International Journal of Contextual Science Education (IJCSE)
e-ISSN. 3046-8876
Vol. 1, No. 3, September 2024
pp. 109-113

The Effect of The Learning Cycle 5e Model On Mastery of Concepts and Creative Thinking Students On Renewable Energy Materials At SMAN 1 Gerung

Barinta Nur Respasari[1], Joni Rokhmat[1]*, I Wayan Gunada[1], Hikmawati[1], Stefanie Astrid Aipassa[2]
[1]Physics Education, Faculty of Teacher Training and Education, University of Mataram, West Nusa Tenggara, Indonesia.
[2]Construction System, Civil and Environmental Engineering Department, University of California Berkeley, California.
*Corresponding autor e-mail: joni.fkip.unram@gmail.com

Accepted: July 17th2024, Approved: August 10th 2024, Published: September 30th 2024

Abstract— This study aims to identify the effect of Learning Cycle 5E learning model on concept mastery and creative thinking ability of students on renewable energy material at SMAN 1 Gerung. The research method used is a pseudo-experimental method with a pre-test and post-test control group design. The research population used in this study were Phase E students of class X SMAN 1 Gerung. Samples were taken using purposive sampling technique and obtained XH class students as experimental class and XK as control class. The research instrument includes a description test that measures mastery of concepts and creative thinking skills that have been tested for validity, reliability, difficulty level of questions, and differentiation of questions. Data analysis used t-test and MANOVA. The results showed that the Learning Cycle 5E model significantly improved students' concept mastery and creative thinking skills compared to the conventional learning method. The average post-test score in the experimental group was higher than the control group, showing the effect of the Learning Cycle 5E model on students' concept mastery and creative thinking on renewable energy material with a significance showing 0.000. So this model provides opportunities for participants to be more active, critical, and creative in the learning process, and helps students better understand abstract and complex concepts. The implication of this research is the need for the application of innovative learning models such as Learning Cycle 5E to improve the quality of physics learning in schools, so that students can achieve the skills demanded by the curriculum and be able to compete in today's educational challenges.

Keywords— Learning Cycle 5E Model, Concept Mastery, Creative Thinking, Renewable Energy.
How to Cite— Respasari, B. N., Rokhmat, J. ., Gunada, I. W., & Hikmawati. (2024). The Effect of The Learning Cycle 5e Model On Mastery of Concepts and Creative Thinking Students On Renewable Energy Materials At SMAN 1 Gerung. *International Journal of Contextual Science Education*, *1*(3), 109–113. https://doi.org/10.29303/ijcse.v1i3.661

1. Introduction

21st century education is currently continuing to experience improvements in its education system. Education is the process of acquiring knowledge, skills and habits of a person or group of individuals, which is transmitted from one generation to the next through educational training or research (Mulyani, 2021). Current educational research is expected to be able to facilitate students to be able to compete in various educational challenges (Puspa, 2023). One of the educational challenges that often becomes a problem for high school students is learning physics.

Physics is one of the main subjects in high school which discusses natural factors and phenomena in the universe (Hernawati, 2018). Educators are required to be creative in compiling and implementing various interesting learning models to arouse students' interest in the physics learning process (Sahidu, 2018). According to Aripin (2021), Physics is seen as both a process and a product, so that in the learning process you must consider efficient and effective learning strategies or methods. However, according to Ichtiari (2022), students' mastery of concepts and creative thinking is still relatively low.

Students' low mastery of concepts and creative thinking abilities requires the use of effective and efficient learning models. According to Wulandari (2022), efficient and effective learning can be created by using varied learning models in order to arouse students' high interest in learning about the subject of physics itself. This problem can be overcome by using various learning models, one of which is the 5E learning cycle model.

The 5E learning cycle model is a learning that allows students to discover their own concepts or consolidate the concepts they learn by going through five stages, namely engage, explore, explain, elaboration, and evaluate (Soebagio, 2001). Through the 5E learning cycle model, it is hoped that teaching staff can prevent conceptual errors and provide opportunities to apply the concepts they have learned to new situations. According to Pratama (2023), the implementation of the 5E learning cycle model in learning is in accordance with the constructivist view where knowledge is built within students. Some of the advantages of using learning in this model in applied learning are student centered, new information is linked to the knowledge that students already have, learning orientation is investment and discovery which is problem solving, the learning process becomes more meaningful

© 2024 The Author(s).
This article is published by International Journal of Contextual Science Education (IJCSE) and licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0).

because it prioritizes real experience, avoiding students students from traditional learning methods which tend to memorize and form active, critical and creative students (Asmawati, 2014). This model can support learning achievement in accordance with the skills required.

The skills emphasized for students are mastery of concepts and creative thinking (Agustiana, 2020). Mastery of concepts is an effort that must be made by students to record and transfer back a certain amount of information from a particular subject matter that can be used in solving problems, analyzing, interpreting the aftermath of a particular event (Siswanti, 2023). Meanwhile, creative thinking is an ability that is based on high creativity possessed by students themselves (Yasiro, 2021).

The results of students' daily assessments on renewable energy materials in class XH and XK in the 2023/2024 school year at SMAN 1 Gerung can be said to be still relatively low. This can be seen from the number of daily grades of students on renewable energy material that has a value that does not meet the predetermined minimum completeness criteria (KKM) of 80.

Tabel 1. Daily Assessment Results of Class XH and XK School Year 2023/2024

Class	Value	Number of Learners	Presentation	Description
X_H	≤ 80	19	54,29 %	Does not meet KKM
	> 80	16	45,71 %	Meets KKM
X_K	≤ 80	20	57,14 %	Does not meet KKM
	> 80	15	42,86 %	Meets KKM
Number of Learners		35 Learners/Class	100%	

Table 1 shows that the average number of students who complete out of 35 students is only 16 people (45.71%) in class X_H and 15 people (42.86%) in class X_K. Through daily assessments that are still low and interviews with educators, it is known that mastery of concepts

Subscribe to DeepL Pro to edit this document. Visit www.DeepL.com/pro for more information.

and creative thinking of students is low. This is indicated by students who are less responsive during question and answer sessions and class discussions.

Through interviews, it is also known that at SMAN 1 Gerung the implementation of learning models for physics learning has never used learning models other than direct learning, Problem Based Learning, and Project Based Learning models. The methods used also still use conventional methods such as lectures centered on educators. The learning outcomes in physics subjects of students should be suspected to occur due to the lack of ability to master concepts and creative thinking in physics subjects in students. In addition, students still have difficulty in understanding physics concepts, especially in abstract and complex physics material.

Based on this exposure, researchers are interested in conducting research with the title "The Effect of the 5E Learning Cycle Model on Students' Concept Mastery and Creative Thinking on Renewable Energy Material". So that the learning received by students becomes more meaningful and can equip them with skills according to the demands of the times.

2. Research Methods

In this study, the type of research used was pseudo-experimental research. This type of research has a control group but cannot function completely to control other external variables that can affect the implementation of the experiment (Sugiyono, 2021).

The research design used was Nonequivalent Control Group Design. This research consists of experimental and control classes. The experimental class will be treated using the 5E cycle learning model. While the control class uses conventional learning model. The population of this study was class X students at SMAN 1 Gerung with a total of 385 people. The sampling technique used was purposive sampling. The sample in this study consisted of 2 groups, namely students of class X_H as an experimental class of 35 people and students of class X_K as a control class of 35 people.

3. Sections

Instruments that were tested in the form of tests in the form of descriptions on the variables of concept mastery and creative thinking on renewable energy material. The instrument has been tested on students of class XIA with 35 participants. The test was conducted on Friday, May 17, 2024. The test results were then analyzed for validity, reliability, level of difficulty, and differentiation of questions before being used for the initial test (pre-test) and final test (post-test) in the experimental class and control class.

Based on the validity, reliability, difficulty level, and differentiation test of the questions that have been carried out on the concept mastery test instrument and creative thinking, the data obtained that for the concept mastery test instrument of the ten problem items provided there are eight acceptable problem items. So that the concept mastery test instrument used is an indicator of remembering one question, understanding one question, applying two questions, analyzing one question, evaluating one question, creating two questions.

As for the creative thinking test instrument of the 5 questions provided, the five questions are acceptable. So that the instrument of creative thinking questions used at the cognitive level, namely C6, namely fluency as many as two questions, flexibility as many as one question, originality as many as one question, and elaboration as many as one question.

Prerequisite tests are carried out to determine whether the analysis can be continued or not. There are several prerequisites that must be met if you are going to use hypothesis testing including homogeneity test and normality test. Based on the initial test (pre-

test) and the final test (post-test) that has been carried out in the experimental class and control class, a comparison of the average values of the two tests is obtained. The results of the homogeneity test and normality test with SPSS 23 concept mastery are presented in Figure 1.

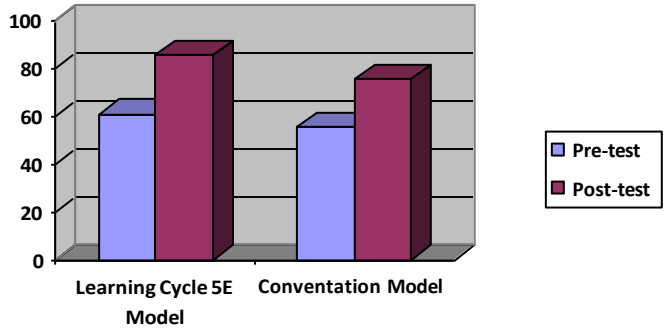

Fig. 1. Comparison of average pre-test and post-test scores of concept mastery.

Based on Figure 1, it is known that there is a difference between before and after treatment in the experimental and control classes. In the experimental class, the comparison of the initial pre-test and the final test post-test reached 24.57 points. The results of the mastery homogeneity test are presented in Table 2.

Table 2. Homogeneity test results of concept mastery

Ability	Class	N	Sig.	Description
Pre-test	Eksperiment	35	0.864	Homogeneous
	Control	35	0.864	Homogeneous
Post-test	Eksperiment	35	0.139	Homogeneous
	Control	35	0.139	Homogeneous

Based on Table 2, it is known that the significance value of the pre-test is 0.864 and the post-test is 0.139. So it can be concluded that the data is included in the homogeneous category because the significance value> 0.05.

Table 3. Normality Test Results of Concept Mastery

Ability	Class	N	Sig.	Description
Pre-test	Eksperiment	35	0.072	Normally distributed
	Control	35	0.059	Normally distributed
Post-test	Eksperiment	35	0.060	Normally distributed
	Control	35	0.068	Normally distributed

Based on Table 3, it is known that the normality test in the experimental class the significance value of the pre-test was 0.059 and the post-test was 0.072 and the final test (post-test) was 0.068. While the normality test in the control class the significance value of the pre-test was 0.059 and the post-test was 0.068. So it can be concluded that the data is normally distributed because the signigication value> 0.05. This can be seen through Figure 2.

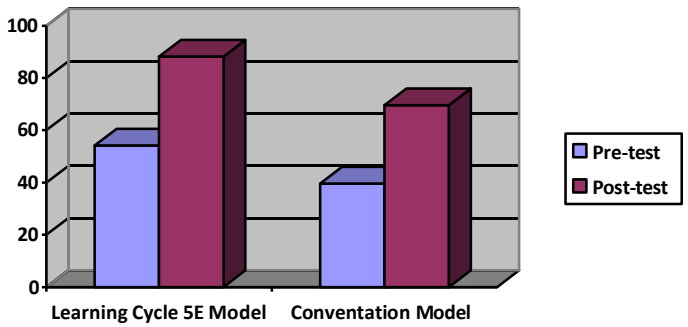

Fig. 2. Comparison of average pre-test and post-test scores for creative thinking

Based on Figure 2, it is known that there is a difference between before and after treatment in the experimental and control classes. In the experimental class, the comparison of the initial test scores (pre-test) and the final test (post-test) reached 0.012 points.

Table 4. Creative Thinking homogeneity test results

Ability	Class	N	Sig.	Description
Pre-test	Eksperiment	35	0.116	Homogeneous
	Control	35	0.116	Homogeneous
Post-test	Eksperiment	35	0.424	Homogeneous
	Control	35	0.424	Homogeneous

Based on Table 4, it is known that the significance value of the initial test (pre-test) is 0.116 and the final test (post-test) is 0.424. So it can be concluded that the data is included in the homogeneous category because the significance value> 0.05.

Table 5. Normality Test Results of Creative Thinking

Ability	Class	N	Sig.	Description
Pre-test	Eksperiment	35	0.072	Normally distributed
	Control	35	0.059	Normally distributed
Post-test	Eksperiment	35	0.060	Normally distributed
	Control	35	0.068	Normally distributed

Based on Table 5, it is known that the normality test in the experimental class the significance value of the initial test (pre-test) was 0.200 and the final test (post-test) was 0.101. While the normality test in the control class the significance value of the initial test (pre-test) was 0.063 and the final test (post-test) was 0.114. So it can be concluded that the data is normally distributed because the signigication value> 0.05. Because both tests have been carried out and meet the requirements, the hypothesis test can be continued. The requirements for conducting the MANOVA test are the Levene test and the Box's M test. Researchers conducted the Lavene test first as in Table 6.

Table 6. Homogeneity Test Results using Lavene test

Dependent Variable	F	df1	df2	Sig.
Concept Mastery	2.236	1	68	0.139
Creative Thinking	0.646	1	68	0.424

The lavene test results show that the F value for concept mastery is 2.236 with a significance of 0.139 and creative thinking is 0.646 with a significance of 0.424. If the significance level is set at 0.05, the value of mastery of concepts and creative thinking of students has a homogeneous variant. So that the MANOVA test can be continued by testing using Box's M test first.

Table 7. Box's M Test Results

Box's M	F	df1	df2	Sig.
4.865	1.570	3	832320.000	0.194

Based on Table 7, it is known that the results of Box's M test show that the significance value of concept mastery and creative thinking is 0.194. If the significance level is set at 0.05, the value of concept mastery and creative thinking has the same variance / covariance matrix value, so the conditions are met and the MANOVA test can be continued. The independent sample t-test test is used to determine whether there is a difference in the average of two unpaired samples. The independent sample t-test can be seen in Table 8.

Table 8 Independent sample t-test results

Dependent Variable	F	df	Sig. (2-tailed)
Concept Mastery	2.236	68	0.000
Creative Thinking	0.646	68	0.000

The results of the independent sample t-test showed a significance number (2-tailed) <0.05 for both the concept mastery and creative thinking variables, which means that there is a significant difference between concept mastery in the experimental class and the control class. Furthermore, there is a significant difference between creative thinking in the experimental class and the control class. So it can be concluded that H01 is rejected and Ha1 is accepted, meaning that there is an effect of the 5E learning cycle model on students' concept mastery on renewable energy. And H02 and Ha2 means that there is an effect of the 5E learning cycle model on students' creative thinking on renewable energy. The MANOVA test was used to test whether there was an effect of the 5E learning cycle model on concept mastery and creative thinking. For this test, Pillae Trace, Wilk Lambda, Hotteling Trace, Roy's Root tests are used which can be seen in Table 9.

Table 9. MANOVA Test Results

Effect	Value	Sig.
Pillae's Trace	.582	0.000
Wilk's Lambda	.418	0.000
Hotteling's Trace	1.394	0.000

Roy's Largest Root	1.394	0.000

The results of the Pillae Trace, Wilk Lambda, Hotteling Trace, Roy's Root test obtained a significance of 0.000. If a significance of 0.05 is used, 0.000 <0.05 so that H03 is rejected and Ha3 is accepted. Based on the MANOVA results, it is found that there is an effect of the 5E learning cycle model on the mastery of concepts and creative thinking of students on energy business material at SMAN 1 Gerung.

4. Conclusion

Based on the results of the study, it can be concluded that the learning cycle 5E model has an effect on improving concept mastery and creative thinking of students in renewable energy manteri at SMAN 1 Gerung. This makes the learning cycle 5E model a useful alternative learning model for educators to improve student learning outcomes, especially in concept mastery and creative thinking.

Acknowledgment

form.) Citation ranges should be formatted as follows: [1], [2], [3], [4] (as opposed to [1]-[4], which is not IJCSE style). When citing a section in a book, please give the relevant page numbers [2]. In sentences, refer simply to the reference number, as in [3]. Do not use "Ref. [3]" or "reference [3]" At the beginning of a sentence use the author names instead of "Reference [3]," e.g., "Smith and Smith [3] show ... ." Please note that references will be formatted by IJCSE production staff in the same order provided by the author.

References

[1] Agustina, I. 2020. Efektivitas pembelajaran matematika secara daring di era pandemi covid-19 terhadap kemampuan berpikir kreatif. *Desimal: Jurnal Matematika*, June, 1(1), 1-11.

[2] Aripin, W. A., Sahidu, H., & Makhrus, M. 2021. Efektivitas perangkat pembelajaran fisika berbasis model problem based learning untuk meningkatkan kemampuan pemecahan masalah dan kemampuan berpikir kritis peserta didik. *Jurnal Penelitian dan Pembelajaran Fisika Indonesia,* 3(1). DOI: 10.29303/jppfi.v3i1.120

[3] Hernawati, E. 2018. *Fisika SMA/MA Kelas X. Jakarta*: Pusat Perbukuan Kemendikbud.

[4] Ichtiari, B. M., Verawati, N. N. S. P., Ardhuha, J., & Susilawati, S. 2022. Pengembangan Perangkat Pembelajaran Model Cooperative Tipe Think Talk Write Untuk Meningkatkan Kemampuan Berpikir Kreatif dan Penguasaan Konsep Fisika Peserta Didik. *Jurnal Ilmiah Profesi Pendidikan*, 7(2b), 565-573. DOI: 10.29303/jipp.v7i2b.568

[5] Mulyani, S. 2021. Pendidikan: Pengertian, Tujuan, dan Manfaatnya. *Jurnal Pendidikan dan Pembelajaran*, 1(1), 1-10.

[6] Pratama, A. R., Iswandi, I., Saputra, A., Hasan, R. H., & Arifmiboy, A. 2023. Pengaruh Model Pembelajaran Learning Cycle 5E terhadap Aktivitas Belajar Pendidikan Agama Islam dan Budi Pekerti di SMA Negeri 4 Kota Bukittinggi. *Cendekia: Jurnal Ilmu Sosial, Bahasa dan Pendidikan,* 3(1), 16-28. DOI: https://doi.org/10.55606/cendikia.v3i1.642

[7] Puspa, C. I. S., Rahayu, D. N. O., & Parhan, M. 2023. Transformasi pendidikan abad 21 dalam merealisasikan sumber daya manusia unggul menuju indonesia emas 2045. *Jurnal Basicedu*, 7(5), 3309-3321. DOI: https://doi.org/10.31004/basicedu.v7i5.5030

[8] Sahidu, H. 2018. *Model-model Pembelajaran Fisika yang Menarik dan Efektif*. Yogyakarta: Pustaka Pelajar.

[9] Siswanti, A. B., & Indrajit, R. E. (2023). *Problem Based Learning.* Penerbit Andi.

[10] Soebagio, A. B. 2001. *Model-model Pembelajaran*. Jakarta: PT. Grasindo.

[11] Sugiyono. 2021. *Metode Penelitian Kuantitatif, Kualit atif, dan R&D*. Bandung: Alfabeta, CV.

[12] Wulandari, T., & Mudinillah, A. 2022. Efektivitas penggunaan aplikasi canva sebagai media pembelajaran ipa mi/sd. *Jurnal Riset Madrasah Ibtidaiyah,* 2(1), 102-118. DOI: https://doi.org/10.32665/jurmia.v2i1.245

[13] Yasiro, L. R., Wulandari, F. E., & Fahmi, F. (2021). Analisis kemampuan berpikir kreatif siswa dalam menyelesaikan soal pada materi pemanasan global berdasarkan prestasi siswa. *Journal of Banua Science Education*, 1(2), 69-72. DOI: https://doi.org/10.20527/jbse.v1i2.11