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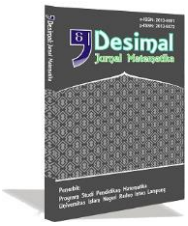

The development of website-based electronic teaching materials on central tendency materials to support online learning

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ABSTRACT

During the implementation of online learning caused by the Covid-19 pandemic, there are some obstacles that occurred in the class. Almost 40% of students in observation class felt bored and spent more time doing assignments during online learning. Hence, to stimulate the activeness of students it is needed to develop website-based electronic teaching materials on central tendency material which has valid, practice, and effective criteria and can support online learning. The development model used is the 3-stage Plomp Model, namely (1) preliminary research, (2) development or prototyping phase, (3) assessment phase. The subjects of this study are 30 students in the 8H class of Junior High School 8 Malang. The results of the validation test show that the product is valid based on the validation sheet by an expert validator and a practitioner validator which get an average score of 3.9. The results of the practicality test show that the product is practically based on the teacher's and the student's response questionnaire sheets which get an average score of 3.67. Besides, about 79% of students agreed that the product is interesting. The effectiveness test shows that the product is effective since 86.7% of students met the minimum KKM score in the evaluation test. So, it could be concluded that the product developed can be used to support online learning.

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INTRODUCTION

In accordance with the Circular Letter of the Minister of Education and Culture of the Republic of Indonesia Number 36962/MPK.A/HK/2020, the implementation of learning during the Corona Virus Disease (COVID-19) pandemic is carried out online in order to prevent the spread of COVID-19 (Kemendikbud, 2020). This is in line with the opinion of Syarifudin (2020) that online learning can be done anytime, anywhere without being bound by time and face to face, so that it can be applied as a learning solution during the COVID-19 pandemic. Online learning can support the realization of distance learning and is an

educational innovation that involves information technology (Darmawan, 2014; Fitriyani dkk, 2020). Therefore, online learning with the use of technology is highly recommended to be carried out at this time.

Junior high school (SMP) students are considered ready to carry out online learning. This is in accordance with the research conducted by Nggema et al., (2020). This readiness is supported by the condition that the majority of junior high school students already have cellphones that can access the internet network and have the ability to operate it, and the way of thinking of junior high school students according to Piaget has entered the formal operational stage, where students will not just receive information for granted (Aini & Hidayati, 2017).

Even though mathematics learning is done online, the learning presented must remain meaningful by relating it to everyday life. One of the mathematics materials in 8th grade of junior high school is a central tendency which consists of the mean, mode, median (As'ari & Tohir, 2017). However, in fact the obstacle was found in the learning. The obstacle that occurs was that students were less interested in participating in the learning, so that students do not really understand the concept of central tendency material.

Based on the results of initial observations made on several students of SMPN 8 Malang related to central tendency material, information was obtained that the learning carried out by the teacher was by uploading assignments or adding videos in Google classroom. In online learning, students felt they spend more time doing assignments that lead students to feel bored. This is in line with the opinion of Tambunan, N., & Siagian (2020) that students complained about many assignments given by the teacher in online learning. In addition, based on previous research conducted on these students in January 2021, it was found that they still had difficulties in understanding the concept of central tendency. From the results of the student answer sheets, there are still some students who cannot determine the mean, mode, and median of a set of data.

Learning by using Google Classroom has a template that the teacher can't create and feels less attractive. This is in line with the opinion of Widyantara (2020) that in Google classroom, more interesting features still need to be added. Therefore, it is necessary to develop more interesting materials as a students online learning facility. Prastowo (2015) explained that teaching materials are all forms of written or unwritten materials used to assist educators in carrying out the learning process. Teaching materials are generally prepared with a learned oriented model, namely students can research the teaching materials independently because the teaching materials have been arranged systematically and completely.

One of the appropriate teaching material types in online learning is electronic teaching materials. If it is reviewed from the way it works, electronic teaching materials are included in the category of teaching materials that are not projected, whereas if it is reviewed from their characteristic they are included in the category of teaching materials based on modern electronic technology. Ary Sandy & Sulistyahadi (2020) states that the substance of a teaching material is knowledge in the form of facts, concepts, principles, procedures, and skills. In electronic teaching materials, the substance is arranged in the form of text, images, and videos with a good structure. It will be the student attraction in learning a subject matter.

Electronic teaching materials can be compiled by utilizing websites that are attractive to students and easy for teachers to arrange. According to Johnson (in Hendrianto, 2014), A website is a collection of web pages consisting of

interrelated files. In a website there is a menu that someone can choose when visiting a website page that has been compiled. Websites can facilitate teachers to be creative in creating teaching materials that attract students with a systematic order and structure. The website is expected to make it easier for students to understand the material and carry out the online learning process (Darmawan, 2014). Website-based teaching materials are easier for students to access, because they can be used without downloading and installing an application on the student's cell phone or computer. It can help students who have mobile phones with little storage space.

There has been previous development research related to website-based learning, among others research conducted by Setyadi & Qohar (2017) concluded that the website-based learning media in the sequence and series material that has been developed is valid and motivates students to learn mathematics. Furthermore, research conducted by Aditya (2018) which stated that web-based mathematics learning media in the developed circle material is said to be valid, practical and can motivate students in learning. Then the research conducted by Harahap & Fauzi (2018) which stated that the website-based mathematics module developed meets the valid and practical criteria. In addition, it is also mentioned that the website-based mathematics learning module has a potential effect on student learning outcomes. So that the website-based mathematics learning module is good to be developed.

Based on the existence of several previous researches, and the properness of the developed teaching materials should meet the criteria of being valid, practical, and effective (Rochmad, 2012), so in this research, researchers developed website-based electronic teaching materials on the central tendency material that were valid, practical, and effective so that students could understand the central tendency material in online learning.

METHOD

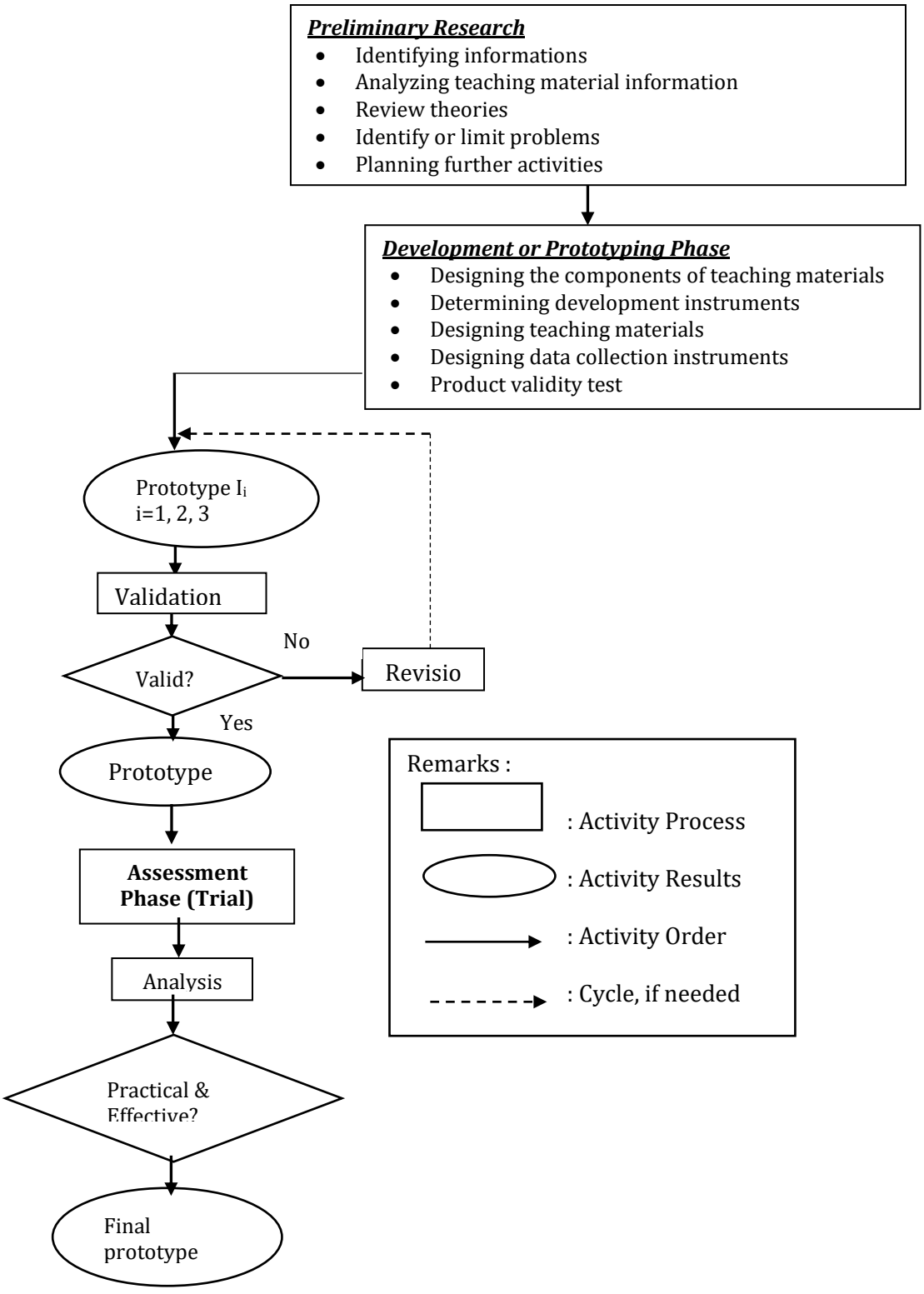

Figure 1. Research Design Conducted Flowchart

The flowchart above describes the research design carried out in this research. This research is a research on the development of website-based teaching materials for central tendency material. This research was conducted on February-March 2021 with the subject of the research trial, namely the 8H grade

students of SMPN 8 Malang which consisted of 30 students. The development model that will be used in this research is the Plomp model (Nieveen & Flomer, 2013). The development using the Plomp model is expected to produce valid, practical, and effective products. The development in Plomp model consists of 3 stages, namely (1) preliminary research, (2) development or prototyping phase (prototype development phase), 3) assessment phase (trial phase and summative assessment).

The preliminary phase consists of several stages, namely (a) identify informations, (b) analyze teaching material information, (c) review theories, (d) Identify or limit problems, (e) planning further activities. In the development or prototyping phase, there are several steps, namely (a) designing the components of teaching materials, (b) determining development instruments, (c) designing teaching materials, (d) designing data collection instruments. (e) product validity test, the product that has been compiled is validated first by expert validators and practitioner validators. After the developed product meets the valid criteria, the product will enter the assessment phase. In the assessment phase, the practicality and effectiveness of the product is tested and assessed.

The data collection instruments in this research consist of: (1) Validation Sheet, (2) Student response questionnaire (3) Teacher response questionnaire (4) Evaluation test. The validation sheet designed consists of (1) teaching material validation sheet, (2) student response questionnaire validation sheet, (3) teacher response questionnaire validation sheet, (4) lesson plan validation sheet, and (5) evaluation test validation sheet. This validation sheet is used to test the validity of teaching materials, while student and teacher questionnaires are used to measure the practicality of teaching materials, and evaluation test is used to measure the effectiveness of teaching materials.

Product Validity Test

The validity test analysis of the website-based teaching material product was carried out based on the results of the validation sheet by expert validators and practitioners. Then analyzed using a modified analysis technique from Hobri (as cited in Cahyani, 2020)as follows.

- Recapitulating the assessment data on the validity of teaching materials according to the data in the table which includes aspects of (A_i), indicator (I_i), and validity (V_a) for each validator.
- Calculate the average value of the validation results from all validators for each indicator (I_i) with the formula

$$I_i = \frac{\sum_{j=1}^{n} V_{ji}}{n}$$

where $\sum_{j=1}^{n} V_{ji}$ is the number of values of the *j*-th validator for the *i*-th indicator, and *n* is the number of validators.
- Determine the average value for each aspect with the formula

$$A_i = \frac{\sum_{j=1}^{n} I_{ji}}{m}$$

where $\sum_{j=1}^{n} I_{ji}$ is the sum of the values of the *j*-th indicator for the *i*-th aspect, and *m* is the number of indicators.
- Calculating the validity score (V_a) with the formula

$$V_a = \frac{\sum_{i=1}^{n} A_i}{s}$$

where $\sum_{i=1}^{n} A_i$ is the average value of the validation results on the *i*-th indicator, and *s* is the number of aspects.

The validity of these electronic teaching materials will be assessed according to the validity criteria adapted from Hobri (as cited in Sholihah, 2018)as follows.

Table 1. The Validity Criteria of Teaching Materials

Validity Score	Validity Criteria	Explanation
$V_a = 4$	Very Valid	No Revision
$3.25 \leq V_a < 4$	Valid	No Revision
$2.5 \leq V_a < 3.25$	Quite Valid	Partial Revision
$1.75 \leq V_a < 2.5$	Less Valid	Partial Revision
$1 \leq V_a < 1.75$	Invalid	Total Revision

Remarks :
$V_a = Validity\ average\ score$

Product Practicality Test

The practicality test was carried out based on the results of the teacher response questionnaire and student response questionnaire which were calculated with the following guidelines:

(a) Teacher response questionnaire

Teacher response questionnaire data was obtained using a modified score guideline from Hobri (in Cahyani, 2020) as follows.

Calculating the average score of practicality (P) with the formula

$$P_a = \frac{\sum_{i=1}^{n} I_i}{n}$$

where $\sum_{i=1}^{n} I_i$ is the number of teacher response questionnaire results on the *i*-th indicator, and *n* is the number of indicators.

(b) Student Response Questionnaire

The analytical technique used in calculating the results of the student response questionnaire modified from Hobri (as cited in Cahyani, 2020) is as follows.

- Determining the average value of respondents on each indicator (I_i) with the formula.

$$I_i = \frac{\sum_{j}^{m} I}{m}$$

where $\sum_{j}^{m} I$ is the total value of the *j*-th respondent for the *i*-th indicator and *m* is the number of respondents.

- Determining the average score of practicality (P_a) with the formula.

$$P_a = \frac{\sum_{i=1}^{n} I_i}{n}$$

where $\sum_{i=1}^{n} I_i$ is the average number of student response questionnaire results on the *i*-th indicator, and *n* is the number of indicators.

The practicality of electronic teaching materials will be measured according to the modified response questionnaire criteria from Hobri (as cited in Rahmasari, 2017) below.

Table 2. Response Questionnaire Criteria

Practicality Score	Criteria
$P = 4$	Very Practical
$3 \leq P < 4$	Practical
$2 \leq P < 3$	Less Practical
$1 \leq P < 2$	Not Practical

Remarks :
$P = Practicality\ average\ score$

Product Effectiveness Test

The effectiveness of teaching materials is measured by the scores of students' evaluation test results. From the evaluation test data, the percentage of students who get the minimum KKM score will be calculated using the formula

$$p = \frac{x}{n} \cdot 100\%$$

Where p is the percentage of students who get the minimum KKM, x is the number of students who get the minimum KKM score, and n is the number of test students. Teaching materials are said to be effective if at least 75% of the test students get a test score of at least 75.

RESULTS AND DISCUSSION

The developed electronic teaching materials used 3 stages in the model developed by Plomp (Nieveen & Flomer, 2013).

Preliminary Research Phase

In this stage, the researcher conducted an interview with a mathematics teacher at SMPN 8 Malang. It was found that SMPN 8 uses the 2013 curriculum. In online learning, SMPN 8

uses assignments and video material in Google classroom. The researcher also analyzed the important and meaningful mathematics material for students, namely the central tendency material which is part of the KD 3.10 and 4.10. In addition, researchers also examined theories about the development of teaching materials in online learning, namely by using the website. Further activities include the developed product design.

Development or Prototyping Phase

In the design phase, the researcher compiles the website according to the general structure of teaching materials. According to Prastowo (2015) the structure or elements of teaching materials in general are (1) Title, (2) Learning instructions, (3) Basic competence, (4) Main material, (5) Supporting information, (6) Exercises, tasks, and work steps, (7) Assessment.

The following is the identification of the application of the developed electronic teaching materials:

- Website name : Statistik Asyik
- Website address : https://yasnakartika92.wixsite.com/statistikasyik
- Material : Statistics sub-discussion central tendency (mean, mode, median)
- User : 8th grade of junior high school student

At this stage the researcher also determined the teaching materials which consist of 3 meetings. In each meeting the material was presented in questions that can guide students in constructing their understanding of the central tendency material. These meetings are designed in the menu of teaching materials. The menus displayed on this website are: (1) "Petunjuk Penggunaan" which contains website usage instructions in the form of text and video. In this menu there are two sub menus, namely the login page and basic competencies that will be developed. This login page serves to find out who is accessing the website during the learning process. (2) The "HOME" menu contains the title of the video introduction to the material of central tendency. (3) "Pertemuan 1" which contains the title, video presentation of data perception material, mean material in the form of video presentation of daily problems related to the mean material, questions and working instructions, (4) "Pertemuan 2" contains the title of the material, videos of daily problems related to the mode and median material, questions and working instructions, (5) "Pertemuan 3" which contains the title of the meeting and the link for the evaluation test questions. In addition, at this stage the researchers compiled the data collection instruments used. The following are some images of the developed products.

Figure 2. Examples of Website Pages

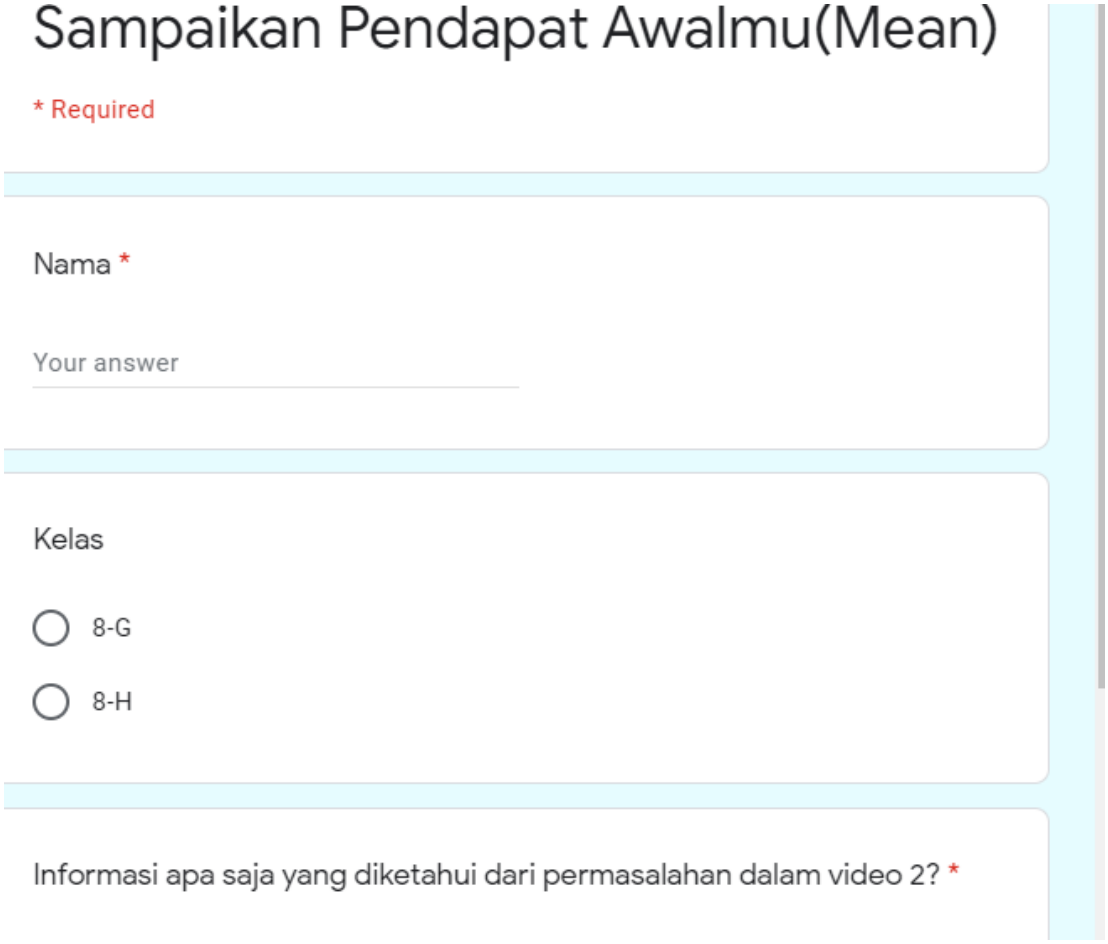

Figure 3. Examples of Student Activities on the Website

Figure 2 is an image of the user manual page on the website. Usage instructions are provided in the form of text and a video user guide. Figure 3 is an example of an activity for students. In the picture, students are given several problems and then students are asked to express their opinion about the problem.

The next activity in this phase is the validity test of electronic teaching materials. Validation was carried out by an expert validator, namely a lecturer in the department of mathematics and a practitioner validator who was a mathematics teacher at SMPN 8 Malang. From the results of the validity test, it produces development data in the form of quantitative data. However, apart from quantitative data, there is also qualitative data in the form of suggestions and comments from validators and students. The qualitative data will be a reference for developers in improving the developed teaching materials. The following are the results of the product validation test and each instrument.

Presentation of Validation Test Results

The results of the validation test of electronic teaching materials, teacher response questionnaires, student response questionnaires, lesson plans (RPP), and evaluation test questions can be seen in Figure 3 below.

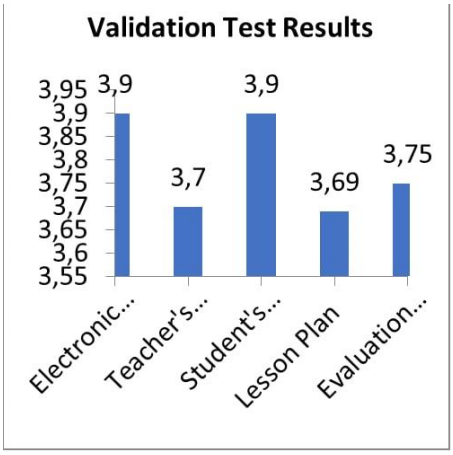

Figure 3. Validation Test Results

a. Website-Based Teaching Material Validation

The validation of these electronic teaching materials is carried out by expert validators and practitioner validators. Based on the data analysis of the assessment sheet validation of teaching materials by expert validators and practitioners, the overall average validity of the website-based teaching materials of the two validators is 3.9, thus meets the valid criteria. In order to make the website to be even better in its use, the authors make revisions based on suggestions from the validator. The qualitative data or suggestions from expert validators are as follows:

(i) On the "Home" page, the size of the opening video should be enlarged. Do not forget to include the video source.
(ii) For the display, it should be consistent in the use of the font. Likewise for the background used.
(iii) What is the function of the image (fill the identity on Google Form)? If students are often asked to fill in like this it will make them bored, it is better if the identity and questions are made into one section.
(iv) It is a good idea to give a video on how to use the developed application (user guide).

b. Teacher Response Questionnaire Validation

Based on the results of the validity test of the teacher response questionnaire which shows the average value of $V_a = 3.7$ which is in the interval $3 \leq V_a < 4$, then the teacher response questionnaire is declared valid and without revision.

c. Student Response Questionnaire Validation

Based on the results of the validity test of the student response questionnaire, the average value of $V_a = 3.7$ which is in the interval $3 \leq V_a < 4$, then the student response questionnaire is declared valid and without revision.

d. Lesson Plan (RPP) Validation

Based on the results of the RPP validity test which shows the value of $V_a = 3{,}67$ which is in the interval $3 \leq V_a < 4$, then the RPP is declared valid and without revision.

e. Validation of Evaluation Test Questions

Based on the results of the validity test of the evaluation test questions which showed the value of $V_a = 3{,}75$ which is in the interval $3 \leq V_a < 4$, then the evaluation test questions were declared valid. However, in order to make the questions can be used properly, the authors make revisions according to the suggestions from the validator. The following are suggestions given by the validator.

a. Please replace the field of study in biology (in the question) with mathematics
b. The questions presented are routine and general questions. It is good to present questions that are quite complex, such as the AKSI questions. For examples of AKSI questions I will send outside this document. You can learn the question.
c. The number of questions and the time allocation given is not appropriate

After the electronic teaching materials reach the valid criteria, this development research enters the assessment phase.

Assessment Phase

After the product is declared valid, the product will be tested in the trial class. In the implementation of learning by using these electronic teaching materials, students not only do routine questions but also learn to construct knowledge about the material with guiding questions. However, there are still some students who are late or do not even take part in online learning. This is in line with what Morgan (2015) explained in his journal that in online learning it is more difficult to monitor student attendance. However, this problem can be overcome with a student attendance regulation policy. So the researchers used Google meet in the last 15 minutes of the learning to conduct discussions and check student attendance.

After participating in learning using these electronic teaching materials, students are asked to fill out a student response questionnaire sheet as a practical test of the developed electronic teaching materials. In addition to using student response questionnaire sheets, the practicality test of electronic teaching materials is also determined based on the results of teacher response questionnaires who have used these electronic teaching materials in the class on the central tendency material.

In addition to conduct a practicality test, in the development of this electronic teaching material, an effectiveness test was also carried out based on the results of the student evaluation test on the central tendency material. This evaluation test question consists of 8 multiple choice questions and 4 description questions that have been validated by expert validators and practitioner validators. This test question is done in the form of a Google form with a link that has been provided on the website. The time allotted for doing this evaluation test is 75 minutes. Then the results of student work will be corrected based on the assessment rubric that has been prepared. The following are the results of the practicality and effectiveness of the developed teaching materials.

Presentation of Practical Test Result Data

The results of the practicality test are determined based on the teacher response questionnaire sheets and the student response questionnaire sheets.

i. Teacher Response Questionnaire

The teacher response questionnaire was obtained from one of the mathematics teachers at SMPN 8 Malang who used

electronic teaching materials that were developed in the learning on the central tendency material. The following are the results of the teacher response questionnaire.

Table 3. Teacher Response Questionnaire Results

No.	Assessment Aspect	Score
1	The content of the material is in accordance with the learning objectives.	4
2	Teaching materials are interesting to use.	4
3	Make it easier for students to understand the material.	3
4	Make students more active in independent learning.	4
5	The material in website-based teaching materials is given in a coherent manner.	4
6	The questions on the website can help teachers introduce the material to students.	3
7	The practice questions on the website are in accordance with the material.	4
8	Website can be accessed easily.	4
9	Informative website content.	4
10	Website-based teaching materials can be used repeatedly.	4
11	The use of language in accordance with Indonesian rules.	3
12	The language used is easy to understand.	4
13	The language used is short, clear, and does not cause double understanding	4
	The number of indicators = 13	$P_a = 3.7$

Based on the results of the product practicality test which shows the value of $P_a = 3.7$, then website-based teaching materials can be declared practical.

ii. Student Response Questionnaire

Student response questionnaires were obtained from 28 of 30 students who took part in the learning using the developed electronic teaching materials. The results of the response questionnaire are presented in Table 4 below.

Table 4. Student Response Questionnaire Results

No.	Assessment Aspect	Average score = $\bar{I}_i$
1	The display of the website is attractive.	3.75
2	The font used on the website is easy to read.	3.66
3	The information provided on the website is easy to understand.	3.64
4	Website is easy to access.	3.54
5	The instructions in this website-based teaching material are easy to understand.	3.54
6	The material in website-based teaching materials is easy to understand.	3.54
7	The teaching materials on the website make it easier to understand learning materials.	3.607
8	Website-based teaching materials can be used repeatedly.	3.79
9	The questions on the website help students understand the material.	3.75
10	The evaluation test questions are easy to understand.	3.54
	The number of indicators = 10	$P_a = 3.64$

The results of data analysis showed the value of $P_a = 3.64$. So, website-based teaching materials are said to be practical based on student response questionnaires.

Presentation of Effectiveness Test Results

The following are the results of the evaluation test questions.

Table 5. Student Evaluation Test Question Score

Name	Score
AAM	82
ANCA	92
AAZ	74
A	94
AZA	95
ANF	95
AA	95
AG	95
BSI	95
DF	73
FR	92
FK	87
JACS	100
MF	95
MW	92
NHGF	76
NRF	87
NNSM	90
NLAS	100
NA	90
NCYS	80
PPK	90
SNA	87
SR	87
SRG	74
SOR	95
SMA	76
MEAP	86
VTD	100
W	71

Based on the value of the evaluation test questions which are the effectiveness test instruments, there are 4 students out of 30 students who get scores below the minimum completeness. While there are 26 students out of 30 students or 86.7% of students in the class who get a minimum KKM score of 75. This shows that the development of website-based electronic teaching materials products can be said to be effective.

Discussion

This website-based electronic teaching material was prepared with the aim of supporting the implementation of online learning, especially on central tendency material in grade 8 of junior high school. Electronic teaching materials are prepared by giving students the opportunity to construct an understanding of the central tendency material independently. This is in accordance with the stage of thinking described by Piaget that junior high school students have entered the stage of formal operational thinking, where students have done reasoning by involving logical thinking. (Aini & Hidayati, 2017). In its preparation, the website collaborated with Google forms as a forum for students to collect answers. So that students can express their opinion about the questions asked. The following is a sample of student responses to the questions asked.

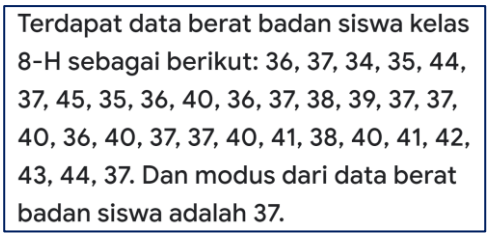

Figure 4. Initial Statement of Mode Material Questions

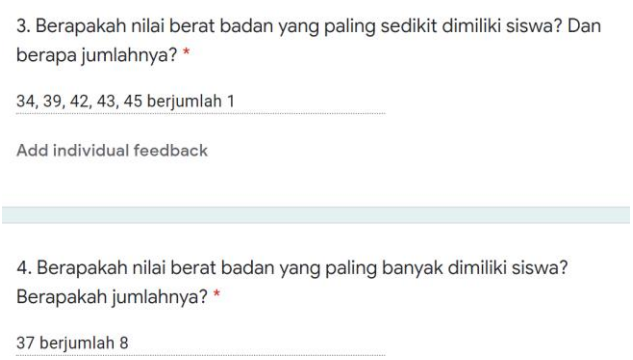

Figure 5. Student Response Sample

From the picture, it can be seen that students are trying to construct an understanding of the mode material independently. In practice, students build their understanding gradually and through real experiences so that learning will be more meaningful. This is in accordance with the research conducted by Kuswandi dkk, (2016).

Based on the results of the development and the trials in the previous description, it was found that the developed teaching materials in this research met the criteria of being valid, practical, and effective. This is in line with the research results of Setyadi & Qohar (2017) and Harahap & Fauzi (2018). So that the website-based teaching materials developed can support online learning. In addition, there were positive results from students towards the developed teaching materials based on the results of the response questionnaire which said that the developed website was interesting, and not boring, and could make it easier for students to understand the material. The response is in line with the researches conducted by Ningrum (2017) and (Setyadi & Qohar, 2017).

Although there were positive results obtained from the trial of teaching materials developed in this research, there were several obstacles during the trial including the website display on the smartphone could not be full and landscape, so students needed to shift the website to operate it. It makes students a little agitated in the implementation of the learning. In addition, in the implementation of online learning there are some students who are late in participating in the learning. This happens because of the lack of student surveillance in the learning, as well as limited quotas and networks. This obstacle is a common obstacle encountered in online learning, according to the researches conducted by Morgan (2015) and Rachmat & Krisnadi (2020).

CONCLUSIONS AND SUGGESTIONS

The developed electronic teaching materials discuss the mean, mode, median and consist of 3 meetings. Based on the results of the properness test of this website-based teaching material product, it can be said that it is valid, practical, and effective. This electronic teaching material is recommended to be used in online learning. In its use, there are several suggestions in using this electronic teaching material. For users, in order to use the website more optimal, it is recommended to access it via a PC/Laptop or tablet at least 10.1 inches.

For researchers who will conduct further research on this teaching material, it is expected to pay attention and adjust to the needs and characteristics of the group of students concerned. Further researchers are also expected to overcome the weaknesses that exist in this teaching material, and make it more attractive. In addition, it is also recommended to add a variety of questions so that students are more interested and challenged to learn this material. Then further researchers can also collaborate these teaching materials with the established school's Learning Management System (LMS).

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