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The Effectiveness of Interactive Powerpoint in Improving Students' Conceptual Understanding of Optics

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Abstract

The purpose of using interactive powerpoint media is improving students' understanding of concepts. In the research that has been conducted involving 62 students of 11th natural science grade even semester of the academic year 2021/2022 at MAS PP Daarun Nahdhah Tawalib Bangkinang, Kab. Kampar, Prov. Riau. The first purpose of research is to describe students' conceptual understanding through the use of interactive powerpoint media. Second, to determine the effectiveness of using interactive powerpoint learning media in improving students' conceptual understanding. The type of research used is a quasi-experimental design with a non-equivalent posttest only control group design with 2 groups of participants, namely the experimental group and the control group. Based on the results of the descriptive analysis, it was found that the understanding of the concept of the experimental group was in the good category with an average achievement capacity of 73.2%. while the result of inferential analysis is that there is a difference in understanding of the concept of the experimental group and the control group with (sig) 0.000 <0.05. it can be concluded that the use of interactive powerpoint media can improve students' conceptual understanding of optical instrument material 11th grade MAS PP Daarun Nahdhah Tawalib Bangkinang.

How to Cite

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INTRODUCTION

The role of a teacher in a learning process greatly affects the achievement of meaningful physics learning and activates students to master the concepts of learning physics in our daily lives. Therefore, a teacher is required to be able to present learning that involves students directly. However, in reality the physics learning process is still mostly done manually, namely conventional learning that is centered only on the ability of students to remember information without being required to understand the information, which causes students' weak understanding of concepts. (Dede Salim Nahdi, et al, 2018)

Understanding is one of the terms in learning that its existence is very important to be able to achieve educational goals so that it takes various ways to achieve understanding in the learning process student. According to Purwanto in (Angga Murizal, Yarman and Yerizon, 2012) states that understanding is the level of ability that students expect to be able to understand a concept, fact or situation that is known by students. According to Wardhani in (Ahmad Yasir Rifa'I, 2020) stated that a concept is an abstract idea that can be used, as well as allowing one to classify a object.

If we look at Bloom's cognitive domain, conceptual understanding is in the second level of the cognitive level which is defined as the ability to be able to absorb meaning from material studied by students. understanding can be obtained, it is necessary to understanding which refers to the ability to understand concepts and interpreting the existing knowledge in the material being taught so that students can rearrange that knowledge in their own sentences (Sutarno in W. Gulo, 2008). Bloom distinguishes understanding the concept into 7 aspects which include (1) interpreting (2) Classifying (3) Exempliying (4) Summarizing (5) Inferring (6) Explaining (7) Comparing (Anderson and Krathwohl, 2010).

Most of the students have weaknesses in understanding concepts and skills procedural knowledge. individual ability to understand a certain concept is referred to as conceptual understanding. a student already has an understanding the concept that good if students have caught the meaning or meaning of a concept. students are weak in understanding the concept reflected when students succeed correctly solved the same problem exemplified by teacher, but when given a problem that is slightly changed, students have difficulty finish it. This shows that students are only able to memorize and remember the formulas and processes involved without understanding the applicable physics concepts. While students are weak in procedural knowledge, it is reflected when students are able to solve problems correctly which is the same as the one exemplified by the teacher, but when given another problem which has the same form as the example or is slightly modified by the teacher, the students always ask questions the sequence of each step to solve the problem to teacher. This shows that students do not understand procedures in solving problems correctly and students always depend on the teacher in solving physics problems. This problem is one of the causes of students having difficulty in learning study. (Luluk Khamidah, 2017)

Based on the problems above, efforts are needed to improve students' understanding of concepts. Seeing the development of technology today has shown a lot of extraordinary progress. Many things from the life sector have used this technology. The presence of these technologies has a major and significant impact on human life in various aspects and dimensions. Advances in technology and information have also triggered changes in the learning system, which is an effort to free the world of education from the shackles of conventional learning models and one of these media is interactive powerpoint. (Nira Alpira and Anik Ghufron, 2015).

Microsoft PowerPoint is a presentation application on a computer that easy to use, because this powerpoint program can be integrated with other Microsoft such as word, excel, access and so on. Power point is also one of the programs under microsoft office computer program and display to the screen using the help of the LCD projector. Learning using powerpoint media is designed for interactive learning, where in powerpoint presentation media is designed and equipped with tools user-operable controller so that the user can choose what you want for instructions for use, materials, and practice questions. (Maria Resti Andriani and Wahyudi, 2016)

According to (Joni Purwono, Sri Yutmini and Sri Anitah, 2014) explain that learning media as a tool in the learning process to stimulate feelings, thoughts, attention, abilities and skills of students so that it can encourage the desired learning process. One of the learning media that is currently developing is audiovisual media that is suitable for use in the learning process. Learning media has a role in the learning process and cannot be separated from the world of education. Information can be sent to the recipient through the media so that it can stimulate students' feelings, thoughts, interest in learning and attention to learning. Teachers can convey learning messages

through learning media that can increase student creativity and student attention in the learning process.

The primacy of media in learning according to (Zainal Arifin and Adhi Setyawan, 2012) are learning media that can overcome student limitations, can produce uniformity of student observations, can generate new desires and interests, can exceed class limits, are able to generate motivation and stimulate students for learning and the media is able to provide integral and comprehensive learning from the concrete to the abstract, from the simple to the complex.

Then, the selection of material by the researcher refers to material that is difficult for students to understand. Based on research that has been carried out by (Wulan Sari Purwaningtias and Ngurah Made Darma Putra, 2020) said that while studying optic instrument many students' experience misconceptions which lead to study habits that do not pay attention, and do not record the material being taught delivered by the teacher, students do not study before the exam takes place, students lack be careful in answering questions, and students only memorize the material when learn without understanding the basic concepts of the material, examples of questions that given by the teacher is less varied, the teacher is too fast in explaining the material, the worksheets used by students are incomplete, there is no practicum support learning. Meanwhile, the students in MAS PP Daarun Nahdhah Tawalib Bangkinang who studying physics in 11th grade natural science have weak conceptual understanding skills where students do not understand the concepts of physics material being taught but students only memorize physics formulas which results in students having difficulty solving physics problem whether the question have the same pattern or solve different questions modified, especially when students are faced with physics material that have a high level of difficulty to understand. The observed characteristics are in line with the research conducted by (Wulan Sari Purwaningtias and Ngurah Made Darma Putra, 2020) that the materials for optical instruments have undergone a lot misconceptions which indicate that the average student has difficulty understanding optical instrument materials and did not rule out the same difficulties experienced by MAS PP Daarun Nahdhah Tawalib Bangkinang student. This is because several factors that have been described by (Wulan Sari Purwaningtias and Ngurah Made, 2020) Darma Putra also happened to MAS PP Daarun Nahdhah Tawalib Bangkinang.

Based on this description, the researcher is interested in carrying out activities research on " The Effectiveness of Interactive Powerpoint in Improving Students' Conceptual Understanding of Optics".

METHOD

In this research we used quasi experimental method with non-equivalent posttest only control group design. There were 62 students of 11th natural science grade MAS PP Daarun Nahdhah Tawalib Bangkinang as participants who were divided into an experimental group of 32 students and into a control group of 30 students. Both groups have been confirmed to be equal through the homogeneity test, so that it is obtained that both groups have homogeneous variances and mean scores.

To the experimental group we have given the treatment in the form of scientific learning assisted by interactive powerpoint media. Meanwhile, in the control group, treatment was given in the form of scientific learning assisted by conventional powerpoint media. The topic of physics chosen in this study is optical instruments. The choice of this topic is based on the consideration that optical instruments are relatively easy to visualize in interactive powerpoints and are more contextual.

Research can be carried out by preparing learning tools needed in the learning process, in the experimental group using interactive powerpoint media and learning tools have been designed consisting of syllabus, lesson plans and worksheets. While in the control group, learning is not carried out using interactive powerpoint learning media but uses powerpoint konventional and has provided learning tools consisting of syllabus, lesson plans and worksheets.

After being given treatment to the two groups, the researcher then gave a test of the students' conceptual understanding ability. The data to be analyzed in this study is the result of the student's conceptual understanding test after being given treatment through the use of interactive powerpoint media consisting of students' conceptual understanding test scores. The conceptual understanding test instrument given to the experimental and control groups was the same. This conceptual understanding ability test instrument is in the form of a multiple choice test on optical instrument material. The tests used in this study are based on their suitability with aspects of conceptual understanding, namely Interpreting, classifying, exemplifying, comparing,

explaining, inferring and summarizing. The conceptual understanding test that has been designed by researcher can be seen in Table 1 as follows:

Table 1. Profile of The Instrument

Aspects	Amount of Question
Interpreting	3
Exemplifying	3
Comparing	3
Clasifying	3
Explaining	3
Summarizing	3
Inferring	3
Total	21

The usefulness of this data collection instrument is to determine the effect after using interactive powerpoint media on students' understanding of concepts. The research instrument has been validated by 2 validators by looking at the curriculum, material, conformity with the indicators of conceptual understanding, the level of difficulty of the questions and the suitability of the instrument's answers so that the instrument can be said to be feasible to use. There are several improvements to some of the conceptual understanding test questions.After improvements have been made, it can be stated that the conceptual understanding test instrument can be used in research.

The data obtained will be analyzed in two stages, namely the stage of descriptive data analysis and also inferential data analysis. Descriptive data analysis was conducted by researchers to determine the level of understanding of students' concepts so that it can be seen how far students' understanding of the learning concepts presented. Descriptive analysis is an analytical technique that only presents information in the form of observed data and does not aim to test hypotheses or draw conclusions that apply in general. That is why descriptive analysis includes deductive statistics because it does not draw conclusions (Sugiyono, 2014). The descriptive analysis referred to in this study looked at the understanding of students' concepts which consisted of the effectiveness and achievement of students.

The achievement of students is the ability of students to absorb a concept or material that has been conveyed by the teacher. Systematically to find the achievement of students used provisions such as the following equation:

Student's achievement = (score obtained)/(maximum score) x 100%

Meanwhile, to determine the average achievement of students can use the following equation:

average achievement of students = (total achievement score)/(total students)

After the conceptual understanding test was carried out, the data obtained were analyzed for achievement capacity.

Table 2. Category of Student' Achievement

Interval(%)	Achievement Category
$85 \leq x \leq 100$	Very good
$70 \leq x < 85$	Good
$50 \leq x < 70$	Quite good
$0 \leq x < 50$	Not good

Based on the equation for the achievement of students, then grouped the achievement categories according to Table 2, namely very good, good, quite good and not good. In addition to the achievement of students, the data obtained after the conceptual understanding test was also analyzed for the effectiveness of the learning obtained by the students and then grouped according to Table 3 with categories of very effective, effective, quite effective and less effective. To determine the increase in achievement, the category of learning effectiveness obtained by students uses provisions such as Table 3:

Table 3. Learning Effectiveness Category

Interval(%)	Effectiveness Category
$85 \leq x \leq 100$	Very effective
$70 \leq x < 85$	Effective
$50 \leq x < 70$	Quite effective
$0 \leq x < 50$	Not effective

Inferential analysis is an analytical technique whose data is taken from a random sample that has the ability to draw conclusions. Inferential analysis was conducted to determine the differences in students' conceptual understanding after the application of interactive powerpoint media in the experimental group and conventional powerpoint media applied to the control group through hypothesis testing. Before testing the hypothesis, prerequisite tests were carried out, namely normality test and homogeneity test. The normality test was carried out using the kolmogorov smirnov test technique, it is used because to test normality on a large sample of more than 50 kolmogorov smirnov test is more precise because the results will be more accurate, while the homogeneity test used the levene test and it

was choosen because the test is a popular test used and hypothesis testing using SPSS with the independent sample t-test technique and it was choosen because the purpose of the study was to compare the conceptual understanding of the two classes after being given treatment. (Erwan Agus Purwanto and Dyah Ratih Sulistyastuti, 2017).

Normality test is a statistical test that serves to see the sample research is normally distributed or not by using the test kolmograv smirnov with a significance level of 5%. Data processing and the test is carried out using SPSS version 24 software. The data tested is secondary data, namely the value of daily tests on light wave material. If the significance ≥ 0.05 then the data is normally distributed and if the significance is < 0.05 then the data is not normally distributed. (Nuryadi, et al, 2017)

Then, the homogeneity test serves to see the two classes studied homogeneous or not. The homogeneity test in this study was carried out on the data daily test of students on light wave material with the help of SPSS 24. If the significance ≥ 0.05 then the data is homogeneous and if the significance < 0.05 then the data is not homogeneous. (I Wayan Widana and Putu Lia Muliani, 2020)

If the test for normality and homogeneity of the data has been completed, a hypothesis test is carried out, hypothesis testing is used to test the truth of the data obtained obtained from the research sample. Test the hypothesis with the technique of independent sample t-test which aims to determine the difference in the average value of the two samples different by determining the level significance. (Erwan Agus Purwanto and Dyah Ratih Sulistyastuti, 2017).

RESULT AND DISCUSSION

The presentation of the results of this study consists of two types of analysis, namely descriptive analysis and inferential analysis. The analysis consisted of student achievement and learning effectiveness, while the inferential analysis consisted of normality test, homogeneity test, and hypothesis testing. The results of the analysis are as follows.

Descriptive Analysis

The data analyzed in this study were the students' conceptual understanding test data in the experimental and control groups on optical instrument material. The conceptual understanding test data was carried out after using interactive powerpoint media in the 11th grade natural science 1 as an experimental group and learning with conventional powerpoint media in the 11th grade natural science 2 as a control group at MAS PP Daarun Nahdhah Tawalib Bangkinang.

Based on the students' conceptual understanding data which was processed using the student achievement equation, the students' achievement of optical instrument material through the application of interactive powerpoint media in the experimental group and conventional powerpoint media in the control group is shown in Table 4.

Table 4. Students' Conceptual Understanding in the Experimental Group

Experimental Group			
Interval	Category	Percentage (%)	Total Students
85 ≤ x ≤100	Very good	15,6	5
70 ≤ x <85	Good	37,5	12
50 ≤ x <70	Quite good	40,6	13
0 ≤ x <50	Not good	6,2	2
Average		73,2	
Category		Good	

Then the following is table 5 which explains the category of student achievement of each aspect in the control group that uses conventional powerpoint media.

Table 5. Students' Conceptual Understanding in the Control Group

Control Group			
Interval	Category	Percentage (%)	Total Students
85 ≤ x ≤100	Very good	0	0
70 ≤ x <85	Good	16,6	5
50 ≤ x <70	Quite good	60	18
0 ≤ x <50	Not good	23,3	7
Average		59,2	
Category		Quite good	

Based on tables 4 and 5, it can be seen that the average achievement of students in the experimental group using interactive powerpoint media is higher than the control group using con-

ventional powerpoint media. This is shown in the experimental group the average achievement of students reached 73.2% and the control group 59.2%. The average percentage of achievement of the experimental group students is in the good category while the control group is in the quite good category, the average achievement of the experimental group students is higher than the control group with a difference of 14.09%.

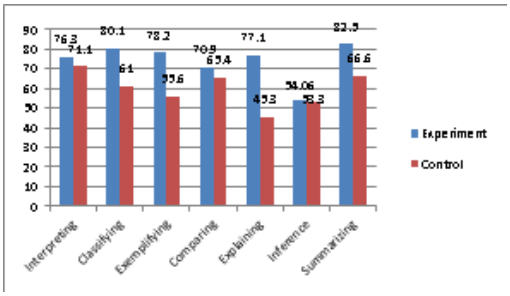

Figure 2. Graph of score results for each aspect of conceptual understanding test

Figure 2 can be seen that the understanding of the concept of the experimental group using interactive powerpoint media in each aspect is higher than the control group using conventional powerpoint media. In line with the results of research conducted by (Fransiskus Xaverius Dolo, Maria Yuliana Kua and Yanuarius Djawaria, 2022) stated that learning using interactive multimedia can improve students' conceptual understanding. From the data analysis, it can be seen that there is an increase in each learning cycle.

Students' understanding of physics concepts can be known in more detail by analyzing aspects of conceptual understanding which include aspects of explaining, summarizing, interpreting, classifying, inferring, comparing, and exemplifying. Analysis of aspects in the experimental group showed that of the seven aspects of conceptual understanding, the aspect of explaining was the highest aspect percentage, with a total percentage of 82.5%. While the comparison aspect is the lowest aspect percentage with a percentage gain of 54.06%. In the control group itself, an analysis of aspects of conceptual understanding was also carried out. interpreting aspect is the aspect with the highest percentage in the control group with a total percentage of 71.1%. While the inference aspect is the aspect with the lowest percentage with a gain percentage of 45.3%. From the results of data analysis, the understanding of the concept of each aspect in the experimental and control groups is different. Based on the graph in figure 2. it can be seen that each aspect of conceptual understanding between the conceptual understanding test scores in each group has differences.

Inferential Analysis

When analyzing inferential data, the researchers previously conducted a prerequisite test, namely data normality test and data homogeneity test to be able to hypotheses test. After being tested, it was found that both groups had a greater significance value of 0.05 means that the two groups are said to be homogeneous and normally distributed. Because both groups have the same variation and are normally distributed then hypothesis testing can be done using independent sample t-test carried out with the SPSS 24 program.

The hypothesis in this study was obtained using an independent sample t-test, a significance value (2-tailed) of 0.000 was obtained, which means that there is a significant difference in the effect on students' conceptual understanding between the group that uses interactive powerpoint media and the group that applies conventional powerpoint media learning to the optical instrument material. In other words, students' conceptual understanding using interactive powerpoint media was higher than the group using conventional powerpoint media. This is supported by Azhar Arsyad's (2015) statement regarding the use of learning media in the learning process can increase desire, new motivations that provide psychological influence to increase effectiveness in the learning process. This means that the higher the motivation to learn, the higher the understanding of students' concepts. In line with the research of Deliany, N., Hidayat, A., & Nurhayati, Y.(2019) stated that the increase in understanding of physics concepts in the experimental group was better than the control group after interactive multimedia was applied in science learning. Interactive multimedia applied in the experimental group is able to visualize abstract material so that students can understand it.

CONCLUSION

Based on research that has been done at MAS PP Daarun Nahdhah Tawalib Bangkinang regarding the use of interactive powerpoint media then can be concluded that the application of interactive powerpoint media can improve student' conceptual understanding on optical instrument material at 11th grade MAS PP Daarun Nahdhah Tawalib Bangkinang with good achievement category. It can be seen in the average value of the achievement of the experimental group

in the good category, while the average score of the achievement in the control group in the quite category. Thus, students' understanding of concepts in the experimental group was better than the control group.

The results of the study concluded that learning using interactive powerpoint media is proven to improve students' conceptual understanding of optical instrument material in 11th grade at MAS PP Daarun Nahdhah Tawalib Bangkinang.

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