Learner Autonomy of Science using 5E Learning Cycle

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This resarch aims to determine the effect of the 5E learning cycle on student learning Autonomy. The research subjects are 84 PGSD students. 5E Learning Cycle applicants with the syntax of Engagement, Exploration, Exploration, Elaboration, and Evaluation were carried out in advanced science courses in the second semester. Research with the type of quasi experiment using questionnaires as a measure of student learning Autonomy. The results showed that the mean pre-test score of the control group and the experimental group had increased. The Mann-Whitney U test obtained a significance of 0.039 and the effect of the 5E learning cycle showed a high category with score of N gain is 0.98. So that it can be concluded that the 5E learning cycle affects student learner autonomy.

Keywords: 5E Learning Cycle, Learner Autonomy, Science

INTRODUCTION

The educational phenomenon arise at this time is how a person can be said to be mature as long as study. One indicator of a person said to be an adult is that he is able to determine his direction in every situation that exists. That is the condition every person when he is studying. He is able to set himself to concentrate in learning, completing tasks in learning and is able to be responsible for dealing with existing problems.

An individual who has not been able to direct his self to be independent, needs guidance from a teacher. The teacher carries out learning through a learning model, namely a plan or a pattern that is used as a guide in planning learning in the classroom, the learning model leads to a specific learning approach, including goals, steps (syntax), environment and management system Arends and I (2008) .

Autonomy is a potential in humans. Autonomy develops as people age. Autonomy is one of the topics in the psychological discussion related to self. The terms of Autonomy used include autonomy, Autonomy, and self regulation. Autonomy in autonomy terms as freedom or ability to decide Steinberg (1995) Joshi (2011) . Autonomy as someone's dependence on others and as the ability to do something in making choices without the help of others. Autonomy can also be interpreted as the ability to resist temptations that come from within and outside a person. In addition, in the context of identity, Autonomy shows an expression of attraction to something Williams (2003); Sokol et al. (2013) . Learning Autonomy or Learner Autonomy is characterized by directing thoughts, feelings and actions to achieve learning goals. Students who have the autonomy learning are called selfregulated learning Zimmerman et al. (1996) . Autonomy of learning can develop because someone has a learning process. Autonomy of learning will be very important in learning, because the skills developed in students will influence the lives of students later.

The characteristics of someone who has learning autonomy according to Williams (2003) are: have the desire to progress (have self motivation, self-esteem, and self-confidence, not seeking attention, tend not to follow peers because independent students are able to decide themselves with little concern if they are wrong), respect for peers and the environment (able to be responsible in groups, constructive time management and disciplined, trustworthy and valued adults, active and energetic, not passive, satisfied when winning, both personal and collective, able to communicate and express feelings, be confident and dare to take risks and work together and when working independently, enjoy challenges), have a higher standard of work, are more socially skilled (more socially aware / have more social awareness, able to offer assistance to friends). Independent students can organize and monitor the learning process. Ceylan (2015) revealed that students who are independent in learning are students who can: 1) determine learning goals, 2) know what is learned and the development of their learning, 3) choose the learning methods and techniques to be used, 4) monitor anything which has been studied, and 5) evaluates what has been obtained. Learning Cycle is a student centered learning model. Learning Cycle is a constructivism approach that has a series of stages of activity (phases) that are organized in such a way that students can master the competencies that must be achieved in learning by playing an active role Bilgin et al. (2013) . Learning Cycle initially consists of exploration phases (exploration), introduction of concepts (concept introduction), and application of concepts (concept application) (Karplus and Their in Renner et al, 1988). In the exploration phase, students are given the opportunity to utilize their five senses as much as possible in interacting with the environment through activities such as practicum, analyzing articles, discussing natural phenomena, observing natural phenomena or social behavior, and others. The three-phase learning cycle has now been developed and refined into 5 and 6 phases. In the 5 phase Learning Cycle, the engagement stage before exploration was added and an evaluation stage was added at the end of the cycle. In this model, each stage of concept introduction and concept application is termed explanation and elaboration. Therefore the 5 phase Learning Cycle is often called the 5E Learning Cycle (Engagement, Exploration, Explaination, Elaboration, and Evaluation) Lorsbach (2002); Bilgin et al. (2013); Runisah et al. (2017) . The engagement stage aims to prepare students to be conditioned in taking the next phase by exploring their initial knowledge and ideas and to find out the possibility of misconceptions in previous learning. In this engagement phase students' interest and curiosity about the topic to be taught tries to be raised. In this phase students are also invited to make predictions about phenomena that will be studied and proven in the exploration phase. In the exploration phase, students are given the opportunity to work together in small groups without direct teaching from the teacher to test predictions, conduct and record observations and ideas through activities such as lab work and literature review. In the explanation phase, the teacher must encourage students to explain the

concepts with their own sentences, ask for evidence and clarification of their explanations, and direct the discussion activities. At this stage students find terms from the concepts learned. In the phase of elaboration (extension), students apply concepts and skills in new situations through activities such as advanced practicum, and problem solving. In the final stage, evaluation is evaluated on the effectiveness of previous phases as well as evaluation of knowledge, understanding concepts, or student competencies through problem solving in a new context which sometimes encourages students to conduct further investigations. Based on the stages in the cyclical learning method as described above, it is expected that students not only hear the teacher's information but can play an active role in exploring and enriching their understanding of the concepts learned. From some of the descriptions above, this study aims to determine the effect of the 5E learning cycle on the autonomy of student science learning.

METHOD

The design of this study use Pre-Test and Post-Test Control Group. The research was conducted in Yogyakarta City against Students of elementary school teacher education. The sample were taken randomly with 84 students divided into two classes. Class A as a control class with 43 students and Class B as an experimental class with 41 students. The research meeting took place in three weeks with three face-to-face use of the 5E learning cycle.

[Table 1 about here.]

Group A is the control class with conventional learning treatment, while Group B is the experimental class with learning using the 5E learning cycle. Each group was given a Pre Test and continued with learning Advanced Science Courses with Reproductive System material and the Circulatory System. The design of this study is in the form of design and experimental analysis with experimental design accompanied by a discussion of statistical analysis used. Data were collected through a modified student learning autonomy questionnaire from Joshi (2011) with thirty items of statements. Students choose by giving a checklist in the questionnaire column as scale 1 = S = Often, 2 = K = Sometimes, 3 = J = Rarely and 4 = T = Never. Each statement is a criterion or indicator of learning autonomy with each of the ten statement points, namely: 1) Having motivation to learn, 2) Being able to make decisions and initiatives to overcome the problems faced, and 3) Responsible for what he does. The data obtained were analyzed to see the effect of the application of the 5E learning cycle on the autonomy of learning science and then analyzed through the Mann-Whitney U test with a statement of results that if the value of $p < 0.05$, the hypothesis is accepted and then to see an increase in independent learning, carried out by analyzing through the N-gain.

[Table 2 about here.]

RESULT AND DISCUSSION

Based on the data collection technique in the form of a questionnaire about student learning autonomy. Questionnaires were filled by 84 students who were research samples so as to obtain the average as follows.

[Table 3 about here.]

The Mann-Whitney U test shows that Asymp. Sig. Shows of means 0.039 <0.05, so the hypothesis is accepted. Thus, the 5E learning cycle has an influence on science learning.

[Table 4 about here.]

From the table above, it can be seen that the learning autonomy of the control class and the experimental class has increased. This increase can be seen from the score of pre-control class 45,488 increasing to 48,233. The control class was not treated in the form of the 5E Learning Cycle model. The class is taught by the same lecturer as the conventional learning model.

On the other hand, the experimental class treated with the 5E Learning Cycle model during the three meetings experienced an increase in the average learning autonomy. The mean score of the pre-test of experimental group 47,366 increased to 50,878. The increase in the experimental class is higher than the control class.

From these results it can also be seen that the N Gain Score of experimental class is higher than the control class N Gain Score. N Gain scores are included in the high category.

[Figure 1 about here.]

From **Figure 1** the mean of control class has increased for each criteria of learner autonomy. The learning process carried out by the lecturer is the same as applying conventional learning. Learning is done by observing the surrounding environment and question and answer, and giving one-way material (students with lecturers).

[Figure 2 about here.]

The results of the questionnaire given to students in the experimental class showed that the average score of learning autonomy had increased in each of the criteria (**Figure 3**). The learning process carried out by lecturers in advanced science materials through the 5E Learning Cycle was carried out in a coherent manner. Students carry out the steps in the 5E Learning Cycle syntax. This shows that the learner autonomy of science can increase with the presence of learning variations, especially through the 5E Learning Cycle. The results of the autonomy of learning science can also be seen apart from the learning process can also be seen also through the upload on social media, especially about the tasks given to make a poster article.

[Figure 3 about here.]

Learning to use the 5E Learning Cycle (Engagement, Exploration, Explaination, Elaboration, and Evaluation) has effective steps to be implemented in science learning (Bybee et al. (2006); MADU and C.C (2012); Ulina (2017) . The implementation of the 5E learning cycle is carried out coherently with prior engagement, which is by looking at the phenomenon of problems that occur in the surrounding environment, especially regarding the reproductive system and circulatory system, an example of the problem is imposing infectious disease images. This step aims to direct students to focus on the material. In addition, this is used as giving initial information and recalling the knowledge that has been possessed by students MADU and C.C (2012). They individually conduct initial questions and answers to explore the problems presented, similar to what was done in the Ulina (2017) .

Furthermore, during the exploration phase, students are grouped with a group of 4-5 people to solve problems about the topics presented (reproductive system and circulatory system). They are looking for various literature to solve the problems presented (Kurniawati and Wilujeng (2016)). Next, they conduct discussions by discussing in groups according to the explanation stage. That stage, students are expected to understand and master the material as a whole.

In the elaboration stage, students choose one topic to be appointed in an individual article, they make a digital poster accompanied by a brief description and must be accompanied by the source of the quotation. Next, it will be uploaded through social media as the evaluation stage. From the whole process, they can be known about the mastery of the material and how to independently learn the stages well. This is similar to Qarareh (2017) research that in carrying out the 5E learning cycle is done by making concept maps in science learning.

Learning using the 5E learning cycle has a positive impact on student autonomy. It was also found in Pitriani (2018) research that the 5E learning cycle can increase learning autonomy. Indicators of learning autonomy have increased, including: having learning motivation has increased, similar to the research of Yuslistiana (2010) and Dewi et al. (2018) who investigated that the 5E learning cycle can increase motivation; the indicators responsible for what they did have increased, similar to the Lutviana (2014) which states that the 5E student cycle is able to improve character; and an increase in indicators is able to overcome problems as well as in increasing mathematical problem solving skills in the research of Handayani et al. (2014) . These things can be seen in student activities during learning which play an active role and participate in activities with enthusiasm, and the task is well done.

CONCLUSION

Based on the data from the analysis it can be concluded that: 1) the 5E learning cycle has an effect on the learning kemadirian students with a significance of 0.039; 2) the influence of the 5E learning cycle shows a high category with an N score gain of

0.98 so that the results can be stated that the 5E learning cycle has an influence on student learning independence in science learning. Learning through this 5E learning cycle has a high influence, but in carrying out further learning it is necessary to provide variation in implementation in each syntax.

THANKFUL

REFERENCES

Arends and I, R. (2008). Learning to Teach: Belajar untuk Mengajar (Yogyakarta: Pustaka Belajar).

Bilgin, I., Coşkun, H., and Aktaş, I. (2013). The Effect of 5E Learning Cycle on Mental Ability of Elementary Students. *Journal of Baltic Science Education* 12, 592–607.

Bybee, R. W., A., J., Taylor, Gardner, A., Scotter, P. V., Powell, J. C., et al. (2006). The BSCS 5E Instructional Model: Origins and Effectiveness (National Institute Of Health: BSCS).

Ceylan, N. O. (2015). GlobELT: An International Conference on Teaching and Learning English as an Additional Language, Antalya - Turkey Fostering learner autonomy. *Procedia - Social and Behavioral Sciences* 199, 85–93. doi: 10.1016/j.sbspro.2015.07.491.

Dewi, N. P. S., Ardana, I. K., and Putra, M. (2018). Pengaruh Model Pembelajaran Learning Cycle 5e Berbantuan Media Lingkungan Terhadap Kompetensi Pengetahuan IPA. Jurnal Penelitian Dan Pengembangan Pendidikan. *Jurnal Penelitian dan Pengembangan Pendidikan* 2, 113–120. doi: http://dx.doi.org/10.23887/jppp.v2i2.15389.

Handayani, I., Sadra, I. W., and Ardana, I. M. (2014). Pengaruh Model Siklus Belajar 5e Berbasis Pemecahan Masalah Terhadap Kemampuan Pemecahan Masalah Matematika Ditinjau Dari Pengetahuan Awal Siswa. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha* 3, 1–7. doi: https://doi.org/10.23887/jppm.v3i1.1346.

Joshi, K. R. (2011). Learner Perceptions and Teacher Beliefs about Learner Autonomy in Language Learning. *Journal of NELTA* 16, 13–29.

Kurniawati, W. and Wilujeng, I. (2016). NEED ASSESSMENT : THE DEVELOPMENT OF 5E LEARNING CYCLE BASED STUDENTS ' SCIEN CE PRACTICUM WORKSHEET IN ELEMENTARY SCHOOL. *Jurnal Pendidikan IPA Indonesia* 5, 247–255.

Lorsbach, A. W. (2002). The Learning Cycle as A tool for Planning Science Instruction. *College Of Education*.

Lutviana, E. (2014). Implementasi Model Learning Cycle 5e Sebagai Upaya Peningkatan Karakter Siswa Kelas Xi Semester 2 Di Sman 1 Dagangan Madiun Jawa Timur. Published Thesis.

MADU, B. and C.C, A. (2012). Effect of Five-Step Learning Cycle Model on Students ' Understanding of Concepts Related To Elasticity. *Journal of Education and Practice* 3, 173–181. doi: https://doi.org/10.7176/JEP.

Pitriani (2018). Prestasi dan Kemandirian Belajar dalam Geometri Tranformasi melalui Learning Cycle 5E Berbantuan Software. *Desimal: Jurnal Matematika* 1, 229–235.

Qarareh, A. O. (2017). The Effect of Using the Learning Cycle Method in Teaching Science on the Educational Achievement of the Sixth Graders. *International Journal of Educational Sciences* 4, 123–132. doi: 10.1080/09751122.2012.11890035.

Runisah, Herman, T., and Dahlan, J. A. (2017). Using the 5E Learning Cycle with Metacognitive Technique to Enhance Students ' Mathematical Critical Thinking Skills. *International Journal on Emerging Mathematics Education (IJEME)* 1, 87–98. doi: 10.12928/ijeme.v1i1.5698.

Sokol, B. W., Grouzet, F. M. E., and Müller, U. (2013). Self-Regulation and Autonomy: Social and Developmental Dimensions of Human Conduct (New York: Cambridge University Press). doi: 10.1017/CBO9781139152198.

Steinberg, L. (1995). Adolescene (Sanfrancisco: Mcgraw-Hill College).

Ulina, N. S. (2017). Meningkatkan Keterampilan Berpikir Siswa Dengan Model Learning Cycle Dalam Pembelajaran Fisika Di SMA Jakarta. *Jurnal Formatif : Jurnal Ilmiah Pendidikan IPA* 7, 49–55.

Williams, J. (2003). Promoting Independent Learning In The Primary Classroom (Enriching the Primary Curriculum - Child, Teacher, Context). Enriching the Primary Curriculum (England: Open University Press).

Yuslistiana, W. (2010). Implementasi Model Pembelajaran Learning Cycle (Lc) "5e" Dengan Mengoptimalkan Media Work Sheet Untuk Meningkatkan Motivasi Belajar Siswa Pokok Bahasan Segi Empat. Published Thesis. http://eprints.ums.ac.id/8387/1/A410060206.pdf.

Zimmerman, B. J., Bonner, S., and Kovach, R. (1996). Developing Self Regulated Learners: Beyond Achievment to Self-efficacy. Psychology in the Classroom Series (Washington: American Psychologycal Association).
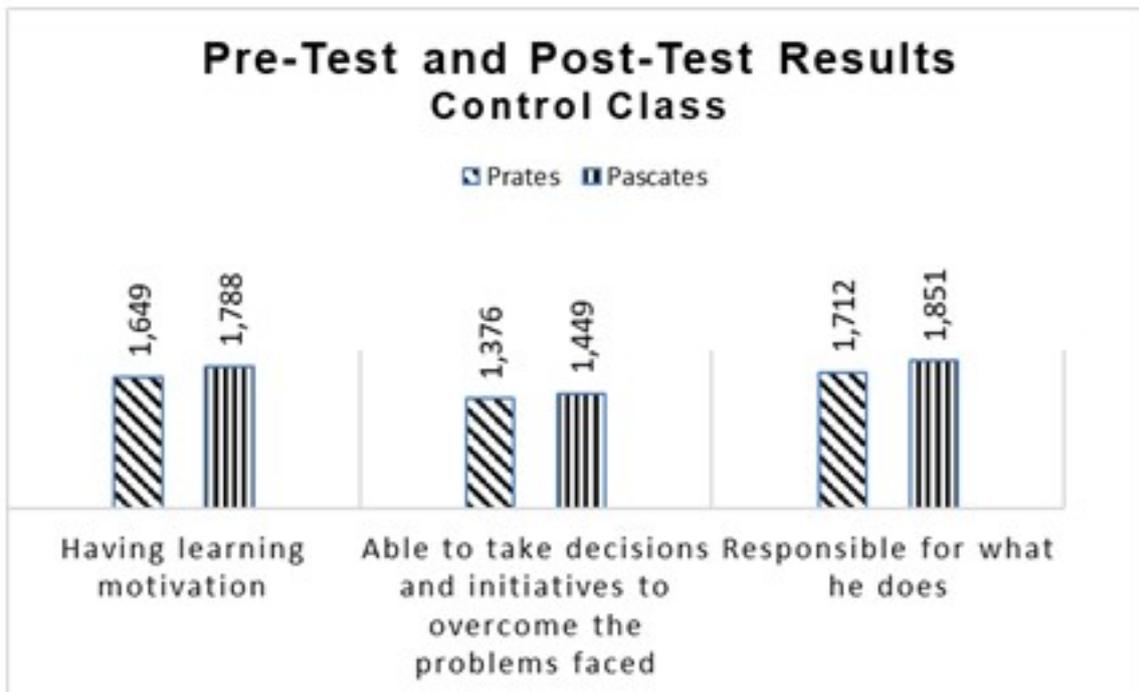
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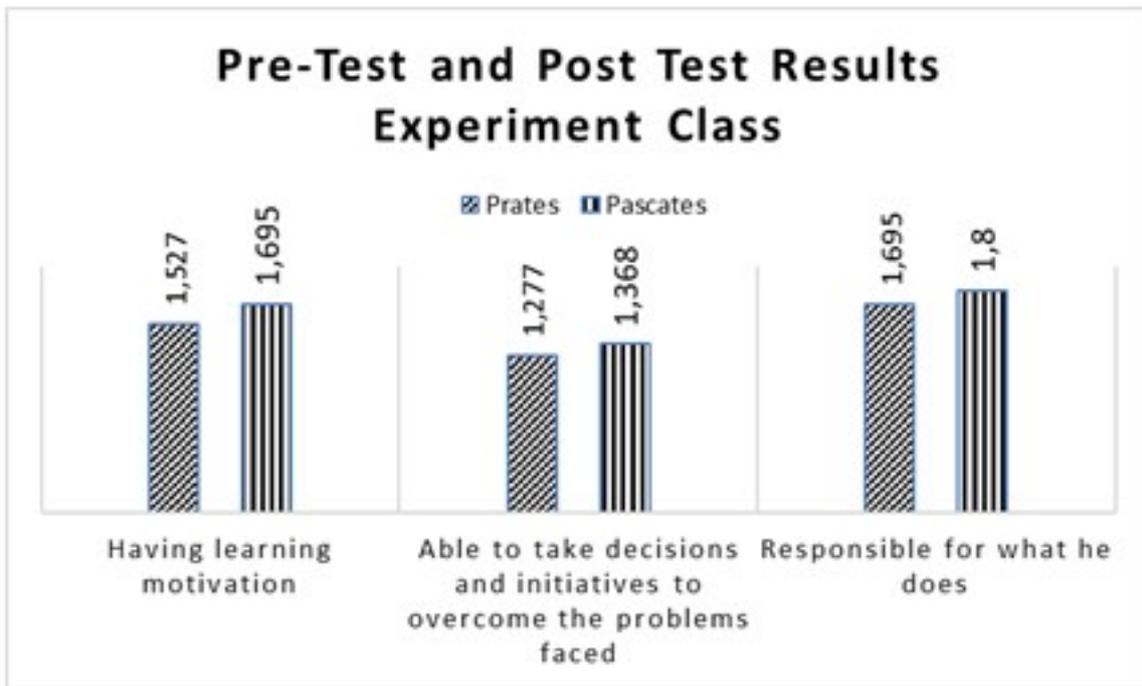**FIGURE 1** | The Result of Control Class in Learner Autonomy Indicators

FIGURE 2 | The Result of Experiment Class in Learner Autonomy Indicators

FIGURE 3 | One of Posters Result (The Task in 5E Larning Cycle)

LIST OF TABLES

TABLE 1 | Research Design

Kelompok	Pre-Test	Perlakuan	Post Test
A	O1	X1	O2
B	O1	X2	O2

TABLE 2 | N-Gain Scor Classification

N-Gain Score Mean	Category
$0{,}70 < N\ Gain \leq 1{,}00$	High
$0{,}30 < N\ Gain \leq 0{,}70$	Moderate
$N\ Gain \leq 0{,}30$	Low

TABLE 3 | The Result of Mann-Whitney U Test

Test Statistics[a]	
	Kemandirian
Mann-Whitney U	651.500
Wilcoxon W	1597.500
Z	-2.063
Asymp. Sig. (2-tailed)	.039
a. Grouping Variable: Kelas	

TABLE 4 | The Summary of N-Gain Score of Learner Autonomy

Mean	Pre-Test	Post-Test	N Gain
Control	45,488	48,233	0,76
Experiment	47,366	50,878	0,98