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Application of cooperative learning modules with the jigsaw-type to volleyball learning outcomes

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Abstract

The development of learning outcomes in physical education for students in the 21st century depends on innovation and a series of learning models designed by educators to improve children's critical thinking skills. In the jigsaw cooperative learning model with the advantage of a deeper understanding of the material, cooperation between students is formed, students' motivation in sports increases, and students are trained in responsibility. For junior high school students, there is volleyball material which is one of the big ball game materials. This research aims to find out whether the application of the jigsaw type cooperative learning model can improve volleyball learning outcomes for junior high school level students. This investigation uses quantitative research with a pure experimental type through a randomized control group pretest-posttest design. In this study, the instruments used were knowledge tests and skills tests, with samples using cluster random sampling to determine 2 classes, namely 8-D as the experimental class and 8-C as the control class. The results of this study used parametric tests on knowledge tests with P-value results of 0.00 < 0.05, which means there was an increase in learning outcomes using the jigsaw-type cooperative learning model on student knowledge and on skills tests with non-parametric tests with results obtained p < 0.05, which means there was significant improvement. Student learning outcomes increased by 68.27% on the knowledge test and by 68.27% on the skills test using the N-Gain test. So it can be concluded that the application of the jigsaw cooperative influences volleyball learning outcomes in the improvement category quite effectively.

Keywords: cooperative learning; jigsaw; volleyball

INTRODUCTION

Physical education is a type of student education whose learning process requires a systematic design because learning requires high skills and is balanced with knowledge to increase the potential that is possessed (Saitya, 2022). The development of skills in students has an important role in facilitating the movement activities of students who experience obstacles so that the physical needs of students are met according to their age (Eddy et al., 2021). Based on the research, it explains that students' skills and knowledge require special attention to make the learning process run effectively. According to (Sauchelli et al., 2024), students' academic

and non-academic success is related to learning that hones independence with the support of innovative learning models provided by education.

The physical education process is an educational process that involves learning interactions between students and physical activities that are systematically designed according to physical development and age level to improve the quality of movement skills to achieve the goals of education (Parwata, 2021). A learning process that is structured systematically with certain patterns in the learning sequence is said to use a learning model. A learning model is a learning design with a pattern used by teaching staff, which can be observed during teacher and student learning activities, as a learning tool used to create learning conditions and systems that will motivate learners to engage in more active learning (Mirdad, 2020).

This learning model has developed and undergone enhancements to the physical education teaching and learning methods, emphasizing that the learning process is not only centered on the teacher but also involves and places more emphasis on the students themselves so that they have their role which has a big impact on the skills of the process. learning (Utamayasa, 2021). The formation of learning models in schools aims to improve the professional competence of teachers in schools (Hong et al., 2024). A greater value is placed on the teacher's position as a mentor and facilitator of the learning process for the students. The type of learning model that provides students with the opportunity to study the material themselves is by using one model, namely cooperative learning. Cooperative learning is learning where the learning process is carried out together with friends in groups as a source of learning that will be obtained. Learning takes place with students interacting with each other in groups to share knowledge in solving a problem that will be presented by the teacher (Hasanah et al., 2021).

Assessment of learning outcomes is the result of the achievements obtained by students from the teacher's efforts to provide learning guidance to determine the progress of the achievements obtained by students in absorbing learning material, based on the 2013 revised 2016 curriculum which states that the physical education subject that is required by teachers is only an assessment of knowledge and skills (Mustafa et al., 2019). The curriculum has a role in realizing educational goals by containing learning plans, the physical education curriculum aims to produce a generation that has skills and good health in facing current global challenges in the 21st century. This dynamic development of the times has led to the curriculum in Indonesia always changing to adapt to changing times (Mustafa & Dwiyogo, 2020). The assessment of physical education learning outcomes for the latest curriculum or the independent curriculum is not much different from the previous curriculum, however, in this independent curriculum the physical education learning process has slight differences in the learning sub-material. Teachers have the freedom to choose their materials according to the facilities and materials that suit the students (Sukma, 2023).

Based on observations made during the physical education lesson, and the volleyball material, it is discovered that there is a lack of student understanding regarding the material and there is poor interaction between students. Students do not seem confident in expressing opinions about the difficulties they face when describing and practicing Volleyball spike movements and the results of the learning outcomes are low. Based on the problems found, it is clear that the existing learning model requires appropriate changes to develop students' skills and knowledge.

To overcome the problems of the learning process that occur, This study will use a cooperative learning technique similar to a jigsaw to teach volleyball. This type of cooperative learning model is done by groups, 1 group consisting of 5 to 6 students will be divided into 2 groups, that is the 'student' group and the expert group, the 'student' group is the center of students consisting of students with the abilities they already have. while the expert group is a group containing students with various abilities, each students are divided evenly (Moskowitz et al., 1985). The jigsaw-type learning model influences mutual respect and acceptance of input between students so that the understanding gained is broader and deeper (Nadya & Santoso, 2021). The argument provided by Almashani et al. (2023) is that cooperative learning can boost speaking confidence and improve the use of appropriate language when expressing opinions. This jigsaw-type cooperative learning is a strategy to develop students' expertise and skills, this approach has five characteristics, that is: listening, conveying (speaking skills), cooperation, reflection of thought, and creative thinking (Lubis & Harahap, 2016). With these five characteristics, this learning model is suitable for application in physical education learning regarding volleyball skills.

Learning to play volleyball is a sport where players in a group are required to support and unite for the success of the group. The basic movement activities in volleyball consist of five skill movements that you need to know, including; service, passing, bait or set-up, spike, and blocking (Putro & Ismoko, 2017). The level of success in volleyball learning requires facilities to improve learning with learning methods or modules that have the potential to open new insights (Kasih et al., 2023).

In the process of learning physical education volleyball material, especially smash, students find it difficult to improve learning outcomes and students are too closed to convey the difficulties experienced during learning. According to Arifin et al. (2021), explaining that to support the success of students in carrying out volleyball materials such as passing, spikes, and services, teachers need to use appropriate and targeted learning methods to develop students' skills and knowledge and hone cooperation between students. By using the cooperative learning approach akin to a jigsaw is expected to improve students' knowledge and movement skills. Based on the background description explained above, researchers are interested in researching the "Application of the Jigsaw Type Cooperative Learning Model to Volleyball Learning Outcomes"

METHOD

The research investigation employs a quantitative methodology. with a type of pure experimental research, which is a study with four principles that can be chosen, namely; random placement of subjects, treatment being provided to the experimental group, the existence of a control group, and the existence of measures of research success (Maksum, 2018). Experimental research functions to determine the results of the influence of 2 variables to be measured and analyzed (Kampling et al., 2016). By using a randomized control group pretest-posttest design, has a study process with the advantages of having a pretest-posttest at the beginning and end of the experiment as well as a control group to increase the effectiveness of the treatment given and random sample selection (Abdullah, 2022). By using this design can avoid threats to internal validity in experimental quantitative research (Febriyanti et al., 2024).

Table 1. Randomized control group pretest and posttest design

Sampling	Group	Pretest	Treatment	Posttest
Random	Experiment	Y1	X	Y2
Random	Control	Y1	------	Y2

Information :
Y_1 : Test learning outcomes before treatment
Y_2 : Test of learning outcomes after treatment
X : Treatment with *jigsaw*-type *cooperative learning*
---- : T does not receive treatment with the *jigsaw model*

The whole of the objects based on the characteristics determined by the researcher is said to be a population (Susanto et al., 2024). All subjects used in the research were 8th-grade students at SMP Negeri 8 Surabaya with a total of 246 students. In the study, it is necessary to simplify the subjects that become data sources to represent the entire population, which is called the sample (Amin et al., 2023). Carrying out sampling through a method called 'probability sampling' with the chosen method of cluster random sampling gives each class a random opportunity to be selected. In the research, the classes selected as samples were class VIII-D as an experiment with thirty-two pupils in all students in the inclusion sample criteria and class VIII-C as a control class with a total of 31 students. There are 2 variables, which are the jigsaw-style cooperative learning model's independent variable and the dependent variable in the volleyball material's learning outcomes. Collecting materials or the results of acquiring research data is a data-gathering approach to assess whether there are inequalities in the outcomes gained (Saefuddin et al., 2023). The data collection used is the result of acquiring knowledge and skills used before treatment and after treatment. To determine whether the research instrument is appropriate for practice, validation results are required. The purpose of the instrument is to measure student achievement results in physical education learning (Ayed & Houssem, 2024). The knowledge test is done in the form of descriptive questions with a total of 5 questions and the skills test students will practice passing down, serving down, and spiking.

Five meetings were needed to complete the research: a pretest was conducted at the first meeting, treatment took place from the second to the fifth meeting, and a posttest was conducted at the fifth meeting. To determine whether there has been an improvement in student learning outcomes, the results of the data collection are further processed through an analysis technique. The research uses the help of the SPSS version 25 application. With data analysis techniques starting from descriptive tests, normality tests, homogeneity tests, Wilcoxon tests, Maan Whitney tests, and N-Gain tests. The percentage's classification of N-Gain test results is as follows:

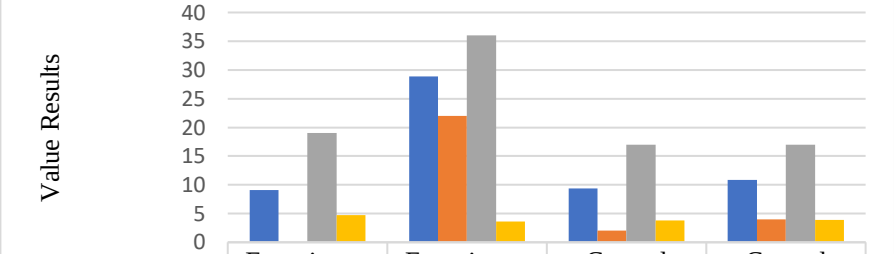
Table 2. Classification of the effectiveness of the N-Gain test percentage percent (%)

Percentage	Category
Below 40%	Ineffective
40% - 55%	Less effective
56% - 75%	Effective enough
75% and above	Effective

Source: Makmur & Burhan (2023)

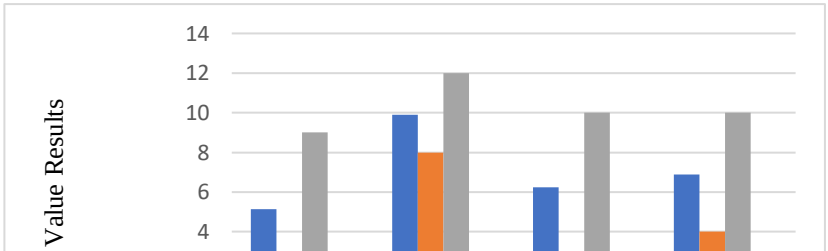
RESULTS

The research was done at SMPN 8 Surabaya from 23 January to 20 February 2024. The research aimed to find out whether there were differences in learning outcomes and to find out how much improvement was obtained. With the following data obtained.



	Experiment Pretest	Experiment Posttest	Control Pretest	Control Posttest
Mean	9.1	28.9	9.35	10.84
Minimum	0	22	2	4
Maximal	19	36	17	17
Std.Deviation	4.7	3.6	3.8	3.9

Figure 1. Chart of acquisition analysis of knowledge test descriptions



	Experiment Pretest	Experiment Posttest	Control Pretest	Control Posttest
Mean	5.13	9.9	6.23	6.9
Minimum	1	8	3	4
Maximal	9	12	10	10
Std.Deviation	1.85	1.07	1.85	1.22

Figure 2. Chart of acquisition analysis of skill test descriptions

Based on Figure 1 the data listed above, explains the results of the knowledge test with an ideal score of 38 if all the questions are correct in the experimental class with an average pretest of 9.1, posttest of 28.9, and in the control class, pretest of 9.35, posttest 10.84. In the results of the skills test in the attached image 2, the ideal achievement is 12 if students can perform the movements correctly with a mean/average in the experimental class pretest 5.13 posttest 9.9 and in the control class the pretest was 6.23 posttest 6.9.

Table 3. Normality test with *Kolmogorov-Smirnov determination*

Class	Mark	Knowledge Test		Skills Test	
		P-value	**Distribute**	***p-value***	**Distribute**
Experiment	*Pretest*	0.17	Normal	0.00	Abnormal
	Posttest	0.16	Normal	0.00	Abnormal
Control	*Pretest*	0.20	Normal	0.00	Abnormal
	Posttest	0.17	Normal	0.00	Abnormal

Based on the data processing results of the skills test in the experimental class, the pretest and posttest results were 0.00<0.05, which means the data was not normally distributed, and in the control class test results, the pretest results were 0.00 <0.05 and in the posttest results were 0.01<0.05, which means both data. not normally distributed. The data is not normally distributed because there is a large spread or difference in values. This causes the data to be distributed abnormally. Because the data obtained was not normal, the next stage used a non-parametric test.

Table 4. Homogeneity test for 2 groups

Class	Mark	*P-value*	Information
Knowledge	*Pretest*	0.313	Homogeneous
	Posttest	0.205	Homogeneous
Control	*Pretest*	0.685	Homogeneous
	Posttest	0.552	Homogeneous

Based on the results obtained above, show that the results of knowledge and skills in two different samples were obtained by pretest and posttest results with p-value results >0.05, which means the data is homogeneous.

Table 5. Paired Sample T-test Knowledge Test

Group	Control		Difference	t	*P-Value*	Conclusion
	Pretest	***Posttest***				
Experiment	9.1	28.9	19.80	20.78	0.00	So, H_1 is accepted
Control	9.35	10.84	1.48	2.68	0.01	So, H_1 is accepted

Based on the calculations in the table above, explain that the difference between the scores for the experimental class is 19.80 and the control class is 1.48. The *T* score for the experimental class was higher with a score of 20.78 while for the control class, it was 2.68. It can be concluded from the data obtained in the experimental class that the *P-value* is 0.00 < 0.05, which means there is a significant influence on the pretest and posttest results.

Table 6. Wilcoxon test on skill tests

Mark	Skills	Skills
Negative Ranking	0	8
Positive Ranks	31	17
Ties	0	6
P-value	0.00	0.103
Conclusion	So, H_1 is accepted	So, H_0 is accepted

From the results of the Wilcoxon test data processing above, it can be seen that the p-value obtained from the experimental class skills pen results is 0.00. So it can be interpreted that the Hypothesis (H_1) is accepted and the Hypothesis (H_0) is rejected because p <0.05. So it is known that there is an increase in jigsaw-type cooperative learning outcomes in volleyball learning at SMPN 8 Surabaya. Meanwhile, the learning outcomes in the skills test for control class students obtained a p-value of 0.10>0.05, which indicates that H_1they was rejected and H_0 accepted, which means there was no increase in learning outcomes.

Table 7. Independent sample *T-test* of knowledge

Mark	Experiment	Control
Mean	19.8	1.48
Std. Deviation	5.30	3.07
T	16.63	
P-Value	0.00	
Conclusion	*P* < 0.05, H $_1$ is accepted	

Based on the results of the independent sample T-test above, it is known that the experimental class average was 19.8, more than the control class with an average of 1.48. With the calculated T, we obtained 16.63 for the difference between the 2 samples. It was concluded that the *P-value* obtained showed a result of 0.00<0.05, which discovered that the two groups differed significantly from one another.

Table 8. *Mann Whitney* test of skills.

Mark	Experiment	Control
Mean Rank	44.53	18.47
Sum of Ranks	1380.5	572.5
Z	-5.72	
P-Value	0.00	
conclusion	*p* <0.05, H0 $_{is}$ accepted	

Based on the Mann-Whitney Test obtained above, shows that the average gain in the skills test was 44.53 for the experimental class, while the control class was only 18.47. It can be concluded from the results of the comparison of the 2 samples that the P-value was 0.00<0.05, which states that there is a difference in scores between the classes. experiment with a control class.

Table 9. N-Gain Test Percent (%)

Mark	Control	Experiment
Knowledge	5.2%	68.30%
Skills	13.3%	68.27%

In the knowledge test control class learning results, there was an increase of 4.65% and for the assessment of skills learning results, there was a decrease in learning results with a result of -0.23%. This shows that the N-Gain score test results in the control class are in the ineffective category. In the experimental class learning results for knowledge tests, there was an increase of 68.30% and for the assessment of skills learning results, there was an increase of 68.27%. This demonstrates that the N-Gain score test results fall into the category of fairly effective.

DISCUSSION

The cooperative model's utilization of the jigsaw kind has advantages in learning to sharpen children's thinking skills by interacting between students through the formation of 2 learning groups, which are the 'student' group and the expert group. The research aims to determine whether there has been an increase in the use of the jigsaw-type cooperative learning model on student learning outcomes in volleyball material implemented at school. The modules used have gone through validation tests approved by validators in Volleyball experts and learning model experts. To answer the increase in learning, a pure experimental type design was used with 2 groups. In the group with the jigsaw module, learning is done with initial treatment providing motivation and learning objectives by informing about the existence of rewards or prizes at the end of learning for each student who is active in both individual and group assessments. In the second treatment, the group is divided into original groups and then the determination continues. expert groups and distribution of Student Worksheet for each group for students to study and work cooperatively In the third treatment, learning evaluation was carried out with group presentations and ended with giving prizes or rewards to the most active and best students.

The assessment of student knowledge is significantly impacted by the cooperative learning approach similar to a jigsaw, according to research on the acquisition of prerequisite tests in research on knowledge tests using a paired sample T-test to determine the effect of pretest-posttest in two groups. Meanwhile, in the skills test using *the* Wilcoxon test, because the data was not normal, the results proved that there was an increase in learning outcomes with a sig value <0.05, which explains that there was an influence from the use of the module on improving students' skills, based on previous research with results, a significant influence was obtained on similar sample T-test on the cooperative jigsaw method in improving student learning outcomes (Halim & Faiza, 2020). In obtaining data processing to find out the differences between the 2 groups in the knowledge test using the independent sample T-test the results there was a difference in scores between the average learning outcomes of the control class and the experimental class showing $p < 0.05$ which means there is a significant difference in the test knowledge. Meanwhile, in the skills test, because the data was not normal, we switched to a non-parametric test with the Mann-Whitney test to determine the difference in *posttest scores* from 2 different samples which showed a significant difference between the experimental and control classes. Based on previous research conducted using different sample T-tests or independent sample T-tests, the results showed that there was an influence on learning to use the jigsaw *model* with conventional models (Reni & Eliyasni, 2020). In terms of improvement before and after treatment, knowledge tests in the experimental class increased by 68.30% and skills increased by 68.27% in the moderately improved category. The results of this increase are supported by previous research which stated that the cooperative model could increase learning motivation, learning endurance, and self-effectiveness (Wang et al., 2023). This increase in student learning motivation is due to the delivery of learning objectives that at the end of learning there are awards or prizes for several categories of student activity, learning endurance, and increased self-effectiveness, this is due to interdependent interaction or collaboration between students and groups to transfer the knowledge gained to each other. In other words, it can be concluded that there has been an increase in use of the Jigsaw type cooperative learning module on volleyball learning outcomes in volleyball material which

includes (spiking, bottom serving, and also bottom passing) at school. This is supported by other studies, which show that participating in extracurricular volleyball improves students' skill fitness. This is confirmed by research Fatirani (2022) that clarifies how increasing student learning activities can result in an important enhancement in learning results when using the jigsaw model. The application of this jigsaw model increases students' motivation and participation in improving academic performance rather than using teacher- or educator-centered learning schemes (Cerón-García et al., 2022).

During the research process, several limitations were used to direct the research to the problems to be solved, namely the use of a jigsaw-type cooperative learning model and the existence of LKPD to support the learning process in class VIII-D as an experimental sample. The learning process is conducted only every Tuesday according to the learning schedule at school and the schedule for the day is the same for the experimental sample and control sample but at different times. Research is delayed by a few things, such as the fact that learning in the field takes a lot of time in class because students waste time, which takes away from the next learning topic by several minutes. Also, students are pressed for time when it comes to teaching their peers new information and working on Student Worksheet.

CONCLUSION

It was concluded from the research results that there was an increase in the jigsaw type cooperative learning model on learning outcomes in volleyball material with the aspects assessed being skills and knowledge. With the results of the increase obtained in the fairly effective category with knowledge acquisition of 68.30% and skills of 68.27% using the N-Gain test.

In connection with the research report that has been carried out, the researchists hope that they can provide useful assistance. From this research, several suggestions for further research were found. This research has the advantage of a learning process that involves the formation of 2 original and expert study groups as well as an exchange of knowledge followed by working on Student Worksheet questions. With a lack of research, students have limited time in the learning process. For teaching staff, this research can be used as a guide to improve learning outcomes by continuing interactions between students in volleyball in future learning by making other modifications to overcome time limitations so that the learning outcomes obtained are further improved.

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