Effectiveness of E-Magazine Teaching Materials on Global Warming Materials Phase E

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Abstract

The independent curriculum requires teaching materials with technological development innovations, including e-magazine teaching materials. E-magazine teaching materials are teaching materials in the form of electronic magazines that can be accessed using mobile phones. The advantage of e-magazine teaching materials is that presenting interesting material with pictures and videos can increase students' interest in physics. This study aims to determine the effectiveness of electronic magazine teaching materials on student learning outcomes in the global warming material phase E of SMAN 6 Padang. The type of research conducted is quasi-experimental. The design used in the study was Randomized Control Group Only Design. The population in the study is all phase E classes of SMAN 6 Padang in the 2023/2024 school year. In this study, 2 sample classes were used with purposive sampling techniques, namely the experimental and control classes. In the learning experiment class, the learning uses e-magazine teaching materials; the learning control class uses printed teaching materials at school. The research results showed that e-magazine teaching materials effectively improve student learning outcomes on global warming materials in the independent curriculum.

Keywords: effectiveness**;** e-magazine; global warming; learning outcomes; teaching materials

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INTRODUCTION

The 21st century is an era where students are required to master skills that can improve the quality of learning. In addition, the government provides solutions to improve education quality by making new curriculum policies (Baro'ah, 2020; Sari et al., 2020). The government is developing a curriculum that was initially revised to an independent curriculum in 2013. In the 21st century, it changed the learning system that focuses on the learning process of students (Fitri et al., 2022; González-Pérez & Ramírez-Montoya, 2022; Sholihah & Lastariwati, 2020). In the learning process, students are more dominant and play an important role. In addition, teachers can also create learning tools tailored to students' needs, swhich aim to improve students' abilities and optimize learning outcomes.

The independent curriculum provides freedom to students and teachers in the learning process (Lapenia & Hidayati, 2023). The standard of material achievement in the independent curriculum is simpler and prioritizes essential material (Suryana et al., 2023). The independent curriculum is adjusted to the characteristics and needs of the learning process, namely in determining the tools and learning models used.

In the independent curriculum, teaching materials are part of the learning tool. Teaching materials are a set of subject matter used by teachers and students that serve as guidelines in carrying out the learning process (Ningsih et al., 2019). The presentation of the material is made so attractive that students can optimize their learning outcomes. Using interactive learning media can increase students' attractiveness in learning, and using technology can make it easier for students to acquire knowledge with a wider range (Abas, 2015). In addition, the development of teaching materials combined with technology can take advantage of technological developments. Digital technology can help improve 21st-century skills and gain extensive knowledge (Anwariningsih & Ernawati, 2013; Roza et al., 2022). In addition, using this technology aims to increase the enthusiasm for learning from students (Anusba et al., 2023). By using smartphones in the learning process, efforts to utilize technology are in accordance with the characteristics of 21st-century students (Mufit et al., 2023).

According to Warista, one of the technological innovations in science is electronic teaching materials, namely e-magazine teaching materials. E-magazine teaching materials are a collection of materials presented with a magazine appearance in the form of writings and images added with interesting videos. The advantage of e-magazine teaching materials is the presentation of interesting materials that can be used anytime and anywhere (Srikandi et al., 2019). Teaching materials that utilize technology can foster students' enthusiasm and interest in learning (Kumar & Mohite, 2016). This is in accordance with the research that has been conducted (Paroza & Hidayati, 2023) that students are interested in electronic teaching materials that are easily used and have detailed materials that can increase students' desire to learn.

Other than the devices, using learning models also helps students understand the subject matter. The PBL model can be used to deliver learning materials. Problem-based learning encourages increased curiosity about their knowledge (Duri et al., 2024). The PBL model focuses on the learning process for students (Ardianti et al., 2021). The PBL model raises a real problem in that it acts as an initial stimulus for students, where students can actively participate in learning (Anuar et al., 2024). A student-centred learning process can encourage increased student responsibility in learning (Fandos-Herrera et al., 2023). In the learning process, students play a role in finding solutions to the problems given in learning (Munawaroh, 2020). Learning occurs because of the interaction between educators and students assisted by learning resources (Ilahi et al., 2021). That way, students are helped in improving their learning outcomes (Sutarto et al., 2022).

Physics is knowledge of natural objects and phenomena (Wartono et al., 2018). Physics learning is a subject whose material is related to daily life. One of the physics learning materials in the phase E class is global warming. Global warming is increasing due to excessive human activities that utilize resources. In line with the characteristics of physical matter, which has a basis for thinking based on natural phenomena (Demirel & Dağyar, 2016). The PBL model is used in research to help convey

subject matter in the classroom. Teachers guide students in improving their abilities to optimize the learning results obtained. A student-centred learning process that can improve learning outcomes (Amin et al., 2021).

Learning outcomes are the process of improving students' behavior after following the learning process. Some factors that can improve student learning outcomes are the use of learning resources in the right learning process (Yandi et al., 2023). The right learning resources can optimally improve student learning outcomes by using teaching materials that can attract students' interest in learning.

After conducting observations in the field, information was obtained that the learning outcomes regarding students' knowledge could have been more optimal. The results of interviews with physics teachers at SMAN 6 Padang show that this happened due to several factors, including: first, students' learning motivation is still low because in the learning process, students pay less attention. Second, students' lack of interest in learning physics is caused by teaching materials that could be more representative and interesting. This factor is the cause of students obtaining optimal learning outcomes.

The author's alternative is to use e-magazine teaching materials that can be accessed using mobile phones. Previous researchers have developed teaching materials, namely Nestia Paroza (Paroza & Hidayati, 2023). Which obtained a validity result of 0.88, with the category of validity and practicality for teachers at 91% and for students at 86%. Based on the advice of previous researchers, the researcher will continue the development research at the next stage, namely the effectiveness stage. This study aims to determine the effectiveness of e-magazine teaching materials on student learning outcomes in phase E global

warming materials of SMAN 6 Padang City.

METHOD

The type of research carried out is quasi-experimental. The sample class is given different applications, and at the end of the meeting, the sample class is given a post-test with the same type and number of questions, using the Random Control Group Only Design, as shown in Table 1.

Table 1 Research design

Class	Treatment	Post-test
Experimental	X	T
Control	-	T

(Sugiyono, 2018)

The research was carried out at SMAN 6 Padang for the 2023/2024 school year. The total population is nine classes, but only two classes are used with the Purposive Sampling technique in the study. The considerations used in this study include: teachers who teach in both sample classes are the same, the Ph value obtained is not much different, and after a statistical test, namely: normality test, homogeneity test, and similarity test, two averages obtained both sample classes are normally distributed, the variance is homogeneous, and have the same initial ability.

This study has two sample classes, the experimental class and the control class, Phase E2 and Phase E9, with 34 and 36 students, respectively. The experimental class uses e-magazine teaching materials in the learning process, while the control class uses printed teaching materials. The researcher uses the PBL model in the learning process. This PBL model is used for four meetings in both classes to help the learning process of global warming material.

Before being given post-test questions for the sample class, the post-test questions are first tested in other classes to determine good questions. After the post-test, 25 questions were tested with multiple-choice questions. Furthermore, statistical analysis was

carried out on the post-test test questions. Analyzing post-test results in the knowledge aspect is carried out using data analysis techniques, including normality test, reliability test, and t-test.

The t-test was carried out to determine the difference in the average learning outcomes obtained by the sample class. Furthermore, to calculate the relationship between e-magazine teaching materials and student learning outcomes, the knowledge aspect is measured by the following Correlation Coefficient formula:

$$r = \frac{\Sigma x_i y_i - \frac{(\Sigma x_i)(\Sigma y_i)}{n}}{\sqrt{(\Sigma x_i^2 - \frac{(x_i)^2}{n})(\Sigma y_i^2 - \frac{(y_i)^2}{n})}} \quad \dots (1)$$

After obtaining the correlation coefficient results, the next step is to calculate the influence of e-magazine teaching materials on the learning outcomes obtained by students using the formula. Coefficient Determination:

$$KD = (r)^2 \times 100\% \quad \dots (2)$$

RESULT AND DISCUSSION

Before the post-test is given for the sample class, the post-test questions are first tested in other classes to analyze the quality of the questions. After a test of the questions, the research instrument was analysed. A validity test analysis used the Product Moment Correlation formula to analyze the post-test questions, which obtained 17 valid category questions. Furthermore, a reliability test was carried out using the KR-21 formula with a result of 0.717 in the high category. Furthermore, a test of the difficulty level of the questions was carried out, and the post-test questions were used in the medium category. The last test is the difference in questions for post-test questions used with the category of sufficient and good. Of the 25 questions, 15 were obtained after statistical analysis that could be used as a post-test for the sample class because these 15 questions met the criteria for good questions to be used as post-test questions.

Fifteen questions were obtained that could be used as a post-test by going through the revision stage first. Post-test questions are given with the same number and type of questions. Furthermore, statistical calculations of data were carried out in the sample class with the following results (see Table 2).

Table 2 Research result data

Class	N	Max	Min	$\overline{x}$	S	S^2
E2	34	94	60	80.85	11.94	148.61
E9	36	87	40	67.36	15.09	227.60

Table 2 shows the research results in the sample class. The standard deviation and variance in the experimental class were lower than in the control class. Then, in the knowledge aspect, data analysis techniques are carried out. The first technique uses a normality test with a value $\propto = 0.05$ at N = 34 and 36 using the lilifors test, as shown in Table 3.

Table 3 Normality test result

Class	$\overline{x}$	S	$\propto$	L_o	L_t	Result
E2	80.85	11.94	0.05	0.148	0.152	Normal
E9	67.36	15.09		0.106	0.148	Normal

Table 3 shows the results of $L_h < L_t$ in the sample class. Both classes of normally distributed samples were obtained. Next, a homogeneity test was carried out with values of $F_t = 1.77$ and $\propto = 0.05$ with $dk_{denominator} = 35$ and $dk_{numerator}$

= 33, with the results obtained in the following Table 4.

Tabel 4 Homogeneity test result

Class	S^2	$\propto$	F_h	F_t	Result
E2	148.61	0.05			
E9	227.60	0.05	1.53	1.77	Homogeneous

Table 4 shows that $F_h < F_t$ showing data in the sample class have homogeneous variance. Next, analysis was carried out using a t-test. The t-test was carried out to see the difference in the learning outcomes of the sample class because it used different teaching materials. This test was carried out with a value $\propto = 0.05$ and dk= $(n_1 + n_2 - 2)$. The test criteria accept H0 if $t_h < t_t$ and accept H_1 if $t_h > t_t$. The results of the t-test are shown in the following Table 5.

Table 5 T-test result

Class	$\bar{x}$	S^2	t_{count}	t_{table}
E2	80.85	148.61		
			4.10	1.67
E9	67.36	227.60		

Table 5 shows that the results of the analysis that was carried out obtained the average value of the experimental class that uses e-magazine teaching materials, which is higher than the average value of the control class that uses printed teaching materials. So that the t-test calculation data in the two sample classes was $t_h > t_t$ with a significant level of 0.05 and dk = $(n_1 + n_2 - 2)$, which can be stated that H_1 is accepted in the sense of "e-magazine teaching materials are effective in improving student learning outcomes in the global warming material phase E of SMAN 6 Padang". Figure 1 below shows the zero hypothesis rejection and acceptance area curve.

Figure 1 shows that the hypothesis acceptance curve is outside the H_0 acceptance area, meaning different teaching materials' treatments obtain different learning outcomes. Thus, the E-magazine Teaching Materials improves student learning outcomes in Phase E of SMAN 6 Padang global warming material.
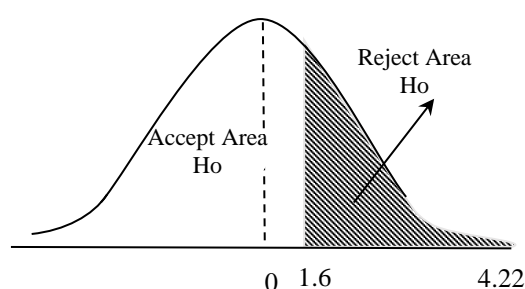

Figure 1 Zero hypothesis acceptance and rejection area

After statistical analysis, the results were obtained that the working hypothesis or H1 that had been previously proposed, namely "E-magazine teaching materials are effective in improving student learning outcomes in phase E global warming materials of SMAN 6 Padang" can be accepted. This was obtained from the difference in the average ability of learning outcomes from the sample class caused by the difference in the treatment given to the sample class.

In learning activities, students in the experimental class have a higher enthusiasm for learning than those in the control class; this happens because they learn using e-magazine teaching materials in the experimental class. One of the advantages of using technology in the learning process is that it can create a dynamic learning environment, improve the interaction between students and obtain a wider range of knowledge (Anunobi et al., 2018; Hussin, 2018; Roemintoyo & Budiarto, 2021; Shantri,

2020). E-magazine is the development of teaching materials that aim to increase student activities (Rohmah et al., 2020).

Next, both sample classes were analyzed for normality tests to determine if the post-test results were normally distributed. After the calculation, it was obtained that Lh < Lt, which states that the sample class is normally distributed. Then, conducting a homogeneity test, Fh < Ft was obtained, which showed that the data in the sample class had a homogeneous variance. A two-mean similarity test is carried out after the data is normally distributed and has a homogeneous variance. The results obtained were 4.10 > 1.67. This means there is a difference in student learning outcomes between the experimental class that uses electronic magazine teaching materials and the control class that uses printed teaching materials. This shows that using technology in the learning process can increase students' activeness and learning outcomes (Akanbi, 2020).

CONCLUSION

After conducting research, it was found that e-magazine teaching materials can improve student learning outcomes. This was obtained from the difference in the average learning outcomes in the sample class. Thus, it can be concluded that E-Magazine Teaching Materials effectively improve student learning outcomes in Phase E of SMAN 6 Padang global warming materials.

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