pasar. V, Medan
Indonesia
Contact e-mail: *mesnan@unimed.ac.id*

Nimrot Manalu
https://orcid.org/0000-0002-4253-652X
Medan State University
Jalan Willem Iskandar Pasar.V, Medan
Indonesia

Amir Supriadi
https://orcid.org/0000-0003-3640-6582
Medan State University
Jalan Willem Iskandar Pasar.V, Medan
Indonesia