IMPLEMENTATION OF INTERACTIVE LEARNING MEDIA USING POWER POINT AND PHET MEDIA ON STUDENT PHYSICS LEARNING OUTCOMES IN SMA

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Abstract

The study aimed to determine of implementation and the study result of physics student's taught by the interactive learning media using the power point and PhET interactive simulation project and study result of physics student's taught by using the power point slides on the subject of characteristics wave in the second semester at the class XI in SMA Swasta Sinar Husni Helvetia Medan. The type of research is experimental by post-test control group design. The population in the study were all student in the second semester at the class XI in SMA Swasta Sinar Husni Helvetia Medan consisting of 2 classes with amount student of 70 people. Sample in this research is the total from the population. The instrument that use to determine students learning outcomes was the result test in the from of multiple choice questions with 24 number by 5 options of answer. The result showed that the average score of the study result of physics student's taught by the interactive learning media using the power point and PhET interactive simulation project that (X_1) is x = 16,73 and s1 = 3,281729407, while the average score of the study result of physics student's taught by the power point slide that (X_2) is x = 14,87 and s2 = 3,135055251. Hipotesis data obtanined ttesting = 2,42 with ttable=1,997 with that mean there were a difference in the study result of the physics that significant at the implementation of the interactive learning media using the power point and PhET interactive simulation project for the student's learning result of physics.

Keyword: power point media, PhET interactive simulation project, result of studying physics

Abstrak

Penelitian ini bertujuan untuk mengetahui implementasi serta hasil belajar fisika siswa yang diajarkan dengan media pembelajaran interaktif menggunakan media *power point* dan *PhET interactive simulation project* dan hasil belajar fisika siswa yang diajarkan dengan menggunakan media *slide power point* pada pokok bahasan karakteristik gelombang kelas XI semester II di SMA Swasta Sinar Husni Helvetia Medan. Jenis penelitian yang dilakukan adalah eksperimental yang melibatkan variabel-variabel tertentu untuk menguji pengaruhnya terhadap hasil belajar fisika siswa dengan desain kelompok kontrol pos test (*post-test control group design*). Populasi dalam penelitian ini adalah seluruh siswa kelas XI IPA Semester II di SMA Swasta Sinar Husni Helvetia Medan yang terdiri dari 2 kelas dengan jumlah siswa 70 orang. Sampel dalam penelitian ini adalah totalitas dari populasi. Instrumen yang digunakan untuk mengetahui hasil belajar siswa adalah tes hasil belajar dalam bentuk pilihan berganda berjumlah 24 soal

dengan 5 opsi jawaban. Dari hasil penelitian diperoleh nilai rata-rata hasil belajar fisika siswa yang diajarkan dengan media pembelajaran interaktif menggunakan media *power point* dan *phet interactive simulation project* (X_1) adalah x = 16,73 dan s1 = 3,281729407, sedangkan nilai rata-rata hasil belajar fisika yang diajarkan dengan media *slide power point* (X_2) adalah x = 14,87 dan s2 = 3,135055251. Uji hipotesis data diperoleh thitung = 2,42 dengan ttabel=1,997 yang berarti ada perbedaan hasil belajar fisika yang signifikan pada implementasi media pembelajaran interaktif menggunakan media *power point* dan *PhET interactive simulation project* terhadap hasil belajar fisika siswa.

Kata kunci : *media power point, PhET interactive simulation project, hasil belajar fisika*

INTRODUCTION

The development of technology and information is growing rapidly and influential in the world of education. in the development of technology and information in learning is very helpful for teachers in utilizing technological facilities to prepare the learning process or when the learning process takes place (Maretha, 2023). Utilization of information technology in the learning process, it can be said that this is a form of adaptation to the development of science that is developing at this time. Basically, there are not a few schools that still have difficulties in holding and implementing up-to-date learning processes through the use of information technology in the learning process (Mundilarto, 2020). Including in physical subjects which also really need adjustments between technology and physics itself.

Physics is part of science that studies natural phenomena and phenomena empirically, logically, systematically and rationally which involve scientific processes and attitudes (Ramadani & Nana, 2020) (Sakdiah & Reni Sasmita, 2018). When studying physics, students will be introduced to concepts, principles, theories, principles and laws of physics. Students will also be taught to experiment in the laboratory or outside the laboratory as a scientific process to understand physics concepts (Ahmad, 2016; Nur'aini, 2017; Sari, 2016).

According to the findings of the World Competitiveness Year Book survey (1997–207), out of the 47 countries surveyed, Indonesia's educational standards fall behind those of other emerging nations. In the 2007 poll, Indonesia was ranked 53rd out of 55 nations. In Asia Pacific, Indonesia is ranked 10th out of 14 developing nations by the United Nations agency UNESCO (2005). This is unquestionably a problem in order to improve student performance and meet learning goals.

In order to achieve good learning outcomes with an increasingly advanced education system and also supported by technological developments (Ahmad, 2016; Putri & Nurafni, 2021). One use of

technological results that can be used to support the learning process is as a learning medium to help students understand subject matter, especially physics subject matter (Adrian & Palloan, 2023; Ministry of Education and Culture, 2014; Mahmudi, n.d.).

The ability to articulate one's views can be directed and stimulated by lessons, learning materials, and technology, resulting in breakthroughs in both theory and practice of education. In order for students to easily understand, master, and apply physics concepts in daily life, one way to improve the physics learning process is through creative and applicable learning (Resti Andriani & Elementary School Teacher Education Studies -FKIP Satya Wacana Christian University Salatiga, n.d.). The opportunity for students to learn more, apply what they learn, and enhance performance in carrying out skills in accordance with the learning objective will expand with the creative use of instructional media.

According to observations made in a classroom setting, many students experience boredom when the physics topics provided are not engaging enough to influence the learning process, which leads to student learning outcomes. The answer is to create instructional media that can draw students in and aid them in comprehending subjects. Teachers can utilize a variety of media when teaching physics to help their students comprehend and master the concepts being covered, one of which is interactive learning materials created using Powerpoint and the PhET interactive simulation project. One of the most widely used Microsoft Office tools for creating presentations is PowerPoint, which has a very nice feature with a display gallery that enables us to see the outcomes of modifications before setting them as options. The PhET (Physics Education Technology) interactive simulation project offers a free interactive simulation of scientifically based physical events.

Learning outcomes are anticipated to be improved by the use of interactive learning media that mixes software-based media with web/online sites, specifically power point and the PhET interactive simulation project. The implementation of interactive learning media using Power Point and PhET interactive simulation project on student physics learning outcomes in high school was then inspired by this, leading the author to pursue research on the topic.

RESEARCH METHODS

The type of research used in this research is a quasi-experimental research type with nonequivalent (Control Group Pretest and Post-test Design) with research data in the form of quantitative teaching materials, class climate, teachers, the same time allocation only lies in the

differences in the learning media used. used. The sampling technique used was Purposive Sampling where the population in the study chose learning with the help of media in the form of power points and the Phet Interactive Simulation Project. The population in this study were all students of class XI IPA Semester II at Sinar Husni Helvetia Private High School Medan, consisting of 2 classes with a total of 70 students. The sample in this study is the totality of the population. Class XI IPA-1 was taught with interactive learning media using power point media and the PhET interactive simulation project and class XI IPA-2 was taught using power point slide learning media. The variables used are:

Variable		Operational Definition	Indicator
Independent variable	X_1	Interactive learning media uses power point media and the PhET interactive simulation project.	RPP with interactive learning media using power point media and the PhET interactive simulation project.
Independent variable	X_2	Learning media uses power point slides.	RPP with learning media using power point slides.
Dependent variable	Y	Student physics learning outcomes.	Student physics learning outcomes test scores.

The instrument used is in the form of a test. The test is in the form of multiple choice questions with 5 options consisting of 30 questions. So, a score is worth 1 if the answer is correct and a score is 0 if the answer is wrong (Safitri, 2017; Safitri et al., 2019, 2022; Safitri & Hasibuan, 2018a, 2018b). So that the maximum score obtained is 30. The learning achievement grid test is based on the 2013 Curriculum (K-2013).

Based on the questions tested, it can be concluded that the number of valid questions is 24 questions and 6 questions are invalid. And from the calculation results obtained reliability of 0.75.
Data analysis techniques are obtained by using the formula:

1. Average score : $x = \frac{f_i x_i}{f_i}$

2. Standard deviation : $s^2 = \frac{n f_i x^2_i - (f_i x_i)^2}{n(n-1)}$

3. Test the data requirements which include the normality test, homogeneity test, and hypothesis testing. The hypothesis that will be used in this study are:

- Ha : $\mu_1 \neq \mu_2$: There is a significant difference in the implementation of interactive learning media using power point media and the PhET interactive simulation project on student physics learning outcomes in wave characteristics material in class XI semester II at Sinar Husni Helvetia Private High School Medan

- Ha:μ1=μ2: There is no significant difference in the implementation of interactive learning media using power point media and the PhET interactive simulation project on student physics learning outcomes in wave characteristics material in class XI semester II at Sinar Husni Helvetia Private High School Medan.

RESULTS AND DISCUSSION

Based on the results of the study, it shows that there are differences in student physics learning outcomes taught by interactive learning media using power point media and phet interactive simulation:

a. *Phet Interactive Simulation*

Interval Class	fi	xi	xi 2	fixi	fixi2
10-11	3	10,5	110,25	31,50	330,75
12-13	5	12,5	156,25	62,50	781,25
14-15	3	14,5	210,25	43,50	630,75
16-17	6	16,5	272,25	99,00	1633,50
18-19	10	18,5	342,25	185,00	3422,50
20-21	8	20,5	420,25	164,00	3362,00
Σ	35	-	-	585,50	10160,75

b. *Power Point*

Interval Class	fi	xi	xi 2	fixi	fixi2
9-10	4	9,5	90,25	38,00	361,00
11-12	5	11,5	132,25	57,50	661,25
13-14	6	13,5	182,25	81,00	1093,50
15-16	7	15,5	240,25	108,50	1681,75
17-18	9	17,5	306,25	157,50	2756,25
19-20	4	19,5	380,25	78,00	1521,00
Σ	35	-	-	520,50	8074,75

The normality test was carried out using the Chi-Square normality test in both experimental classes. From the calculation results for classes taught with interactive learning media using power point media and phet interactive simulation projects:

a. *Phet Interactive Simulation*

Class limit	Z is for class boundary	Z area	The area of each class interval	Expected frequency hi	Observed frequency oi	X2= oi-hi2hi
9,5	-2,20	-0,4861				
11,5	-1,59	-0,4441	0,0420	1,470	3	1,592
13,5	-0,98	-0,3365	0,1076	3,766	5	0,404
15,5	-0,37	-0,1443	0,1922	6,727	3	2,065
17,5	0,24	0,0948	0,2391	8,369	6	0,670
19,5	0,84	0,2995	0,2047	7,165	10	1,122
21,5	1,45	0,4265	0,1270	4,445	8	2,843

b. *Power Point*

Class limit	Z is for class boundary	Z area	The area of each class interval	Expected frequency hi	Observed frequency oi	X2= oi-hi2hi
8,5	-2,03	-0,4788				
10,5	-1,39	-0,4177	0,0611	2,139	4	1,620
12,5	-0,76	-0,2764	0,1413	4,946	5	0,001
14,5	-0,12	-0,0478	0,2286	8,001	6	0,500
16,5	0,52	0,1985	0,2463	8,621	7	0,305
18,5	1,16	0,3770	0,1785	6,248	9	1,213
20,5	1,80	0,4641	0,0871	3,049	4	0,297

In testing the homogeneity Fcount<Ftable from the calculation results obtained Fcount=1,096 while the Ftable value obtained from the F distribution with a significance level (α) = 0.10 and degrees of freedom (5.5) is 5.05. Therefore the two samples come from the same (homogeneous) population (Rahmad et al., 2017; Wicaksono, n.d.).

The value of tcount = 2,42 is obtained while testing the hypothesis based on the analysis of the difference in average count, and the value of ttable with a significance level () = 0.05 and 68 degrees of freedom is 1.997. means (2,42 > 1,997) tcount>ttable. Therefore, it can be said that the hypothesis is true, i.e., that students who are taught physics using interactive learning materials such as PowerPoint presentations and PHET interactive simulation projects achieve better learning outcomes than students who are taught physics using PowerPoint slides.

CONCLUSION

1) The average score of students' physics learning outcomes taught by interactive learning media using power point media and phet interactive simulation project on the subject matter of wave characteristics is better than the average score of students' physics learning outcomes taught by interactive learning media using media powerpoint slides

2) From the calculation results obtained tcount>ttable, then there is a significant difference in the implementation of interactive learning media using power point media and the PhET interactive simulation project on student physics learning outcomes in wave characteristics material in class XI semester II at Sinar Husni Helvetia Private High School Medan

3) In the implementation/implementation of interactive learning media using power point media and phet interactive simulation projects this has a better effect on improving physics learning outcomes compared to using power point slide media because it is based on many things, namely from animation, videos, and examples as well as simulations that are in accordance with the subject matter of physics through this media are able to attract students' attention so that they can increase students' conceptual understanding of complex and abstract concepts and become an attraction for students to explore.

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