



Application of Pedagogical Content Knowledge (PCK) on Magnetic Materials Assisted by Flash Player Media to Improve Student Learning Outcomes and Activeness

Afrianus Gelu^{1✉}, Ellianawati²

¹STKIP Citra Bakti, Ngada Flores NTT, Indonesia

²Physics Education, Postgraduate FMIPA Universitas Negeri Semarang, Semarang, Indonesia

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Abstract

Pedagogical Content Knowledge (PCK) is the interaction between pedagogy and content. PCK describes the ability of teachers to integrate knowledge of the content into their knowledge of learning and student characteristics that can guide the learning situation. Flash Player media is software used to stream and view video, audio, and multimedia on a computer or supported mobile device. The purpose of this research is to know the application of PCK strategy based on flash player media to increase the mastery of concept and student learning activity. The research method used is classroom action research. Data collection techniques are carried out through tests, observations and interviews during learning. From the research results obtained t count $16,087 > t$ table $2,02$ showing that the PCK strategy based on flash player media can improve the mastery of student concepts. The observation data in the experimental class shows that there is an increase in student learning activity. In general, the conclusion that can be drawn from this research is PCK strategy based on flash player media has positive effect in the case of the improvement of learning outcomes and student learning activeness

Correspondence:

STKIP Citra Bakti

Ngada Flores NTT, Indonesia 86461

e-mail: afrigelu20@gmail.com

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INTRODUCTION

Welcoming the era of free market competition in 2030, it is necessary to prepare appropriate concrete steps to deal with it. One of the most urgent steps is to improve the quality of education which includes human resources, learning facilities, curriculum and so on (Depdiknas, 2006).

The use of computers for a field of study has now become a necessity that is widely used by many educational institutions in Indonesia to make it easier for students to learn. Robin and Linda (2001) states that developments in information technology and computers have a positive influence on the fields of science and communication because they can integrate text, graphics, animation, audio and video.

The teacher is one of the determining factors for the success of the learning process. Arends (2007) states that there are seven categories of knowledge domains that are important to be mastered by a teacher in order to carry out learning well. The domain including knowledge of: (a) Content Knowledge; (b) Pedagogical Content Knowledge; (c) Knowledge of Learners; (d) General Pedagogical Knowledge; (e) Knowledge of Educational Context; (f) Curriculum Knowledge; and (g) Knowledge of Educational ends, purposes, and values.

One of the important knowledge for teachers is Pedagogical Content Knowledge (PCK). Several definitions of PCK have been put forward by educational experts and observers. Mishra and Koehler (2006) states that PCK is pedagogic knowledge that applies to the teaching of specific content. PCK includes what approach fits the content or how content elements can be arranged for better learning. Abbit (2011) states that PCK is knowledge of pedagogy, learning practices and lesson plans, as well as appropriate methods for teaching a material, whereas Rosnita (2011) stated that PCK is one of the standards for preparing prospective teachers. One of the problems that sometimes arises in the world of education is that the use of technology is not yet optimal for the quality of our learning (Dewi & Kamaludin, 2022).

There is an increase in cognitive learning outcomes for prospective teacher students after implementing PCK by using CoRe and PaP-eRs (Marselina, 2021). The implementation of PCK with the use of appropriate media is expected to be a solution to overcome the low learning outcomes and students' interest in physics subjects. Various studies on the application of PCK have been carried out (Widodo, 2017; Maryani, I., & Martaningsih, S. T., 2015). Based on the results of previous research, it turns out that PCK has a positive impact on learning activities. This has implications for a close relationship between the way teachers teach or

pedagogical knowledge and the content of the material being taught (Saminan and Zulfira, 2015).

Based on the results of observations in MA Al Hadi Kabupaten Demak, there are still many teachers who do not utilize technology as a medium in learning. With the teacher's lack of knowledge in visualizing the material, the use of software such as Macro media Flash Player, Video Animation, Video Tracker and so on can help teachers in creating fun learning. (Putriani, 2014). Another factor that causes low physics learning outcomes is the low number of teachers who have academic qualifications, competencies and certifications in Indonesia (Sukadi and Eti, 2015). Based on the results of identification in the field, students experienced difficulty in understanding magnetic material, especially topics about determining magnetic poles, magnetic properties, how to determine the magnetic field around a straight wire carrying an electric current, and how to determine the magnetic force. By using flash player media that contains videos, images, animations and audio, it is hoped that it can increase students' understanding and activeness in studying magnetic material. This study aims to implement PCK with the help of Flash Player media in the matter of object magnetism, magnetic fields and magnetic forces with the hope of increasing student learning outcomes and activeness.

METHODS

This research uses the classroom action research research method. The research was carried out at MA Al Hadi Girikusumo, Demak Regency. The research subjects were class XII science students. Researchers used purposive sampling subject selection techniques. The results of the observations show that the selected samples truly represent the characteristics of the majority of the population. The topics displayed in the application are discussing the magnetic properties of an object, how to make a magnet, how to determine a magnetic field, how to determine magnetic force, and providing examples of the magnetic properties of objects in technology. The material presented on Flash Player media is in the form of images, videos and animations accompanied by explanatory descriptions in the form of sound and sentences written on each method image and video. The media developed also includes evaluation of student learning outcomes. The combination of interesting pictures, videos and animations can increase students' understanding of magnetism.

Data collection techniques use observation, interviews and tests. The research instrument consists of observation sheets, interviews and pretest-posttest questions. The instruments developed were validated by experts before being used. To see the validity, reliability, distinguishing

power and level of difficulty, the instrument developed was analyzed using IBM SPSS software. Data analysis used the t test and gain test. The gain test is used to determine the increase in student learning outcomes and the t test is used to determine the effectiveness in terms of increasing student learning outcomes using the PCK strategy with Flash Player multimedia.

RESULTS AND DISCUSSION

Learning on magnetism material is designed by linking pedagogy and subject matter content. Pedagogically, this learning is intended to make students not "phobic" of mathematical equations. If viewed from the content, magnetism material can be studied concretely. This is in line with Shulman

(1986) which states that PCK is part of the knowledge content which consists of understanding pedagogical knowledge (teaching methods, child development, motivation, student needs and behavior).

The learning media used involves three components, namely videos, images, and animations. Before the research was carried out, the flash player media was assessed by a media validator to determine the feasibility of the media when used in research. Based on the results of the assessment, the media validator decided that the learning media made were suitable for use in research.

Increasing student achievement in each cycle is known by analyzing data on student learning scores using N gain. Calculation of student physics learning outcomes data using N gain can be seen in Table 1.

Table 1. Value of N Gain in Cycles I, II, and III

	Cycles I			Cycles II			Cycles III		
	Pre-test	Post-test	N Gain	Pre-test	Post-test	N Gain	Pre-test	Post-test	N Gain
x	58	62,8	0,11	58	77,3	0,46	58	79,2	0,5

Based on Table 1 it can be said that the increase in the N Gain score for cycle I was 0.11 in the low category, while the N Gain score for cycle II was 0.46 in the low category, and the N Gain score for cycle III was 0.5 in the medium category. Thus, there was an increase in N Gain of 0.39 from the difference between cycle I and cycle III. It is known from these results that there is an increase in

students' physics learning achievement, so the hypothesis is accepted.

Analysis of students' physics learning achievement was also carried out by comparing the results of the t-test between t count and t table to strengthen data analysis. Calculation of student physics learning outcomes data using the t-test can be seen in Table 2.

Table 2. Calculation Results of the T-Test

	Cycles I	Cycles II	Cycles III
$t_{table(0,05)}$	2,02	2,02	2,02
T_{count}	5,123	15,205	16,087
d.b	37	37	37
Conclusion	Hypothesis accepted	Hypothesis accepted	Hypothesis accepted

Based on the results of the t-test, it is known that $t_{table} < t_{count}$, so there is a significant difference between the pre-test and post-test and the hypothesis is accepted. So, there is a difference in the learning achievement of class XII IPA students at MA Al Hadi Girikusuma when they are taught

using the conventional method and when they are taught with the application of PCK based on Flash player media.

The percentage of student activity increased after implementing PCK learning based on flash player media as shown in Figure 1.

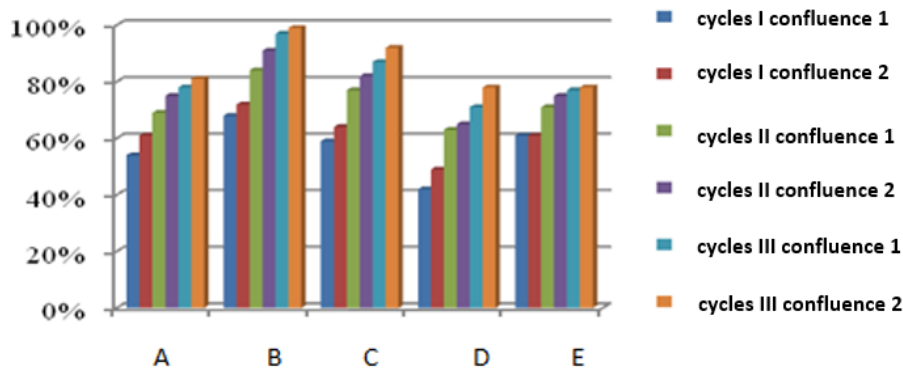


Figure 1. Increased student activity

In Figure 1, A is the student's active questioning, B is the activity of making individual questions, C is the activity of answering, D is the activity of students in answering questions made by their friends, and E is the activity of conveying students in conveying ideas. Student activity during learning from cycle I to cycle III is getting better. The learning stages applied require students to always carry out activities, interact with other students, develop communication skills and think critically in dealing with problems.

Increased student activity is also influenced by the teacher's ability to manage the class. Weaknesses and obstacles to each learning must be followed up. Therefore, teachers must improve the learning process by looking at errors and deficiencies in previous learning.

Based on research data obtained by researchers regarding PCK based on Flash Player media, there are significant differences and influences between before and after being given learning with the application of PCK based on Flash Player media. The research data shows that the score of students' physics learning outcomes before getting treatment is an average of 58 and the percentage of classical mastery is 24% and after getting treatment with PCK based on Flash Player media, namely an average of 79.15 and a percentage of 97%. Based on the test results, it was obtained that the average percentage of students' ability to formulate questions experienced an increase in the percentage from 32% in cycle I to 92% in cycle III and in cycle III 35 students had fulfilled the KKM. The data shows that students' ability to formulate questions is very high.

The data is then reinforced by the results of the t test, with the results of $t_{table} (2.02) < t_{count} (5.12)$ in cycle I, $t_{table} (2.02) < t_{count} (15.21)$ in cycle II, and $t_{table} (2.02) < t_{count} (16.087)$ in cycle III with a significant level of 5% so it can be concluded that there is a significant difference between the pre-test and post-test cycles I, II, and III. The results of cycle I, II, and III tests also illustrate

the magnitude of the difference in pre-test and post-test values as illustrated by the increase in t_{count} from cycle I to cycle III.

The increase in student achievement in each cycle is also known and strengthened by analyzing student learning score data using N gain. Based on the results of the N Gain calculation, it can be said that the increase seen in the N Gain score for cycle I was 0.11 in the low category, while the N Gain score for cycle II was 0.46 in the low category, and the N Gain score for cycle III was 0.5 with medium category. Thus there is an increase in N Gain of 0.39 from the difference between cycle I and cycle III.

Learning media is everything that can convey messages, can stimulate students' thoughts, feelings, and willingness so that they can encourage the creation of a learning process to foster new information in students (Astuti dkk, 2019; Dasmo dkk, 2019). Based on the results of the t and N gain tests, it can be concluded that the application of PCK based on Flash Player media has increased the physics learning achievement of class XII IPA MA Al Hadi Girikusuma students on magnetism.

CONCLUSION

The conclusion that can be drawn from this study is that the PCK strategy based on flash player media has a positive effect on improving learning outcomes and student learning engagement. This can be seen from the research data showing that student activity in learning increased from 57% in cycle I to 86% in cycle III. Based on the results of the t test, the PCK strategy based on flash player media can significantly improve student learning outcomes.

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