The Effectiveness of the Learning Cycle Model (5E and 7E) in Learning to Build Flat Side Sides Viewed From Student Self-Efficacy

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Abstract. The purpose of this study was to test the effectiveness of mathematics learning using the 5E learning cycle model and the 7E learning cycle model; as well as distinguishing more effective learning between the learning cycle models 5E and 7E in terms of the self-efficacy of class VIII students in learning to build flat side space. This research is a quasi-experimental study with a pretest-posttest non-equivalent comparison-group design. The study population included all eighth grade students of state junior high schools in Yogyakarta City consisting of high and medium level schools. With stratified random sampling technique, 2 schools were selected as research samples. The research instrument used student self-efficacy questionnaires. To test the effectiveness of the LC 5E model and the LC 7E model, whether there is an interaction between the learning model and the school level, as well as whether there is a difference in student self-efficacy in high school and medium school, the two way ANOVA test is used. Furthermore, to compare the self-efficacy of students who use the LC 5E model and the LC 7E model in high school and high school level students are using an independent sample t test, while to test whether there is a difference in effectiveness between the LC 5E model and LC 7E model against self-efficacy students used the N-Gain effectiveness formula. Each analysis was carried out at a significance level of 5%. The results showed that: 1) there was no difference in self-efficacy between students whose learning used the LC 5E model and students whose learning used the LC 7E model; 2) the self-efficacy of students who use the LC 5E model is not higher compared to those who use the LC 7E model in high and medium level schools; 3) there is no interaction between the learning cycle model with the school level on learning to build flat side space; 4) there is no difference in self-efficacy between students in high schools and students in medium schools; and 5) there is no difference in effectiveness between LC 5E and LC 7E models on student self-efficacy.

1. Introduction
Mathematics as one of the compulsory subjects taught at all levels of education, is a universal science that underlies the development of modern technology and has an important role in various scientific disciplines and advancing human thought power. As one of the most important disciplines, mathematics needs to be learned at every level of education. Mathematics is given to all students starting in Elementary School with the aim to equip students with the ability to think logically, analytically, systematically, critically, and creatively. This is contained in the Regulation of the Minister of Education and Culture No. 81A of 2013.
Based on the report absorption results of the National Examination (UN) by the National Education Standards Agency in the city of Yogyakarta, especially Junior High Schools, the absorption capacity of students in subjects building flat side spaces is not yet optimal. This can be seen from the percentage that is still relatively low. So that when maximized the results will be better. Namely according to the 2013 State Junior High School Curriculum in the city of Yogyakarta, students in learning are said to be complete when they have achieved the KKM (Minimum Criteria for Completion) 75, while classically it is said to be complete if 80% of the number of students have achieved the KKM value.

Learning cycle learning is part of the inquiry approach which in principle directs students to find the concepts themselves. This is in accordance with the opinion of Jarret [1], "the learning cycle is a model that can be used to facilitate inquiry". Cycle learning is learning that contains a series of stages of activities organized in such a way that students can master a number of competencies that must be achieved by playing an active role.

The learning cycle model was first introduced by Robert Karplus in the Science Curriculum Improvement Study (SCIS) in 1967. At first the learning cycle was developed into 3 learning phases, namely the exploration phase, the discovery phase, and the discovery phase. Following are the three phases of the learning cycle by Robert Karplus [2].

| Phase      | Summary                                      |
|------------|----------------------------------------------|
| Exploration| Students have an initial experience with phenomena. |
| Invention  | Students are introduced to new terms associated with concepts that are the object of study. |
| Discovery  | Students apply concepts and use terms in related but new situations. |

In the development of the learning cycle, the mid-1980s Biological Science Curriculum Study (BSCS) developed the learning cycle into five phases, known as 5E (engagement, exploration, explanation, elaboration, evaluation). Although there are changes, but basically the conceptual learning cycle remains the same. Here is a comparison of the stages of learning cycle 3E and learning cycle 5E [3].

| Phase                           | Summary                                          |
|---------------------------------|--------------------------------------------------|
| Engagement (New Phase)          | Exploration (Adapted from SCIS)                  |
| Invention (Term Introduction)   | Explanation (Adapted from SCIS)                 |
| Discovery (Concept Application) | Elaboration (Adapted from SCIS)                  |
|                                 | Evaluation (New Phase)                           |

Self-efficacy was first revealed by Bandura, who is one of the figures in social-cognitive theory. Social cognitive theory states cognitive abilities are not only influenced by innate factors of a person but also influenced by the social environment. Bandura believes that an important learning factor is self-efficacy.

Although someone believes they can make the desired results from the actions they do, but they have little incentive to act [4]. The belief in efficacy (efficacy) is a major basis of action. Someone directs his life with their belief in personal efficacy. So Bandura asserted that "perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" which means that feelings of self-efficacy pertain to beliefs in one's ability to organize and carry out a series of actions needed to produce the desired achievements.
Self-concept is more general, constructed by several perceptions about self (self) including self-efficacy [5]. Self-concept is built from the results of internal and external comparisons, while self-efficacy focuses on one's own ability to successfully complete a particular task without the need to compare with others. When compared to self-esteem, self-efficacy is more related to opinions about personal abilities, while self-esteem is more related to opinions about self-worth (self-worth). There is no direct relationship between self-esteem and self-efficacy. It is possible to feel high self-efficacy in a particular field and still feel that it does not yet have high self-esteem.

Self-efficacy is a person's belief that he has the ability to produce positive results by overcoming a situation with calm behavior, which influences the choice he chooses and how much effort he makes to organize and carry out an action by choosing what will be done, how much effort we have and how we survive without the need to compare with the abilities of others.

The 7E learning cycle model emphasizes transfer learning and the importance of initial knowledge in the process of understanding (eliciting prior understanding). Based on the existing problems, the research questions are as follows: 1) Is there a difference in self-efficacy between students whose learning uses the LC 5E model and students whose learning uses the LC 7E model; 2) Is the self-efficacy of students who use the LC 5E model no higher than those who use the LC 7E model in high school or medium level schools; 3) Is there no interaction between the learning cycle model and the school level in learning to build flat side space; 4) Is there a difference in self-efficacy between students in high schools and students in medium schools; and 5) Is there a difference in effectiveness between the LC 5E model and the LC 7E model on student self-efficacy.

2. Method
This research is a quasi-experimental study which aims to test the hypothesis about the presence or absence of the effect of an action when compared with other actions. The research design used was a pretest-posttest nonequivalent comparison group design.

The sample in this study was chosen two classes randomly from two selected schools. Of the two selected classes then drawn to determine which class will be treated with the LC 5E model or LC 7E model.

3. Result and Discussion
Based on the results of statistical tests show that there is no difference in self-efficacy between students whose learning uses the LC 5E model and students whose learning uses the LC 7E model. The decision criteria, namely, reject menolak0 or there is a difference in the average score of achievement pretest, creative thinking, and self-efficacy in the LC 5E and LC 7E groups if p-value <0.05 and accept \( H_0 \) if p-value > 0.05.

In this study, the learning model in terms of learning achievement and creative thinking abilities is said to be effective if students in learning mathematics meet the specified criteria and there are significant differences between the two experimental classes. Or the learning model is said to be effective if the value of competency achieved by students reaches a minimum completeness criterion of 75 and a 75% classical completeness percentage.

The results showed that: 1) there was no difference in self-efficacy between students whose learning used the LC 5E model and students whose learning used the LC 7E model; 2) the self-efficacy of students who use the LC 5E model is not higher compared to those who use the LC 7E model in high and medium level schools; 3) there is no interaction between the learning cycle model with the school level on learning to build flat side space; 4) there is no difference in self-efficacy between students in high schools and students in medium schools; and 5) there is no difference in effectiveness between LC 5E and LC 7E models on student self-efficacy.

4. Conclusion
Based on the results obtained, mathematics learning with LC 5E model in high-level schools is effective in terms of aspects of learning achievement and self-efficacy, but it is not effective in terms of the creative thinking ability of class VIII students in learning material to build flat side spaces. Mathematical learning with the LC 7E model in high-level schools is effective in terms of aspects of
learning achievement and self-efficacy, but it is not effective in terms of the creative thinking ability of class VIII students in learning material to build flat side spaces. Mathematics learning with LC 5E models at the school level is being effective in terms of self-efficacy, but ineffective in terms of learning achievement and creative thinking abilities of class VIII students in learning material to build flat side spaces. Mathematics learning with LC 7E models at medium level schools is not effective in terms of aspects of learning achievement, creative thinking abilities, and self-efficacy of VIII grade students in learning material to build flat side spaces. Learning in high schools with the LC 7E model does not differ significantly compared to learning with the LC 5E model in terms of learning achievement, creative thinking skills, and self-efficacy of students in learning material to build flat side spaces. Learning in medium level schools with LC 5E models differ significantly compared to learning with LC 7E models in terms of learning achievement, but not significantly different in terms of creative thinking abilities and self-efficacy of students in learning material to build flat side spaces. There is an interaction between learning models and school level in terms of student achievement.

References

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