

PRACTICALITY E-MODULE OF VIBRATION IN EVERYDAY LIFE ON ONLINE LEARNING TO IMPROVE SCIENCE PROCESS SKILLS OF GRADE X HIGH SCHOOL STUDENTS

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ABSTRACT

The development of 21st century skills can be done through the discipline of physics. Physics learning in schools has a central role in providing learners with 21st century skills. One of the lessons that can develop students' skills and stimulate students to be active and creative is learning with a science process skills approach. The learning process involves more students acting more actively, as well as managing findings derived from aspects of skills. From the initial studies conducted it was found that students' science process skills in online learning to have a variety of problems. One alternative to problem solving is to develop electronic modules (e-modules) to improve students' process skills. The methodology used in this research is Research and Development (R&D). The model used is the R&D research model according to Sugiyono in 2012. The object of this research is the e-module vibration in everyday life in online learning. The data collection instrument used was a practicality questionnaire. The practicality test instrument consists of four components, it is usability, ease of use, attractiveness, and clarity. The results of the practicality assessment were analyzed based on the interpretation criteria of the scores obtained. Based on the research objectives and data analysis carried out, it was obtained the average value of e-module practicality which was developed according to the teacher, which was 94.5 in the very good category and the average value of e-module practicality according to the students got a value of 90.5 in very good category.

Keywords : *E-Module of Vibration; ICT; Simple Harmonics Vibration; Science Process Skill*



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I. INTRODUCTION

Education is part of the media to achieve a change in human mindset that is demanded in accordance with the 21st century. The learning process carried out by educational units should be able to develop 21st century skills that must be acquired by students [1]. In the 21st century students should have several competencies including competence skills, knowledge and abilities in the field of technology, media and information [2]. In line with the competencies mentioned, the government through the ministry of education formulated graduate competencies that must be achieved by students in the 2013 curriculum in the form of attitude competence, knowledge, and skills.

The development of 21st century skills can be acquired through the disciplines of physics. The process of learning physics in schools can play a good role or play a central role in developing students' 21st-century skills[3]. In line with that, the 2013 Curriculum also explains the purpose of physics learning which also supports students to acquire 21st century skills which include mastery of physical concepts and principles, knowledge development skills, and confidence as higher education abilities, and the development of Knowledge and skills, as well as science and technology.

Mastery of concepts and achievement of graduate competence in physical learning can be obtained if the learning process involves learners directly. This aims to make students play an active and creative role to gain scientific experiences so that learning becomes more meaningful. Meaningful learning can be described as a learning process in which students directly experience an event during that learning so that they can store the information they receive for a long period [1]. To achieve this, physics learning can be carried out through the process of conducting scientific activities known as science process skills. In line with that, Turimin, et al. (2011) mentioned that "The skills of the 21st century can be grown through science literacy and science process skills" [4].

The development of learners' skills can be achieved through learning by practicing science process skills. It's due to several reasons. First, teachers as a source of learning cannot teach all concepts to students directly because of the rapid development of science. Second, to discover concepts through science, students can be helped with concrete examples in learning so that it is easier to understand complex and abstract materials. Third, the development of concepts in learning cannot be separated from the development of students' skills and attitudes [5].

However, there are indications of a gap between real conditions and expected conditions in SMA Negeri 4 Kerinci. The real conditions in the field are known after a preliminary study was conducted on December 7th — 10th, 2020. Preliminary studies conducted with regard to experimental activities in the laboratory, the implementation of online learning, and student learning outcomes.

The first real conditions are related to experimental activities. The instrument/tool for collecting data on this study is a guide to interviews with two physics teachers. Based on the data from the interview, it is known that real or virtual experimental activities at SMA Negeri 4 Kerinci were not carried out. The second real condition relates to the implementation of online learning. The data in this preliminary study was obtained using observation sheet instruments on online learning activities in physics learning at SMA Negeri 4 Kerinci. Based on observations obtained the results that the implementation of preliminary activities is 75%, core activities 50%, and closing activities 79%. From the data and based on the analysis of the indicators measured can be stated that the implementation of online learning at SMA Negeri 4 Kerinci does not support the implementation of learning activities that train science process skills. The third real condition relates to the student's physics learning outcomes. Data on student physics learning results is secondary data obtained from the results of the Midterm Assessment in odd semesters in 2020. Of the 139 students, the average score was 35. The data obtained interprets that the physics learning outcomes of MIPA's X-grade students are still in the low category.

From the results of preliminary studies that have been conducted, it is seen that there are deviations between real conditions and ideal conditions as expected. This indicates that there are problems on the ground that must be resolved immediately. Real conditions show that experimental activities in the laboratory are not carried out during the online learning process. The non-implementation of experimental activities resulted in many processing skills that were not obtained by students. Real conditions also indicate a problem with the online learning system that is applied. Online learning should be done face-to-face via video conference or using the Learning Management System (LMS) such as zoom, moodle, and google classroom. These problems have an impact on students' learning outcomes, especially in physics subjects. An alternative to problem solving is to use teaching materials in the form of electronic modules (e-modules) to improve students' process skills.

Teaching materials are part of the learning system component and play an important role in helping students obtain basic competencies and competency standards [6]. Teaching materials are arranged to facilitate teachers as teachers in delivering learning materials and learning messages to learners, so that learning with teaching materials can stimulate the minds of learners, as well as their interests or motivation to learn [7]. One of the functions of the module is as a source of self-study so that students can learn to accordi to their respective speed or ability [8]. From the description it can be concluded that the module is a form of teaching material that is systematically arranged to achieve learning skills and objectives so that students can learn alone with or without teacher supervision.

The presentation of teaching materials in the form of modules that have been converted in electronic form is called an electronic module or e-module. E-modules are part of teaching materials that are arranged in a direct and systematic manner in the learning unit so that users can achieve their intended learning goals. Modules that have been converted into electronic format include animation, sound, and navigation that create interaction between e-modules with users [9]. E-modules are organized non-print teaching materials that aim to train students to learn independently[10]. With electronic modules, the learning process includes interactive and audiovisual displays that make it easy to understand their use so that they can be used as excellent teaching materials.

Learning media that have been converted in electronic or e-module form have several advantages and disadvantages. The advantages of e-modules include: 1) easy to access through devices such as Smartphones and laptops, 2) potentially in increasing self-learning activities and easy to use in anytime and anywhere. 3) It can be available for a long time. 4) can be integrated with media such as audio, video, and interactive problems, 5) can train students' skills. While the shortcomings of e-modules, namely: 1) take a long time to compile and convert e-modules. 2) Some e-module development applications are complicated enough that not everyone mastered them. 3) Requires high perseverance for teachers in monitoring students in learning. 4) There must be adequate internet-connected electronic devices [11].

Learning to use e-modules can be done on online learning. Online learning is learning done through a web-based network with accessibility, connectivity, flexibility, and the ability to generate interaction in learning [12]. Online learning takes place where teachers and students do not meet in person. Online learning can also be understood as learning through multimedia technology, virtual classrooms, CD-ROM, video transmission, voicemail, email, video conference, animation, and streaming video [13]. From some of these definitions, it can

be concluded that online learning or e-learning is learning that uses the internet and uses virtual classrooms, video conferencing, and other means as a liaison between teachers and students.

Based on the results of preliminary studies and problems presented, the title of this study is "Practicality E-Module of Vibration in Everyday Life on Online learning To Improve Science Process Skills of Grade X High School Students ". The purpose of this study was to find out the practicality of using e-modules of vibration in everyday life in online learning. The learning model that will be applied is online learning (online learning) using the learning management system (LMS).

II. METHOD

This research method applies the Research and Development (R&D) method by applying the Sugiyono R and D model 2012. The R and D method is a research method that aims to produce a particular product by testing the practicality of its use and effectiveness [14]. Research and Development focuses on testing or implementing ideas to solve a problem in the real world. Therefore, this study is inherently more realistic because it produces results and products. The output of this research is a product that is e-module vibration in everyday life on online learning for high school X class students.

The procedure in this study applies 6 out of 10 steps of the R&D method, namely: 1) potential and problems, 2) data/information collection, 3) product design, 4) product validation, 5) product revision, 6) product trials. The potential for this research is the first is the current state of Indonesian education that prioritizes distance learning or online due to the covid-19 pandemic. The next potential is the development of science in the 21st century and technological advances of the industrial revolution 4.0. In this century students should have the ability to use technology that can help students later face the current era. The third potential is that in general, students of class X SMAN 4 Kerinci already have mobile devices such as smartphones with android operating systems to help the learning process.

Furthermore, the information that has been collected is used as data to proceed at the product planning stage. Researchers gather information for materials in developing learning resource products using interview methods about the constraints of experimental activities in schools, limitations in online learning, and learning difficulties in online learning. After gathering information, e-modules are designed and designed in everyday life on online learning to improve the process skills of X high school students. The resulting product design was then validated by three experts, namely Lecturer in Physics FMIPA UNP.

After the product is declared valid, then a trial of the product is carried out, namely a practicality test. In the process of product trials, researchers act as teachers by implementing products that have been declared valid by experts. The steps taken in the practicality test are to introduce e-modules with simple harmonic vibration material to students of class X MIPA SMAN 4 Kerinci, and carry out learning to use e-modules on simple harmonic vibration material and ask students to fill out the questionnaire as an e-module practicality testing instrument. Furthermore, practical analysis of e-module vibrations in everyday life on online learning for high school X class students. Weighting is done based on the Likert Scale. The criteria used to test practicality are as follows.

Table 1. Practicality Criteria for Product Use

Interval	Kategori
80 -100	Very Good
66 -79	Good
56 -65	Enough
40 -55	Less
30 -39	Fail

(Source : Ref [15])

Based on Table 1 there are five practical criteria of e-modules. The results of the practicality assessment of the use of e-modules are carried out based on the criteria of interpretation of the score obtained from the filling of the questionnaire by the practitioner. Classification of practical values accepted in this study if practicality lies in a category of good or good with a range of values 66-100.

III. RESULTS AND DISCUSSION

The results achieved in this study are the results of practicality tests of e-module use. The results of the e-module practicality test consist of practicality tests according to teachers and practicality according to students. The level of practicality is obtained by analyzing instrument sheets or practicality test questionnaires. The

instrument used is composed of four components of assessment, namely the usability component, ease of use, attractiveness, and clarity.

In the assessment of practicality tests according to teachers there are several indicators from each component of the assessment. Indicators of each assessment component are given a score of 1 – 4. The number of teachers who respond to the e-module is two people, the minimum score of each assessment indicator is 2 and the maximum score is 8. The score is changed in the form of a value so that the minimum value for each indicator is 25 and the maximum value is 100.

The first component in the assessment of the practicality of the e-module according to the teacher is the usability component. The usability component consists of eight indicators, namely: 1) E-Module vibration can increase the independence of learners in learning, 2) E-Module vibration in being able to transfer knowledge well so that teaching materials are easily understood by learners, 3) e-module vibration can help educators / teachers to deliver learning materials 4) E-Modules developed are able to add insight to readers (educators and learners), 5) E-Modules can help teachers motivate students in learning, 6) E-Modules can help educators in encouraging learners' courage in achievement, 7) Experiments / worksheets on e-modules can direct learners on science process skills activities, 8) Evaluation questions / work mastery tests on e-modules can train students' science process skills. The plot results of the usability component can be seen in Figure 1.

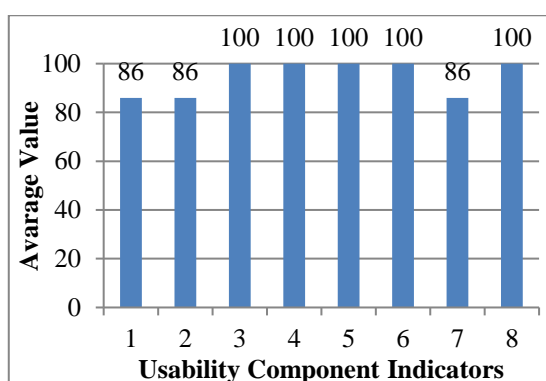


Fig. 1. Value of usability component according to teacher

Based on the data displayed in Figure 1 can be explained the practicality of the e-module on the usability component. The average value of each indicator on the usability component is in the range of 86 to 100 with an average of 95. From the value shown it can be known that the practicality of e-modules on the usability component according to the teacher has reached the criteria very well. Thus, the e-modules developed play a role in helping teachers to provide teaching materials more easily and informatively so that they can be used in the learning process.

The second component in the assessment of practicality according to the teacher is the ease of use component. This component consists of 5 indicators, namely: 1) The use of e-modules in the learning process can save time and efficiently for use in learning, 2) the use of language on e-modules is easy for learners to understand, 3) the presentation of materials and exercises on e-modules is clear and simple, 4) e-modules are practical and easy to carry because they can be stored, 5) e-modules are practical and easy to use over and over again as needed. The results of the data plot for the ease of use component can be seen in Figure 2.

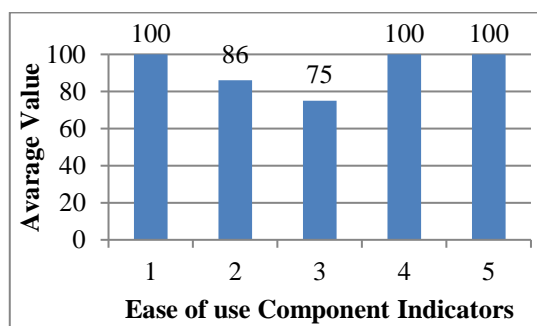


Fig. 2. Value of ease of use component according to teacher

From Figure 2 can be revealed the practicality of the e-module on the ease of use component. The value of each indicator on the ease of use component is in the range of 75 to 100. From the analysis of data on the value of

each indicator obtained an average value of 92. This means that teachers as practitioners assess the practicality of using e-modules in this component reaches a very good category, in other words the use of e-modules can save teacher time and can be used repeatedly as needed in the learning process.

The third component in the assessment of practicality according to the teacher is the appealing component. This component consists of four indicators namely: 1) the design and appearance of the e-module is very interesting to see, 2) the description of the material on the e-module is equipped with appropriate images and illustrations, 3) the type of writing (font) on the e-module can be clearly read, 4) the selection and color combination used in the e-module is already interesting. The results of the data plot for the Appealing component can be seen in Figure 3.

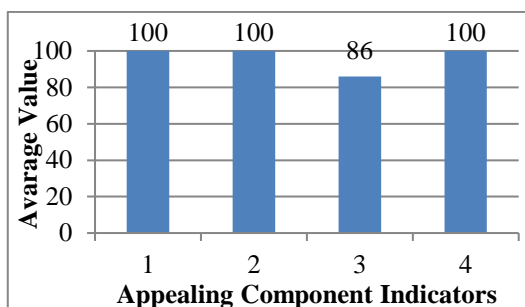


Fig. 3. Value of appealing component according to teacher

Dotted on the data displayed in Figure 3 can be explained the practicality of the e-module on the Appealing component according to the teacher. The range of values for the appealing component is 86 to 100 with an average of 97. The results of the analysis of the data showed that the practicality in the appealing component was very good or was in a very good category. This shows that teachers as practitioners assess the e-modules developed have good appeal in terms of presentation display and have coherence between font types, colors, and images presented.

The fourth component in the assessment of practicality according to the teacher is the clarity component. This component consists of seven indicators namely: 1) the image displayed in the e-module is clear, 2) the objectives and indicators to be achieved in the e-module are clear, 3) the instructions instructed on the e-module are clear, 4) the font type on the e-module is clearly read, 5) the instructions for the use of e-modules are clear, 6) the description of the material on the vibration e-module is clearly presented so that it is easy to understand, 7) The activities and worksheets on the vibration e-module are clearly presented so that they are easy to understand. The results of the data plot for the Appealing component can be seen in Figure 4.

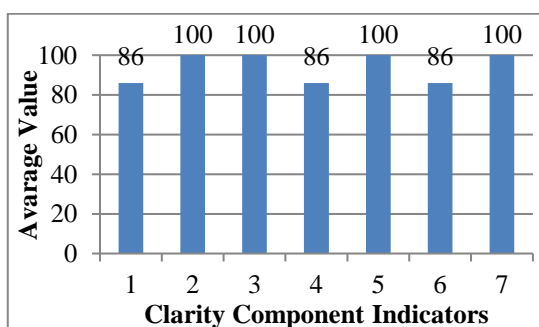


Fig. 4. Value of clarity component according to teacher

Based on the data shown in Figure 4 can be explained the practicality of the e-module on the clarity component. The results of the assessment by the teacher for this component are at a value of 86 to 100 with an average of 94. Judging from these values, the practicality assessment for the clarity component reaches a very good category or very good. This shows that the e-modules developed contain presentations, learning objectives and indicators, commands in the e-module, font types, instructions for use, materials and activities and worksheets that are clearly used in learning.

Based on the above results can be analyzed on average from the four components of practicality of e-modules according to the teacher. These components are: 1) usability (US), 2) ease of use (EU), 3) appealing (AP), and 4) clarity (CL). The results of the data plot for each assessment component can be seen in Figure 5.

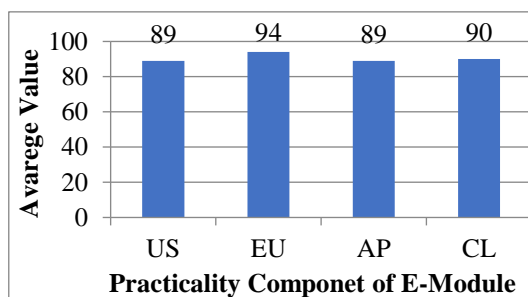


Fig. 5. Average grades of practical components according to teachers

Based on the data presented in Figure 5, the entire practicality component of the e-module has an average value of 92 to 97. The criteria or level of practicality of using e-modules according to the teacher is determined by calculating the average value of all assessment components. The final value obtained is 94.5 which means the vibration e-module is at the criteria very well. Thus, it can be revealed that the use of these e-modules is practical or easy for teachers to use in online learning.

The assessment of the practicality test according to the student has several indicators from each component of the assessment. Indicators from each assessment component have a score of 1 – 4. The number of students who have responded to the e-module is 35 people. The minimum score for each indicator is 35 and the maximum score is 140. The score obtained will be converted to a value with a minimum value of 25 and a maximum value of 100.

The first component in the assessment of the practicality of the e-module according to the student is the usability component. The nervousness component consists of eight indicators: 1) e-modules can help me to improve independence in learning, 2) e-modules are able to explain learning materials well, 3) e-modules help me to understand learning materials, 4) e-modules can add to my insights, 5) e-modules can be used to improve my motivation in learning, 6) e-modules can help me in encouraging courage to excel, 7) experiments / worksheets on e-modules can help me develop science process skills, 8) evaluation problems / tests can help me train science process skills. The results of the data plot for usability components can be seen in Figure 6.

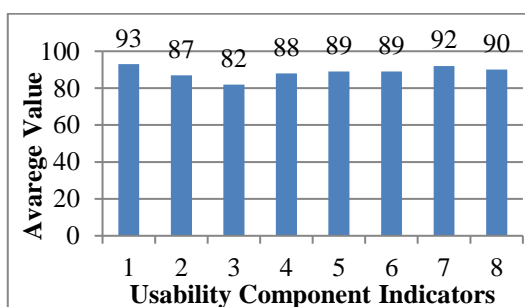


Fig. 6. Value of usability components by student

Based on the data displayed in Figure 6 can be explained the practicality of the e-module according to the student for usability components. The range of values obtained is 82 to 93. The average value of the eight indicators on this component is 89 or very good. This shows that the e-modules developed have an advantage in making the material easier for students to understand.

The second component in the assessment of the practicality of e-modules according to students is the ease of use component. The ease of use component consists of five indicators namely: 1) the use of e-modules in learning can save my time and is efficiently used in learning, 2) the language used on e-modules is easy for me to understand, 3) learning materials and training problems on e-modules are clear and simple, 4) e-modules are practical and easy to carry because they can be stored, 5) e-modules are practical and easy to use over and over again. The results of the data plot for the ease of use component can be seen in Figure 7.

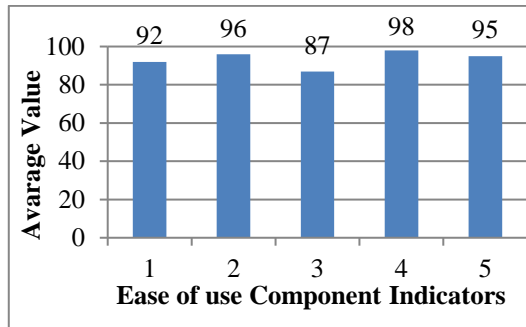


Fig. 7. Value of ease of use component by student

Based on the data displayed in Figure 7 can be disclosed the practicality of e-modules according to students on the ease of use component. The range of values obtained for each indicator is 87 to 98 with the average value gain of 94. These grades indicate that the results of the student-by-student e-module assessment for the ease of use component are excellent or achieve the criteria very well. This suggests that the use of e-modules can save time and be efficient for use by students. In addition, e-modules are also practical and easy to use over and over again.

The third component on the assessment of the practicality of the e-module according to the student is the appealing component. The Appealing component consists of four indicators, namely: 1) the design and appearance of interesting e-modules to see, 2) the description of the material contained in the e-module is equipped with appropriate images and illustrations, 3) the type of writing (font) on the e-module can be read clearly, 4) the selection and color combinations used in the e-module are interesting. The results of the data plot for the ease of use component can be seen in Figure 8.

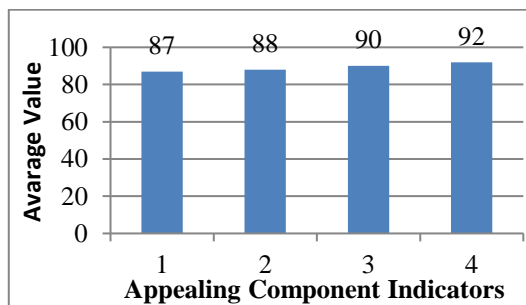


Fig. 8. Values of appealing components by student

Dotted on Figure 8 can be explained the practicality of the e-module on the Appealing component according to the student. The assessment results for each indicator on this component are in the range of values 87 to 92. The average value for each indicator is 89 or very good. This shows that students as practitioners assess the e-modules developed have good appeal in terms of presentation display and have coherence between font types, colors, and images presented so as to increase interest in using e-modules in learning.

The fourth component in the assessment of the practicality of the e-module according to the student is the clarity component (Clear). The clarity component consists of seven indicators namely: 1) the image displayed in the vibration e-module is clear, 2) the purpose and learning indicators on the vibration e-module are clearly presented, 3) The commands on the e-module are clearly stated, 4) The font type on the E-Module is clearly read, 5) the instructions for use of the modules are clear, 6) the description of the material in the vibration e-module is clearly presented so that it is easy to understand, 7) The activities and worksheets presented on the e-module are clear and easy to understand. The results of the data plot for the ease of use component can be seen in Figure 9.

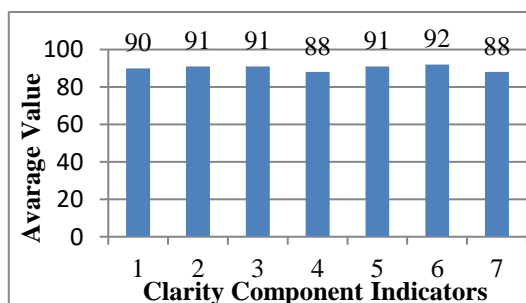


Fig. 9. Clarity component values by student

From Figure 9 can be revealed the practicality of the e-module on the clarity component according to the student. The range of values for each indicator in this component is 88 to 92. The average value of the seven indicators is at 90. The value shows that the practicality of e-modules on the clarity component according to students has very good criteria. This shows that the e-modules developed contain presentations, learning objectives and indicators, commands in the e-module, font types, instructions for use, materials and activities and worksheets that are clear so that students are not confused in using e-modules in the learning process.

Based on the above results can be analyzed on average from the four components of practicality of e-modules according to the teacher. These components are: 1) Usability (US), 2) Ease of Use (EU), 3) Appealing (AP), 4) Clarity (CL). The results of the data plot for each assessment component can be seen in Figure 10.

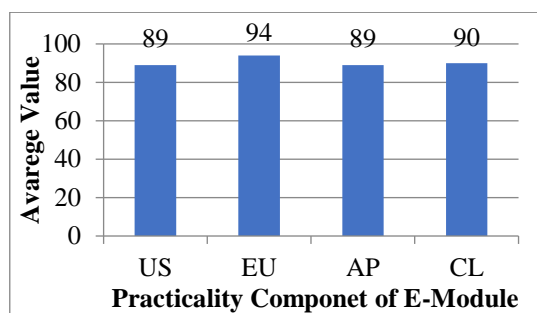


Fig. 10. Average grades of practical components by student

Based on the data shown in Figure 10 can be seen the value of each component on the practical assessment of e-modules according to students. The value of each component is in the range of 89 to 94 with the average being at 90.5. The data shows that the practicality of e-modules according to students has very good criteria. Based on these results, it can be concluded that the use e-modules of vibration in everyday life is practical for online learning.

Based on the results of research and data analysis obtained the results of research, namely e-module vibration in everyday life in online learning has practical value in the category of very good. E-modules are practically used because they are designed as android-based teaching materials and use software capable of providing high feedback or interactivity between users and e-modules. E-module vibrations in everyday life are also practical and can be used repeatedly. This is in accordance with the characteristics of the e-module as a teaching material that can replace the function of the teacher [16].

E-modules designed for online learning are practically used because they can be adapted to the availability of learners' time to save time and efficiently to use in learning. Learning with the vibration of e-modules in everyday life on online learning can help students to learn to match their respective speed and learning abilities. In addition, these e-modules also adjust to different student learning speeds [17]. It also conforms to one of the practicality criteria of the e-module, which refers to the ease of use in the learning process as it can be used repeatedly according to the student's learning speed [18].

The research conducted has various limitations so that solutions are needed to overcome these limitations. The first limitation is that the e-module developed is still limited to KD 3.11 class X semester 2 regarding the relationship of style and vibration in everyday life. This is due to the limited time of researchers in the creation of one semester e-module. The solution to this limitation is for e-modules to be developed based on all materials contained in class X both semester 1 and semester 2, so as to produce more complete teaching materials.

The second limitation is from the research stage. This stage of research is carried out until the product trial stage. The product trial phase is limited to two research classes. This is due to the limited time of researchers to conduct research. The solution to this limitation is in the future e-modules are tested more widely and reach the stage of use trials so that the coverage and quality on the e-module is better.

IV. CONCLUSION

Based on the results of the study, the results of practicality tests can be concluded, namely the practicality value of e-module vibration in everyday life in online learning to accord to teachers of 94.5 who are on the criteria very well and according to students of 90.5 are also on the criteria very well. Thus, the use of vibration e-modules in everyday life is practical for use in learning.

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