JoSLEPI 2 (2) (2024)
Journal of Science Learning Process and Instructional Research
https://journal.riau-edutech.com/index.php/joslepi
ISSN 3031-3252
Publisher :
Andester Riau Edutech
Pusat Inovasi Pendidikan dan Teknologi

Implementation of the ECIRR (*Elicit, Confront, Identify, Resolve, Reinforce*) Learning Model in Work and Energy Material for Improving Cognitive Learning Outcomes of Class XI Students SMAN 2 Tambang

Cici Elizabeth [1] , Dedi Irawan [1], Ernidawati [1]

[1] *Physics Education, Faculty of Teacher Training and Education, Riau University*

*Corresponding author's email: cici.elizabeth3223@student.unri.ac.id

Submiited: 30/04/2024
Revised: 27/05/2024
Accepted: 27/05/2024
Published: 09/08/2024
Vol. 2
No. 2

ABSTRACT

This research aims to describe improving students' cognitive learning outcomes through the application of the ECIRR learning model to work and energy material at SMAN 2 Tambang. This research was carried out in the 2023/2024 academic year in the even semester. Quasi-experiment is a method in this research with a non-equivalent posttest only control group design. The population in the study was class XI students of SMAN 2 Tambang with a total of 139 people. The samples were classes XI.1 and XI.2, totaling 69 people. The research instrument is in the form of written questions on cognitive learning outcomes consisting of 20 multiple choice questions arranged based on indicators of cognitive learning outcomes in accordance with the revised Bloom taxonomy. The posttest on cognitive learning results was carried out after learning the material on work and energy was completed in both classes. The data from the cognitive learning posttest were then analyzed descriptively and inferentially. The results of data processing show that there is a difference in the average score of the experimental class, namely 67.79 (good category) and the average score of the control class, namely 51.43 (fairly good category). Inferential analysis shows that there are significant differences between the group that applies learning using the ECIRR learning model and the group that applies conventional learning.

Keywords: *Cognitive learning outcomes, ECIRR Learning Model, Work and Energy*

1 Introduction

Education is one of the keys to the progress of a nation, with a good standard arrangement of educational elements, it will produce quality human performance. Form a business with awareness to gain knowledge through education. The state of learning in the learning process so that students proactively improve their ability to have religious values and character, self-control, character and morals, intelligent intellect, noble morals and the skills needed by themselves and society are realized through education (Rahman, et al., 2022:2). At this time, the world is in the 21st century which is marked by developments in all fields, including in the field of education. Education certainly plays a major role in ensuring students learn skillfully and think critically, are skilled in utilizing technology and can work and have life skills.(Ariyansyah, 2018:2-3). With increasingly sophisticated technology and increasingly modern lifestyles, this shows its practical value (Delviandri 2023:2).

In the 2019 Indonesian Human Development Report, Indonesia's Human Development Index (HDI) was ranked 111th out of 189 countries. The OECD conducted a survey of student abilities by the Program for International Student Assessment (PISA) in Paris in December 2019, placing Indonesia in 72nd place out of 77 countries. The quality of Indonesian education in ASEAN is currently ranked 5th. The decline in the quality of education and students' cognitive knowledge can also be seen from the results of the National Examination (UNBK), which decrease every year(Arista et al., 2022:124).

How to Cite :
Elizabeth, C. *et al*. (2024). Implementation of The ECIRR (*Elicit, Confront, Identify, Resolve, Reinforce*) Learning Model in Work and Energy Material for Improving Cognitive Learning Outcomes of Class XI Students SMAN 2 Tambang. *Journal of Science : Learning Process and Instructional Research* (JoSLEPI), 2(2), 1-8

According to Minister of Education and Culture Regulation no. 59 of 2014 physics learning at the high school level is important because it can be a means of developing thinking skills in solving problems in everyday life for students(Haspen et al., 2022:10). In reality, the objectives of physics learning have not been achieved. The quality of education in Indonesia is still categorized as low (Ikayanti et al., 2017:162).

Physics is a field of study that plays an important role for students, but the importance of physics lessons has not been balanced with good cognitive learning knowledge. It can be seen from the 2019 UNBK results which show that the average Physics UNBK score for students in Indonesia is 46.47 (2019 Ministry of Education and Culture UNBK Results). This shows that students' knowledge abilities in the field of physics at school are still less than optimal(Arista et al., 2022:124). Based on an interview conducted with Mrs. Hafirizka, M.Pd, a physics teacher at SMA Negeri 2 Tambang, she said that students' physics learning outcomes were relatively low and were decreasing. Low physics learning outcomes certainly indicate a lack of students' cognitive abilities. According to Lasmini(2019:330) less than optimal learning process activities cause students' low cognitive abilities. In learning, students tend to only understand science as a product, by memorizing relevant concepts, theories and laws (Megahati et al., 2023:38). This causes students not to understand the true purpose of learning physics, so the learning process becomes boring.

Teachers have an important role in the learning process, they are expected to provide an interactive and quality learning experience for students. Choosing a learning model is very necessary to attract and trigger students' attention so that they actively participate in teaching and learning activities (Isty et al., 2023: 9). In general, the learning models used by teachers have not been implemented optimally and are varied. The learning model used is the Direct Instruction learning model, where the learning process carried out in the classroom is still dominated by the teacher (teacher centered) using the lecture method. Azmi et al (2023:3) say that some students are less interested in using the lecture method in explaining physics material because it makes students sleepy while studying. This results in students only listening to the teacher's explanation so that students are passive and unable to respond well to the lessons given. Learning activities are still centered on listening and listening activities, not interpreting the meaning of what is learned, as well as efforts to build their own knowledge, as a result students cannot master learning optimally.(Redhana, 2019:2241).

Learning activities are limited to discussing theories that are already in the student handbook, every time they are given the opportunity to ask questions, not a single student dares to ask or express an opinion.(Suweta, 2022:114). As a result, physics is limited to reading and students can only imagine (Amalia et al, 2024:34).A student-centered learning model is needed as an effort to improve students' cognitive learning outcomes in schools. In facing the challenges of the 21st century, teachers are expected to prepare students to have good cognitive abilities so that they can improve student learning outcomes. One learning model that can develop students' cognitive abilities where students are required to be active in class by training students to build their own conceptual knowledge is by using the ECIRR (Elicit, Confront, Identify, Resolve, Reinforce) learning model. This learning model requires students to build their own knowledge based on previous knowledge that students have, so that students do not immediately accept statements (knowledge) conveyed by the teacher. This model provides opportunities for students to express and weigh the results of their own thoughts. Students will not just state the final answer, but students will use higher level thinking skills to find and explain the right way to solve the problem they face.

The ECIRR learning model has five syntaxes in the learning process, namely Elicit, Confront, Identify, Resolve, Reinforce (Wulandari & Rusmini, 2021:2). At stage elicit, teachers explore students' initial knowledge by providing activities that can stimulate students to think. This stage can identify initial concepts and even misconceptions experienced by students. The second stage, namely confront, at this stage the teacher confronts students' initial conceptions so that students experience cognitive conflict through questions and demonstrations. The third stage, namely identify, at this stage students explain the initial conception they experienced. At this stage, the teacher also identifies misconceptions expressed by students. The fourth stage, namely resolve, at this stage the teacher facilitates students to overcome the problems they have in the initial concept. The final stage reinforce,where the teacher review or provide reinforcement of the concepts that have been conveyed (Ardiansyah et al., 2019:78).

In the field of mechanics, one of the materials that is quite complex can be viewed from the relationship between concepts, namely work and energy (Maison et al., 2020:2). Results of research conducted by Maison et al., (2020) shows that the conceptual understanding experienced by students in the work and energy material is relatively low with the average percentage of students' understanding score obtained being only 24%, there are misconceptions in the work and potential energy sub-chapter of 80%, the relationship between energy kinetic, potential energy and mechanical energy are 43%. This is also supported by research conducted by Darmawanet al., (2019) which shows that it is not only students who experience misconceptions about work and energy material but also university students. Darmawan revealed that students' understanding of work and energy material was still classified in the low comprehensive category, as evidenced by the results of the average percentage score that understood the concept being only 26.09%. Misconceptions are a serious problem in Indonesian education. Misconceptions are also one of the factors causing poor student learning outcomes (Ananda & Syuhendri, 2021:2). From the explanation outlined above, through the learning process using the ECIRR learning model it is hoped that it can improve students' cognitive abilities, therefore the author will conduct research entitled "Implementation of the ECIRR(Elicit, Confront, Identify, Resolve, Reinforce) Learning Model on Work and Energy Material to Improve Cognitive Learning Outcomes of Class XI Students of SMAN 2 Tambang".

2 Research Methodology

2. 1 Time and Place

This research was carried out at SMA Negeri 2 Tambang in the 2023/2024 academic year in the even semester. The research was conducted in November 2023 - January 2024.

2. 2 Research Subject

The sample in this research were students in classes XI.1 and XI.2 at SMA Negeri 2 Tambang with a total sample size of 69 students.

2. 3 Research Design

The type of research used in this research is quasi-experimental by design non-equivalent posttest onlycontrol group design (Hastjarjo, 2019:194). The research design can is shown in Table 1.

Table 1. Research design

Group	Treatment	*Posttest*
Experiment	X_1	O_1
Control	-	O_2

Keterangan:
X_1 = Learning treatment uses the ECIRR
O_1 = Results posttest experimental class
O_2 = Results posttest control class

2. 4 Research Instrument

The learning tools used consist of learning modules, Work and Energy PPT, LKPD andPhET Simulation.

2. 5 Data Collection Instrument

This research instrument used in this study was a cognitive learning ability test for class XI SMA for thecontext of work and energy material. This test indicator was prepared by referring to Bloom's taxonomy. This test consists of 20 question items from 6 indicators of cognitive learning outcomes.

2. 6 Data Collection Techniques

The data collection technique in this research used a written test. The test consists of 20 multiple choice questions. The sample was divided into two class groups in the research design, class XI.2 was used as the experimental group and class XI.1 was used as the control group. The experimental group gained knowledgeabout work and energy material through the ECIRR learning model and the control group through conventional learning. Research data was collected by administering cognitive learning outcomes tests after learning the material on work and energy was completed (*posttest*). The post-test aims to measure the increase in students' cognitive learning outcomes regarding work and energy material. Each correct answer receives a score of 5, while incorrect answers receive a score of 0.

2. 7 Data Analysis Techniques

The method used consists of descriptive and inferential, using hypothesis testing to obtain differences in cognitive learning outcomes that apply the ECIRR learning model with students' cognitive learning outcomes from conventional learning on work and energy material. The data is collected as it should be, then processed and analyzed to provide a picture of the problems discussed, which is the meaning of descriptive analysis (Andriani, 2019: 9). According to Sugiyono (2022:255), identifying sample data through inferential techniques then the results obtained can be concluded as a population, which is an inferential analysis.

3 Results and Discussion

3.1 Descriptive Analysis Results

From on the results of data analysis, found a comparison of students' cognitive learning outcomes after using it *ECIRR* learning model and conventional learning models in the context of work and energy material. Data on average score results posttest. The ability of students' cognitive learning outcomes in the experimental and control classes effort and energy material per indicator is in accordance with the cognitive learning outcomes test indicators which refer to the revised Bloom taxonomy as well as categories that are in accordance with the criteria for interpreting students' cognitivelearning outcomes as shown in Table 2.

Table 2. Analysis of cognitive learning outcomes of experimental and control classes in every aspect

Resuits Aspect Cognitive Learning	Experimental Class		Control Class	
	Average	**Category**	**Average**	**Category**
C1 (remembering)	88,24	Very Good	77,14	Good
C2 (understand)	86,76	Very Good	74,29	Good
C3 (apply)	81,86	Very Good	64,28	Good
C4 (analyze)	61,76	Good	43,67	Enough
C5 (evaluate)	44,12	Enough	30,00	Not enough
C6 (creating)	41,18	Enough	25,71	Not enough
Average score	67,79		51,43	
Standard deviation	11,023		10,612	
Category	Good		Enough	

Table 2 shows data on the average value of students' cognitive learning outcomes in the experimental and control classes which are compiled from aspects of cognitive learning outcomes based on the revised Bloom taxonomy. The experimental class achieved an average value of 67.79 in the good category and the control class achieved an average value of 51.43 in the quite good category. The distribution of data on students' cognitive learning outcomes in the experimental and control groups can be seen in Table 3.

Table 3. Distribution of score categories for experimental and control classes students

Intervals	Category	Experimental Class		Control Class	
		Amount Student	**Percentage (%)**	**Amount student**	**Percentage (%)**
81≤ X ≤ 100	Very good	4	11,76	0	0
61≤ X ≤ 80	Good	21	61,77	5	14,29
41≤ X ≤ 60	Enough	9	26,47	23	65,71
21≤ X ≤ 40	Not enough	0	0,00	7	20,00
0 ≤ X ≤ 20	Very bad	0	0,00	0	0,00
	Amount	34	100,00	35	100,00

Table 3 shows the percentage differences between the cognitive learning outcomes of experimental class and control class students. Students who has cognitive learning results in the good category in the experimental class the highest percentage is 61.77% of the total students in the class. Learning outcomes cognitive level in the control class occupied the highest percentage, namely 65.71% being in the sufficient category has sufficient cognitive learning outcomes. A comparison of the achievement of student learning outcomes in each cognitive aspect can be seen in graphical form in Figure 1.

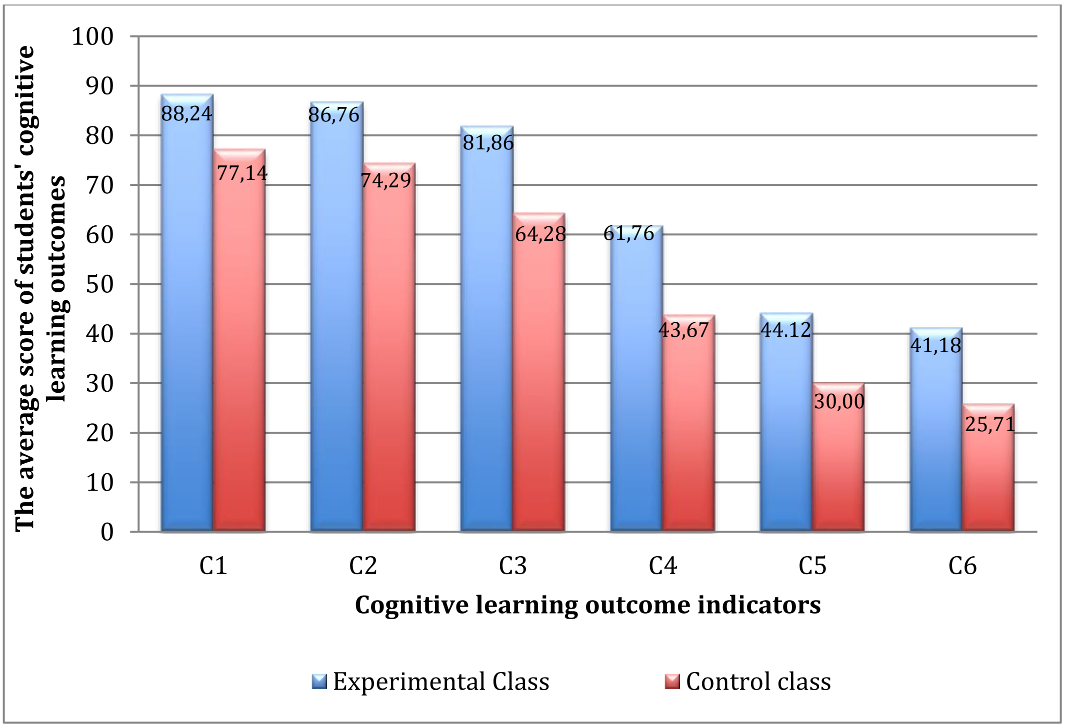

Figure 1. Comparison graph of learning outcomes for each indicator

Figure 1 shows that intervals the highest posttest average score is on the analyzing indicator (C4). The difference in posttest scores between the experimental and control classes in the analyzing aspect was 18.06.

3.2 Inferential Analysis Results

In this research, inferential analysis uses SPSS version 22 software, involving normality tests, variance tests, and hypothesis tests (t-test).

Tabel. 3.3 Results of Inferential Research Analysis

Results Study	Types of Analysis Inferential	Group	Jenis Uji	Sig	Hasil Uji
Material Work dan Energy	Uji Normalitas	Experiment	*Kolmogrov*	0.119	Normal Data
		Control	*Smirnov*	0,161	Normal Data
	Uji Varians	Experiment and control	*Levene's Test for Equality of Variances*	0.947	Both classes same variance
	Uji Hipotesis (uji-t)	Experiment and control	*Independent sampel t test*	0.000	Ho was rejected dan Ha accepted

Obtaining normality test results for data that has been processed using the Kolmogorov-Smirnov technique assisted by SPSS version 22 software shows that the significance value for the experimental class is 0.119 and for the control class is 0.161. Because both significance values are > 0.05, it can be concluded that learning outcomes in the experimental class and control class is normally distributed. Next is the variance test using the Levene test, the significance value of the Levene test for the data as a whole is > 0.05, namely 0.947, which means the posttest data is homogeneous.

The requirements for conducting hypothesis testing with the t test have been carried out So the test method used is the independent samples t-test. This test is used to assess whether there are significant differences in the form of increased cognitive abilities in student learning achievement in classes that apply the ECIRR learning model and classes that apply conventional learning. Obtaining the results of the t test carried out, for Overall data obtained a value of t = 6.284 with sig. (2-tailed) of 0.000. Refers to decision making the condition is, if the significance level (p) <0.05 then H_0 is rejected, so that these results are obtained hypothesis testing can be concluded that there is a significant difference in students' cognitive learning results, between classes that apply learning using the ECIRR learning model and classes that apply conventional learning to work and energy material.

4 Conclusion

The conclusion obtained is that the cognitive learning outcomes of students in classes that apply learning using the ECIRR learning model are better than the cognitive learning outcomes of students in control classes that apply conventional learning. Classes with learning using the ECIRR learning model are superior in each indicator of cognitive learning outcomes and overall. After carrying out inferential analysis, itwas found that there were significant differences between classes that implemented learning using the ECIRR learning model and classes that applied conventional learning. Conclusions can be drawn, implementation of the ECIRR learning model is effectively used to improve the cognitive learning outcomes of SMA Negeri 2 Tambang students on work and energy material.

5 Acknowledgement

We would like to thank the Department of Physics Education, FKIP, Riau University.

Reference

Amalia, I., et al. (2024). Development of Learning Tool Based on Inquiry Training Model to Understand Students Concept on Harmonic Vibration Material.*Journal of Science : Learning Process and Instructional Research (JoSLEPI)*, 2(1),33-39

Ananda, L., & Syuhendri, S. (2021). Misconceptions of prospective physics teacher students in IPBA courses with period material the moon's orbit around the earth.*Proceedings of the 2021 National Science Education Seminar*. https://conference.unsri.ac.id/index.php/semnasipa/article/view/2196/1298

Andriani, Rida. (2019).*Descriptive Analysis of Editorial Management at Global Planet. News.*Undergraduate Thesis thesis, UIN Raden Fatah Palembang. https://repository.radenfatah.ac.id/10794/

Ardiansyah, A., Dirgantara, Y., Agustin, RD, & Sugilar, H. (2019). Application of the ECIRR Learning Model (Elicit,Confront, Identify, Resolve, Reinforce) to Improve Students' Problem Solving Ability in Static Fluid Material.*Physics Learning Research Journal*,*10*(1), 77–82. https://doi.org/10.26877/jp2f.v10i1.3543

Arista, KD, SUma, K., & Suastra, IW (2022). The Effect of E-Assisted Phenomenon Based Learning Learning on Critical Thinking Abilities and Student Learning Motivation.*Undiksha Journal of Physics Education*, *12* (1),154–163. https://doi.org/10.23887/jjpf.v12i1.41462

Ariyansyah, A. (2018). Application of Several 21st Century Skills Through the Field Trip Method to Improve the Quality of Learning on Low Level Plant Taxonomy.*Oryza (Journal of Biology Education)*,*7*(1), 1–9. https://doi.org/10.33627/oz.v7i1.11

Astuti, W., Sulastri, S., Syukri, M., & Halim, A. (2023). Implementation of the Science, Technology, Engineering Approach,and Mathematics to Improve Students' Scientific Literacy Abilities and Creativity.*Indonesian Science EducationJournal*,*11*(1), 25–39. https://doi.org/10.24815/jpsi.v11i1.26646

Azmi, SN, Irawan, D., Azhar .(2023). Application Of The Phenomenon Based Learning (PHENOBL) Model To Temperature And Heat Materials To Improve Concept Understanding Of Students In Class XI SMA. 10, 1– 11

Darmawan, A., Ramadhana, Z., Hadi, P., & Suyudi, A. (2019). Understanding the Concepts of Prospective Teacher Students in Work and Energy Topics through Graphical Representation.*Journal of Physics Education Innovation and Integration, 02*(02), 41–54. https://www.researchgate.net/publication/352785856

Delviandri, R., & Irawan, D. (2023). Development of Simple Light On / Off Controller Using LDR Sensor-Based Relay and Arduino Uno on Physics Learning Electromagnetic Materials.*Journal of Science : Learning Process andInstructional Research (JoSLEPI)*, 1(1) , 1–7.

Hastjarjo, T.D. (2019). Quasi-Experimental Design.*Psychological Bulletin*,*27*(2), 187. https://doi.org/10.22146/buletinpsychologi.38619

Ikayanti, R., Suratno, S., & Wahyuni, D. (2017). Critical Thinking Skills In Science On Junior High School By Problem Based Learning Models.*The Radiance of Education*,*6*(3), 162–177. https://doi.org/10.25037/pancaran.v6i3.78

Isti, MF (2023). Analysis of Interest and Written Scientific Communication Skills Using the TGT Type Cooperative Learning Model Assisted by Spinnerwheel.com.*Journal of Science : Learning Process and Instructional Research(JoSLEPI)*,1(1), 8-14

Lasmini, NW (2019). Improving Student Learning Outcomes Through Cooperative Learning Models in Mata Science lessons in Class V of SD Negeri 2 Tatura.*Tadulaki Creative*,*4*(4), 329–342. https://media.neliti.com/media/publications/116269-ID-meningkatkan-hasil-belajar-siswa-through.pdf

Maison,M., Lestari, N., & Widaningtyas, A. (2020). Identifying Student Misconceptions in Work and Energy Material.*Journal of Science Education Research, 6(1)*, 32–39. https://doi.org/10.29303/jppipa.v6i1.314

Megahati S, RRP. Et Al (2023). Students Scientific Attitude in Learning Physics with Cooperative Model Through The Guided Note Taking (GNT) Method in Class X6 SMA Negeri 1 Kampar. Journal*of Science : Learning Process and Instructional Research (JoSLEPI)*, 1(1), 37-41

Rahman, A., Munandar, SA, Fitriani, A., Karlina, Y., & Yumriani. (2022). Understanding Education, Educational Science and Elements of Education.*Al Urwatul Wutsqa: Study of Islamic Education*,*2*(1), 1–8. https:// journal.unismuh.ac.id/index.php/alurwatul/article/view/7757

Redhana, IW (2019). Developing 21st Century Skills in Chemistry Learning.*Innovation Journal Chemistry Education*,*13*(1). https://doi.org/10.15294/jipk.v13i1.17824 Sugiyono. (2022).*Research and Development Methods*. ALPHABET: Bandung

Suweta, IP (2022). Implementation of the Ecirr Learning Model to Increase Motivation and Learning Achievement Physics for Class *Daiwi Widya*,*9*(1), 111–127. https://doi.org/10.37637/dw.v9i1.1012

P., Dwi, C., Haspen, T., Studi, P., & Education, M. (2022).*Journal of Physics Research and Learning – Vol 8 N.8*, 10–16. https://ejournal.unp.ac.id/index.php/jppf/article/download/115684/106170

Wulandari, CA, & Rusmini. (2021). The Effect of Using Lkpd with the Ecirr Deep Learning Model Reducing Misconceptions in Class X High School Stoichiometry Material.*Orbital: Journal of Chemical Education*,*5*(1), 1–12. https://doi.org/10.19109/ojpk.v4i1.5487