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Improving the Understanding of Students' Learning Concepts on Optical Equipment Materials through Interactive Learning Media

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ABSTRACT

This research was motivated by the lack of learning media that facilitates understanding of students' concepts on optical material. The existing learning media generally integrate the visualization of image formation on mirrors and lenses. Not yet equipped with practice questions and evaluation questions in accordance with the concept understanding indicators. Then the percentage of student learning outcomes that are below the KKM and student learning motivation is low. The purpose of this study is to improve the understanding of students' concepts by using Lectora learning media. The design used in this study was a randomized control group pretest-posttest and the research subjects were students of class XI SMA N 5 Tapung. The control class applied conventional learning and the experimental class applied the use of learning media. The application of Lectora Inspire interactive learning media affects students' conceptual understanding in the experimental class with an average increase of 0.58, and the control class with an average increase of 0.54. The results showed that there were significant differences in conceptual understanding between the experimental group and the control group.

1. Introduction

Physics learning can be interpreted as a teaching and learning process that studies natural events in everyday life (Putri, 2016). The achievement of students in understanding a concept becomes one of the indicators of success in the learning process. If this wrong concept continues, students will experience misconceptions. One of the physics materials that often occurs misconception is optics (Suparno, 2013). This is in line with the research of Sulaeman, N.F (2018), one of the causes of the low understanding of students' concepts is due to misconceptions. Physics

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subjects become very vulnerable for students because students have limited information so that the assignment of concepts is not complete, simple, and different.

Optics is one of the main subjects of physics which is actually easy to grasp for students but the learning outcomes obtained by students are still low. Physics teachers have applied various learning models in delivering optical material. Students' understanding of optics has not been maximized, so the teacher takes longer than scheduled to explain the material to students again. Such conditions disrupt the lesson plans that have been prepared by the physics subject teacher at the beginning of the semester. Optical materials are very useful for explaining various phenomena in everyday life and have very wide applications in various life activities. According to Handayani (2018) who conducted research at SMAN 1 Demak, it showed that as many as 72% of class XI students and 76% of class XII students stated that they had experienced wrong concepts while they were studying physics. As many as 56% of class XI and 52% of class XII said that geometry optics is the most difficult material to understand. The misconception about geometrical optics was found by Fariyani (2015) in her research at SMA Negeri 2 Semarang that students think that the angle of reflection produced by diffuse reflection is not the same as the angle of incidence.

Misconceptions about geometrical optics were also found by Syarif (2016) in a similar study at SMA Negeri 6 Pontianak, namely students experienced misconceptions in the process of seeing the image on a flat mirror, determining the position of the image on a flat mirror, and determining the position (distance) of the image equal to the position (distance) of the image.) object. Another misconception was also found by Sutopo (2014) in his research which showed that students still experience misconceptions about the process of forming real images and the nature of virtual images. Students also assume that if the loop is half closed, the image of the object will not be visible. From various studies that have been carried out by previous researchers, it can be concluded that misconceptions in high school students still occur in geometric optical material.

The research entitled Identification of student misconceptions and their causes in optical instrument material conducted by Munawaroh (2016), states that students still experience misconceptions in optical material, the highest misconceptions occur in the Lup sub-material with an average percentage of 35.26% and the lowest in sub material microscope and telescope with an average percentage of 17.95%. Some of the causes of students' misconceptions are preconceptions, associative thinking, incomplete reasons, wrong intuition and low interest in learning. One way to overcome this is by using interactive learning media. The position of learning media in learning physics is one of the efforts to enhance the process of teacher-student interaction and student interaction and the physics learning environment. The function of learning media is as a teaching aid, namely supporting the use of teaching methods used by teachers. Interactive learning media has great potential to stimulate students to respond positively to the learning materials presented. One of the learning media is using a computer (Istiqlal, 2017).

The positive impact of using interactive multimedia in learning can be seen from the results of research by Finkelstein (2005) which says that computers can be used to support the implementation of physics practicum both for collecting data, presenting, and processing data. In addition, computers can also be used to modify experiments and display complete experiments in virtual form. Then Gunawan, et al (2016) found that computer simulations can be integrated with various physics learning models. The combination of problem solving laboratory models with computer simulations has helped students learn optical concepts better than students who study conventionally. Research on interactive multimedia conducted by Sutarno (2011) found that the increase in conceptual mastery of students who participated in learning using cooperative learning groups assisted by interactive multimedia was significantly higher than students who participated in conventional learning. In another study, Sutarno (2011), found that the increase in mastery of concepts and critical thinking skills of students who took magnetic field learning using interactive multimedia online was significantly higher than students who took conventional learning.

Based on a preliminary study conducted at SMAN 5 Tapung, information was obtained that the learning resources used by the teacher were only textbooks and the teacher had used media in learning as a learning resource by using Powerpoint (PPT) media. However, the display of powerpoint media is only in two-dimensional form, so it still looks monotonous and can only help teachers deliver material but cannot visualize abstract physics concepts. The absence of variations in the use of learning media, for example, the absence of animation or video in three-dimensional form that is displayed in visualizing abstract concepts so that in terms of attractiveness and novelty the media used has not been able to make physics subjects interesting and easy to understand. One of the learning media that can be used is the Lectora inspire application. Lectora inspire is an Authoring Tool software for E-learning content development developed by Trivantis Corporation. Lectora is very easy to use in developing Interactive Learning Multimedia (MPI) content and has the advantage of being able to combine flash, record video, combine images, and screen capture (Mas'ud, 2012).

According to Ngubaidillah & Kartadie (2018), visual media lectora has a positive influence on student learning outcomes compared to conventional learning in ICT lessons. Meanwhile, Herizon Primadona, Nehru (2013) stated that learning physics using Lectora inspire learning media is better than using powerpoint learning media in terms of student learning motivation on momentum and impulse material for class X SMAN 3 Muaro Jambi. Then Zuhri & Rizaleni, (2016) concluded that student achievement using Lectora Inspire with a contextual approach can be improved. In addition, the average ability to understand mathematical concepts of students who are taught with the Lectora-assisted Concept Attainment learning model is better than the conventional learning model (Rasiman, et al, 2018)

Furthermore, according to Setyo and Yuswono (2015), in their research entitled *The Effect of Lectora Inspire-Based Use on Motivation and Learning Outcomes of Class X Students on Competency Standards Using Measuring Tools in the*

Light Vehicle Engineering Department of SMK Muhammadiyah 1 Bantul, which states that the use of learning media lectora-based can have a positive effect on students' learning motivation and the average learning motivation of the experimental class students is higher than the average learning motivation of the control class. Based on the description above, the researcher will develop learning media with the title Use of Lectora Inspire-Based Interactive Learning Media to Improve Concept Understanding on Optical Instrument Material.

2. Methodology

Research Design

This study applied a pretest-posttest randomized control group research design as shown in Table 1. Prior to the treatment, homogeneity tests were carried out, for homogeneity tests were taken from the data from the odd semester exam results for the 2020/2021 school year. After the data is declared homogeneous, the experimental and control classes are selected randomly).

Table 1. Research Design

Class	Pretest	Treatment	Posttest
Experiment	O ₁	X	O ₂
Control	O ₁	-	O ₂

Information:

O₁ = Initial test (pretest)

X = Treatment of the experimental group

O₂ = Final Test (posttest)

In this design, before the treatment was given, the sample was given a pretest (initial test) for both classes (experimental and control). After that, the experimental class was given treatment in the form of learning using interactive learning media Lectora Inspire. While in the control class, conventional learning was carried out. At the end of the lesson, both classes were given a posttest (final test). The pretest and posttest data requirements used must be normally distributed. Therefore, before the data is used, a prerequisite analysis is carried out with a normality test. The following are the steps of data processing used in the study.

Normality Test

In this study, the normality test was carried out using the Kolmogorov-Smirnov test assisted by the Statistical Package for Social Sciences (SPSS) 23.0 software for windows. With the decision criteria in the normality test on SPSS according to Arifin (2017) SPSS are:

- If the significance value is > 0.05 , the data is normally distributed.
- If the significance value < 0.05 then the data is not normally distributed.

Hypothesis Testing

Hypothesis testing of students' conceptual understanding ability test data was carried out using parametric statistical tests (Independent sample t-test) with the help of SPSS 23.0 software. The test criteria are, if the significance value > 0.05 then H_0 is accepted and H_a is rejected. If the significance < 0.05 then H_a is accepted and H_0 is rejected. This technique is used to test whether there is a significant difference in the results of the students' concept understanding test in the experimental and control groups. The statistical hypotheses made to determine the effectiveness of using media in learning activities are as follows:

H_0 = There is no difference in students' conceptual understanding between the experimental class and the control class.

H_a = There is a difference in students' understanding of the concept between the experimental class and the control class.

Concept Understanding Analysis

To find out students' understanding of physics concepts, a reasoned multiple-choice test is used in which each question provides 4 alternative answers with a total of 10 questions. The provisions for scoring the items on the multiple-choice test questions given are as follows:

- 1) If the answer is correct and the reason is right, it gets a score of 4.
- 2) If the answer is correct and the reason is not correct, it gets a score of 3
- 1) If the answer is correct and the reason is wrong gets a score of 2
- 2) If the answer is wrong and the reason is wrong, it gets a score of 1
- 3) Not answering gets a score of zero.

To calculate the score for each indicator of concept understanding (translation, interpretation, extrapolation) obtained using the formula:

$$\text{Concept understanding score per indicator} = \frac{\text{score obtained}}{\text{maximum score}} \times 100\%$$

Table 2. Categories of Students' Concept Understanding

No.	Interval	Criteria
1	90-100%	Very high
2	80-89%	Tall
3	65-79%	Currently
4	55-64%	Low
5	0-54%	Very low

Source ; Akbar, 2013

N-Gain Test

The N-Gain test was conducted to determine the effectiveness of using Lectora Inspire learning media by seeing how much the students' conceptual

understanding ability in the experimental class increased when compared to the control class. N-Gain is a normalized gain, with N-gain criteria, the category of N-Gain value assessment can be seen in Table 3.

Table 3. Criteria for the N-Gain . value

Persentase (%)	Category
0,00-0,30	Low
0,30-0,70	Currently
0,70-100	Tall

Source: Hake (1998:65)

N-Gain is obtained by using the following formula:

$$(g) = \frac{\text{skor posttest} - \text{skor pretest}}{\text{skor maksimum} - \text{skor pretest}}$$

(Meltzer, 2002)

Population and Sample

The population of this study is all students who study optical instruments, namely all students of class XI SMAN 5 Tapung for the academic year 2020/2021 which consists of 2 MIA classes and 3 IIS classes. To determine the sample, the homogeneity test was taken from the data from the odd semester exam results for the 2020/2021 school year. After the data was declared homogeneous, the experimental and control classes were randomly selected, namely class XI MIA 1 (experimental class) and class XI MIA 2 (control class).

3. Results and Discussion

Figure 1 is the main menu on the interactive learning media used, including the "Syllabus and lesson plans" page, "LKPD" page, "Material" page, "Evaluation" page, "Compiler Biography" page. Figure 2 explains the interactive learning media Lectora Inspire equipped with images, audio, video, animation and flash that support the material. The first meeting contained sub-materials on the formation of images on flat mirrors, curved mirrors, concave lenses and convex lenses which were equipped with pictures, videos and animations. The second meeting contains sub-materials of eye optics and eye defects which are complemented by pictures, videos and animations. The third meeting contains sub-materials of loupe and microscope which is equipped with pictures, videos and animations. The fourth meeting contained binoculars and camera sub-materials equipped with pictures, videos and animations. Then there is an evaluation menu that contains Quiz questions and practice questions.



Figure 1. Lectora Inspire kerja work page display

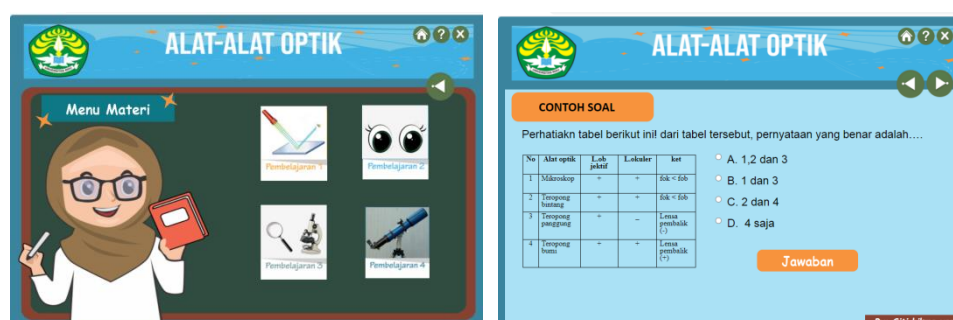


Figure 2. Lectora Inspire Teaching Material Page Display

The design used in this study was a randomized control group pretest-posttest. Before determining the experimental class and control class, homogeneity test was carried out on the population at SMAN 5 Tapung which consisted of 5 classes. Homogeneity analysis using data from the odd semester exam results for the 2020/2021 school year. After the data was declared homogeneous, the experimental and control classes were randomly selected, namely class XI MIA 1 (experimental class) and class XI MIA 2 (control class). In this design, before the treatment was given, the sample was first given a pretest (initial test) for both classes (experimental and control) after which the experimental class was given treatment in the form of learning using the interactive learning media Lectora Inspire. Meanwhile, the control class did not use Lectora Inspire interactive learning media. At the end of the lesson, both classes were given a posttest (final test). The pretest and posttest data requirements used must be normally distributed. Therefore, before the data is used, a prerequisite analysis is carried out with a normality test.

a) Normality Test

The Kolmogorov-Smirnov test is better used if the sample is more than 50 people, while the Shapiro-Wilk test is better used if the sample is smaller than 50 people (Riduwan, 2012). The samples in this study each amounted to 35 people, so a

good test to do is to use the Shapiro-Wilk test. Table 4 shows that the pretest data obtained have a significance value of 0.363 and 0.130 respectively, which means the Sig count > 0.05 , namely $0.363 > 0.05$ and $0.130 > 0.05$ with a level of $= 0.05$ so that H_0 is accepted. . This shows that the pretest data of both classes has a normal distribution.

Table 4. Posttest Data Normality Test Results

Class	Df	Sig.
Control	35	0,079
Experiment	35	0,054

Table 5 shows that the posttest data obtained have a significance value of 0.079 and 0.054, respectively, which means the Sig count > 0.05 , i.e. $0.079 > 0.05$ and $0.054 > 0.05$ with a level $= 0.05$ so that H_0 is accepted. . This shows that the posttest data of the two classes has a normal distribution so that it can be directly used for further statistical tests.

b). Statistical Test (Hypothesis)

The normal pretest and posttest data were then analyzed by statistical analysis techniques using the Independent Sample T test. This test is used to test whether or not there is a difference in the mean between two unrelated samples. In this case, two unrelated samples are posttest sample data from the experimental class and posttest sample data from the control class. The Independent Sample T Test analysis technique was used to test whether or not there were differences in the students' conceptual understanding abilities of the experimental class and the control class. This analysis technique is assisted by the Software Statistical Package for Social Science (SPSS) version 23.0 for Windows. The description of the data on the ability to understand concepts seen from the average posttest results of students in the experimental class and control class can be seen in Table 5.

Table 5. Data Description of the Average Posttest Value of the Experimental Class and the Control Class

	Class	Total Students	Average
Method	Experiment	35	89,857
	Control	35	85,571

Based on Table 6, it is known that the average value of the students' conceptual understanding ability test on the subject of optical instruments in the experimental class obtained an average value (mean) of 89.86, while the control class obtained an average value (mean) of 85.57. So it can be concluded that there is a difference in the average value of the experimental class and the control class. Furthermore, to see whether the difference is significant (real) or not with the hypothesis:

Ho : There is no difference in the average value of the experimental class and the control class after treatment

Ha : There is a difference in the average value of the experimental class and the control class after treatment

Significant data for the experimental class and control class can be seen that the value of Sig. Levene's Test for Equality of Variance is $0.901 > 0.05$, it means that the data variance between the experimental class and the control class is the same or homogeneous, so that the Equal Variances Assumed Table shows the value of Sig.(2-tailed) of $0.001 < 0, 05$, it can be concluded that H0 is rejected and Ha is accepted. Thus, there is a significant difference between the average value of the experimental class and the control class. The difference in understanding of the concepts of experimental and control class students is seen from the posttest results in the form of concept understanding questions. Understanding the concept of students can be analyzed from the questions given which contain indicators of understanding the concept. Based on the posttest results, the experimental class got a higher average score than the control class. This is because in the learning process the experimental class uses Lectora Inspire interactive learning media which was developed in accordance with the indicators of concept understanding. Where indicators of understanding this concept are also included in the posttest questions. The same result was also obtained by Rasiman, et al (2018) where the ability to understand mathematical concepts of students who are taught with the Lectora-assisted Concept Attainment learning model is better than the conventional learning model.

In the experimental class students have been trained to develop students' conceptual understanding through image formation videos, animations and questions in interactive media, so that there is a change in students' conceptual understanding of the experimental class before and after using Lectora Inspire interactive media. This shows that Lectora Inspire's interactive learning media on optical instruments can improve students' conceptual understanding. The results of this study are in line with the research of Setyo and Yuswono (2015) that the use of lectora-based learning media can have a positive influence on students' learning motivation and the average learning motivation of experimental class students is higher than the control class's average learning motivation. Then according to Ngubaidillah & Kartadie (2018) the visual media lectora has a positive influence on student learning outcomes compared to conventional learning in ICT lessons.

c). The effectiveness of Lectora Inspire learning media

The test to determine the effectiveness of the use of Lectora Inspire learning media on optical instruments in the experimental class and without Lectora Inspire media in the control class on students' conceptual understanding can be seen from the increase in posttest scores through the N-Gain Score statistical test. The results of the analysis of the N-Gain Score test data from the concept understanding test of the experimental class and control class students can be seen in Table 6. Based on Table 6 all indicators of concept understanding show an increase in the value of N-gain in the moderate category, but at indicators 8,9 and

10 there is a considerable difference between the experimental class and the control class. In the eighth indicator, understanding the correct event based on the picture, in the experimental class the N-Gain value is much higher than the control class. This is caused by the use of Lectora Inspire interactive learning media which can stimulate students' understanding of concepts from video and animation shows about optical materials so that students are able to understand the correct events according to the pictures. This is in line with the opinion of Duffin & Simpson (2000) concept understanding as a student's ability to re-express what has been communicated to him.

The indicator of understanding the ninth and tenth concepts is to distinguish the value of consideration from a prediction. Based on Table 8, there was an increase of 0.61 with the moderate category in the experimental class. These results indicate that students have the basic ability to understand concepts so that they can distinguish the value of a judgment from a prediction with the help of interactive learning media.

Table 6. Results of N-Gain Pretest and Posttest for Experimental and Control Classes

No	Concept Understanding Indicator	N-Gain Value			
		Exsperiment	Category	Control	Category
1	Translating one form of statement into another form	0,50	Effective enough	0,54	Effective enough
2	Translating abstractions to other abstractions	0,57	Effective enough	0,57	Effective enough
3	Translate events based on pictures	0,57	Effective enough	0,54	Effective enough
4	Understand the main idea	0,58	Effective enough	0,58	Effective enough
5	Distinguishing justification/denial of a conclusion contained in a data	0,63	Effective enough	0,63	Effective enough
6	Interpreting various data	0,56	Effective enough	0,53	Less effective
7	Inserting one data in a data set is seen the trend	0,55	Effective enough	0,50	Less effective
8	Understanding true events based on pictures	0,65	Effective enough	0,54	Less effective
9	Distinguishing the value of a judgment from a prediction	0,61	Effective enough	0,49	Less effective
10	Drawing conclusions from an explicit statement	0,64	Effective enough	0,48	Less effective

In the interactive learning media there are questions that guide students to guide students to understand the material of optical instruments. With the questions in the media, students will be trained in answering questions related to understanding concepts. While in the control class there was an increase of 0.48 with the medium category. These results indicate an increase in understanding of concepts in the experimental class because it uses interactive media. The understanding ability of students which is an important component in building a connection to

understanding the material as a whole is in line with the opinion of Gunawan (2014) which states that learning will be meaningful if learning is directed at developing conceptual abilities that will connect various ideas that are interrelated with one another so that it will be built. thorough understanding. And Zendler's (2018) opinion about the use of computer simulations and experimental methods has the same performance, so that computer simulations can build a comprehensive knowledge process and apply more concrete knowledge.

The results of the analysis of the ten components of the concept understanding indicator showed that each component increased even though all indicators were in the moderate category. The use of Lectora Inspire interactive learning media on optical instruments affects students' conceptual understanding. To see the average N-Gain value of the experimental class and the control class, it can be seen that the N-Gain score test, it shows that the average value of the N-Gain score for the experimental class is 58.87 or 0.58. Based on Table 3.9 regarding the N-Gain assessment criteria, with a score of $0.58 > 0.3$, it is included in the medium category. The N-Gain value for the control class is 54.0 or 0.54 including the medium category. From the above results, it can be concluded that the effectiveness of learning using Lectora inspire interactive media on optical instrument materials is more effective than conventional learning. Although the N-Gain category in the experimental class and control class are both in the "medium" category. These results are also supported by the results of research conducted by Sarabando, C (2014) entitled Contribution of a computer simulation to students' learning of the physics concepts of weight and mass, and Nara (2018) with the title dents: Focusing on the effectiveness of risk communication using Crossroad game , Shows that interactive teaching materials are effective for increasing students' understanding of concepts.

The advantages of Lectora inspire media are very user friendly "easy to use" by students. This learning media can also be published online or offline, so that students can learn independently with the media. Lectora inspire learning media is able to attract the attention of students, generate learning motivation, and direct interaction between students and their environment. This is because the Lectora Inspire learning media has combined writing, images, sound, animation, video and flash which can visualize concepts in three-dimensional aspects. This media is interactive so that in presenting the material students interact directly with the computer to get the desired response. This learning media has also integrated the visualization of image formation on mirrors and lenses as well as image formation on optical instruments (eyes, loupe, microscopes, binoculars, and cameras). In addition, the Lectora Inspire interactive learning media is equipped with material that is in accordance with the indicators of concept understanding in one learning media. In this media there are also sample questions, practice questions and evaluation questions according to the indicators of understanding the concept. The media also displays feedback and scores that can be known directly by students and makes it easier for teachers to assess. With the existence of learning media that presents material, animations, interactive simulations and evaluation questions, it will help students understand the concept of a material and train students to make logical estimates of a problem.

4. Conclusion

Based on the results of the research conducted, it can be concluded that the application of Lectora Inspire interactive learning media on optical instruments material affects students' conceptual understanding in the experimental class with an average increase of 0.58 and the control class with an average increase of 0.54. Meanwhile, the effectiveness of the Lectora Inspire interactive learning media material. Optical instruments developed are in the medium category to improve students' understanding of concepts

References

- Duffin, J. M., & Simpson, A. P. (2000). A search for understanding. *The Journal of Mathematical Behavior*, 18(4), 415-427.
- Fariyani, Q., & Rusilowati, A. (2015). Pengembangan four-tier diagnostic test untuk mengungkap miskonsepsi fisika siswa sma kelas x. *Journal of Innovative Science Education*, 4(2), 41-49.
- Gunawan, G., Harjono, A., Sahidu, H., & Sutrio, S. (2014). Penggunaan multimedia interaktif dalam pembelajaran fisika dan implikasinya pada penguasaan konsep mahasiswa. *Jurnal Pijar Mipa*, 9(1), 15-19.
- Gunawan, G., Harjono, A., & Sahidu, H. (2016). Laboratorium Virtual Fisika dan Implikasinya pada Penguasaan Konsep Optik Mahasiswa. dalam *Prosiding SNFA (Seminar Nasional Fisika dan Aplikasinya)*. 1, 65-70.
- Handayani, N. D., Astutik, S., & Lesmono, A. D. (2018). Identifikasi Miskonsepsi Siswa Menggunakan Four-Tier Diagnostic Test Pada Materi Hukum Termodinamika Di SMA Bondowoso. *Jurnal Pembelajaran Fisika*, 7(2), 189-195.
- Primadona, H. (2018). Perbandingan Motivasi Belajar Siswa Dengan Menggunakan Media Lectora Inspire Dan Powerpoint Pada Materi Momentum Dan Impuls Kelas X Sman 3 Muaro Jambi. *Edufisika*, 3(1), 43-54.
- Mas'ud, M. (2012). *Membuat Multimedia Pembelajaran dengan Lectora*. Yogyakarta: Pustaka Shonif.
- Munawaroh, R. (2016). Identifikasi miskonsepsi siswa dan penyebabnya pada materi alat optik menggunakan three-tier multiple choice diagnostic test. *Jurnal Inovasi Pendidikan Fisika (JIPF)*. 5(2), 79-81.
- Nara, Y. (2018). Action research for improving the risk literacy of university students: Focusing on the effectiveness of risk communication using Crossroad game. *Procedia computer science*, 126, 2219-2227.
- Ngubaidillah, A., & Kartadie, R. (2018). Pengaruh Media Visual Menggunakan Aplikasi Lectora Inspire Terhadap Hasil Belajar Peserta Didik. *Jurnal Penelitian Pendidikan*.
- Putri, H. K., & Mahardika, I. K. (2016). Model Pembelajaran Inkuiri Terbimbing Disertai Teknik Peta Konsep dalam Pembelajaran Fisika di SMA. *Jurnal Pembelajaran Fisika*, 4(4), 321-326.
- Rasiman, R., Rozana, E., & Sugiyanti, S. (2018). Efektivitas Model Pembelajaran Concept Attainment dan Model Pembelajaran Guided Discovery
-

- Berbantuan Lectora Terhadap Kemampuan Pemahaman Konsep Matematika. *Jurnal Ilmiah pendidikan matematika*, 3(2), 134-139.
- Riduwan. 2012. metode dan teknik menyusun proposal penelitian. Bandung, Alfabeta.
- Sarabando, C., Cravino, J. P., & Soares, A. A. (2014). Contribution of a computer simulation to students' learning of the physics concepts of weight and mass. *Procedia Technology*, 13, 112-121.
- Setyo, Muryo dan Yuswono, C. Lilik. (2015). Pengaruh Penggunaan Media Pembelajaran Berbasis Lectora Inspire Terhadap Motivasi Belajar dan Hasil Belajar Siswa Kelas X Pada Standar Kompetensi Menggunakan Alat-alat Ukur di Jurusan Teknik Kendaraan Ringan SMK Muhammadiyah 1 Bantul: Studi Pendidikan Teknik Otomotif. Yogyakarta. *Jurnal Pendidikan Otomotif*, 9(1), 154-160.
- Sulaeman, N. F., Laili, K dan Siska, M. F. (2018). Analysis of High School Student's Misconception in Energy Using Ordered and Reasoning Multiple Choice. *Jurnal Pembelajaran Fisika*, 7(2), 202-209.
- Suparno, P. (2013). *Miskonsepsi dan perubahan konsep dalam pendidikan fisika*. Jakarta: PT. Grasindo.
- Sutarno, M. (2011). Penggunaan Multimedia Interaktif Pada Pembelajaran Medan Magnet Untuk Meningkatkan Keterampilan Berpikir Generic Sains Mahasiswa. *Jurnal Exacta*, IX(1), 60-66.
- Sutarno, M. (2011). Pembelajaran Medan Magnet Menggunakan Online Interactive Multimedia Untuk Meningkatkan Penguasaan Konsep dan Keterampilan Berpikir Kritis Mahasiswa. *Program Studi Pendidikan Fisika Jurusan PMIPA FKIP Universitas Bengkulu*.
- Sutopo. (2014). Miskonsepsi pada optika geometri dan remediasinya. *Jurnal Peningkatan Kualitas Guru*, 2(5), 359-365.
- Syarif, A. (2016). Remediasi miskonsepsi cermin datar menggunakan learning cycle 5E berbantuan LKS concept cartoons di SMA. *Jurnal Pendidikan Dan Pembelajaran*, 5(6), 134-139.
- Zuhri, M. S., & Rizaleni, E. A. (2016). Pengembangan Media Lectora Inspire dengan Pendekatan Kontekstual pada Siswa SMA Kelas X. *Pythagoras*, 5(2), 113-119.
- Zendler, A., & Reile, S. (2018). The effect of reciprocal teaching and programmed instruction on learning outcome in computer science education. *Studies in Educational Evaluation*, 58, 132-144.

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