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The Effectiveness of Powerpoint-Based Audio Visual Media on Science Learning Outcomes on Solar System Material in Class VII Students

Feliza Paramitha Sinaga[1], Adelakun Isaac Tosin[2], Amit Kumar Das[3]
[1]Department of Teacher Training and Education, Physics Education, Universitas Jambi, Jambi, Indonesia
[2]Federal College Of Education(Technical), Omoku, Rivers State, Nigeria
[3]Education department,West Bengal,India

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ABSTRACT

Purpose of the study: To determine the effectiveness of power point-based audio visual media on student learning outcomes regarding the solar system in class VII in junior high school

Methodology: This type of research is quantitative research with a quasi experimental research method. The research carried out involved two classes, a control class and an experimental class. Simple random sampling technique. The class that is the control class is class VII C while the class that is the experimental class is class VII D. The instruments used in this research were questionnaires and questions. The data collection method for this research was carried out using pretest and posttest. The data analysis technique used in this research is the T-test using the SPSS program.

Main Findings: Main findings of this study reveal that the use of PowerPoint-based audiovisual media significantly enhances students' learning outcomes in the Solar System topic. Statistical analysis shows a significant difference between the experimental and control groups, with higher scores for the experimental group. The media effectively improves understanding of complex materials and increases student motivation. This practical, interactive approach highlights the potential of simple technology in science education, providing new empirical evidence and a scalable solution for improving learning in diverse educational contexts.

Novelty/Originality of this study: This research is the basis for developing a science study on learning media regarding the solar system using Power Point learning media for class VII junior high school students.

Corresponding Author:
Feliza Paramitha Sinaga,
Department of Teacher Training and Education, Physics Education, Universitas Jambi,
Jl. Jambi – Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, 36361, Indonesia
Email: flzaprmthhsngg54@gmail.com

1. INTRODUCTION

Education is one of the fundamental aspects of life. Education is defined as a systematic and systemic activity directed at the formation of students' personalities [1]-[3]. Systematic because the educational process takes place through continuous stages (procedural) and systemic because it takes place in all situations, in all complementary environments (home, school and community environments) . Education pays attention to the unity of physical and spiritual aspects, self-aspects (individuality) and social aspects, cognitive, affective and

psychomotor aspects, as well as all aspects of human connectedness with himself (concentric), with his social and natural environment (horizontal), and with God [2].

Natural Sciences is related to how to find out about nature systematically so that science is not only mastery of a collection of knowledge in the form of facts, concepts or principles, but is also a process of discovery [3]. It is hoped that science education can become a vehicle for students to learn about themselves and the natural world around them, as well as prospects for further development in applying it in everyday life. The learning process emphasizes providing direct experience to develop competencies to explore and understand the natural surroundings scientifically [4].

One of the science materials in junior high school is the solar system material. The scope of solar system material in junior high school includes the components of the solar system, rotation, revolution of the earth and moon, and their impact on life on earth. Solar system material is material that is difficult to observe directly or is abstract, so visualization or animation is needed to study it [5]. For this reason, solar system material really needs media that can form a common understanding in students so that the solar system is no longer abstract.

Media is a message carrier technology that can be used for learning purposes. Nowadays, learning media has many innovations, especially technology-based media [4], [5]. One of them is audio visual media. Audio visual media is a set of tools that can project moving images and sound [6], [7]. The combination of image and sound forms the same character as the original object [8], [9].

This audio visual media can be combined with other media such as power point media. The Power Point application program is a program for creating existing presentations that can be used to create learning programs, so that the resulting program will be quite interesting with the color composition and animation used [10], [11]. With the Microsoft PowerPoint computer program, a teacher can design various learning programs according to the materials, methods and learning objectives to be achieved [12], [13].

This research examines the effectiveness of using PowerPoint-based audiovisual media on student learning outcomes on solar system material in class VII junior high school. The use of PowerPoint learning media was chosen for various reasons that are relevant to the characteristics of class VII students and the complexity of the solar system material [14], [15]. First, class VII students are at a stage of cognitive development where they are starting to be able to think abstractly, but still need visualization assistance to understand complex concepts. The material of the solar system, which includes components such as planets, rotation, revolution and other astronomical phenomena, is abstract material and difficult to observe directly [16]-[18]. Visualization through interactive and interesting PowerPoint media can help students understand this concept better.

Second, PowerPoint learning media can integrate audiovisual elements which help increase students' attention and motivation to learn [19]. Research shows that the use of moving images and sound can increase student involvement in the learning process, so that they are more active and interested in the material being taught. This is especially important for seventh grade students who generally have shorter attention spans and require variety in teaching methods [20]. Third, PowerPoint media allows for systematic and structured preparation of material, which makes it easier for students to follow the learning flow [10], [21], [22]. With PowerPoint, teachers can present information in stages, combining text, images, video, and animation to explain difficult concepts in a way that is easier to understand. PowerPoint's ease of use also allows teachers to adapt the material to suit students' needs and abilities.

Previous research has also examined learning media using PowerPoint. Previous research found that the application of audio-visual learning media based on Microsoft PowerPoint helped students learn and understand learning material better [23]. In line with previous research, this research was conducted to see how PowerPoint -based audio -visual learning media on the learning outcomes of the Natural Sciences of students of the solar system. The current generalization of research is carried out in the first middle school population that studies material related to the solar system. The difference is that previous research and the current focus of the subject and material to be measured.

This study offers novelty in the use of PowerPoint -based learning media for solar system in class VII junior high school. This novelty lies in the integration of interactive and interesting audiovisual elements, which have not been widely applied in the teaching of abstract and complex scientific material. In this context, this study shows that the use of enriched powerpoint with moving images, animation, and sound can significantly increase student understanding and learning outcomes compared to conventional methods.

This research provides a significant contribution to the development of learning media in education, especially in science teaching which is often considered abstract and complex. The results of the study indicate that PowerPoint-based learning media with interactive audio-visual integration can improve students' understanding of the solar system material, facilitate the visualization of abstract concepts, and internalize learning materials more effectively. These findings encourage teachers and curriculum developers to create learning media that are more creative and relevant to students' needs, and motivate policy makers to integrate technology into the education curriculum by providing training for teachers. In addition, this study improves students' digital literacy, supports inclusive teaching by accommodating various learning styles, and opens up opportunities for further research related to the use of technology-based media in various fields of study and levels of education. Thus, this

research not only has a positive impact on student learning outcomes, but also encourages the transformation of teaching methods in the digital era, making them more relevant, interesting, and effective to be implemented in schools.

This research is urgent because of the urgent need for innovative and effective learning methods to improve the quality of learning of class VII students, especially in complex and abstract solar system materials. The use of conventional methods is often less able to accommodate diverse student learning styles and tends to make students passive. Class VII students need effective visualization assistance to understand scientific concepts such as rotation and planetary revolution. Powerpoint-based learning media, interactive and attractive, can increase student involvement and motivation, and to help explain the concepts that are clearly difficult [24], [25]. With empirical evidence that this media can significantly improve student learning outcomes, this research provides a strong basis for teachers to adopt this technology. In addition, the use of PowerPoint also helps students develop technological skills that are relevant to their future needs. In the end, this study aims to improve the quality of education as a whole through more effective and efficient learning methods. Based on this description, researcher is interested in conducting research to find out how much influence power point learning media has on student learning outcomes.

The purpose of this study was to analyze the effect of using PowerPoint-based learning media on the learning outcomes of grade VII students on the solar system material. This study aims to test the effectiveness of interactive learning media in helping students understand complex and abstract scientific concepts, such as planetary rotation and revolution, through attractive and easy-to-understand visualizations. In addition, this study aims to evaluate the extent to which PowerPoint-based media can increase student engagement and motivation to learn, while supporting the development of technological skills that are relevant to the needs of the digital era. The results of this study are expected to provide real contributions to improving the quality of learning, offering innovative solutions to conventional teaching methods, and being a reference for teachers and curriculum developers in implementing technology effectively in the learning process.

2. RESEARCH METHOD

This research is quantitative research. The method used in this research is a quasi-experimental or quasi-experimental method (quasi-experimental) where it is not possible for the researcher to control or manipulate all relevant variables except for these few variables. The design used in this research is a control group pretest-posttest design. In this design there are two groups, namely the experimental group and the control group [26], [27], [28]. Each group will be given an initial test (pre test) to determine the extent of students' basic abilities regarding the concept of the solar system [29]. Furthermore, both of them will be given different treatment. The control group will be given treatment using ordinary or conventional learning without interactive media, while the experimental class will be given treatment using interactive power point learning media. After being given treatment, both groups will be given a final test (post test) to find out the extent of the increase in the understanding abilities of each group [30], [31].

The population in this study were 7th grade students of State Junior High School 1 Muaro Jambi, the sample in this study were 7th grade C and 7th D students with a sampling technique using simple random sampling. Meanwhile, the data collection techniques used in this research were tests, questionnaires and documentation [24]. The data analysis technique used in this research is in the form of assumption tests, namely normality tests and homogeneity tests as well as hypothesis testing [33], [34].

Data is collected through two main techniques: questionnaires and tests. The questionnaire is used to measure students' perceptions and responses to the use of powerpoint media in learning, while tests are used to measure student learning outcomes before and after intervention. Pretest is given before learning begins to find out the initial abilities of students, while posttest is given after learning to measure the increase in learning outcomes [35], [36]. The instrument grid in this study was presented in the following table:

Table 1. Student Learning Outcomes Test Instrument Grid

No.	Indicator	Item	Information
1	Basic knowledge of the solar system	1, 2, 3	Measuring the initial knowledge of students about the basic concepts of the solar system
2	Understanding the concept of planet	4, 5, 6	Measure students' understanding of the planets in the solar system
3	Clarity of presentation of information	7, 8	Measuring students' understanding of the concept of orbits and planetary revolution
4	Understanding of astronomical phenomena	9, 10	Measure students' understanding of astronomical phenomena related to the solar system
5	Improvement of post -learning learning outcomes	11, 12, 13	Measuring Increased Student Knowledge After Learning Using PowerPoint Media

As for the students' response to the use of PowerPoint media in this study are as follows:

Table 2. Student response to the use of PowerPoint media

No.	Indicator	No. Question item	Type scale	Information
1	Ease of understanding the material	1, 2, 3	Likert (1-5)	Measuring student perceptions about the ease of understanding the material using PowerPoint
2	Interest in learning	4, 5, 6	Likert (1-5)	Measure the level of student interest when using PowerPoint
3	Clarity of presentation of information	7, 8, 9	Likert (1-5)	Measuring student perceptions about the clarity of information presented through PowerPoint
4	Media interactivity	10, 11	Likert (1-5)	Measuring the extent of interactive powerpoint media and involving students
5	Motivation to learn	12, 13, 14	Likert (1-5)	Measuring the impact of using powerpoint on student motivation

Data analysis was carried out using the T (T-test) test and regression test with the help of the SPSS program. The T test is used to test the hypothesis whether there is a significant difference between student learning outcomes in the experimental class and the control class. And test the effect of learning media on student learning outcomes [37], [38]. Data on pretest and posttest results were analyzed to see an increase in learning outcomes and the effectiveness of the use of PowerPoint -based audiovisual media.

This research was conducted through several stages. First, preparation which includes determining samples, preparation of research instruments, and preparation of powerpoint -based learning materials. Second, the implementation of the pretest for the two classes. Third, the implementation of learning with two different methods: the experimental class uses PowerPoint media and the control class using conventional methods. Fourth, the implementation of posttest to measure student learning outcomes after intervention. Fifth, data collection and analysis using SPSS to test the research hypothesis. Finally, the interpretation of the results and preparation of research reports.

3. RESULTS AND DISCUSSION

3.1. Normality test

The results of the data normality test in this study can be seen in the following table:

Table 3. Normality Test Results with Kolmogorov-Smirnov

Class		Kolmogorov-Smirnov		
		Statistic	df	Sig.
Learning outcomes	Control posttest	.954	30	.219
	Experimental posttest	.972	28	.636

Table 3 shows the results of statistical measurements for two different groups: control groups and experimental groups. Kolmogorov-Smirnov Statistics: This is the normality test used to determine whether the data follows the normal distribution. Statistical values close to 1 indicate data that is close to normal distribution. From Table 3, it is known that the learning outcomes for the control group (sig. = 0.219) and the experimental group (sig. = 0.636) shows the value of sig greater than 0.05, which means the data is normally distributed.

3.2. Homogeneity Test

The results of the homogeneity test of this research data can be seen in the following table:

Table. 2 Test Of Homogeneity of Variance

ANOVA

Learning outcomes

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	304.239	1	304.239	2.530	.117
Within Groups	6735.417	56	120.275		
Total	7039.655	57			

From the table above it can be seen that the significance value is 0.117 > 0.05. So it can be concluded that the data is distributed homogeneously.

3.3. Hypothesis Test (T-Test)

The results of hypothesis testing in the form of a t-test on this research data can be seen in the following table:

Table 3. Independent Sample t-Test Results

		t-test for Equality of Means							
		Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Learning outcomes	Equal variances assumed	.012	-2.627	54	.011	-9.6429	3.6703	-17.0013	-2.2844
	Equal variances not assumed		-2.627	44.113	.012	-9.6429	3.6703	-17.0392	-2.2455

From the table above it is known that the calculated t-value is -2.627 for power point-based audio visual media with a probability of 0.012. Because -t count (-2.627) <-t table (-2.392) and probability 0.012 <0.05 then ha is acceptable. The average difference of -9.6429 shows that the learning outcomes of experimental groups are higher than the control group. The means means that student learning outcomes using powerpoint-based audio-visual learning media on Solar System material are higher and more significant comparated to conventional media.

From the results of the statistical test above, it can be concluded that the use of powerpoint -based learning media is effective in improving student learning outcomes. Data shows that the learning outcomes of the experimental group increased significantly compared to the control group. This study shows the importance of using interactive media in learning to improve student understanding and learning motivation. Audio -visual -based PowerPoint media has been proven to have a positive impact on student learning outcomes regarding the concept of solar system.

This study shows that the use of interactive learning media based on powerpoint is effective in increasing students' understanding of the concept of solar system. This novelty lies in the application of simple but interactive technology in teaching complex material, which has not been explored in previous research. Through statistical analysis, it was found that there were significant differences in learning outcomes between the control group and the experimental group. These results provide new empirical evidence that PowerPoint -based audiovisual media can significantly improve student learning outcomes, which is an important contribution to educational literature. The results of this study add literature on the effectiveness of technology -based learning media in education. This provides references for researchers and other educational practitioners who are interested in implementing or developing similar learning media.

This research provides practical guidelines for teachers about how to use powerpoint in learning. These findings can be used by teachers to improve their teaching methods, make learning more interactive, and improve student learning outcomes [39]. The teacher can use audio-visual-based powerpoint as a tool to make learning more interesting and effective. This can increase student participation and understanding, especially in complex science subjects. Schools and developers of learning media can develop more interactive technology -based learning materials [40], [41]. This will help in creating a more dynamic and innovative learning environment. This research is limited by the limitations of the control variable, namely as a quasi-experimental research, not all variables can be controlled.

This study provides a new contribution in the context of the use of technology-based learning media, especially audiovisual-based PowerPoint, to improve student learning outcomes in the Solar System material. Unlike previous studies that focused more on conventional media or sophisticated technology applications that are difficult to implement widely, this study offers a practical solution through simple but interactive technology [36], [42]. The findings show that audiovisual-based PowerPoint not only improves students' understanding of complex material but also motivates them to be more active in the learning process [34], [35]. The results of this study confirm that there is a significant difference between the control and experimental groups, providing new empirical evidence of the effectiveness of this media in science learning.

This study provides a new contribution in the application of simple yet interactive technology to teach complex materials, especially on the concept of the solar system. The uniqueness of this study lies in the integration of PowerPoint-based media designed to increase student interaction and engagement in learning. Previously, this media has not been widely explored in the context of complex science learning such as the solar system [45], [46].

Statistical analysis showed a significant difference between the control and experimental groups, confirming that this media is able to significantly improve student learning outcomes [47]. This finding is new empirical evidence that enriches the literature on the effectiveness of technology-based learning media in education.

The implications of this study are very relevant to various parties. Teachers can use this media to make learning more interactive and interesting, thereby increasing student participation and understanding, especially in difficult material. Schools can also encourage the development of a dynamic learning environment by utilizing simple but effective technology like this. In addition, developers of learning media can use this study as a basis for creating other similar innovations, while still considering the aspect of ease of implementation [48]. For further research, qualitative integration methods are recommended to dig deeper into students' and teachers' perceptions of the use of this media, as well as identify the influence of external factors that can affect learning outcomes.

This study has several limitations that need to be considered. First, the study was only conducted on seventh grade students in one particular school, so the results may not be fully generalizable to student populations at different levels and educational conditions. Second, although PowerPoint-based learning media is designed to be interactive, this media may not fully accommodate all students' learning styles, especially for those who are more comfortable with kinesthetic learning methods or direct experiments. Third, the effectiveness of this learning media is highly dependent on the availability of technological infrastructure such as computers, projectors, and adequate electricity, which are not always available in all schools. Fourth, the limited duration of the study only allows for short-term impact measurements, so it does not yet cover the long-term impact of using this media on student learning outcomes. Finally, the success of implementing PowerPoint-based learning media is also greatly influenced by the skills and creativity of teachers in compiling and presenting materials, which can differ from one teacher to another.

For further research, it is recommended that the research subjects be expanded by involving a wider population and covering various schools in different areas to increase the external validity and generalization of the research results. In addition, the development of more varied learning media needs to be done to accommodate various student learning styles, including kinesthetic elements or direct experiments in technology-based learning. The development of technological infrastructure in schools is also important, so that the availability of devices such as computers, projectors, and electricity access can support the optimization of the use of PowerPoint media. Further research also needs to be done with a longer duration to evaluate the long-term impact of this learning media on student learning outcomes. On the other hand, teachers need to receive special training to improve their skills in designing and using PowerPoint media interactively and effectively. Finally, exploration of other technology-based learning media, such as web-based applications or augmented reality, is also recommended to study their effectiveness in explaining complex science concepts and improving the overall quality of learning.

4. CONCLUSION

From the results of the statistical test above, it can be concluded that the use of powerpoint -based learning media is effective in improving student learning outcomes. Data shows that the learning outcomes of the experimental group increased significantly compared to the control group. This study shows the importance of using interactive media in learning to improve student understanding and learning motivation. Audio -visual -based PowerPoint media has been proven to have a positive impact on student learning outcomes regarding the concept of solar system. So researchers recommend that further research combines qualitative research methods to gain a more in -depth insight about the perception of students and teachers on the use of technology -based learning media. In addition, further research is recommended to incorporate qualitative methods to gain deeper insights into students' and teachers' perceptions regarding the use of technology-based learning media, as well as to explore the long-term impact of these tools on different educational contexts.

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