DEVELOPMENT OF TEACHING MATERIALS FOR E-LEARNING-BASED STATISTICS MATERIALS ORIENTED TOWARDS THE MATHEMATICAL LITERACY ABILITY OF VOCATIONAL HIGH SCHOOL STUDENTS

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ABSTRACT

The aim of this study is the development of teaching materials for statistical materials based on Edmodo-assisted e-learning and how they impact students' mathematical literacy skills. The method used is the Dick & Carey development model. The research population is class XII Catering, one of the Vocational High Schools in Bandung City, with a sample of class XII Catering 1. The instrument used a mathematical literacy test, validation sheet, student response questionnaire, and interview guidelines. The data collected were analyzed descriptively qualitatively through triangulation, Q-Cochran statistical test, and N-Gain test. The results of this study indicate that the design of teaching materials for statistical materials based on Edmodo-assisted e-learning is very feasible to use in learning mathematics. Furthermore, the results of the application of teaching materials have a positive effect on mathematical literacy skills with a reasonably good category. Therefore, teaching materials must further develop animation, use communicative language, and utilize the latest technology.
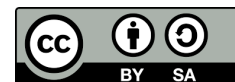
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1. INTRODUCTION

Today's education cannot be separated from the use of technology. Most teachers and students already use technology in schools. According to information from 258 students, 50.8% often, 45% never, and 4.2% never mathematics teachers in West Java apply ICT in learning (Supianti, 2018). Online learning can be said to be an electronic learning system

called e-learning which uses a website and can be accessed anytime, anywhere. E-learning is a learning activity that uses electronic services, for example, telephone/mobile phone, video, audio, computer, laptop, tablet, internet access, and so on (Alifia & Pradipta, 2021; Fisher et al., 2019; Supianti et al., 2021; Wahyuni & Sugiharta, 2019). Thus, the internet network as a supporting facility for e-learning must be fulfilled. Students can use E-learning to learn independently. The role of teachers in modern learning systems is much as a facilitator, which results in a paradigm shift that prepares students to learn independently (Yaniawati, 2012). In line with that, learning mathematics using e-learning is better than conventional (Supianti, 2013). E-learning-based learning provides opportunities for students to learn freely and without being pressured, accessible in the sense of finding learning resources, free from embarrassment as in conventional learning when they cannot answer questions from the teacher, fail to learn, and so on (Supianti, 2018). Online learning or e-learning is practical because it can be used anywhere and anytime (Irfan et al., 2020).

Easy, safe, and simple e-learning media can help students set strategies. E-learning media is interactive, and the information delivered is more real-time (Sugianto et al., 2022). Media in the learning process delivers the source of the message and the recipient of the message and stimulates thoughts, feelings, attention, and willingness so that they are encouraged and involved in the learning process (Hamid et al., 2020). Learning media will overcome the limitations of time, space, and senses. The function of learning media is also to influence the climate, conditions, and learning environment (Pratama & Ismiyati, 2019). Edmodo is a secure and free social media-based digital classroom that helps teachers manage virtual classes to connect students with other students (Balasubramanian et al., 2014). Thus, the Edmodo application is suitable for teaching and learning activities because it supports what teachers and students need in the learning process. The Edmodo application has a school environment-based network because it helps teachers in virtual classes according to learning conditions in the classroom, based on natural class divisions in schools, where classes contain assignments, quizzes, and final assignments in each lesson (Putranti, 2013). Learning through the Edmodo platform needs to be applied to be more varied, active, interactive, and independent (Pratama & Ismiyati, 2019). The learning objectives will be achieved with suitable learning media, and the student's abilities are expected to increase. The ability that is expected to increase is the ability of mathematical literacy.

Mathematical literacy is a person's ability to formulate, use, and interpret mathematics in any context, including mathematical reasoning, mathematical concepts, procedures, facts, and tools to describe, explain and predict an event (Sari, 2015). Even Johar emphasized that knowledge and understanding of mathematical concepts are essential, but more importantly, activating students' mathematical literacy skills to solve everyday problems (Yudiawati et al., 2021). Mathematical literacy is an individual's ability to effectively use his mathematical knowledge to solve real problems in everyday life (Anwar, 2018). Effectiveness in question is in solving one's problems, starting with understanding problems, formulating them, and using mathematical knowledge to solve them and interpret them.

The mathematical literacy of students in Indonesia is still below the OECD average. The average international score to determine the ability of mathematical literacy is 500 (level 3), and Indonesian students' average mathematical literacy score is 375 (level 1). Based on data from the National Center for Education Statistics that the mathematical literacy ability of Indonesian students in PISA 2015 it was still low, namely 37.9% at level 1, 30.7% at level 1, 19.6% at level 2, 8.4% at level 3, 2.7% at level 4, 0.6 at level 5, and no one was able to reach the value of 0.6%. In PISA 2015, the mathematical literacy results of Indonesian students were 380 and 490, which are the average scores of all countries that took the mathematical literacy test (Kafifah et al., 2018). Thus, students' mathematical literacy skills

need to be improved, with the development of teaching materials for statistics materials based on e-learning assisted by Edmodo oriented towards mathematical literacy skills. Therefore, based on the introduction, the research objectives were: (1) to analyze the design of the development of teaching materials for Statistics materials based on e-learning assisted by Edmodo; and (2) to analyze the mathematical literacy abilities of students who used these teaching materials.

2. METHOD

This type of research uses R & D (Research and Development) with the model Dick & Carey (Gafur, 2012) through 10 stages in the Figure 1.
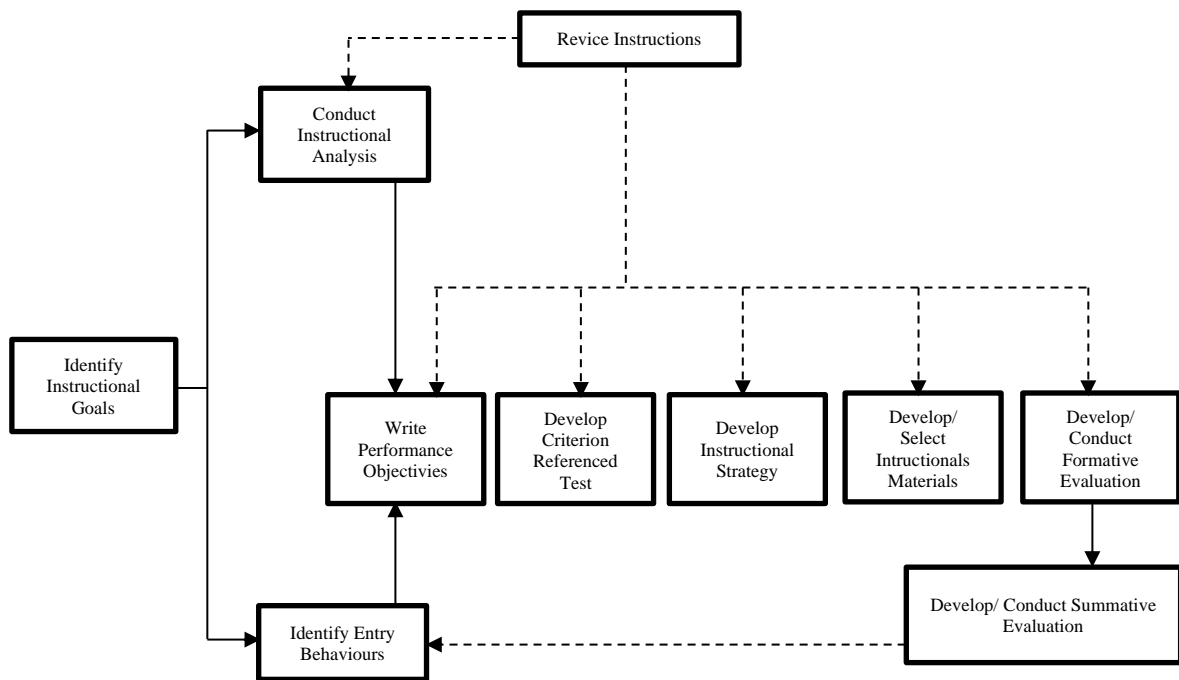

Figure 1. Dick & Carey's learning design model (Gafur, 2012)

The Figure 1 showed the first stage in this research is to identify the competencies and general learning objectives of the teaching materials developed, namely statistical material. The second stage is to identify the objectives of developing teaching materials and the strategies used in presenting the developed teaching materials. The third stage identifies the characteristics of the initial ability of the class XII Culinary Management SMKN 2 Baleendah as many as 36 students. The initial ability of students is seen from the average daily test results which show the average value is still below the minimum completeness criteria. The fourth stage is to formulate special abilities that must be mastered specifically during and after completing learning.

The fifth stage is developing relevant research instruments, namely the development of 6 items of essay questions on mathematical literacy abilities. The sixth stage is finding researches and student characteristics that are carried out based on relevant learning theories. The seventh stage is choosing materials based on the strategies that have been set and the abilities to be improved. The material in the teaching materials includes competence, main content and practice questions.

The eighth stage is a formative evaluation with validation, limited trials and field trials. Validators in this study are material & media experts, and student response questionnaires. Limited trials were conducted on 6 students who had obtained statistical material selected by purposive sampling. Field trials were conducted on class XII Culinary Administration students at SMK Negeri 2 Baleendah, Bandung Regency. The sample was taken by 30 students and given learning using teaching materials for statistics based on e-learning assisted by Edmodo. The sampling technique is purposive sampling, which is tailored to research needs. Namely, all students have gadgets. The study went through a limited trial with ten subjects and a field trial with 30 subjects using The One Group Pretest-Posttest research design. The instruments used in this study are in the form of tests and non-tests. The test-shaped instrument consists of 6 mathematical literacy test questions in the form of a description, while the non-test is in the form of validation sheets, student response questionnaires, and interview guidelines. The collected data were analyzed using Q-Cochran, N-Gain, and triangulation by comparing validation results, questionnaires, and interviews. The ninth stage makes improvements to the evaluation results in stages three to seven. The tenth stage is the refinement of teaching materials based on input at the summative evaluation stage.

3.   RESULT AND DISCUSSION

3.1. Result

3.1.1. E-Learning-Based Teaching Materials

The development of e-learning-based teaching materials is carried out through 10 stages of Dick & Carey with the following results: The first stage identifies instruction goals, teaching materials have not been accompanied by animation and the existing e-learning, learning media have not varied, the second stage of conduct instructional analysis, relevant knowledge is statistical material because this application plays a vital role in daily life. The third stage of identifying entry behaviors, students have not been able to manage and regulate themselves in thoughts, feelings and behaviors, so that students' self-regulated learning is low, the fourth stage of writing performance objectives, simple, easy and appropriate learning media is the use of the Edmodo application, the fifth stage of developing criterion-referenced tests, it is necessary to develop relevant question items that improve mathematical literacy skills, the sixth stage of develop instructional strategy, teaching materials are arranged according to the components of e-learning, the seventh stage of develop and select instructional materials, the display of teaching materials prepared based on the provisions of the development of teaching materials, the eighth stage of design and conduct formative evaluation of instructional, statistical teaching materials have been designed equipped with contextual problems, exciting animations, drawings with examples as shown in Figure 2.
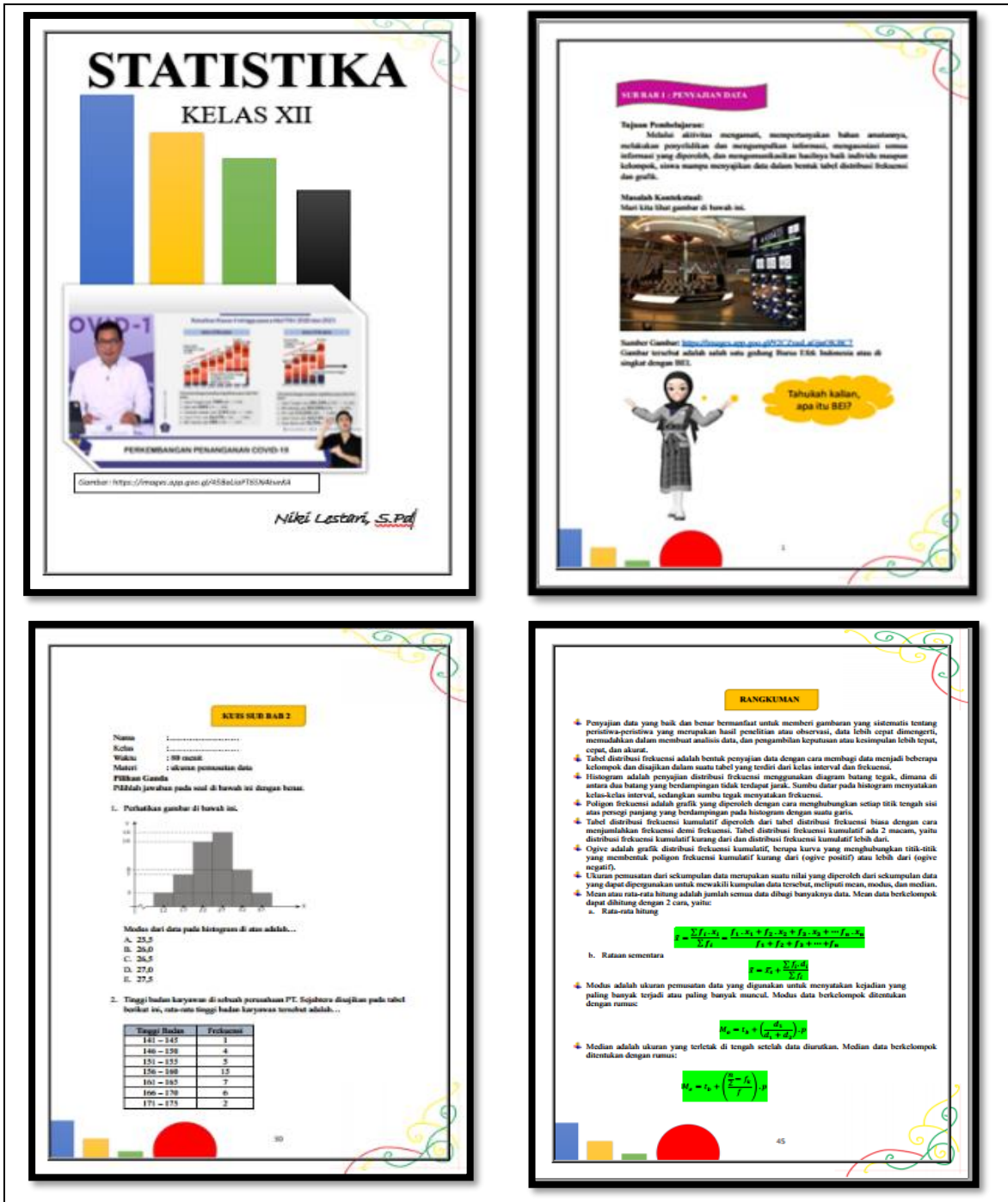
Figure 2. Display of teaching materials

Then the teaching materials were validated by six material experts and three media experts. The validation results by material experts obtained 90.78% on very valid criteria, the media experts obtained 88.52% on very valid criteria, and student response questionnaires obtained 76.47% on the criteria were entirely valid. Thus, the teaching materials developed are said to be feasible and can be used in learning. The results of the validation of teaching materials by material experts and media experts, along with student response questionnaires, are listed in Table 1.

Table 1. Data from the validation of material experts

No	Criterion	Average Grades (Percentages)					
		V1	V2	V3	V4	V5	V6
1	Aspects of Content Eligibility	76.67	90	96.67	85	96,67	95
2	Aspects of Presentation Feasibility	78	90	100	96	94	94
3	Aspects of Linguistic Feasibility	80	86.67	93.33	100	93.33	95.56
4	Aspects of Mathematical Literacy Assessment	80	86.67	91.11	95.56	91.11	93.33
Average		78.67	88.33	95.28	94.14	93.78	94.47
Average validity		**90.78**					
Validity Level		**Very Valid, or can be used without revision**					

Based on Table 1, the difference in scoring was obtained for V1. The criteria with the most significant value were the feasibility of language and mathematical literacy. For V2, the most significant criterion was the content and presentation feasibility. Followed by V3, the most significant criterion was the feasibility of the presentation. For V4, the most significant criterion is linguistic eligibility. For V5, the biggest criterion is content eligibility, and for V6, the most significant criterion is linguistic eligibility. Next, the data from the validation results of media experts are presented in Table 2.

Table 2. Media expert validation data

No	Criterion	Average Grades (Percentages)			Average
		V1	V2	V3	
1	Display	74.67	89.33	96	86.67
2	Use	80	83.33	93.33	85.55
3	Utilization	90	96.67	93.33	93.33
Average Validity		81.56	89.78	94.22	**88.52**
Validity Level		**Very valid, or can be used without revision**			

Table 2 shows that the most significant criterion of teaching materials is utilization, with an average percentage of 93.33%. The difference between display and utilization was 6.66%, and between utilization and usage was 7.78%. Next is the student response questionnaire presented in Table 3.

Table 3. Data on the results of the recapitulation of student response questionnaires

NO	Aspects	Statement Number	Average Value (Percentage)
1	Interest	1-6	75.67
2	Material	7-11	74.40
3	Language	12-14	79.33
Average validity			76.47
Validity Level		**"Quite valid, or usable but needs minor revisions"**	

Table 3 shows that the teaching materials assessed by students have a good language aspect because the scores obtained are more significant compared to the aspects of interest and material. The difference between the three aspects is not much different.

In the ninth stage of revised instruction, improvement of teaching materials based on criticism and suggestions, input and suggestions are included indicators as triggers from making the content of the discussion, determining quiz material to the end on the post-test question into direct evaluation, whether through the media students can achieve the expected essential competencies. The teaching materials are then revised according to these inputs and suggestions. In the tenth stage of design and conducting summative evaluation, an evaluation is carried out to improve the effectiveness of teaching materials.

Based on the q-Cochran test shows the validation of material experts with statistical results $\rho = 0.010 < \alpha = 0.05$ means that there are differences in the validation results of e-learning-based teaching materials assisted by Edmodo between material experts validators 1, 2, 3, 4, 5 and 6. As for the q-Cochran test, media experts showed results of $\rho = 0.007 < \alpha = 0.05$, meaning that there are differences in the validation results of e-learning-based teaching materials assisted by Edmodo between media expert validators 1, 2, and 3.

3.1.2. Mathematical Literacy Skills

Based on the pretest and post-test results of students' mathematical literacy ability tests, the average student score before learning using Edmodo-assisted e-learning-based statistics teaching materials is 30.23. Then, using statistics teaching materials based on e-learning assisted by Edmodo obtained an average score of 74.30. Based on the minimum completion criteria set by the school of 75. So in the results of the pretest, students have not been able to reach the minimum completion criteria, while in the post-tests results, students have almost reached the minimum completion criteria. Of the 30 students who took part in the learning, 19 students reached the minimum completion criteria, and 11 students had not reached the minimum completion criteria, so 63.33% of students had reached the minimum completion criteria. Based on the completeness of learning, it is said to be complete with good categories if the average is 60% - 79%. Based on the n-gain value, a result of 0.6 with moderate interpretation was obtained, meaning that there was an increase in mathematical literacy ability with moderate criteria. Thus, the results of the analysis of pretest and post-test data obtained by students have achieved complete learning with good categories, and an increase in their mathematical literacy skills is moderate. A comparison diagram of the pretest and post-test values of the mathematical literacy test is shown in Figure 3.
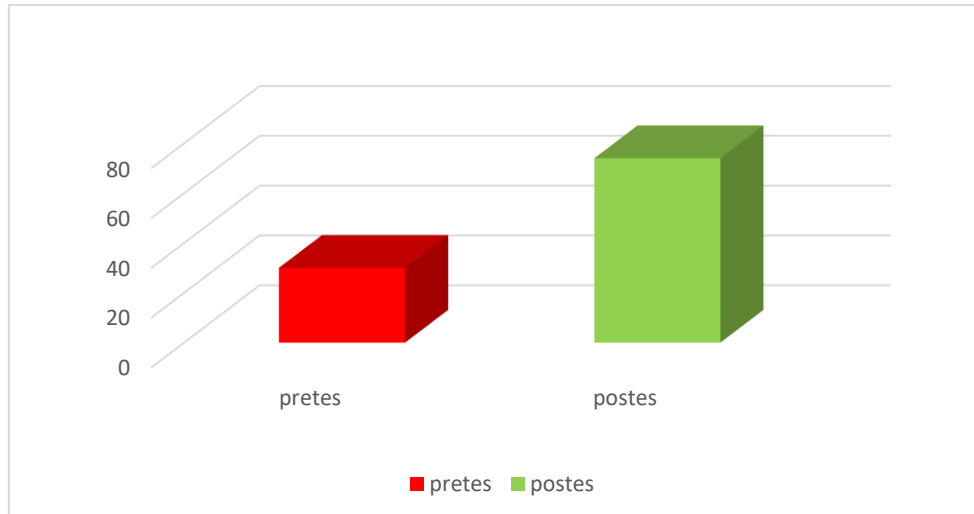

Figure 3. The value of pretes and postes of mathematical literacy ability

One example of the results of superior student work and low related to mathematical literacy test questions (level 1) with indicators of students being able to build their knowledge by making their data and processing the data into a frequency distribution table is presented in Figure 4.

Question

Class XII Busana 2 is carrying out mathematics learning with the teacher. The task given is identifying information and using his knowledge to solve the problem. With the instruction, make a set of scores of 80 students, with the lowest test score being 35 and the highest score being 99, where log 80 = (1.9031). Present in a group frequency distribution table.

Superior Student Answers

Translate:

Count of data = 80

Range = R = 99 – 35 = 64

Determine the number of classes:

K = 1 + 3.3 log 80

K = 1 + 3.3 (1.9031)

K = 1 + 6.28

K = 7.28

K = 7

class length = 64/7 = 9.1 = 10

Asor Student Answers

Translate:

2. The income that students and their wood shop often earns is 141,912 rupiah

Figure 4. Postest problem number 1

Based on Figure 4, the answers of superior students have been able to make their data with their knowledge. Solve problems with already known formulas so that students can create a frequency distribution table from data that has been created by themselves. Thus, students are considered capable of completing level 1 mathematical literacy skills. As for the answers, the students did not do the questions according to the instructions. The students did not write down the requested data and could not solve the problem using formulas, so the students were not able to make a frequency distribution table. Thus, students are considered unable to complete level 1 mathematical literacy skills.

3.2. Discussion

In the first stage of the development of teaching materials for statistics materials based on e-learning assisted by Edmodo was found that in the process of teaching and learning mathematics, only package books are available in the library. In the learning process, teachers always use the old method, namely the one-way learning process, so the teacher explains or lectures more. The lecture method is straightforward for verbalism to occur. More visual students become at a loss, teachers find it challenging to conclude between students who already understand or not, and students become passive in the learning process (Helmi, 2016). So student activity becomes less because students only listen, without opening up opportunities for students to think more broadly than what the teacher conveys. Thus, students experience difficulties when learning mathematics, especially when faced with math problems that are not routine.

These difficulties are further increased by learning from home due to the covid-19 pandemic. Teachers and students often use WhatsApp groups to give assignments or just provide youtube links already available on the internet and ask students to learn about it. So, it can be concluded that the learning media used has not been maximized. Schools need to consider efforts and approaches to improve the quality of e-learning and the learning outcomes achieved (Al-smadi et al., 2022). Especially for mathematics, they were learning that students find challenging and cause students' grades to always be below the criteria of minimal completion. So that the design of teaching material products that are attractive, easy to understand, and can be studied anywhere, which is currently indispensable for students to learn remotely using e-learning-based teaching materials that are already well done and students feel interested. E-learning can be beneficial in mastering the material, which is expected to increase awareness that learning is essential and fun in mathematics subjects, will achieve maximum achievements and positively influence mathematics learning and even increase learning outcomes (Utami & Cahyono, 2020).

In the second stage, the material in this study is statistics. Statistics is the subject matter of mathematics related to data collection and concluding the results of observations in the field. Statistics has become the basis for researchers, research, or observations in various fields of science (Listiati, 2022). Statistics material is significantly related to daily life. Statistics will be needed by students, both in the field of work and in completing their studies. Wahyuningrum (2020) states that by studying statistics, a person can explain the relationship between variables, make decisions for the better, overcome changes and make plans and predictions.

Therefore, the basic competence used is to determine and analyze the size of the centralization of data and the dissemination of data presented in frequency distribution tables and histograms. Apart from that, by studying statistics, many students will be trained to think systematically, conscientiously, and understand more mathematical symbols, because many are faced with formulas and problems that are not routine. Studying statistics will benefit students in their daily lives because statistics can be applied in everyday life. Statistics are often used in everyday life, such as in the research of a study, and applied in disciplines such as astronomy, biology, economics, and industry (Janna, 2020).

The third stage is to identify the initial abilities of the students and the strategies used. At this stage, it is found that students' initial ability in mathematics is still low, both in terms of affective and cognitive. So, the right learning strategy uses the Edmodo application, which can be accessed on mobile phones and computers and helps students learn independently from home. Learning by using phones is used to access learning, materials, instructions, and questions related to student learning, when and wherever they want to learn (Yunianta et al.,

2019). Edmodo's application can help students achieve affective and cognitive abilities for the better.

The Edmodo application is a digital application that looks very easy and simply because it is similar to social media applications. Of course, students are used to social media. Edmodo is a free and secure learning platform available on www.edmodo.com. This website looks similar to Facebook but is much more private and safer for the learning environment (Ompusunggu & Sari, 2019). Using the feature in Edmodo encourages student involvement in responsible learning (Balasubramanian et al., 2014). Edmodo has complete learning features, including flowing features, a calendar, classes, discovery, and messages. Thus, using Edmodo can help teachers and students in learning activities carried out online can be more directed and organized. Edmodo can help students in learning because Edmodo is developed based on classroom management and social media principles. Edmodo also makes it easier for teachers to track student abilities. Grades and assignments are automatically stored in the system and easy to access (Ekayati, 2018; Hanifah et al., 2019; Kristianti, 2016; Putranti, 2013; Wahyuni & Sugiharta, 2019).

The fourth stage is to formulate the developed procedure. At this stage is an explanation of the procedures for accessing Edmodo. The first step that must be done is to create an account for both teachers and students and fill out the registration form and valid data. Then the teacher arranges the Edmodo account, such as forming classes according to the many classes taught and students joining the provided classes (Ekayati, 2018). These steps are not an obstacle for students because students are used to accessing applications on the internet. However, when installing the application, some students experienced problems because their cellphone memory was full, so they could not install Edmodo. However, this can be handled because creating an account on Edmodo does not always have to install an application. Edmodo can also be accessed from Google directly. Conditions like this do not hinder teaching and learning activities because students of any type now enjoy technology and are familiar with it (Kristianti, 2016). Overall, students feel that they do not mind learning using Edmodo. Even students feel happy because the learning process in Edmodo is easy to access. So, it requires careful preparation when using the Edmodo application. The use of Edmodo requires training for students starting from how to use and create accounts, class codes, how to access materials, and abilities that students must have when using the Edmodo application (Sari, 2015).

The fifth stage is to develop relevant research instruments. At this stage, the instrument developed is a question of mathematical literacy ability consisting of 6 questions in the form of a description, each question made based on indicators and levels of mathematical literacy ability. Karmila (2018) state that indicators of mathematical literacy ability are Level 1 students that can use knowledge to solve routine problems and problems with a general context. Level 2 Students can interpret problems and solve them with formulas. Level 3 Students can carry out procedures well in solving problems and can choose problem-solving strategies. Level 4 Students can work effectively with models, choose and integrate different reprints, and connect with the real world. Level 5 Students can work with models for complex situations as well as be able to solve complex problems. Level 6 Students can use their reasoning to solve mathematical problems and generalize, formulate, and communicate their findings. The question was compiled by the researcher and assessed by the supervisor, and has been tested. The results of the question trial based on statistical processing and mathematical literacy ability are feasible for field trials.

The sixth stage is the components of this e-learning-based teaching material which consists of twelve components. The essential components of e-learning-based teaching materials are an attractive appearance, a display filled with many interesting images, colors, and animations, and explicit material content and contents that make it easier for students to

understand learning material. Because with teaching materials that follow what is needed by students, learning will be enjoyable and can help achieve learning goals very well. The e-learning system requires technological support in the digital era as a mechanism and exciting content (Elyas, 2018). The use of videos and files uploaded to Edmodo's account makes students more enthusiastic about learning (Hanifah et al., 2019).

The seventh stage is the established strategy and the abilities to be improved. Based on the results of the validation of teaching materials, it produces teaching materials worthy of trial with an outstanding level of validity. Going through the validation stages of teaching materials will make the developed teaching materials very good and get various criticisms and suggestions from validators that will help improve teaching materials. Validity determines the quality of the teaching materials, and it will be seen what should be measured (Azis, 2019).

The eighth stage is the trial stage of e-learning-based teaching materials to students who are used as research samples. Eight meetings have been held in the field trial stage; the learning was carried out online and through the Edmodo application. The first meeting was with the giving of pretests to students. The second to the seventh meeting is giving materials and quizzes from each sub-topic, consisting of 3 sub-topic. Moreover, the eighth meeting was the giving of the post-test. The teaching materials that are compiled must be excellent and correct because teaching materials are an essential part of learning. Through teaching materials, students will be more helpful and easy to learn (Magdalena et al., 2020). According to students, the results of interviews using google forms by learning to use Edmodo-based e-learning teaching materials throughout the secular state that the appearance is attractive, reasonable, understandable, concise, and straightforward. Then based on the material's content, teaching materials are straightforward to understand but problematic when faced with complex calculations. Most students feel happy learning with this e-learning-based teaching material because it is straightforward to understand and understand. E-learning-based learning can improve maximum learning outcomes (Hartanto, 2016).

The last stage is inputs on the improvement of teaching materials rather than validators that the teaching materials that have been prepared have several inputs. First, the teaching materials covered should be given authentic images of the material discussed in the media. The second is to include indicators in each discussion so that students know what should be achieved in the learning process. Researchers have tried to improve the results of these inputs and produce suitable teaching materials.

Based on all the stages that have been carried out, the design of the developed teaching materials for statistics based on e-learning is assisted by Edmodo. Teaching materials are prepared by paying attention to the components of teaching materials suitable for e-learning-based. Teaching materials can be accessed through the Edmodo application easily. The teaching materials developed have gone through the validation stage by expert validators, media, and teachers so that teaching materials have good validity with excellent categories and can be used in the learning process for students. E-learning can make students access teaching materials or structured assignments independently without being limited by distance and time. However, in this case, there are also several obstacles faced in learning mathematics using e-learning media related to how difficult the material is to deliver because some materials are not easy to deliver, even face to face (Hulukati et al., 2021).

Mathematical literacy ability refers to the PISA mathematical literacy ability level (Karmila, 2018), which consists of 6 levels. At level 1, with mathematical literacy skills, students can use their knowledge to solve routine problems and problems with general contexts. Most students can solve this problem well because, with their knowledge, students are asked to make data, and the data created by themselves must be processed so that the answers that arise from students will, of course, be different. A small part of there are

students who do not finish working on the problem, and some students suddenly make the final result in the form of a frequency distribution table. Students can guess the answer, or students forget how to solve it. In addition, the lack of students in solving these problems is that students do not provide conclusions on the answers that have been made. This situation happens based on the results of the researchers' analysis; students may forget, or students are not accustomed to making conclusions outlined in written form. According to PISA, students' mathematical literacy achievement is concerning; 42.3% of students have not reached level 1 of the lowest proficiency (Styawati & Nursyahida, 2017). Therefore, here the role of the teacher is needed to continue to train students so that their mathematical literacy skills develop to the maximum.

Level 2 literacy skills, namely interpreting problems and solving them and solving them with formulas, some students have been able to solve this problem, read the problem, and change it into a mathematical context well so that students can solve the problems faced. Students can change the data presented as a bar chart into a frequency distribution table which is then searched for the mode value of the question posed. However, as in the case of mathematical literacy skills at level 1, students do not give conclusions at the end of their answers. At level 3 literacy skills, namely carrying out procedures well in solving problems and choosing problem-solving strategies, Students are given questions about a table containing information about reports of visitors to a swimming pool. In this question, students' answers can vary depending on which side the student will answer. Because what is being asked in this question are deciles, students can answer deciles 1, 2, 3, 4, or 5 so that the answer can be five alternatives. Most of the students also have solved this problem well, can read the data, and complete what is asked in the question. However, it remains the same as the level 1 and 2 mathematical literacy skills. Students do not provide reviews or conclusions from the results of their calculations.

Level 4 literacy skills can work effectively with models, choose and interpret different representations, and then relate them to the real world. Mathematical literacy in learning mathematics in PISA develops competencies directly related to the real world (Umbara & Nuraeni, 2019). The OECD states that mathematical literacy can help someone understand the role or use of mathematics in everyday life. In addition, mathematical literacy emphasizes the ability of students to analyze, give a reason and communicate ideas effectively in solving mathematical problems they encounter (Muzaki & Masjudin, 2019). Some students have solved the questions given, but at level 4, some are wrong in the calculations. In this matter, accuracy is needed, and knowing the formula and how to calculate it must be used. Because not a few students answered the questions, not to completion, and did not give conclusions at the end of their answers.

At level 5 literacy skills, namely being able to work with models for complex situations and solving complex problems, and level 6, using reasoning in solving mathematical problems, making generalizations, and formulating and communicating findings. For this level, most students cannot solve this problem well. Most of them are wrong in answering the questions given. The results of the 2012 PISA research state that none of the Indonesian students can answer the PISA level 5 and level 6 questions (Putra et al., 2016). Based on the question posed is about the variance or variance and standard deviation, where the variance and standard deviation are related. Meanwhile, the calculations require calculations that students feel to be very difficult because there are calculations with unmistakable signs, powers, and formulas that are difficult to remember. Thus, mathematical literacy skills at levels 5 and 6 still need to be improved to achieve everything more optimally.

Based on mathematical literacy skills from level 1 to level 6 seen from the results of student work, the abilities that have been achieved are level 1 to level 4, meaning that

students can use their knowledge to solve, interpret, and interpret problems to solve them with formulas. In addition, students can carry out procedures well in solving problems and choose strategies. Students can work effectively with models and relate them to the real world. Because students have not been able to achieve optimally at levels 5 and 6, it means that students have not been able to work with models with complex situations and have not been able to solve complex problems. Then students have not been able to use their reasoning in solving mathematical problems, formulating and communicating their findings.

Mathematical literacy plays a vital role as a life skill. Therefore, teaching mathematics in schools should aim to develop mathematical literacy and improve the ability of each student to use and apply mathematical knowledge to solve real-life problems or situations (Sumirattana et al., 2017). Mathematical literacy skills are essential because mathematical literacy is an individual's capacity to formulate, use, and interpret mathematics in various contexts. These skills include mathematical reasoning and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. These skills lead individuals to recognize mathematics's role in life and make sound judgments and decisions that are needed by constructive and reflective citizens (Sari, 2015). Mathematical literacy ability does not automatically grow in every child; it takes effort to grow these abilities. For example, literacy-based learning is one of the efforts that can be done. In addition to improving students' mathematical literacy skills, appropriate teaching materials are needed so that students are trained to solve mathematical literacy problems at a higher level by frequently practicing problem-solving (Masfufah & Afriansyah, 2021).

4. CONCLUSION

Based on the processing results and findings in this study, the development of Edmodo-assisted e-learning-based teaching materials is very valid and can be used in learning. The method of developing e-learning-based teaching materials uses the Dick and Carey model with the following stages: (1) identify the instruction goal, the existing teaching materials are not accompanied by animation and the e-learning learning media is not varied; (2) conduct instructional analysis, relevant knowledge is statistical material, because its application plays a vital role in everyday life; (3) identify entry behaviours, students have not been able to manage and regulate themselves in thoughts, feelings and behavior; (4) write performance objectives, formulate the ability to use Edmodo application learning media; (5) develop criterion referenced test, it is necessary to develop relevant items that improve mathematical literacy skills; (6) develop an instructional strategy, teaching materials are arranged according to the e-learning component; (7) develop and select instructional materials, display of teaching materials that are arranged based on the provisions of developing teaching materials; (8) design and conduct formative evaluation of instructional, statistical teaching materials have been designed equipped with contextual problems, animations and exciting pictures; (9) revision instruction, improvement of teaching materials based on criticism and suggestions, and (10) design and conduct summative evaluation, making improvements to teaching materials to increase the effectiveness of teaching materials.

Statistics teaching materials based on e-learning assisted by Edmodo give pretty good results on mathematical literacy skills, most students have achieved the minimum completeness criteria scores, and there is an increase in mathematical literacy skills in the medium category. These results cause by students that can use their knowledge to solve routine problems with general contexts, students can interpret problems with formulas, students can complete procedures well, and students can work effectively and integrate with

real problems. So that students feel more helpful in understanding the material and can follow the learning process well even though it is done online.

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