Improving Student Learning Outcomes on Gravity Material by Using Self-Organized Learning Environment Model

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Abstract

The problem raised in this study is whether there is an influence of the self-organized learning environment model on the learning outcomes of students in class X IPA SMA Dharma Pancasila Medan. This research is a quantitative study with a research sample consisting of two classes, namely the control class and the experimental class. Data analysis employed a t-test. The results of the study concluded that there was a difference between student learning outcomes using SOLE and conventional learning models with t_{count} = 2,094 > t_{table} = 1,997. Applying the SOLE model has obtained data from physics learning outcomes with an entirety presentation of 62.5%, while conventional learning models obtained an entire presentation of 52.9%.

Keywords: Self-organized, learning environments, gravity, learning model.

Introduction

A Self-Organized Learning Environment is defined as environs that facilitate learning undertakings preferred and arranged by students without formal stimulus from the teacher. This understanding of learning has consequences for delving into the concept of formal and informal learning. Social software can provide informal circumstances for a learning environment that is self-regulated by students, thus causing informal education to become formal education (Mathiasen & Dalsgaard, 2006). Self-organized learning has the potential to empower learners to build their confidence to take control of their learning. It can be said with confidence that the pedagogical principles of social constructivism will remain of great value in the design of any learning model (Lee Looi Chng& Coombs, 2004).

By using SOLE, students hold the fort of their learning and develop new skills (eg, communication, presentation, leadership, teamwork, research, and technology skills) that they can use to tackle pursuing answers to questions (Mitra, 2014). Firdaus et al (2021) in their research concluded that learning the SOLE Model can increase the learning independence of fourth-grade students at SD Negeri (State Primary School) Sleman V during the Covid-19 pandemic. If students do not have high self-assurance, independence, autonomy in learning, and receptiveness to the surrounding environment, then they will not be adequately prepared to face the real world and the future (Anis & Anwar, 2020).

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Dharmayana (2012) in his research recommends that the implementation of learning programs pay more attention to the process of developing students' emotional competencies to increase student involvement in schools. The teacher's role is deemed as a facilitator, inspiration, motivator, imagination, creativity, social empathy, and work team as well as a developer of character values that cannot be replaced by technology (Lubis, 2020). Marlina (2021) in his research concluded that the SOLE learning model increased online science learning outcomes from cycle 1 to cycle 2 by 25%. This also echoes a study from Kusasi and Satui (2021) who argue that learning activities increased by 5% and learning outcomes increased by 82% with the SOLE learning model in the physics subject of gas kinetic theory.

Students cultivate their thinking about physics-based matters largely on everyday life experiences. Syuhendri (2019) in his research revealed that physics education students experience strong misconceptions about gravity. The right way to reduce the tendency of students to have difficulty solving problems with the concept of Newton's gravity is by introducing the first step of identifying the understanding of the concept. It will then be known as the percentage of the category's understanding of the concept so that the learning strategies chosen can help students find and emphasize the correct concept (Rahayu, Syuhendri & Sriyanti, 2019).

Research Methods:

This study is a quantitative study using a quasi-experimental design in the form of a nonequivalent control group design. In this design, the experimental group and control group were not chosen randomly (Sugiyono, 2013). The research design table can be seen in table 1.

Table 1. Research Design Nonequivalent Control Group Design (Sugiyono, 2015)

Pretest	**Treatment**	***posttest***
$\boldsymbol{O_1}$	X	O_2
$\boldsymbol{O_3}$		O_4

O_1 and O_3 are student learning outcomes before treatment. O_2 is the result of student learning after treatment with the SOLE model. O_4 is student learning outcomes with conventional model treatment. This research was conducted at SMA Dharma Pancasila Medan, starting from March to May 2021. The samples in this study were students of class X SMA Dharma Pancasila Medan which consisted of 2 classes, namely the control class and the experimental class, which amounted to 34 and 32 people.

The steps of the SOLE learning model are carried out in three stages as also mentioned previously by Pratama, Connie & Risdianto (2021), namely;

i. Questions, asking questions that stimulate students' curiosity about the gravity material.
ii. In the investigation, students form small groups and collaborate using internet devices, books, or the surrounding environment as objects of investigation to find answers.
iii. (3) Reviewing, each group presents the results of their findings to the questions given.

The data collection technique in this study employed an instrument used to collect data on students' understanding of the gravity material in the form of a test. The test used is in the form of essay questions. The test is used to measure students' understanding from a cognitive perspective, namely to see students' depth of understanding of the given material after applying the SOLE learning model.

Results and Discussion:

Before learning gravity, the material is carried out, an initial test is carried out to evaluate students' mastery of the material. From table 1, it can be seen that there were no students who achieved a complete score of 75, both in the experimental class and the control class. The highest score achieved by the students was 65. After implementing the learning, the student's level of understanding of the material was still low, both in the experimental class and the control class. The presentation of entirety in the control class was 52.9% with the lowest score achieved being 65, while the percentage of entirety in the experimental class was 62.5% with the lowest score achieved being 66.

Table 1: Frequency Distribution of Student Scores

S No.	Pre-test				Post-test			
	Experimental Class		Control Class		Experimental Class		Control Class	
	Value Interval	F	Value Interval	F	Value Interval	F	Value Interval	F
1.	48-50	0	48-50	5	66-69	7	65-67	7
2.	51-53	6	51-53	6	70-73	4	68-70	2
3.	54-56	9	54-56	10	74-77	8	71-73	5
4.	57-59	4	57-59	3	78-81	5	74-76	10
5.	60-62	6	60-62	3	82-85	4	77-79	8
6.	63-65	7	63-65	7	86-89	4	80-82	2
Total		**32**		**34**		**32**		**34**

From the data of the pretest learning outcomes of the control class and the experimental class, the results of descriptive statistical analysis were obtained. The minimum pretest score for the experimental class is 51 and for the control class is 50. And both classes have the same maximum score of 65. The average value of the experimental class is 57.65 and the control class is 56.15. Complete descriptive statistical analysis can be seen in table 2.

Table 2: Statistics of Pretest and Posttest Study Results for Experiment Class and Control Class

	Experimental Class		Control Class	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Minimum	51	66	50	65
Maximum	65	89	65	82
Average	57.65	76.34	56.15	73.32
Median	58	77	55	75
Modus	51 and 60	66 and 77	50	77
Variance	20.233	46.459	26.094	21.922
Standard Deviation	4.5	6.889	5.1	4.682
N-Gain	0.441 (medium)		0.391 (medium)	

From the posttest learning result data for the control class and the experimental class, the results of descriptive statistical analysis were obtained. The minimum post-test score for the experimental class was 66 and for the control class was 65. The maximum post-test score for the experimental class was 89 and for the control, the class was 82. The average value for the experimental class was 76.34 and the control class was 73.32. Both the experimental class and the control class have the value of learning outcomes which were held before and after and showed that learning treatment has increased. Judging from the average N-Gain, the experimental class is in the medium category, as well as the control class.

Normality and Homogeneity Test:

Parametric statistics require that the variable data be normally distributed before testing the hypothesis (Sugiyono, 2013). Analysis of the data normality test in this study used the Lilliefors test. The results of the analysis of the normality test in table 3, the pretest data for the control class and the experimental class $L_{count}<L_{table}$, then the two data are normally distributed. It is equally obtained as well with the posttest data for the control class and the experimental class in which $L_{count}<L_{table}$.

Table 3: Results of Normality Test Analysis

	Control Class		Experimental Class	
	L_{table}	L_{count}	L_{table}	L_{count}
pretest	0.1519	0.1480	0.1566	0.1114
posttest		0.1173		0.0999

Furthermore, before generalizing the results of the study, it must be ensured that the groups come from the same population as evidenced by the similarity of group variances (homogeneity test)[13]. The homogeneity test used the Bartlett test with a significance level of $\alpha = 0{,}05$. It obtained $\chi^2{}_{count}$ =7,603, and$\chi^2{}_{(0{,}05)(3)} = 7{,}81$.. The result of this calculation shows that $\chi^2{}_{count}$ =7,603 < $\chi^2{}_{(0{,}05)(3)} = 7{,}81$ which means that H_0 is accepted or there is no difference in variance between groups.

Hypothesis testing:

A comparative hypothesis test was conducted using a t-test (independent sample t-test) to determine the difference between the average of the control class and the experimental class. The value earned is that t_{count} = 1,271 < $rable$ =1,997 for pretest data. So it can be concluded that H_0 is accepted, or there is no difference in the average pretest learning outcomes between the control class and the experimental class. Thus, it can be said that in the two sample groups, students had the same average initial ability before learning the gravity material.

For posttest data from the two sample groups, t_{count} = 2,094> t_{table} =1,997. So it can be concluded that H_0 is rejected, or there is a difference in the average pretest learning outcomes between the control class and the experimental class. This means that the application of the SOLE learning model has a different effect on the learning outcomes of the experimental class and the control class which is applied by the conventional learning model.

This difference can be caused by students in the experimental class being given the autonomy to review their learning and satisfy their curiosity by seeking information from various learning sites on the internet. Although it is inseparable from the skills and abilities of students, teachers must provide structured assignments. The teacher's role in the learning process is to provide support and direction, as well as provide clarification on student misapprehensions in understanding physics concepts. Students are responsible for carrying out learning activities in teacher-directed information.

In addition to following the material face to face with teachers at school, students also have teachers in virtual spaces, namely the Google search engine which can facilitate the search for knowledge very swiftly and practically. Students can dig up any information from all over the world in seconds. This social network which is currently being loved by the community also has great potential to shift the role of the teacher as an educator, one of whose functions is to disseminate information and knowledge (Angraini, Saragi, Jannah, and Sopian, 2017).

Conclusion:

The application of the SOLE (Self Organized Learning Environments) learning model affects student learning outcomes, where learning gravity material by applying SOLE obtained data from physics learning outcomes with a completeness presentation of 62.5%. These results are better than the control class that applies the conventional learning model with a 52.9% completeness presentation. This is due to the emphasis on the independent learning process by utilizing the internet and smart devices owned by students. Teachers can also explore the depth of the subject's understanding to students by utilizing their curiosity of students.

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