



The Effect of the Self Organized Learning Environment (Sole) Model on Scientific Attitudes and Cognitive Learning Outcomes of Students in SMA/MA Colloid Material

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Abstract: Education requires a learning model that involves technological developments to improve students' scientific attitudes and cognitive learning outcomes. One learning model that can be used to improve students' scientific attitudes and cognitive learning outcomes is the Self Organized Learning Environment (SOLE). This research aims to test whether there is an influence of the SOLE learning model on students' scientific attitudes and cognitive learning outcomes as well as the number of effective contributions made by the SOLE learning model on students' scientific attitudes and cognitive learning outcomes. This research is a quasi-experimental research. The sample in this research were students from two classes of XI Mipa at SMAN 2 Yogyakarta. The sampling technique in this research used cluster random sampling. Data collection techniques were carried out using questionnaires and observation sheets on students' scientific attitudes and test questions. The data analysis technique used is the Manova test and descriptive analysis. Based on the research results, the sig value was obtained. $0.00 < 0.005$, which means that there is an influence of the SOLE learning model on students' scientific attitudes and cognitive learning outcomes with an effective contribution of 11.6% in the medium category. Meanwhile, the contribution for each variable, namely scientific attitudes, was 4.6% in the small category and cognitive learning outcomes were 7.7% in the small category.

Keywords: Cognitive learning outcomes; Scientific attitude; Self Organized learning environment (SOLE)

Introduction

Learning is essentially a process of interaction between students and their environment so that changes in behavior occur for the better (Emda, 2017). Learning in Indonesia currently refers to 21st century learning, namely education ensures students have learning and innovation skills, skills in using information technology and media and can work and survive using skills (Wati, 2021). The characteristics of 21st century learning are student-centered learning. But the facts on the ground, the learning process tends to be teacher-centered, this causes most of the students to become passive, lazy to learn, feel bored when learning takes place and do not

understand the concept of the material provided by the teacher.

In this regard, the Government of Indonesia has issued various policies, one of which is the National Education Standards (SNP), including graduation standards as seen from the unity of attitudes, skills and knowledge and process standards that direct the implementation of learning to be held in an interactive, inspiring, fun learning atmosphere, challenging, motivating students to participate actively, and providing sufficient space for initiative, creativity, independence in accordance with the talents, interests, and physical and psychological development of students (PP Number 4 of 2022). Based on this, it is

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expected that the teacher is able to make learning or teaching materials that can attract students' interest to be active and able to make students take advantage of technological developments in the current era (Indarta et al., 2022).

Technological developments currently have a vital role in education, some of which are the emergence of electronic media as learning resources other than teachers, new learning methods that facilitate learning and learning processes that can be carried out using the internet (Effendi et al., 2019). For information, within 5 years (2017-2021) the use of Information and Communication Technology has shown rapid development. Indonesian population's internet use in 2017 - 2021 has experienced a significant increase from year to year. This increase occurred both in urban and rural areas. The percentage of the population accessing the internet in 2017 was 34.34% and in 2021 it will be 62.10% (Badan Pusat Statistik, 2021). The development of this technology allows students to study anywhere and students can also access learning resources from anywhere as long as there is still an internet signal in their area (Wasis D, 2020). It is hoped that the rapid development of technology and communication, especially the internet, can be applied to science learning, especially in chemistry.

Chemistry is a science that examines the structure, content, features, and energy changes to investigate matter and energy (Kemendikbud, 2020). Permendikbud No 22 of 2006 in the content standards there are 2 things related to chemistry, including namely the process of learning chemistry not only aims to provide opportunities for students to learn about facts and theories, but also develop scientific habits and attitudes to discover and renew again practice and reasoning skills in order to construct knowledge and understanding (Mardika, 2020).

In chemistry there is the concept of colloid which is a concept related to processes in nature and is used in life (Hayati et al., 2014). The concept of colloids is a concept that contains highly contextual material and studies the phenomena that occur and changes in matter that exist in nature (Pradita et al., 2015). Learning the colloid concept in general, students are only required to memorize the concept. The amount of memorization of the colloid concept makes students less interested in learning it (Totiana et al., 2012). In research Ernawati et al. (2015) information was obtained that there were still many students who did not complete colloid material compared to other material. One of the factors causing the low percentage of students' incompleteness in this class is the lack of involvement of students in learning activities and an unpleasant learning process.

Based on this, a learning model is needed that supports learning to be fun. The learning model used by an educator must be adapted to the material to be studied, the characteristics of students, the availability of facilities and infrastructure, and learning objectives. Choosing the right learning model can help educators when delivering material to students so that the learning process can run according to the expected learning objectives. The learning model is very effective in efforts to improve the quality of learning because in the process students are required to play a role and are expected to use high-level thinking skills, train group collaboration (Octavia, 2020).

The Self Organized Learning Environment (SOLE) learning model is one model that can be used. This model is a learning model that emphasizes an independent learning process that can be carried out by anyone and anywhere by utilizing the internet and the smart devices they have (Wati, 2021). The SOLE learning model can direct students to actually learn and understand a material independently by being literate in technology and ready to communicate it to others. The SOLE learning model is designed to help teachers encourage students to have an innate sense of wonder by implementing student-driven learning (Firdaus et al., 2021). Weisblat et al. (2017) stated that self-organized learning environments offer promising pathways that can be used in 21st century learners. The Self Organized Learning Environments (SOLE) model creates an environment that makes each individual, both teachers and students involved in learning so that individual success is achieved. The SOLE learning model has the goal of forming the competencies and skills possessed by students. The competencies that are expected to be formed in students through the SOLE learning model include: creative thinking (Creative Thinking), problem solving ability (Problem solving capability), and communication ability (Communicate capability) (Wati, 2021).

Based on the description above, this study aims to determine the effect of using the Self-Organized Learning Environment (SOLE) learning model on scientific attitudes and cognitive learning outcomes of students in colloidal material and determine the effective contribution of the Self-Organized learning model Learning Environment (SOLE) on scientific attitudes and cognitive learning outcomes of students on colloidal material.

Method

This research is a quantitative type of quasi-experimental research with a post-test only design. The sampling technique used was cluster random sampling.

The sample for this research was class XI MIPA students at SMAN 2 Yogyakarta.

The data collection techniques used were learning outcomes tests and student scientific attitude questionnaires. Data analysis to test the hypothesis uses the Manova test and descriptive analysis.

Table 1. Posttest Only Control Design Research Design (Manampiring et al., 2019)

Class	Treatment	Posttest
Eksperimen	X ₁	P1, P2
Kontrol	X ₂	P1, P2

X1 = model self organized learning environment (SOLE)

X2 = model 5M

01 = scientific attitude questionnaire

02 = cognitive learning outcomes test

Result and Discussion

Scientific Attitude

Students' scientific attitude was obtained through a scientific attitude questionnaire given to the experimental class and control class after being given treatment. then obtained by using observation sheets carried out by observers every time learning takes place. The results of the questionnaire and the results of observing scientific attitudes in the experimental class and control class can be seen in the table below.

Table 2. The Results of a Scientific Attitude Questionnaire

Group	Value		Mean
	Low	High	
Control	66.21	89.57	78.26
Experiment	70.16	92.56	80.82

Table 3. The Results of Observations of Scientific Attitudes

Percentage	Criteria
83-100%	Excellent
68-82%	Good
52-67%	Fair
37-51%	Poor
0-36%	Very Poor

Based on the research results, it was found that 30% of the experimental class students were in the very good category and 70% in the good category, Meanwhile 18% of the control class students were in the good category and 82% of the students in the fair category. Based on the class average value for scientific attitude, it shows that students who are taught using the SOLE learning model are higher than the class that applies the 5M model so that the scientific attitude possessed by the experimental class is better than the control class. this is in line with

research conducted by Sandika et al. (2018) stating that learning using the SOLE learning model in learning can stimulate students' scientific attitudes, so that students are enthusiastic and active in responding to lessons. Students who have curiosity are characterized by asking questions, reading more learning resources to find information and conducting investigations. The use of the SOLE model is a means of forming scientific attitudes and training students' skills in learning (Mutiasari, 2021).

Learning Outcomes

Student learning outcomes were obtained through tests given to the experimental class and control class after being given treatment. The test results in the experimental class and control class can be seen in the table below.

Table 4. The Results of Outcomes Learning Test

Group	Value		Mean
	Low	High	
Control	30.58	92.31	63.40
Experiment	46.15	100	71.62

Based on the results of the study, it was found that the SOLE model was superior in improving student learning outcomes compared to using the 5M model. this can be seen from the average cognitive learning outcomes of students for the experimental class 71.62 and the control class 63.40. The results of this study are the same as research conducted by Indrayana (2019) that a learning system that uses the SOLE model can improve students' cognitive abilities from a class average value of 46 to 79. Research Faqihudin (2022) states that the application of the SOLE model to learning has been proven to have an influence on increasing student learning outcomes. This increase occurred because students were able to adapt to the syntax of the SOLE learning model, thereby training students' learning independence to think creatively, get used to using internet devices, and train their self-confidence during presentations. This result is because the SOLE model is effective in improving critical thinking skills and problem solving skills (Amit et al., 2022).

The SOLE learning model emphasizes students to build new knowledge with previous knowledge. In this study the use of the internet is used to gain new knowledge for students. The SOLE model produces students who are independent in their thought patterns and skills, because students are encouraged to play an active and active role in the learning process so that competency achievement indicators are achieved to the maximum (Fariha, 2021).

Before carrying out the Manova statistical test, 9 prerequisite tests are required. based on this research the

9 prerequisite tests have been fulfilled, then it is continued by conducting the manova test.

Table 5. The Results of Manova Test

Class	Sig.	Partial Eta Squared
Pillai's trace	0.00	0.116
Wilks' lambda	0.00	0.116
Hotelling's trace	0.00	0.116
Roy's Largest Root	0.00	0.116

The results of the Manova test showed that there were significant differences in scientific attitudes and cognitive learning outcomes of students who followed the SOLE model with a sig. $0.000 < 0.005$. the results of this study are in line with research conducted by Kusasi (2021) which states that the SOLE learning model can improve student learning outcomes. Other supporting research, namely Suciati (2021) states that the application of a proven self-organized learning environment (SOLE) learning model can increase students' understanding of polymer material in class X RPL at SMKN 1 Sanden. Then for each variable in the SOLE model it can be seen from the Test of Between-subjects effects.

Table 6. The Results of Between-Subjects Effects

Dependent variable	Sig.	Partial eta squared
Scientific Attitude	0.013	0.046
Learning Outcomes	0.001	0.077

In succession the scientific attitude and cognitive learning outcomes of students who use the SOLE model with students who use the 5M model are 0.013 and 0.046 < 0.05 . this shows that there is a significant influence of the use of Environmental Online-based Self Organized Learning (SOLE) on each variable, namely scientific attitudes and student learning outcomes. Asmawati et al. (2021) said that the SOLE model can train curiosity which is one of the scientific attitudes of students and attempts to find alternative answers to the questions given.

The SOLE learning model emphasizes students to build new knowledge with previous knowledge. In this study the use of the internet is used to gain new knowledge for students. The SOLE model has an impact on students' scientific attitudes, especially responsibility in learning and the SOLE model also encourages student initiatives in learning (Reeve, 2012). SOLE is a constructivist learning which in the learning and teaching process allows students to control the learning process to create their own meanings and subjects (Anis et al., 2020). Freedom in controlling learning makes students able to create their own findings after being preoccupied with discovering their identity, knowledge in society, and spontaneity to try to learn (Mitra, 2014).

The SOLE learning model provides opportunities for students to organize their own learning so as to provide independent learning experiences for students, train literacy in using computers (internet), and train readiness in making presentations (Setyorini et al., 2022).

From the start, the model selection in this research aimed to improve student learning outcomes. The SOLE model is intended for students to explore the depth of understanding of the material being studied by utilizing their curiosity (Rahayu, 2021). The SOLE learning model in its implementation is designed to assist teachers in encouraging students' curiosity (innate sense of wonder) by organizing learning that encourages students' curiosity (student driven learning) which is self-organized, involved (engaged), social, and facilitated by encouragement from adults (facilitated by encouragement) (Mitra, 2014).

Conclusion

The Self Organized Learning Environment (SOLE) model influences scientific attitudes and cognitive learning outcomes of students on colloidal material. There is an effective contribution of 11.6% in the medium category for learning using the Self Organized Learning Environment (SOLE) model on scientific attitudes and cognitive learning outcomes of students and for each variable of scientific attitudes and cognitive learning outcomes of 4.6% and 7.7% with the small category.

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Author Contributions

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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