



Meta Analysis: The Effect of Edmodo Assisted Physics Learning Media on Student Learning Outcomes

Naurah Nazifah^{1*}, Nurul Azmi¹, Putri Nurhaliza¹, Desnita²

¹ Magister of Physics Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Indonesia

² Physics Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Indonesia

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Abstract: The industrial revolution 4.0 requires humans to have 21st century skills. In essence, education is expected to produce students who have the quality to live as individuals who are creative, innovative, intelligent, and globally competent. The purposes of this study are to: 1) Determine the effect of Edmodo media on student learning outcomes in the aspect of high school level class levels. 2) Determine the effect of Edmodo media on student learning outcomes on the material used. 3) Determine the effect of Edmodo media on student learning outcomes. The type of research used is meta-analysis. The articles analyzed in this study amounted to 15 articles published in 2014-2021. The average overall effect size of using Edmodo-assisted learning media on high school students' learning outcomes is 2.51 in the high category. The Edmodo-assisted physics learning media provides an effect size on the XI SMA level with an average of 2.91 in the high category, the Edmodo-assisted physics learning media provides an effect size on the XI SMA level with an average of 2.15 in the high category. The highest average value of the effect size of Edmodo-assisted learning media on global warming material with a value of 7.50 in the high category, while the lowest average value of the effect size of Edmodo-assisted learning media on optical instrument materials with a value of 0.87.

Keywords: Meta-analysis; Learning media; Edmodo.

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Introduction

The industrial revolution 4.0 requires humans to have 21st century skills. The century where various information is available anywhere and anytime so that it can be obtained by everyone in all corners of the world without exception. 21st century learning is learning that requires students to have the skills or competencies that need to be possessed to face the developments of this globalization era (Desnita, et al., 2021). The development of science and technology (IPTEK) is so rapid, there is no longer a space limit for us to communicate with each other. The development of science and technology has an impact on global

challenges and competition faced by every country. In Indonesia, it is necessary to create quality human resources to be able to compete with the wider community. On this basis, 21st century education should be able to develop student competencies in superior knowledge, skills, attitudes and values (Asrizal, et al., 2018).

Education is very important for the life and progress of the nation, because starting from education, strong human resources are created and able to make changes to support the development of the country in a more advanced direction (Ali, 2013). Since in the womb, parents have introduced education to their children, after birth then grow and develop, learning to children

*Email: naurahnazifah13@gmail.com

is given through basic education, secondary education to college. In essence, education is expected to produce students who have the quality to live as individuals who are creative, innovative, intelligent, and globally competent (Usmaldi, et al., 2017). Thus, one of the efforts is to improve the quality of education.

Improving the quality of education is one of the national development programs. All educational institutions, from basic education to higher education, strive to improve the quality of education in accordance with their respective fields. Schools must increase the creativity of teachers and pay attention to students to be more actively involved in learning activities (Desnita, et al., 2020).

In education, technology must be used appropriately in order to improve the quality of learning experienced by students (Yuberti, 2015). Technological developments are marked by the emergence of various technology-based activities, such as e-commerce, e-government, e-medicine, e-laboratory, and e-education, all of which are electronic based. (Hamzah, 2011). In learning, technological developments can be felt, especially media technology used by students in high school (Ghaliyah, et al., 2015).

Physics is a science that is studied at the high school level in the 2013 Curriculum. Physics is a science that studies natural phenomena. (Hidayani, et al., 2016). Physics explains various phenomena that occur in nature (Diani, 2015). And to create students who can glorify the greatness of God. (Setiawan, et al., 2013). In physics, it is important to observe natural events which can basically be studied using appropriate and interesting teaching materials and learning media for students.

Media is very important in learning because it aims to convey information from the source to the recipient of the message and to stimulate students to participate in learning activities (Ambarwulan and Mulyati, 2016). According to AECT (Association of Education and Communication Technology). Media are all forms used for the process of distributing information. While the notion of media is any tool that can be used as a channel for messages to achieve learning objectives. Learning media are tools used by teachers to assist the process of delivering material. Media is anything that can be used to channel messages from the sender to the recipient so that it can stimulate the thoughts, feelings and interests and attention of students in such a way that the learning process occurs (Sadiman, 2006).

One of the online learning applications that can be used as a learning medium is Edmodo. Edmodo is a learning media which contains material, assignments, quizzes, scoring and can be divided into several classes according to the number of classes taught by an

educator (Nugroho, 2014). Edmodo helps in the learning process. Edmodo provides a safe and easy way to build virtual classrooms based on class divisions like in a school. Edmodo's display design is almost the same as Facebook's display design. With Edmodo, teachers can easily send grades, assignments, or quizzes to students.

The results of an initial study were carried out by reading from several journals related to the development of Edmodo learning media, obtained some real conditions in the field. The first real condition is that physics textbooks in schools will be easily damaged and torn and the use of physics textbooks is boring and makes students rarely study them because of an unattractive appearance. There are several weaknesses in physics textbooks, including in appearance, manufacturing process and use. This causes a lack of student motivation in learning physics and causes students to be lazy to study. So that many students cheat on exams because of their lazy attitude and lack of awareness to be honest in themselves.

The second real condition is the results of interviews with several physics subject teachers and students that the physics learning carried out has not been as expected. After being identified, information was obtained that the physics learning media used by teachers in learning did not support it. Teachers only use textbooks from several publishers and rarely use ICT-based media. Meanwhile, in the current era of globalization with the development of science and technology, students are required to be able to compete between people and people, groups with groups, the wider community and even between countries.

The formulation of the problem from this research are: 1) How is the influence of Edmodo media on student learning outcomes in the aspect of the high school level class level. 2) How is the influence of Edmodo media on student learning outcomes on the material used. 3) How is the influence of Edmodo media on student learning outcomes.

The purposes of this study are to: 1) Determine the effect of Edmodo media on student learning outcomes in the aspect of high school level class levels. 2) Determine the effect of Edmodo media on student learning outcomes on the material used. 3) Determine the effect of Edmodo media on student learning outcomes.

Method

The type of research used is meta-analysis. The article analyzed in this study amounted to 15 articles published in 2014-2021, which can be seen Table 1.

Table 1. List of Articles Meta Analysis

Article	Author
K1	Pedungge, et al., (2020)
K2	Chandramidi, et al., (2016)
K3	Fadila, (2018)
K4	Ardiansyah, (2019)
K5	Handayani, (2019)
K6	Aulia, et al., (2019)
K7	Aulia, et al., (2018)
K8	Salim and Odja, (2020)
K9	Yuanita, et al., (2016)
K10	Hikmah et al., (2017)
K11	Denny, et al., (2020)
K12	Warjanto, et al., (2014)
K13	Hadjarati, et al., (2020)
K14	Tania, et al., (2020)
K15	Mamonto, et al., (2020)

The data in this study is secondary data because it is obtained from the results of previous research. Data were collected using documentation techniques. The steps of data tabulation are (1) identification of research variables and enter them in the appropriate variable column, (2) identification of the mean and standard deviation of the experimental group and control group data for each research subject, 3) if the standard deviation is not known then can use the t value formula, (4) analyze the data to obtain the effect size value. Effect size is a measure of the magnitude of the effect of a variable on other variables, then the magnitude of the difference and the relationship of a sample. The effect size can be specified in the following statistical parameters (Becker and Park, 2011):

- a. Average in one grup

$$ES = \frac{x_{posttest} - x_{pretest}}{SD_{pretest}} \dots\dots\dots (1)$$

- b. If the standard deviation is not known then it can be done by t test

$$ES = t \sqrt{\frac{1}{n_{experiment}} + \frac{1}{n_{control}}} \dots\dots\dots (2)$$

- c. Mean and standard deviation of two group pre-post test

$$ES = \frac{(\bar{x}_{post} - \bar{x}_{pre})_E - (\bar{x}_{post} - \bar{x}_{pre})_C}{\frac{SD_{preC} + SD_{preE} + SD_{postC}}{3}} \dots (3)$$

Information:

- ES = Effect size
- $X_{posttest}$ = Posttest average
- $X_{pretest}$ = Pretest average
- $SD_{pretest}$ = Standard deviation
- X_E = Experimental group mean

- X_C = Control group mean
- t = t value
- n = Number of samples
- X_{postE} = Mean posttest experimental group
- X_{preE} = Mean pretest experimental group
- X_{postC} = Mean posttest control group
- X_{preC} = Mean pretest control group
- SD_E = Standard deviation experimental group
- SD_C = Standard deviation control group

After the effect size is calculated, it is further categorized at the following levels (Cohen's, 1988)

Table 2. Effect Size Criteria (ES)

Effect Size	Category
ES < 0.2	Low
0.2 < ES < 0.8	Medium
ES > 0.8	High

Result and Discussion

The Effect of Edmodo-Assisted Physics Learning Media based on Student Learning Outcomes

The first result in this study is related to the effect of Edmodo-assisted learning media on high school student learning outcomes. There are 15 articles that fit the first objective. The average effect size value is obtained from the calculation of the effect size of each article. The effect size value of the influence of Edmodo-assisted learning media on high school students' learning outcomes can be seen in Table 3.

Table 3. The effect size value of the influence of Edmodo-assisted learning media on high school students' learning outcomes

Article	Effect Size
K1	7.50
K2	1.34
K3	1.26
K4	1.01
K5	1.23
K6	1.50
K7	1.50
K8	3.02
K9	9.80
K10	1.53
K11	0.87
K12	1.09
K13	1.74
K14	2.45
K15	1.77
Average Effect Size	2.51

Based on the data in Table 3. there are 15 articles with different average effect sizes. The average overall

effect size of using Edmodo-assisted learning media on high school students' learning outcomes is 2.51 in the high category. The average effect size describes that the Edmodo-assisted physics learning media has an effect on student learning outcomes. This shows that the use of Edmodo-assisted physics learning media can improve high school student learning outcomes.

Edmodo is a simple electronic learning media tool that is used to present lesson content, usually all of these smartphone operating systems provide useful tools for students and teachers to interact online outside the classroom, anywhere and anytime (Hourdequin, 2014). Teacher and student interaction is a learning process carried out to transform knowledge, attitudes, and skills (Hamalik, 2007). The use of Edmodo-assisted learning media provides behavioral changes in students that can be observed and measured in the form of knowledge, attitudes, and skills (Putri, et al., 2018).

Effect of Edmodo Assisted Learning Media based on High School Class Level

The second result in this study is related to the influence of Edmodo-assisted physics learning media in terms of grade level. Of the 15 articles included in the article review, there are 7 articles for class X SMA and 8 articles for class XI SMA. The average value of the effect size for the X SMA level is in Table 4.

Table 4. The average value of the effect size for the X SMA level

Class Level	Article	Effect Size
X	K1	7.50
	K2	1.34
	K5	1.23
	K6	1.50
	K7	1.50
	K10	1.53
	K11	0.87
XI	K15	1.77
	K3	1.26
	K4	1.01
	K8	3.02
	K9	9.80
	K12	1.09
	K13	1.74
	K14	2.45
Average Effect Size		2.16

Based on the data in Table 4, it can be described that the use of Edmodo-assisted learning media has an effect on the learning outcomes of X and XI high school students. The average value of the highest effect size at the XI SMA level is 2.91 in the high category. This shows that the use of Edmodo-assisted physics learning

media has an effect on the learning outcomes of class X high school students.

At the age of 11-12 years and over, children experience a formal operational phase, which is a phase where children are able to think about something that will or may happen and something is abstract. In the learning process students apply various models for high reasoning and require children to actively think and draw meaning from empirical and abstract things (Bujuri, 2018). This is in accordance with the concept of abstract physics learning and physics learning is a science that learns about natural phenomena.

The Effect of Edmodo Assisted Learning Media based on High School Physics Materials

The results of these three meta-analyses related to the influence of Edmodo-assisted physics learning media based on high school physics material can be seen in Table 5.

Table 5. The results of Three Meta-Analyses Related to the Influence of Edmodo-assisted Physics Learning Media Based on High School Physics Material

Subject matter	Article	Effect Size	Average Effect Size
Impulse momentum	K2	1.34	1.64
	K4	1.01	
	K13	1.74	
	K14	2.45	
Static Fluid	K5	1.23	1.38
	K10	1.53	
Dynamic Fluid	K6	1.50	1.50
	K7	1.50	
Temperature and Heat	K3	1.26	4.69
	K9	9.80	
Effort and Energy	K8	3.02	1.09
	K12	1.09	
Global Warming	K1	7.50	7.50
Optical Device	K11	0.87	0.87
Sound Waves	K15	1.77	1.77

Based on the data in Table 5, the average effect size values for physics learning materials are different, but the average effect size is in the high category. The highest average value of the effect size of Edmodo-assisted learning media on global warming material is 7.50. This shows that the Edmodo-assisted learning media has an effect on the learning outcomes of high school students on physics material. With the application of Edmodo-assisted learning media, they carry out learning even though they stay at home and the time used is not limited so that students do not feel bored to learn physics (Hanum, 2013).

Conclusion

Based on the results of the research and discussion, it can be concluded that the use of Edmodo-assisted physics learning media affects the learning outcomes of X and XI high school students. High school physics material on Edmodo-assisted learning media has an effect on high school student learning outcomes. Edmodo-assisted physics learning media has an effect on improving high school student learning outcomes.

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