Jurnal Penelitian Pembelajaran Fisika
Vol. 15 Issue 3 – July 2024, p338-344
p-ISSN 2086-2407, e-ISSN 2549-886X
Available Online at http://journal.upgris.ac.id/index.php/JP2F
DOI: 10.26877/jp2f.v15i3.20472

Improving Learning Outcomes Using Case Based Learning (CBL) Assisted by Interactive Videos on Optical Materials

I Gede Windrawan[1,2], Abdul Muhyi[1] and I Made Astra[1]
[1]Department of Master Physics Education, State University of Jakarta, Jl. Rawa Mangun Muka No. 11 RT.11/RW.14, Rawamangun, Pulo Gadung District, East Jakarta City, Special Capital Region of Jakarta 13220

[2]E-mail: gedewindrawan@gmail.com

Received: 1 June 2024. Accepted: 15 July 2024. Published:31 July 2024

Abstract. This study examines the effectiveness of applying the Case Based Learning (CBL) Model assisted by interactive videos in improving students' cognitive learning outcomes on optical materials. The method used is Classroom Action Research with the subject of grade XI MIPA 5 students at SMA Negeri 6 Tangerang Regency for the 2023/2024 school year. This research was carried out in three cycles, including planning, implementation, observation, and reflection. The results showed that implementing interactive video-assisted CBL significantly improved students' cognitive learning outcomes. The average cognitive score of students increased from 55.6 in the first cycle, to 70.4 in the second cycle, and reached 75.2 in the third cycle. In addition, the success rate of classical learning also increased from 28.7% in the first cycle to 79.7% in the third cycle. This improvement shows that interactive video-assisted CBL is effective in actively engaging students in learning, improving conceptual comprehension, and motivating students to learn physics. This study suggests the application of interactive video-assisted CBL as an alternative learning method that can improve the quality of physics education in schools.

Keywords: Cased Based Learning (CBL), interactive videos, cognitive learning outcomes

1. Introduction

Education is a process of transforming the attitudes and behaviors of individuals and groups, aiming to mature through teaching and training [1]. Entering the 21st century, the national education system faces complex challenges in preparing quality human resources (HR) who can compete globally. Education is an important instrument in preparing quality human resources and functions as the main tool to build superior human resources [2]. According to Hayani (2019), the development of education in the 21st century must be accompanied by a change in teachers' perspectives on teaching in the classroom [3]. Education in this era is expected not only to provide theoretical knowledge, but also to prepare students to become a generation that is ready to work, critical in understanding information, innovators, and have skills in using and utilizing technology and information media that are developing rapidly. According to the "21st Century Partnership Learning Framework", there are several skills that must be possessed by 21st-century students, including Critical Thinking and Problem-Solving, Communication, Creativity and Innovation Skills, and Collaboration Skills.

Hayani (2019) also explained that to achieve 21st-century skills, the Independent Curriculum gives teachers the freedom to use various methods that can improve students' skills. 21st-century learning has two main characteristics: first, a learning process that actively involves students; Second, learning is directed to improve students' thinking skills [3]. This thinking process helps students gain knowledge that they have built on their own. One of the applications of the Independent Curriculum is in physics subjects.

Physics is a branch of natural science (IPA) that studies natural phenomena. Natural sciences play an important role in shaping qualified students [4]. Physics learning should be designed in such a way that students are actively involved, which in turn can improve physics learning outcomes. However, learning in schools is still often teacher-centered. Research by Pitriah and colleagues (2018) shows that the lack of interaction between teachers and students causes learning to be one-way. As a result, students rarely ask questions, get sleepy, and do not listen to the teacher's explanations, so learning becomes monotonous and passive, which has a negative impact on students' learning outcomes [5].

Based on the results of observations and interviews at SMA Negeri 6 Tangerang Regency, the learning outcomes of grade XI students are still not optimal, because many have not reached the KKM score set by the school, which is 75. This can be seen from the average score of physics private universities in odd semesters which is quite low. The physics learning process in grade XI is still dominated by teachers (teacher-centered). The results of interviews with several students in grade XI showed that physics was considered a difficult and boring subject because of the many complicated formulas. This opinion is in line with Charli and colleagues (2018) who stated that physics is considered difficult by students because they do not master the concept of matter well, so they do not know the formula that must be used. Students tend to memorize physics formulas rather than understand concepts, which has an impact on low interest in learning and physics learning outcomes [6].

To overcome these problems, it is necessary to implement a learning model that is appropriate and able to actively involve students. One of the alternative learning models that can be applied is Case Based Learning (CBL). The CBL model is a learning method that focuses on complex cases based on real conditions to stimulate classroom discussion and collaborative analysis. According to Pratiwi and colleagues (2015), case-based learning involves factual learning and investigation of current issues in daily life [7]. Mutmainah (2008) added that case-based learning emphasizes approaches to problem-solving that are often encountered in daily life, as well as involving interactive conditions and students' exploration of realistic and specific situations [8].

Type Case Based Learning (CBL) has several advantages, namely: (1) developing analytical skills, (2) improving the ability to apply theory in a practical context, (3) promoting independence in finding solutions through problem-solving exercises, (4) increasing confidence, enthusiasm, group cooperation, and oral presentation skills. The application of the CBL model makes it easier for students to use basic skills to solve cases given in the learning process [9]. The study by Dewi & Hamid (2015) shows that the implementation of CBL in Chemistry learning for grade X students has a positive effect on generic science skills and concept understanding, especially on petroleum materials [9]. Research by Angela and colleagues (2018) also found that CBL increased the learning effectiveness of accounting students at Maranatha Christian University [10]. These findings suggest that CBL contains the characteristics of Student-Centered Learning (SCL) and Contextual Teaching and Learning (CTL).

In addition to the learning model, learning media also has a crucial role in improving students' understanding of concepts. The use of learning media can make it easier for teachers to convey material and help students understand the material more easily so that they become more interested and motivated to learn physics [11]. One of the effective media to help understand physics concepts is interactive videos. This video documents the physical symptoms in real life, which can then be analyzed to improve students' understanding of physics concepts in solving the problems in the video [12]. The use of interactive videos is expected to meet the demands of 21st-century learning. As stated by Hayani (2019), the success of learning does not only depend on the learning method, but also on other factors such as teaching aids, learning media, and the availability of facilities [13,14,15]. In addition, this interactive video has taken advantage of technological advances as a learning medium. According to Hamdanillah and colleagues (2017), the use of video as a learning medium is proven to significantly improve student learning outcomes, because students are required to be active in the learning process. With video as a learning medium, it is hoped that it can help students understand the material taught [16].

Based on the problems that have been described, it is very important to test the application of Model Case Based Learning in learning physics, especially in optical materials, through research. This research is needed to find alternative solutions in physics learning so that learning goals can be achieved and physics learning becomes interesting and not monotonous. For this reason, a study was conducted with the title "Improving Learning Outcomes using Case Based Learning (CBL) Assisted Interactive Video on Optical Materials".

2. Method

This research uses the following methods: Action Research or Classroom Action Research (CAR), which aims to address problems that arise in the classroom environment. At the beginning of the learning process, issues occurring in the classroom are identified, and researchers determine interventions as solutions to address them. Researchers observe behavioral changes when students implement the suggested actions. These actions can be described as either unsuccessful or successful. If the action taken does not yield satisfactory results, subsequent actions are repeated in the second, third, and so on cycles. The subjects of this study are students of SMA Negeri 6 Tangerang Regency, class XI MIPA 5, in the 2023/2024 academic year. The class consists of 39 students, 22 females, and 17 males. Data collection took place from the fifth week of May 2024 to the first week of June 2024. The study design is based on the model by Kemmis and McTaggart, which adapts each cycle to refer to a gradual phase, as shown in **Figure 1** [8].

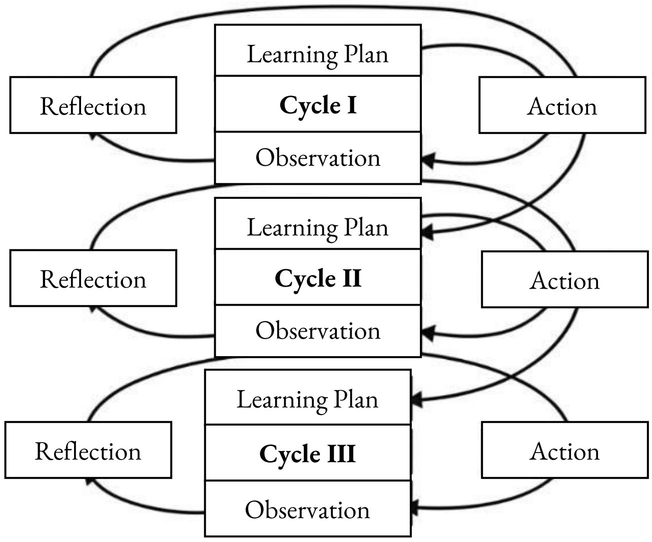

Figure 1. Action Research Flow.

The research was carried out in cycles, each consisting of four stages: planning, action, observation, and reflection. During the planning stage, the researcher develops a learning plan aimed at solving the identified classroom problems. The actions include implementing the Case-Based Learning (CBL) model assisted by interactive videos. Each cycle consisted of one meeting, after which observations were conducted to assess changes in student behavior. Reflection was then carried out to evaluate the effectiveness of the actions, and if the results were not satisfactory, a new action plan was devised for the next cycle [8]. The independent variable in this study is the application of the CBL model with the assistance of interactive videos, while the dependent variable is the students' learning outcomes on the topic of optical devices.

Data collection was conducted using evaluation tests and questionnaires at the end of each cycle. The cognitive element was assessed through learning tests measured by questionnaires. The data analysis methods used were qualitative and comparative, involving a comparison of the quantitative data on students' cognitive learning outcomes. Based on the total score, the level of enthusiasm for learning physics is categorized as "very high," "high," "moderate," "low," or "very low." The calculation of students' overall cognitive learning outcomes was carried out by calculating the average test scores obtained and analyzing the level of classical learning success. A learning outcome is considered complete when it meets the minimum performance standard (KKM), which is 75 or more.

The interactive videos used in this research were designed to facilitate the Case-Based Learning model. These videos served as visual aids that presented case scenarios related to the topic of optical devices. The videos were equipped with interactive questions that encouraged students to think critically and engage in discussions, helping them to better understand key concepts. The level of enthusiasm for learning physics was categorized based on the total score obtained from the questionnaire, with the following ranges:

Table 1. Categories of Cognitive Learning Outcome Score.

Range	Category
85-100	Very High
70-84	High
55-69	Moderate
40-54	Low
0-39	Very Low

These ranges were adapted from previous studies that assessed students' motivation using Likert scales [8].

3. Results and Discussion

This research was carried out with three learning cycles to realize the improvement of students' cognitive learning outcomes on optical topics. The steps to carry out the cycle consist of four stages: planning, actions, observations, and reflections. Phase Planning was implemented through the development of a CBL model strategy (Case-Based Learning) assisted by interactive video. In the actions, learning occurs according to the syntax of the CBL model. The syntax of this model consists of 1) establishing cases relevant to the material, 2) analyzing cases by discussing them in groups, 3) independently finding information, data, and literature, 4) making conclusions from the answers discussed together, 5) presenting the agreed-upon results, and 6) correcting incorrect answers [7]. The CBL method is used as a method of discussion and collaboration to achieve a maximum learning experience, both individually and in groups. After learning, a comprehensive test will be carried out to ensure the improvement of students' cognitive learning outcomes.

This research aimed to measure students' cognitive learning outcomes by evaluating them through tests administered at the end of each learning cycle. After obtaining the cognitive learning outcomes, the average and success of classical learning were calculated. The data on the calculation of the average cognitive learning outcomes and classical learning success are presented in Table 2 below. The CBL method assisted by interactive videos was effective in improving students' cognitive learning outcomes on optical materials. This was evident in the increase in average scores and classical learning success across the three cycles. In the first cycle, the average cognitive learning outcomes were relatively low, with a score of 55.6, and only 9 out of 39 students completed learning. The learning success rate was 28.7%. In the second cycle, the average score of cognitive learning increased to 70.4, with 21 students achieving success, raising the success rate to 53.6%. By the third cycle, the highest cognitive learning outcomes were achieved, with an average score of 75.2, and a learning success rate of 79.7%, indicating a significant improvement across the cycles.

Table 2. Analyze the cognitive learning outcomes of each cycle.

No.	Indicators	Results Cycle I	Results Cycle II	Results Cycle III
1.	Average cognitive learning outcome score	55,6	70,4	75,2
2.	Total successful students	9	21	34
3.	Classical learning success	28,7%	53,6%	79,7%

The visualization diagram related to the results of improving students' creative thinking abilities can be seen in **Figure 2.**

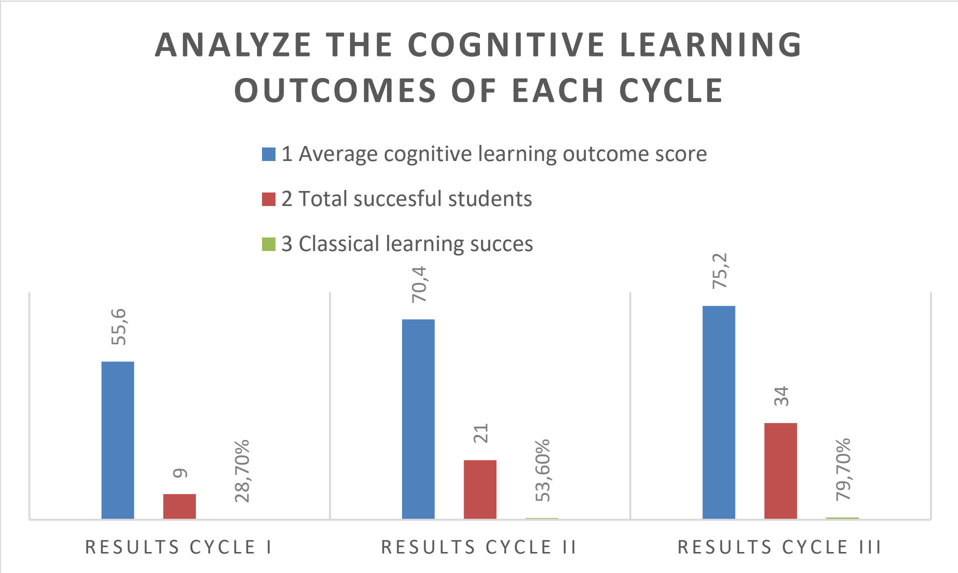

Figure 2. Result of Analyze the Cognitive Learning Outcomes of Each Cycle

From this graph, Type-Cased Based Learning Assisted by interactive videos can be used together to improve students' cognitive learning outcomes on optical materials. This can be seen in the increase in average and classical learning success. In the first cycle, the average cognitive learning outcomes were still relatively low with a score of 55.6, and only 9 out of 39 students completed learning. Of the total students who achieved grades above the minimum performance standards, the learning success rate was 28.7%. In the second cycle, the average score of cognitive learning of students increased to 70.4 and as many as 21 students succeeded. In the second cycle, the proportion based on students who obtained learning success was 53.6%. The learning success rate increased by 24.9%. In the third cycle, the highest cognitive learning outcomes were achieved, where the average score of cognitive learning was 75.2, but only fivestudents did not succeed in the test. Based on data from students who managed to learn classically, a success rate of 79.7% was obtained, an increase of 26.1% in the third cycle.

However, several challenges were encountered during the implementation of the CBL model and the use of interactive videos. Cognitive learning outcomes are still low in the first cycle. This is because students are less motivated to participate in learning. Students who are confused are reluctant to ask their friends or teachers. In cycle II, teachers direct students in data collection and analysis. This allows teachers to find solutions if problems arise. The implementation of Cycle II Learning shows that by learning students are more enthusiastic in acquiring knowledge. This can be seen from the efforts of students when responding appropriately to the practice questions given by educators. In the third cycle, cognitive learning outcomes were the highest. In addition to training the material to flow statically, the teacher also emphasizes the stage of delivering stimuli. In the stimulation phase, the teacher provides stimulating questions and perceptual videos about optical phenomena in life. By emphasizing stimulation, studentswork hard in exams, understand, and successfully find material concepts on their own.

Qualitative feedback from students further complemented the quantitative data, indicating that the use of interactive videos made the learning process more engaging and easier to understand. Some students mentioned that the visual and interactive elements of the videos helped them grasp complex concepts more quickly and retain information better. Others appreciated the group discussions and collaborative aspects of the CBL model, which encouraged them to actively participate and share their ideas. These insights suggest that while challenges were present, the combination of CBL and interactive videos not only improved cognitive outcomes but also enhanced the overall learning experience.

The achievement of full cognitive learning outcomes in students illustrates that the problem of cognitive learning outcomes can be overcome by applying the interactive video-assisted CBL model. This can be observed from the increase in the average score of cognitive learning outcomes from the first cycle, the second cycle, to the third cycle. Model application-based Cased Base Learning has the

advantage of strengthening and improving students' thinking stages and helping them evaluate the problem areas of the questions they want to answer [8]. In addition, model-based Based Learning can contribute to students practicing learning methods that involve active participation by finding information independently, and ensuring that the results achieved are easily remembered by students [9]. The use of technological media in model-based Learning can increase students' enthusiasm for learning and affect the improvement of learning outcomes [19].
Based on the explanation above, students' cognitive learning outcomes can be improved by implementing learning using Cased Based Learning with the help of interactive videos. Therefore, the combination of CBL assisted by interactive video is an appropriate step to improve cognitive outcomes in the student learning process in physics education [20].

4. Conclusion

Based on the findings from the three learning cycles in the classroom, the highest average score in Cycle III was 75.2 where the average cognitive learning score also increased. The average cognitive learning score was initially low at 55.6 in the first cycle, increased by 70.4 in the second cycle, and reached a high of 75.2 in the third cycle. So it can be concluded that there is an increase in student learning outcomes using Cased Based Learning assisted by interactive video on optical device materials. Suggestions for further research, are to conduct a pre-test before taking data, to know mathematical skills, basic concepts of understanding physics in daily life, and misconceptions from students.

Acknowledgments
Thank you to the school of SMA Negeri 6 Tangerang Regency, physics teachers, and students of gradeXI MIPA 5, for allowing us to carry out Action Research.

References

[1] Husamah, Restian and Widodo 2019 *Introduction to Education* (Malang: UMM Press)
[2] Al-Tabany 2014 *Designing an Innovative, Progressive, And Contextual Learning Model,* (Jakarta: PT. Kharisma Putra Utama)
[3] Hayani 2019 *21st Century Learning Methods* (Banten: Indonesian Mathematics Learning House)
[4] Widiarini P, Pramadi I P W Y and Mardana I B P 2021 Pengaruh Model Pembelajaran Berbasis Proyek Berbantuan Lab Virtual Terhadap Kreativitas Mahasiswa *ORBITA: Jurnal Pendidikan dan Ilmu Fisika* **7**(1) 212-218
[5] Pitriah P, Sutrio S and Taufik M 2018 Pengaruh Model Pembelajaran Berbasis Masalah Berbantuan Alat Peraga Tiga Dimensi Terhadap Hasil Belajar Fisika Peserta Didik Tahun Pelajaran 2017/2018 *Jurnal Pendidikan Fisika dan Teknologi* **4**(2) 283-290
[6] Charli L, Amin A and Agustina D 2018 Kesulitan Siswa Dalam Menyelesaikan Soal Fisika Pada Materi Suhu dan Kalor Di Kelas X SMA Ar-Risalah Lubuklinggau Tahun Pelajaran 2016/2017 *Journal of Education and Instruction (JOEAI)* **1**(1) 42-50
[7] Khoiri N, Ristanto S and Kurniawan A F 2023 Project-Based Learning Via Traditional Game In Physics Learning: Its Impact On Critical Thinking, Creative Thinking, And Collaborative Skills *Jurnal Pendidikan IPA Indonesia* **12**(2) 286-292
[8] Ismawati E Y, Khoiri N, Saefan J, Ristanto, S, Prakosa H A and Ristianti S 2023 Pengembangan E-LKPD Berbasis Problem Based Learning Untuk meningkatkan Kemampuan Pengambilan Keputusan Peserta Didik *Jurnal Inovasi Pembelajaran di Sekolah* **4**(2) 712-720
[9] Dewi C A and Hamid A 2015 Pengaruh Model Case Based Learning (CBL) Terhadap Keterampilan Generik Sains dan Pemahaman Konsep Siswa Kelas X Pada Materi Minyak Bumi *Hydrogen: Jurnal Kependidikan Kimia* **3**(2) 294-301
[10] Angela A, Tjun L T, Indrawan S and Krismawan R 2017 Penerapan Metode Pembelajaran Kooperatif Berbasis Kasus Terhadap Efektivitas Pembelajaran Mahasiswa Akuntansi Universitas Kristen Maranatha *Jurnal Akuntansi* **9**(2)

[11] Sudjana and Rivai, *Learning Media* (Bandung: *Sinar Baru Algensindo*, 2013).
[12] Riyanto A, Hamzah S and Hadiwinarto H 2022 Effectiveness of Problem-Based Learning Application with Video Assistance on Improving Medical Record Understanding *Edukasi* **16**(2) 118-124
[13] Syahidi K, Hizbi T, Hidayanti A and Fartina F 2020 The Effect of PBL Model Based Local Wisdom Towards Students Learning Achievements on Critical Thinking Skills *Kasuari: Physics Education Journal (KPEJ)* **3**(1) 61-68
[14] Maknun J 2020 Implementation of Guided Inquiry Learning Model to Improve Understanding Physics Concepts and Critical Thinking Skill of Vocational High School Students *International Education Studies* **13**(6) 117-130
[15] Yunita N, Zahara L and Sahidi K 2020 Pengaruh Model Problem Based Learning (PBL) Melalui Lesson Study Terhadap Kemampuan Berpikir Kritis Siswa *Kappa Journal* **4**(2) 233-239
[16] Hamdanillah N, Harjono A and Susilawati S 2017 Pengaruh Model Pembelajaran Advance Organizer Menggunakan Video Pembelajaran Terhadap Hasil Belajar Fisika Peserta Didik Kelas XI *Jurnal Pendidikan Fisika Dan Teknologi* **3**(2) 119-127
[17] Hidda and Sundaygara 2021 Pengaruh Model Pembelajaran Discovery Learning Dengan Metode Probing Prompting Ditinjau Dari Motivasi Belajar Siswa Terhadap Prestasi Belajar Siswa *Jurnal Sains dan Teknologi Terapan* **3**(3) 247–251
[18] Kemmis, McTaggart and Nixon 2014 *Action Research Planner Book* (Springer Science + Business Media Singapore)
[19] Gajanan D, Gaurav C and Vishal K 2020 Student Perception and Effectiveness of Case based Learning in Pharmacology *Pravara Medical Review* **12**(4)
[20] Lolang E, Andilolo J and Silka S 2023 Analisis Kelayakan Video Pembelajaran Fisika Pada Platform Youtube Materi Getaran dan Gelombang Kelas VIII SMP *Jurnal Penelitian Pembelajaran Fisika* **14**(1) 119-124