THE EFFECT OF CHILDREN LEARNING IN SCIENCE MODEL ON STUDENTS' LEARNING OUTCOMES

Rani S.N Damanik and Ridwan Abd. Sani
Physics Education Faculty of Mathematics and Natural Science
State University of Medan

ABSTRACT

The purpose of this research is to find out the effect of children learning in science (CLIS) model on students learning outcomes in thermal expansion topic at VII Grade in SMP N 1 Tebing Tinggi. Students' learning outcomes is considered better if teacher use learning model that make students have real activities like experiment based worksheet when learning activities occurs. One of the suitable learning models is children learning in science model that used in this research. The result that was obtained: there was difference of post-test mean value between the experiment class and control class. The hypothesis testing using t test and found t_{count} is bigger than t_{table} thus H_a was accepted. So it can be concluded that CLIS learning model has an effect on students' learning outcomes in thermal expansion topic at VII Grade in SMP N 1 Tebing Tinggi.

Keywords : children learning in science, learning outcomes, thermal expansion, physics

INTRODUCTION

Gagne in Sridevi (2008) state that science is what the scientist does. It is a process by which we increase and refine our understanding and of the universe through continuous observation, experiment, application and verification. Sciences is related, how to find about natural phenomenon systematically, so that science is not just mastery knowledge in the form of collection of facts, concepts or principle but also a process of discovery (*Depdiknas* in Yuyun, 2010:1). Just like the branches of a tree, a branch of science is made up of many smaller branches. Physics is smaller branches of science.

In curriculum of SMP/MTs (*Depdiknas* in Asshagab,2012:3) the aim of physics education is to make students able to use scientific method based on scientific attitude to solve encountered problems so that they will more aware of the Majesty of God Almighty. All those skills can be acquired through a process of inquiry or discovery learning, lab activities or experiments so that students get hands-on experience and discover the process themselves.

Based on a preliminary study in SMP N 1 Tebing Tinggi on January 15th 2013, it was found that the process of learning that takes place in class in general, is still teacher centered. The teacher still uses conventional model in teaching and learning. The teacher usually uses conventional model to teach the students. Even in the process of learning physics, teachers usually try to transfer the knowledge to the students, so it tends to make students passive. Also from preliminary studies by the author, it was found that in observed class of the junior high school at Tebing Tinggi, only 50% who liked physics. And the rest of students don't like physics. Usually topics in physics lesson not relate by the teacher with things in daily life. So they still confused about their aim to learn about physics, they just know how to solve problems without application in their daily life.

One indicator of the quality and success of the learning process is the learning outcomes achieved by the students. In accordance with that, Sudjana (2001:45) states that "every process of learning success is measured by how big the learning outcomes achieved by students, as well as measured in terms of the process." But in a preliminary study by the authors also found that, students also less involved in the learning process, so it's easy to forget the concepts that have been given, and make the lack of understanding of concepts and skills of students in solving problems. It can be seen from the average value of learning achievement in physics last semester of school year 2012/2013 was only 64.4. This value is below the minimum completeness criteria (MCC) established by the curriculum that is 75.0. Just 39% of students who get value above the minimum value of mastery criteria, the rest 61% get value below the minimum value of mastery criteria. In addition, the physics teacher is also not usual in using visual aids and demonstrations in physics, causing students are not usual to doing practical activities. This is one of the causes of low student learning outcomes.

To improve student learning outcomes, teachers can perform a variety of ways, for example by using a model of effective teaching and learning in accordance with the objectives set in the curriculum. Suparno (in Asshagab, 2012:5) state that in the last decade constructivist philosophy has influenced and improved learning physics in particular and science in general. Constructivism is not a new concept. It is learning or meaning making theory. It suggests that individuals create their own understanding, based upon the interaction of what they already know and believe and the phenomena or ideas which they come into contact (Sridevi, 2008:9). A model of teaching is a plan or pattern that can be used to shape curriculums (long term courses of studies), to design instructional materials and to guide instruction in the classroom and other settings (Joyce, 2003). One model of learning is based on constructivist views of learning models Children's Learning in Science (CLIS) developed by the CLIS in the UK, led by Driver (Tytler, 2002:2).

The aim of the Children's Learning in Science was to discover how to use a constructivist approach to teach the selected topics, and translate this into materials which could be used by other teachers. Based on the findings of researcher in Adey (Matitamole, 2012:3), that if the activity increases, student learning outcomes will also increase. Therefore, one way to improve student learning outcomes is to increase activities in learning. In relation to this, the application of CLIS learning model developed by researcher is expected to be an alternative to classroom teaching and improve student learning outcomes.

RESEARCH METHOD

The type of this research was *quasi experiment*, in this case involves two different treatments between the experimental class and the control class, where the two classes are treated differently. The population of this research is all students at VII Grade of SMP N 1 Tebing Tinggi and consists of 9 classes. The sample of this research as much as 2 classes totalling 56 people, namely the class VII-8 and VII-9 SMP N 1 Tebing tinggi. The experiment class treated with CLIS learning model and the control class treated with conventional model.

The procedures carried out were as follows: (1) Preparation phase consist of : develop research schedule, create a lesson plan, develop instruments that consist of sub topic (a) definition of expansion (b) thermal expansion of solids (c) thermal expansion of liquids (d) thermal expansion of gasses (e) problems because of expansion (f) benefit of expansion, then test the instrument with validity test by two lecturers and one physics teacher (2) implementation phase, as follows: determining the sample grade of the population; the researcher choose VII Grade and VII-8 and VII-9 as samples, provide initial test; where the researcher gives the students the instrument/test that have valided by experts, then researcher do test for normality and homogeneity testing for pre-test both samples, then researcher implement physics learning with learning model CLIS for the experimental class and control classes using conventional model, after that researcher provide post test to determine student learning outcomes, then test the normality and the homogeneity test and do hypothesis testing and finally researcher draw the conclusions and suggestions.

Definition of CLIS Learning Model

CLIS Model (Children Learning in Science) is a learning model that seeks to develop students ideas or ideas about a particular problem in learning as well as reconstructing the idea or ideas based on observation or experiment (Ginting, 2010). According to Salwin (1996), CLIS model is a learning model that includes a series of stages to raise students conceptual change. The purpose of this strategy CLIS learning model as the establishment of "knowledge" into the memory of students, so that the concept can be long-lasting. CLIS model also can be interpreted or defined as a learning strategy that involves students in practical activities, experiments, present, interpret, predict, and concludes with the student's work using the work sheet (Ali, 2008).

The Children Learning in Science (CLIS) model is based on constructivist view of learning. Briefly, this view acknowledges that children construct their own knowledge through personal interaction with natural phenomena and through social interaction with adults and peers. As a result, children already hold beliefs about how the world operates before they come to formal science. One important role teacher is to produce a learning environment in which children can:

a. recognize and reflect on their ideas

b. realize that other people may hold other conflicting, but equally valid ideas
c. evaluate the usefulness of these ideas alongside their teacher's scientific theories .

In this learning model, students are given the opportunity to express ideas about the topics covered in the study, expressing ideas and comparing ideas with other students and discuss ideas for the same perception. Furthermore, students are given the opportunity to reconstruct the idea after comparing the idea with the experimental results, observations or the results look textbooks. In addition, students also apply the results of the reconstruction of the ideas in the new situation.

In CLIS model, teachers as a facilitator, the teacher nurtures creative thinking, problem solving, interaction, communication, and discovery. Finally, as a guide, the teacher helps to bridge language gaps and foster individuality, collaboration, and personal growth. Purpose and methods at every phase of CLIS model can be described as follows:

Stages, Purpose and Methods that can use in learning activities using CLIS Learning Model (Needham, 1987)

Phase	Purpose	Methods
1. Orientation	Arouse interest and set the scene	Practical activities real problems to solve, teacher demonstration, film clips, videos, newspaper cutting.
2. Elicitation of ideas	To enable pupils and teachers to became aware of prior ideas	Practical activities small group discussion followed by reporting back.
3. Restructuri-ng of ideas	To create an awareness of an alternative viewpoint – the scientific one to : a. modify b. extend, or c. replace with a more scien-tific view	
a. Clarificati-on and Exchange	Recognize alternative ideas and critically examine own	small group discussion and reporting back
b. Exposure to conflict situation	Test validity of existing ideas	Teacher demonstration, performing personal experiments, worksheet.
c. Constructi-on of new ideas	Modify extent or replace existing ideas.	Discussion, reading, teacher input.
d. Evaluation	Test validity of newly constructed ideas.	Practical work, project work, experimentation, teacher demonstration.
4. Applicati-on of ideas	Reinforce-ment of constructed ideas in familiar, novel situations.	Personal writing, practical activity, problem solving, project work.
5. Review	Awareness of change of ideas and familiarization with learning process to allow the pupils to reflect upon the extent to which their ideas have changed.	Personal writing, group discussion, personal diaries, etc.

Advantages CLIS learning model as follows (Ali, 2008):

1) The ideas of children are more easily generated.
2) Allowing students to learn independently in solving a problem.
3) Creating creativity of students to learn in order to create a

more comfortable classroom atmosphere and creative, there is cooperation among students and students directly involved in the activities.

4) Creating learning more meaningful for students to find their own pride emergence of scientific concepts learned.
5) Teachers teaching will be more effective because it can create an active learning environment

Research Design

Two Group Pretest-Posttest Design

Class	Pretest	Treatment	Posttest
Exp	Y_1	P	Y_2
Con	Y_1	Q	Y_2

With:

Y_1= Pretest

P = Learning with CLIS model

Q= Learning with conventional model

Y_2= Posttest

To test the hypothesis of research used t test with formula (Sudjana, 2001: 239):

$$t_{count} = \frac{\overline{X_1} - \overline{X_2}}{s\sqrt{\left(\frac{1}{n_2}\right) + \left(\frac{1}{n_2}\right)}}$$

With S is mixed variance:

$$s^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

with :

$\overline{X_1}$ = average in experiment class

$\overline{X}_2$ = average in control class

n_1 = total of sample in experiment class

n_2 = total of sample in control class

s_1^2 = sample variance of experiment class

s_2^2 = sample variance of control class

Testing Criterion accepted H_o if $t_{count} < t_{table}$ where $t_{1-\alpha}$ get from t distribution with dk = n_1+n_2-2 and probability (1-α). For anothers condition of t, H_o is rejected.

RESEARCH RESULT

This research is quasi experimental research involving two classes that were given different treatments, namely experiment class were treated by using CLIS learning model and control class were treated by using conventional learning model. Obtained pretest average value for experiment class 45.19 with a standard deviation of 9.04 while the values obtained in the control class average pretest students was 43.1 with a standard deviation 9.95.

After give the different treatment, the experiment class with CLIS model and control class with conventional model, than obtained an average posttest score of experiment class 76.11 with a standard deviation of 9.44, while average posttest value for control class was 62.93 with a standard deviation 9.31.

Data Analysis

Normality of Data

Before conducted the hypothesis test, firstly conducted prerequisite test of data that is normality test using Lilliefors test. Normality test results obtained is presented in the following table:

Data Normality Test of Experimental and Control Class

	Class	L_{count}	L_{table}	Conclusion
Pre-test Data	Experiment	0.1379	0.173	Normal
	Control	0.0727	0.173	Normal
Post test Data	Experiment	0.1187	0.173	Normal
	Control	0.1045	0.173	Normal

Data Homogeneity

Homogeneity test conducted to determine whether sample class derived from a homogeneous population or not, meant whether the sample used in this research may represent the entire population.

Homogeneity test of data is done by F-test. The results of data homogeneity test obtained can be seen in the following table:

Summary of Homogeneity Test Result of Data

Data	Class	Variance	F_{count}	F_{table}	Conclusion
Pretes	Experi-ment class	81.69	1.212	1.90	Homogeneous
	Cont-rol class	99			
Post test	Experiment class	89.11	1.02	1.90	Homogeneous
	Control class	86.67			

Hypothesis Testing

The hypothesis testing using t test that is distinguish the average of post-test result of students in experiment and control class to know whether or not the influence of CLIS learning model on students learning outcomes in thermal expansion topic at VII Grade SMP N 1 Tebing Tinggi.

The testing criteria is accept H_0 if t_{table} between -1.61 and 1.61, and rejected H_0 if t has the other score. From the calculation result of concept mastery obtained t_{count} = 5.26, so H_0 is rejected and H_a is accepted or in other word said that there are significant influence between CLIS learning model and conventional learning model on students learning outcomes.

Calculation of Hypothesis Test of Post-test

Num.	Class	Average	t_{count}	t_{table}	Conclusion
1.	Experiment	76.11	5.2	1.61	H_o is rejected
	Control	62.93			

DISCUSSION

The results showed that there was the effect of using Children Learning in Science (CLIS) model on students learning outcomes in thermal expansion topic at VII grade in SMP N 1 Tebing Tinggi. This is reinforced by the acquisition value of the average pretest students in the experimental class was 45.19 with a standard deviation of 9.04 and an average posttest score of 76.11 with a standard deviation of 9.44. While the values obtained in the control class average pretest students of 43.1 with a standard deviation of 9.95 and an average posttest score of 62.93 with a standard deviation of 9.31. From the data above, average posttest value of experiment class is bigger than control class. The increasing of posttest value is caused by the treatment to the students. In experiment class we give the treatment using CLIS learning model and control class give the treatment using conventional model.

This study showed that CLIS learning model has beneficial because this model was able to make students more active in exploring, analyzing, evaluating, and understanding of the concepts being studied. CLIS learning model is an efficient model to present information that has been organized from a broad topic to topic easier to understand for every stage of the development of the concept. This learning model can provide a way of conveying concepts and clarify concepts and to train students to be more effective in developing the concept of working through worksheets. This learning model also increases motivation because students are involved in learning, helping students develop scientific attitude and learning more meaningful. This can be seen when researchers carry out research. Students almost to better understand the concept of topic thermal expansion, so that learning is not only about the teaching of calculations using formulas.

Although the use of CLIS learning model could improve learning outcomes, but there is still learning obstacles encountered. There are students who are less interested in the teaching of the concept because it has been accustomed to working on the problems when learning physics calculations. For some questions in test, like questions number 6, 7, 10, and 14 students also still not usual to do the concept test. In addition students are not accustomed to working in groups that tend to work alone rather than working in groups. Therefore, the efforts is by making learning more interesting, namely the use of methods that stimulate students to be more active, such as the experimental method, cooperative and frequently asked questions. Researchers also pay more attention and guide students during the experiment. Here the researchers applied the formation of cooperative learning groups during student experiment. This research aims to more easily observe and guide students. Researchers further motivate students to learn group, and facilitate students during group learning.

In addition the time required for each stage is quite a lot. Therefore the solution for the future in order to further research may provide more oversight with the assistance of another teacher. In conducting this research is also needed help from a friend who observed each group so that the teaching and learning activities implemented well. The use of time should be streamlined as much as possible, so that each stage in the CLIS going well.

CONCLUSION

Based on the research result, data analysis, and discussion so can be concluded that: there is significant effect of using CLIS learning model in learning outcomes in VII grade SMP N 1 Tebing Tinggi of thermal expansion topic, where is average of learning outcomes while using CLIS learning model is higher than students who learn with conventional model. This result can happened because in CLIS learning model, students actively involved in learning the topic with experiment based worksheet and based application in daily life. Then students are easier to understanding about the topic.

SUGGESTION

Based on research result and discussion, researcher gives suggestions as follows: When teacher use CLIS learning model, teacher should use the time as efficient as possible, so that the stages in CLIS learning model can occurs well.

REFERENCES

Ali, I. (2008). *Implementasi Model Pembelajaran CLIS untuk Meningkatkan prestasi belajar Siswa*. Tesis UPI : Tidak diterbitkan

Asshagab, S.M.N. (2012). *Penerapan Model Pembelajaran Children's Learning in Science (CLIS) untuk Meningkatkan Keterampilan Proses Sains dan Pemahaman Konsep Hukum Newton Siswa*. Tesis UPI: Tidak diterbitkan

Ginting, A.S. (2010). *Pengaruh Model Pembelajaran Koperatif tipe STAD dengan Menerapkan Children Learning In Science (CLIS) Terhadap Hasil Belajar Siswa Kelas IX SMPN 1 Tigabinanga Tahun Pelajaran 2009/2010.* UNIMED: Medan

Joyce, B. & Martha W. (2003*). Models of Teaching 5th Edition*. Prentice Hall: New Jersey

Matitamole, L.E. (2012). *Penerapan Model Pembelajaran Children Learning in Science untuk Meningkatkan Hasil Belajar Siswa dalam Pembelajaran Fisika di SMP pada Pokok Bahasan Suhu dan Kalor*. UPI: Tidak Diterbitkan

Needham, R in association with Hill, P. (1987). *CLIS in the Classroom "teaching strategies for developing understanding in science*. Children's Learning in Science Project: University of Leeds

Sanjaya, W., (2006). *Kurikulum Pembelajaran Teori dan Praktik Pengembangan KTSP*, Jakarta; Kencana

Salwin, M.D. (1996). *Kemampuan Menerapkan Konsep Fisika Model Children's Learning in Science.* Tesis UPI : Tidak diterbitkan

Scott, P in association with Dyson, T. And Gater, S. (1987). *A constructivist view of learning and teaching in science.* Children's Learning in Science Project: University of Leeds

Sridevi, K.V.(2008). *Constructivism in Science Education*. Discovery Publishing House : New Delhi

Sudjana, N.(2001). *Metode Statistika*, Tarsito : Bandung

Tytler, R.(2002) *Teaching for understanding in Science: Student conceptions research, & changing views of learning*. Australian Science Teachers Journal: Proquest Research Library

Yuyun, Y.(2010). *Pembelajaran IPA Topik Pesawat Sederhana Melalui Model CLIS untuk Meningkatkan Ketrampilan Berpikir Rasional Siswa*. UPI: Tidak Diterbitkan