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IMPROVING STUDENT SCIENCE LEARNING OUTCOMES THROUGH COOPERATIVE LEARNING: EARLY CHILDHOOD STUDENTS THROUGH SMALL GROUPS

I Made Citra Wibawa[1*)]
[1]Universitas Pendidikan Ganesha, Singaraja, Bali, Indonesia; imadecitra.wibawa@undiksha.ac.id
[*)]Corresponding author; E-mail addresses: imadecitra.wibawa@undiksha.ac.id

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Abstract. The cooperative learning model is one of the learning models currently being developed. This learning model is expected to change and direct students to be better. The purpose of this research is to compare the effect of cooperative learning and conventional learning in their effect on the learning outcomes of elementary school students. This research is a quasi-experimental involving two groups of samples taken randomly. This research involved a sample of 39 grade V elementary school students in clusters 1 and 2 of Marga. Students' science learning outcomes were captured using essay tests and analyzed using independent group t-tests. The results showed that there was a statistically significant effect of cooperative learning and conventional learning on students' science learning outcomes. Thus, cooperative learning is the right learning to use in improving the learning outcomes of elementary school students.

INTRODUCTION

There are many students, especially at the initial or elementary school level still have problem in science learning or science material and concepts (Manalu, et al., 2015; Damayanthi et al., 2022). Excessive number of students in one class is also a problem in conducting individual guidance (Supanc et al., 2017). In addition, many students are less motivated in science problems, because the material presented by the teacher is less attractive (Humairah, 2022). The learning model applied by the teacher has not been able to accommodate the learning needs of individual students. Moreover, a learning model that is monotonous and unattractive, causing students to get bored (Jannah, 2020; Nuryani & Abadi, 2021; Jumanto & Irmade, 2020). Base on those problems, the teacher should design a lesson that is able to accommodate the needs of students. As a compulsory subject, science must be taught in a meaningful way, where students build their own knowledge through teacher guidance (Veldman et al., 2020; Sumandya et al., 2022). Meaningful here mean that students know their purpose in learning science for life, rather than only learning science to face exams or tests.

This research examines two treatments or interventions that are expected to improve science learning outcomes for elementary school students through the application of cooperative learning models. This is very important because many students lack confidence in their abilities, so they avoid science subjects. Cooperative learning is increasingly being considered as an effective means of facilitating learning and level thinking. Cooperative learning can be defined as learning that organizes students to study together in small groups that allow them to actively participate in group activities (Supanc et al., 2017; Susmariani, 2022). In the literature, cooperative learning is generally considered theoretically as a healthy and empirically supported learning model capable of improving student performance (Johnson, Johnson, & Smith, 2014; Casey & Fernandez-Rio, 2019; Delgado-García, Conde, & Toscano, 2021). Cooperative learning is a family of constructivist learning models that are often used in order to improve student learning outcomes and interpersonal behavior by working in small groups. Cooperative learning is rigorous in emphasizing (a) positive interdependence between group members, and (b) individual accountability for self-learning is the foundation for building effective learning teams. Therefore, in order to translate these principles into lesson plans, teachers are advised to build student learning starting from a cooperative task structure or a cooperative reward system, or a combination of both (Slavin, 2014; Opdecam & Everaert, 2018).

Cooperative task structures exist when the information needed to complete a task is divided into parts. Each member of the group has responsibility for one particular part but is still responsible for ensuring relevant aspects of the tasks of other individuals in a group (Supanc et al., 2017). Implementation of good cooperative learning is assigned to all groups of students but group performance is measured as the average of individual member achievements. For low grade students, in working on group assignments they are trained to have skills in the form of: 1) high communication between students in completing assignments, 2) active participation of all group members, and 3) positive socio-emotional ethos in groups (Veldman et al., 2020). Research on the effect of cooperative learning on student achievement, especially in elementary schools, has not been done much (Johnson et al., 2014; Anitra, 2021; Buaton et al., 2021; Suci, 2018; Razak, 2016). Research using meta-analysis of cooperative learning has been carried out (Gracia & Anugraheni, 2021; Johnson et al., 2014). The results of these studies provide evidence of the superiority of cooperative learning compared to conventional learning in its effect on student learning outcomes.

Apart from the findings that emphasize the importance of cooperative learning in elementary schools, there are several obstacles encountered in classes with large numbers of students. Sometimes most students work in groups, but not as groups. In addition, several studies show that teachers experience difficulties in implementing cooperative learning in class. For example, teachers have time management problems and problems in preparing students to work together. Implementing cooperative learning in the classroom should not be underestimated, because the majority of teachers are not trained to use cooperative learning in their daily classroom practice (Veldman et al., 2020; García & Privado, 2020). Cooperative learning implementation may be very challenging in primary education (Turgut & Gülşen, 2018; Loh & Ang, 2020; Buchs, at., 2017). For this reason, further research needs to be carried out which will further add to the body of the effects of cooperative learning at the elementary school level. The purpose of this research is to investigate whether cooperative learning has an impact on improving the learning outcomes of elementary school students. This study contributes to or supports previous research because it focuses on improving student learning outcomes. In addition, this study also wanted to find out the behavior of

students working together in cooperative groups which is still rarely studied by other researchers.

METHOD

This study applies cooperative learning in primary education classrooms to improve student science learning outcomes that are integrated into thematic learning. Before learning begins, the lesson plan is prepared by the research team together with the teacher. Implementation of thematic integrated science learning is conducting for 26 hours per week, specifically science as much as 3 hours per week. Cooperative learning implementation training was given to teachers outside the treatment class before the research was conducted. During the training the teachers were observed in carrying out the learning, such as: assessing students in small group learning, students asking questions to each other, answering questions. Furthermore, cooperative learning uses various types, such as: Student Team Achievement Division (STAD), Team Assisted Individualization (TAI), Numbered Heads Together (THT), and Think-Pair-Share (TPS). The teacher gives to students who show activeness in class with a point system, aimed at motivating students (Kusmayani et al., 2022).

This research is classified as a quasi-experimental design involving two learning models, namely: the cooperative model and the conventional model which are given randomly to the experimental group and the control group. So, the design used is a static group comparison (Kaluas et al., 2015). This research was carried out in the 2022/2023 academic year for 4 weeks on theme 6 with the title Heat and Transfer. This research involved fifth grade students in clusters 1 and 2 of Marga which included SDN 1 Baru, SDN 2 Baru, SDN 1 Tua, SDN 3 Payangan, SDN 1 Payangan, SDN 2 Payangan, SDN 2 Petiga, dan SDN 1 Geluntung with a total student population of 117 people (n = 58 boys, n = 59 girls) involving a sample of 39 people (n = 16 boys, n = 23 girls) who were taken by random sampling technique, but the sampled were the class (see Table 1.).

Table 1. Research Population

No	School Name	The Number of Students		Total
		Boys	Girls	
1	SDN 1 Tua	8	10	18
2	SDN 1 Baru	9	7	16
3	SDN 2 Baru	6	4	10
4	SDN 1 Payangan	8	13	21
5	SDN 2 Payangan	2	6	8
6	SDN 3 Payangan	4	6	10
7	SDN 1 Geluntung	8	10	18
8	SDN 2 Petiga	13	3	16
Total		**58**	**59**	**117**

Students study and work on group assignments in small groups of four students. Teachers formed groups heterogeneously, with previous science grade achievement being the most important determining factor. All groups are mixed so that there are no groups with only high achievers or only low achievers. The number of groups ranged from three to five groups per class. The experimental group which was the intervention group carried out group learning, while the control group carried out learning like everyday learning. Both groups received the same material during the study.

There are two instruments used in this study, one instrument in the form of group work assignments during learning and a final test to determine student learning outcomes. The tasks in the group are adapted to the subject matter and related to students' daily lives, such as drying clothes, making hot water, or removing dew on leaves in the morning. The task given is an open question, meaning it has an open answer that does not have one correct answer such as multiple-choice questions or closed assignments. Each individual in the group will be given a student worksheet (LKS). Each student studies individually the given LKS, after that discusses what they learn in their group members. During this activity the teacher facilitates group work activities as a moderator and facilitator. In the end each group will produce the results of their group work which will be presented at the end of the discussion activity. The implementation of this discussion activity takes approximately 15-20 minutes.
As for the research instrument in the form of a student final test consisting of 5 essay questions concerning the material in Theme 6, namely Heat and Transfer. The same final test is given to the experimental group and the control group. This test was developed by the researcher through discussions with the subject teacher to determine the essential indicators to be tested. Before the learning outcomes test is used, it has to consult with two science education experts to determine the validity of the content of the test prepared. To determine the content validity coefficient using Gregory's approach (Mahendra, 2019), and a result of 0.80 was obtained with a very high content validity category and a test reliability of 0.83 which was calculated using the Cronbach's alpha formula. Student performance scores when answering science learning outcomes tests use the criteria in Table 2 below.

Table 2. Rubric for Assessment of Student Science Learning Outcomes

Score	Criteria
5	Using one's own perspective which is the result of complex and coherent group discussions; The results aim to build new knowledge, and solve problems from different points of view.
4	Approaching a problem as though it were aimed at making a new conclusion using evidence and principles, solving the problem from a different point of view.
3	Organize knowledge, present problems in a coherent and balanced way, seek to interpret information and evaluate evidence from different points of view.
2	Using evidence logically to support a conclusion but jumping to conclusions as if the goal is to accumulate evidence and information to support the conclusion.
1	Presents information but does not interpret, results ostensibly aim to find a single correct answer, does not provide any explanation or evidence to support claims about the matter.

To test the statistical hypothesis or the null hypothesis using the mean difference test (t-test) with $p < 0.05$ to determine there is a significant change in the mean in the posttest. Data on the results of science learning from the two groups (experimental and control) have previously been tested for the normality of data distribution and the homogeneity of the variances. Data were analyzed using SPSS version 26 and presented using tables in the form of descriptive statistics. Student learning outcomes are measured or collected by science learning outcomes tests in the form of open-answer essay tests with scoring guidelines in Table 2. Thus, student science learning outcomes scores range from 5 to 25. Examination of student work results in answering science learning outcomes tests is carried out by two teachers independently.

RESULTS AND DISCUSSION

Of the total students involved as a sample of the study as many as 39 (36.44%), as many as 18 people (46.15%) were male and 21 people (53.85%) were female with an average age of 11.20 years and SD = 0.86 (see Table 3). If we look at the characteristics of the students from the two sample groups, the experimental group that took part in cooperative learning out of a total of 18 students: 10 people (55.56%) were male, 8 people (44.44%) were female, and 38.89% of them are 11 years old. As for the control group who took part in conventional learning out of a total of 21 students: 8 people (38.09%) were male, 13 people (61.91%) were female, and 52.38% of them were 11 years old.

Table 3. Characteristics of the number of samples based on gender and age

Sample Characteristic		Amount	Percentage (%)
Gender	Boys	18	46.15
	Girls	21	53.85
Age	10	8	20.52
	11	18	46.15
	12	10	25.64
	13	3	7.69

Table 3. shows that the science learning outcomes score of the experimental group (M=19.41, SD=4.51) is higher than the control group's science learning outcomes scores (M=12.14, SD=4.20). This difference turned out to be significant on the confidence interval (95%) with (t=5.029, p<0.001) indicating that there were differences in science learning outcomes between groups of students who followed the cooperative learning model and groups of students who followed the conventional learning model. In other words, the cooperative learning model has a statistically significant effect on the science learning outcomes of elementary school students.

Table 4. The Average Score of Science Learning Outcomes in the Experiment and Control Group

Group	Mean	SD	t	*df*	*p-value*
Exsperiment	19.41	4.51	5.029	37	< 0.001
Control	12.14	4.20			

The findings from this study reveal that the cooperative learning model has a statistically significant effect on students' science learning outcomes compared to the conventional-based learning model. This indication shows that cooperative learning is more useful in improving the science learning outcomes of elementary school students than the conventional model. The results of this study are similar to other research findings that cooperative learning is more effective than conventional learning models (Ferdiana & Mulyatna, 2020; Wiratama, 2020; Hasanah, & Himami, 2021).

This study also shows that cooperative learning affects students' science learning outcomes objectively. This can be seen from the participation and interaction of students during the learning process. Observations made by the teacher that at every meeting, students actively participate in ongoing learning. Even though, the observations made by the teacher are not carried out systematically in relation to the sequence or interactions that occur. Knowledge

that is built as a group is better than knowledge that is built individually. This is in accordance with the objectives of cooperative learning, that students are expected to get greater benefits from the knowledge that is built together. Students have individual responsibility, positive interdependence, social skills, group processing, and interaction with the material or the teacher (Loh & Ang, 2020; Fernández-Ríos et al., 2017; Gil, 2015; García & Privado, 2020).

In addition to the advantages shown by cooperative learning compared to conventional learning, in certain parts the teacher also encounters obstacles in its application. For example, it is very difficult to teach students to foster positive interdependence with group mates and individual responsibility in group work which is in line with the findings Bermejo, et al. (2020). Hazmiwati (2018) & Widarta (2020) argues that the main idea behind cooperative learning is to encourage students to help each other in order to master the skills taught by the teacher. If students want the group to get prizes, they must help their group mates in learning the lesson. They must encourage their group mates to do their best, displaying norms that learning is important, valuable, and fun. Students are given time to work together after the lesson is given by the teacher, but they do not help each other when given quizzes, so students must master the material. This is where positive interdependence emerges. So it is not surprising that cooperative learning has advantages over conventional learning in its effect on the science learning outcomes of elementary school students..

CONCLUSION

The cooperative learning model has a very good effect on science learning outcomes for elementary school students compared to conventional learning models on the same material. Cooperative learning has a statistically significant effect on students' science learning outcomes, and they consider cooperative learning to be the best learning model. They prefer this learning model by showing very active activity in every meeting.

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