https://dx.doi.org/10.22161/ijaers.5.6.29 *ISSN: 2349-6495(P) | 2456-1908(O)*

Double-Display Media in Geometrical Optics Learning in Vocational High School

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Abstract**—** *This research is oriented on analysis of the impact of Double-Display media on Geometrical Optics learning used by students to improve students' learning outcomes and concept understanding. This research aims to determine the effectiveness of Double-Display media in Physics's subject Geometrical Optics. The effectiveness of Double-Display media as a learning tool is determined by the improving of students' learning outcomes and concept understanding. It is a quasy experimental research which is implemented in Vocational High School Islam Pajarakan class IX academic year 2017/2018 with a number of 36 people. Data collection techniques used in this research, are observation, tests, and documentation. The result showed that the use of Double-Display media in Geometrical Optics subject can improve learning outcomes by increasing the N-Gain score of 0.9 and it can be said as high category with the level of concept understanding of translation, interpretation and extrapolation are 97%, 86%, and 68%. Concluded the use of Double-Display Media on Geometrical Optics subject can increase students' learning outcomes and students' concept Understanding.*

Keywords— Media Double-Display, Effectiveness, Geometrical Optics, Concept Understanding.

I. INTRODUCTION

Physics is one branch of Natural Science. Physics as the heart of the development of information and communication technology has fundamentally changed human life. Physics consists of many concepts that are generally abstract and concrete. The difficulty many students face is interpreting various concepts of physics. It is because students are required to be able to interpret the physical knowledge precisely and not vague or unambiguous meaning. Physics is one of the lessons that has contributed greatly to the development of science and technology and is widely used in everyday life (Sanders, 2007).

Physics' subject which has an obstacle in direct observation is Geometrical Optics. One of its material taught is formation of shadows in mirror and lenses. It is an abstract subject and difficult to observe directly. So, the students need a fit media to understand physics' subject more actively (Coca, et al., 2013). Physics with abstract characteristic is difficult to visualize and makes the students difficult in studying the concept of physics. (Yanti, 2017) Generally, students solve physics problems by using formulas. Whereas physics is a science that begins with analyzing the symptoms or natural processes. It often happens because students do not understand the concept of physics so that students see physics as a difficult lesson (Omek, et al., 2008).

One strategy of using computers as a learning medium is composing a multimedia-based media. These new concepts and the developments show that the advances in the digital era have broadened the learning processes and enabled higher levels of learner interactions in order to make learning more meaningful for overcoming the insufficiency in rote learning (Dembo & Seli, 2012). Utilization of multimedia as a source of information in learning methods can improve the achievement of learning outcomes (Anitah, 2009:61).

Multimedia can be defined as a mixture of various media (text, images, audio, video, animation) that is compiled in a complete, integrated, and appropriated to the learning objectives by utilizing computer equipment. In this way the process of teaching and learning will be more interesting, so that will improve the achievement of student learning outcomes. Combining various media (text, image, audio, video, animation) can use Kvsoft Flipbook maker application.

The interactive simulation display can be equipped by combining video, animation, audio, even virtual labs so that it can use Double-Display Media to blend them all. By using Double-Display, it is expected to help students to visualize an abstract subject matter, so that students can understand the material maximally.

Double-Display Media is an animation media that blends all visuals of verbal, graphic, image, audio, animation, and video into a simple view with a double display. Double-Display can be interpreted two views. The Double-Display media is designed by combining two views with a first view contain of the physical phenomena in everyday life that can be viewed from videos and other displays showing how the process of physical phenomena occurs. The application of Double-Display is packaged in

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two views aimed at letting learners get a clear visualization of the concept under study and become a special advantage. It is because learners are indirectly invited to understand concepts in the real environment. The virtual laboratory is an interactive medium, so it not only shows but also allows students to manipulate equipment, collect, analyze data, prepare experimental reports, and draw conclusions based on data and graphs (Darrah, Humbert, Finstein, Simon, & Hopkins, 2014).

The development of computer-assisted learning software is considered proper and important to do (Wagiran 2008: 229). It is because it can give a great effect to the learners in improving the quality of learning, learning motivation, and support individual learning. The use of e-Flipbook (Double-display) can also improve understanding and achievement of learning outcomes (Nazeri, 2013). The use of interactive multimedia in Physics learning creates a student-centered learning environment. Students can be entertained, relaxed and can produce a better understanding of what they learn, and can improve students' science process skills (Chuang & Yang, 2005; McLaughlin & Arbeider, 2008; Knighton & Smoak, 2009; 2005; Rohaida & Kamariah, 2005). Objectives raised by the researchers is analyzing the effectiveness of student learning outcomes by using Double-Display media in Physics Learning Geometrical Optics subject.

Based on the description above, this research aims to determine the effectiveness of Double-Display media on Physics' subject Geometrical Optics. The effectiveness of Double-Display media as a learning tool is determined by the improving of students' learning outcomes and concept understanding.

II. METHODOLOGY

The type of this research is quasy experimental research. It was implemented at Vocational High School Islam Pajarakan class XI academic year 2017/2018 consisting of 36 students. This research is oriented on analysis of the impact of Double-Display media on Geometrical Optics learning used by students to improve students' learning outcomes and concept understanding. Data collection techniques used in this research, are observation, test, and documentation. Data collection techniques used in the measurement of conceptual understanding is in the form of written tests on post test amounted to 2 esay questions. While the data analysis techniques use N-Gain Test to determine the effectiveness of student learning outcomes.

III. RESULTS

Student learning outcome data is used to find the value of effectiveness by using N-Gain Test during teaching and learning activity by using Double-Display media which get from result of pre-test and post-test. The large increase in student learning outcomes by using the N-Gain test using Double-Display media can be seen in table 1.

Table.1: The effectiveness of student learning outcomes using double-display media

No.	Pre-test average value	Post-test average value	N-Gain	Category
1.	**14**	**91**	**0,9**	High

Conceptual understanding is the ability to grasp insights such as being able to understand or understand what is taught in a particular problem or situation. Conceptual understanding can be classified into 3 categories, namely understanding of translation, understanding of interpretation, and understanding of extrapolation. In this development test 3 understanding of the concept is measured through post-test activities implemented at the last meeting. The result of the analysis of students' physics concept after using Double-Display media can be seen in Figure 1

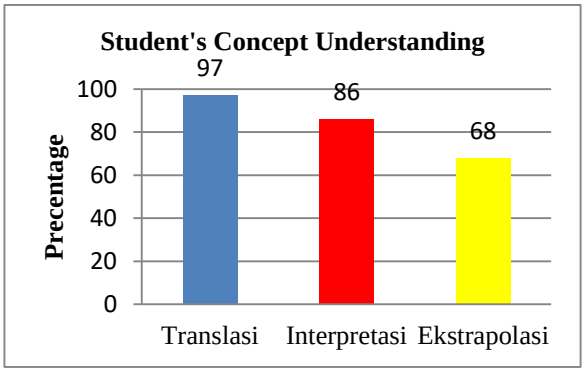

Fig.1: Students'conceptual understanding outcomes after using double-display media.

IV. DISCUSSION

Figure 1 shows that improving of students' learning outcomes using Double-Display Media has a high category with a total N-Gain score of 0.9. Another study implemented by Hayati in 2012 media flipbook used to measure student learning outcomes. The result of the analysis shows that using Flipbook media (double-display) improves learners' learning outcomes (Hayati, 2012). Sugianto, et al (2013: 115) states that flipbook maker based e-module get a positive assessment because the learning materials become very easy to understand by students, in addition, the operation of the module is very easy, the elements of music and animation is considered to increase the motivation, and learning activities of the learners. Thus learning using Double-Display media can increase student learning outcomes.

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Data of students' physics conceptual understanding shows that the percentage of translation's conceptual understanding reaches 97% and interpretation's conceptual understanding reaches 86% with very understandable category, whereas in extrapolation comprehension reaches 68% with enough understood category. So as a whole of students' physics conceptual understanding can already be categorized "understood" with an average of 84% with the most percentage on Translation conceptual understanding. Thus using the Double-Display media can also help the students in understanding the concepts, moreover on the material difficult to delivered by using real media and abstract material. students more easily understand the concept with the existence of learning media (Jatmiko, et al., 2016) and (Wicaksono, et al., 2017).

Students' physics conceptual understanding is divided into three categories, namely understanding of translation, understanding of interpretation, and understanding of extrapolation. Understanding of translation with indicator of students able to write and translate symbols of known variable, questioned and described the matter into the form of the image has a percentage of 97% greater when compared with understanding of translation and extrapolation. However, extrapolation understanding has the lowest percentage when compared with the other aspects of conceptual understanding. Understanding of extrapolation is a conceptual understanding that prioritizes students able to predict the continuation of the existing tendency according to certain data, on this matter of extrapolation understanding refers to the question of analysis. From the value of conceptual understanding obtained prove that learning using media Double-Display is effective. It is as written by Shabiralyani (2015) suggests that visual Aid arouses students' interest and help teachers explain concepts easily. A visual aid is a learning tool used in the classroom to encourage teaching and learning process.

The results of this study supported by Wijayanto's research (2014) states that the development of module that is packed in electronics allow students to be able to learn independently because it can be read by using a computer or electronic book reader. Meanwhile, according to Gunawan (2010) electronic module that is interactive will involve audio visual, sound, movie and others and the program is easy to understand so that it can be used as a good learning media.

V. CONCLUSION AND SUGGESTIONS

Based on the research objectives and the result of the research that has been done then it can be concluded the use of Double-Display Media on Geometrical Optics subject can increase student learning outcomes with increased score N-Gain 0.9 and fairly high category. It is supported by the average percentage of students' conceptual understanding after using the Double-Display Media on Geometrical Optics subject of 91% with the "very understood" category so that Double-Display media can be said to be effective.

Suggestions that can be given for further research are 1) This Double-Display Media will be more effective if the number of computers used equals to the number of students; 2) Double-Display Media Development can be applied to the broader scope of educational institutions with different materials to know the level of effectiveness.

ACKNOWLEDGEMENTS

The author would like to thank the Faculty of Teacher Training and Education (FKIP) of Jember University which had provided support in writing this journal.

REFERENCES

[1] Anitah, S. (2009). Media pembelajaran. Kadipiro Surakarta: Yuma Pustaka bekerja sama dengan FKIP UNS.

[2] Coca, D., Slisko, Josip. (2013). "Software Socrative and Smartphone as Tools for Implementation of Basic Processes of Active Learning in Classroom: An Initial Feasinility Study With Prospective Teachers". European Journal of Physics Education vol 4(2).

[3] Chuang, L. Y., & Yang, H. C. (2005). "The Development Of Multimedia Courseware for Biotechnology". International Journal of Computer, the Internet and Management, 13 (3): 33-44.

[4] Dembo, M.H. & Seli, H. (2012). "Motivation and Learning Strategies for College Success: A Focus on Self- Regulated Learning". NY: Erlbaum.

[5] Darrah, M., Humbert, R., Finstein, J., Simon, M., & Hopkins, J. (2014)." Are Virtual Labs as Effective as Hands-on Labs for Undergraduate Physics? A Comparative Study at Two Major Universities". Journal of Science Education and Technology, 23 (6), 803-814.

[6] Gunawan, Dedi. (2010). "Modul Pembelajaran Interaktif Elektronika Dasar Untuk Program Keahlian Teknik Audio Video Smk Muhammadiyah 1 Sukoharjo Menggunakan Macromedia Flash 8". Jurnal KomuniTi. Vol. 2, No. 1, Juni 2010.

[7] Hayati, S. (2015). "Pengembangan Media Pembelajaran Flipbook Fisika Untuk Meningkatkan Hasil Belajar Peserta Didik. Jurnal Pembelajaran Fisika". ISSN: 2339-0654. Vol IV.

[8] Jatmiko, B., et al. (2016). "Effectiveness of the INQF-Based Learning on a General Physics for Improving Outcomes". Journal of Baltic Science Education. vol 15(4). ISSN: 1648-3898.

[9] Knighton , K. M. C., & Smoak, J. M. (2009). "Integrating Basic Analytical Methods and

https://dx.doi.org/10.22161/ijaers.5.6.29 *ISSN: 2349-6495(P) | 2456-1908(O)*

Computer-Interface Technology into an Environmental Science Water Quality Lab Improves Student Attitude". International Journal of Environmental and Science Education, 4 (10):419-428.

[10] Mc Laughlin, J., & Arbeider, D. A. (2008). "Evaluating Multimedia-Learning Tools Based on Authentic Research Data that Teach Biology Concepts and Environmental Stewardship". Contemporary Issues in Technology and Teacher Education, 8 (1):45-64.

[11] Nazeri. (2013). "Penggunaan e-FlipBook dalam Topik Elektrik dan Elektronik: Inovasi dalam Pengajaran Reka Bentuk dan Teknologi PISMP RBT". Prosiding Seminar Penyelidikan IPG Zon Timur, 1 (1).

[12] Ornek, F., Robinson, W. R., & Haugan, M. P. (2008). "What Make Physics Difficult". International Journal of Enviroonmental & Science Education, 3(1): 30-34

[13] Rohaida, M.S., & Kamariah A. B. (2005). "Technology-Based Science Classroom: what Factors Facilitate Learning". Journal of Science Education,20:1-19.

[14] Sanders, D. L. (2007). "Making ublic the Private Life of Plants: The contribution of informal learning environments". International Journal of Science Education vol 29(10): 1209-1228.

[15] Shabiralyani, G., Khuram, S.H., Naqvi, H., and Nadeem,I. (2015). "Impact of Visual Aids in Enhancing the Learning Process Case Research: District Dera Ghazi Khan". Journal of Education and Practice. Vol: 6 (19)

[16] Sugianto, dan Doni,. (2013). "Modul Virtual: Multimedia Flipbook Dasar Teknik Digita"l. INVOTEC. Vol IX, (2). hal: 101-116.

[17] Wagiran. (2008). "Pengembangan Media Pembelajaran Berbantuan Komputer dalam Mendukung Perkuliahan Metrologi". Jurnal Kependidikan, 38, 225-242.

[18] Wicaksono, I., Wasis, Madladzim. (2017). "The Effectiveness of Virtual Science Teaching Model (VS-TM) to Improve Student Scientivic Creativity and Concept Mastery On Senior High School Physics Subject". Journal of Baltic Science Education. Vol 16(4). ISSN 1648-3898."

[19] Silwal, P., & Bhatta, K. (2017). Assessing the effectiveness of Vocational Education and Trainings (VET) in Improving Employability: A Case Study of Skills for Employment Programs in Nepal. *International Journal Of English Literature And Social Sciences*, *2*(5), 131-139. doi: 10.24001/ijels.2.5.16

[20] Wijayanto. (2014). "Pengembangan e-modul berbasis flip book maker dengan model project Based learning untuk mengembangkan kemampuan pemecahan Masalah matematika". Jurnal Pembelajaran Matematika. ISBN 978-602-0960-00-5. Hal: 625-628

[21] Yanti. (2017). "Development of Interactive Learning Media on Kinetic Gas Theory at SMAN 2 Takalar. Makasar"