Validity and Practicality of 3D Page Flip Professional Assisted Mobile Learning-Based E-Module on Ecology Material and Environmental Change

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Abstract: This study aims to produce a valid and practical Mobile Learning (ML)-Based E-Module Assisted by the 3D Page Flip Professional Application. This type of research is development research using the Plomp model. The development stage of this model begins with the initial investigation stage, the development or prototyping stage, and the assessment stage. The instruments used in this development research were teacher interview guideline instrument sheets, student response questionnaire sheets, self-evaluation sheets, and E-Module validation sheets by experts, as well as e-module practicality assessment sheets filled in by teachers and students. The results showed that the 3D Page Flip Professional Application Assisted Mobile Learning (ML) Based E-Module based on expert judgment was very valid with a score of 89.10%. Practicality assessment of student assessment in field trials (large group evaluation) with a score of 88.95% with very practical criteria, and practicality assessment by the teacher obtained a score of 93.75% with very practical criteria. It can be concluded that the 3D Page Flip Professional Application Assisted Mobile Learning (ML) Based E-Module that has been developed is in the category of very valid, and very practical.

Keywords: E-Module validity; E-Module practicality; Mobile learning; 3D page flip professional application

Introduction

Education is a very important process for students. This is related to the process of increasing knowledge, because education can improve knowledge and skills for students. Education can be achieved by learning, both learning at the formal and non-formal levels. Formal education is carried out in a learning system (Kosilah et al., 2020).

Learning is a process that includes interactions that occur between teachers and students. Besides that, fellow students can interact with each other and between fellow students and their environment. This interaction process requires a good design, which is made in a simple way so that it can achieve optimal results (Lufri et al., 2017).

The achievement of learning outcomes is closely related to learning media, learning media is anything that can be used to channel messages from senders to recipients, so that they can stimulate students' thoughts, feelings, concerns, and interests to learn (Tafonao, 2018). In addition to learning outcomes, students' motivation in learning can also be developed using learning media.

Learning media is a tool that can help the teaching and learning process so that the meaning of the message conveyed to students becomes clearer and learning objectives can be achieved effectively and efficiently (Nurrita, 2018). Learning objectives describe the learning processes and outcomes that are expected to be achieved by students in accordance with basic competencies, the nature of learning objectives does not only refer to the maximum learning outcomes, but the importance of the

process in each of these learning (Azzah et al., 2021). In the learning process many problems are often found.

These many problems have an impact on low motivation and student learning outcomes (Sholichin et al., 2021). This happens because students' interest in learning is low and a lot of time is wasted. The decline in student learning outcomes is caused by several factors. Both internal factors, namely factors that come from within the students themselves and external factors, namely factors that come from outside the students themselves (Yuniarti et al., 2022).

Based on the results of the interview, which was conducted with Mrs. Maharani Wulandari, S.Pd. who is one of the X MIPA subject teachers at SMAN 1 Bayung Lencir on December 9 2021 it is known that teachers are still implementing conventional learning and are still teacher-centered. So that it causes a lack of student creativity such as asking questions, responses to the class atmosphere, self-confidence and responsibility for doing assignments or exercises and a lack of understanding of concepts. Furthermore, the teaching materials used by students in the learning process are still in the form of textbooks and learning support books, teachers have also never used IT-based teaching materials, such as the unavailability of mobile learning-based e-modules, which can visualize ecological material and environmental changes.

This learning process causes students to tend to only act as recipients of information provided by the teacher so that motivation in learning and student learning outcomes are still relatively low. The low learning outcomes can be seen from the daily test scores on ecology and environmental changes that have not reached the Minimum Completeness Criteria (KKM), which is 72.

Based on the value of the daily test, it can be seen that the average daily test score for class X MIPA SMAN 1 Bayung Lencir on Ecology is 55.31 and Environmental Change is 58.33 which is still under the KKM category. Due to the low understanding of students towards the material taught by the teacher, this has an impact on student learning outcomes.

Responding to the above problems, two important components that can increase the motivation and learning outcomes of students through learning are by using teaching materials that are adapted to the characteristics and needs of students. Teaching materials that can increase students' motivation and learning outcomes are using e-modules that are supported by the use of the right components so that they can make students learn effectively.

E-modules are books that can be accessed through digital technology via smartphones, PCs, and others (Vianis et al., 2022). The use of e-modules as learning media is more durable and costs less than other textbooks (Amelia, 2022). With this e-module, it can add insight to students in understanding the subject matter. In addition, students can also access it through devices such as laptops, PCs and smartphones.

According to Saputri et al. (2020) e-modules can preserve a large number of book literature, are durable, and can be stored in files and can be accessed at any time. The application of e-modules in the teaching and learning process in schools is highly recommended. Learning activities that use e-modules can increase student learning motivation (Fauziyah et al., 2020). Research by Pramana et al. (2014) shows the development of e-modules can increase student learning independence. The development of e-modules in learning activities can increase student motivation to learn (Adnan et al, 2019). In addition, the development of e-modules is very effective as a learning resource (Eskawati, 2012). E-module development can also be collaborated with mobile learning technology.

Mobile learning is a technology and information device that can be used in learning (Martha et al, 2018). According to Wati et al. (2022) mobile learning is a learning process that uses moving equipment (devices) such as Ipads, smartphones, computers, and others. The teaching and learning process that uses mobile learning is able to create an effective learning atmosphere (Widyanirmala et al., 2014). In addition, learning with mobile learning can make the teaching and learning process innovative (Warsita, 2010).

The use of mobile learning has flexibility in accessing learning information without time constraints (Fahyuni et al., 2020). The presence of mobile learning is a solution for solving various kinds of learning problems and solutions for the development of educational technology (Aprianto et al., 2022). Using mobile learning students can operate it via their smartphones anywhere and anytime (Rorita et al., 2018). However, mobile learning can also be collaborated with other technologies, one of which is a professional 3D page flip application.

The professional 3D page flip application is an application that can be used to create teaching materials with 3D effects in the form of e-modules or e-books (Diana, 2022). Professional 3D page flip applications are able to make display modules attractive with animations, images, videos in various formats in the form of Exe, Zip, Html, 3DP, screen savers and so on (Fitri et al, 2019). Modules resulting from professional 3D page flip applications can help students access learning materials (Oktasari et al., 2018). According to Sumantri et al. (2020) Learning that uses a professional 3D page flip application assists teachers in conveying subject matter to students. This Professional 3D Page Flip application can visualize ecological material and

environmental changes, so that it can help increase student motivation and learning outcomes.

Based on the problems that have been raised, a research was conducted on the Development of Mobile Learning (ML) Based E-Modules Assisted by Professional 3D Page Flip Applications to Increase Student Motivation and Learning Outcomes at SMAN 1 Bayung Lencir.

Method

This type of research is research and development (research and development). This study aims to produce a product in the form of a professional 3D page flip-assisted mobile learning-based E-module that is valid and practical on ecology and environmental change to increase motivation and learning outcomes for class X MIPA SMAN 1 Bayung Lencir. The e-module development will be carried out using the Plomp development model. The developer of this research model is Tjeerd Plomp, whose research consists of three stages, namely the preliminary research phase, the development or prototyping phase, and the assessment phase (Plomp et al., 2013).

The initial investigation stage aims to get an overview of the characteristics of the product to be developed for use in learning. Activities carried out at this stage are: problem and needs analysis, curriculum analysis, concept analysis, and student analysis. Furthermore, at the development or prototyping stage which aims to design a solution to the problem identified at the initial investigation stage. Activities carried out in prototype development include designing and developing prototypes I, II, III, and IV. Next, the assessment stage is the final stage of development research. At this stage a practicality test was carried out by filling out a questionnaire on the practicality of responses of teachers and students to the use of ecological e-modules and environmental changes based on mobile learning.

The test subjects for the development of mobile learning-based e-modules on ecology and environmental change were carried out in class X MIPA 3 at SMAN 1 Bayung Lencir. The type of data collected in this study is primary data. Primary data types are data obtained directly through research instruments, namely qualitative and quantitative data. Qualitative data, namely in the form of the validator's opinion from the validation data as well as the opinions of teachers and students about the practicality of the developed mobile learning-based e-module. Meanwhile, quantitative data is collected through validation assessment sheets from experts, the practicality of teachers and students in mobile learning-based e-modules.

The instruments used in this development research were, at the initial investigative stage, in the form of teacher interview guide instrument sheets, student response questionnaire sheets. Furthermore, at the development or prototyping stage, namely the self-evaluation sheet, and the E-Module validation sheet by experts or experts. Then, at the assessment stage, namely the e-module practicality assessment sheet filled in by the teacher and which was tested on students in the small group (small group) and large group (field test) stages.

The data analysis technique used is qualitative data in the form of descriptive analysis. This descriptive data analysis describes the validity and practicality of mobile learning-based e-modules. The analysis technique used on validity and practicality data was carried out by means of a modified Likert scale scoring.

Result and Discussion

Initial Investigation Stage

The development process in this research begins at the initial investigation stage, which aims to find out what problems students and teachers face in the learning process. The analysis carried out included: problem analysis, needs analysis, syllabus analysis, and analysis of the teaching materials used.

Based on the results of problem analysis through interviews with biology teachers at SMA N 1 Bayung Lencir, information was obtained that students had difficulty understanding the concept of ecological material and environmental change. In addition, the material on ecology and environmental change which is located at the end of the semester is often an obstacle for teachers because there are subject matters that have not been conveyed in detail and thoroughly in learning, so the teacher only gives assignments independently to students in the form of summarizing, working on questions. -questions from textbooks and student worksheets, related to the material. This was added to the results of the problem analysis through student interviews, as many as 67.16% of students stated that the material on ecology and environmental change in biology learning was quite difficult material for students to understand.

Based on the analysis of the teaching materials used in learning, they still do not motivate students actively, such as aspects of the display of teaching materials, for example, the images contained in teaching materials generally do not have color so that they become less attractive for students to read. Furthermore, in the graphic section, the color background used in teaching materials does not use color and does not support students to study independently during learning. This makes it difficult for students to find an understanding

of the concepts they are learning. In accordance with the opinion of Winarko et al. (2013) requires an interesting teaching material so that it can help improve learning outcomes which can stimulate students to carry out learning effectively. Nova et al. (2018) stated that the existence of variations in learning materials in learning, can motivate students to better understand the material.

Based on the results of the analysis of the needs of mobile learning-based E-Modules, it is known that as many as 95.52% of students stated that it was necessary to develop mobile learning-based E-Modules equipped with pictures and videos that could support and facilitate students in understanding the subject matter of ecology and environmental change. In accordance with the opinion of Amalia et al. (2016) states that the use of pictorial and video media in learning can stimulate students' feelings to understand learning.

Based on the analysis that has been carried out, from several topics on ecology and environmental change, this material requires an explanation of the material that is supplemented by supporting pictures and videos as well as a structured and clear explanation of the material. Especially on materials related to cycles such as biogeochemical flows. Then also, the material on ecology and environmental change requires tools and materials such as making displays for example the water cycle, carbon, nitrogen, waste recycling, and others.

Based on the results of the analysis that has been carried out, the teaching materials used by the teacher are printed teaching materials in the form of books, student worksheets, and others that are used by teachers in learning biology. In this teaching material there are aspects that are not in accordance with the needs of learning, for example in the aspect of display of teaching materials, the images contained in teaching materials that are used generally do not have color so that it becomes less attractive for students to read, then in the graphics, background colors used in teaching materials have not used color. In addition, teachers have not used teaching materials that help students to be able to study independently, such as modules, both printed and electronic. This is based on the results of student interviews, many students are more fun and easy to understand learning that is interactive and not monotonous, learning that is directly practiced is related to the theory that has been learned, learning in which there is material in the form of pictures and videos that can relate material to real life. According to Sarah et al. (2016) the use of e-modules can improve learning outcomes and make it easier for students to understand subject matter because it is equipped with learning videos and can create learning experiences, arouse curiosity, and excitement in students through research projects in learning.

Interesting teaching materials are teaching materials that are complemented by pictures and videos so as to increase students' interest in reading. Arsyad (2013) further revealed that teaching materials equipped with pictures will facilitate understanding and strengthen memory, besides that it can also provide a relationship between the content of the material and the real world of students so that it has an impact on satisfying learning outcomes. Another purpose of using pictures and videos is to make it easier for students to understand the material and not feel bored and bored in obtaining learning material.

Development or prototyping phase (Development or prototyping phase)

The prototype development stage is the stage of making valid and practical mobile learning-based E-Modules. Validity is an activity carried out aiming to see the accuracy of a product that has been developed. This is in accordance with the opinion of Sugiyono (2013) which states that validity is the degree of accuracy of the data that occurs in the research object with the actual data. Lufri et al. (2017) also revealed that validation refers to the accuracy, meaning, and usability of a product developed by a researcher.

The material presented in the mobile learning-based E-Module can help students to be directly involved actively, creatively in discovering their knowledge and understanding. Mobile learning-based e-modules are made using the 3D Page Flip Professional application. The use of the 3D Page Flip Professional application in the design process is structured not only to contain text and images but also equipped with relevant videos and evaluations regarding the material presented. In addition, the results of E-Module products developed using the 3D Page Flip Professional application will be used more effectively and efficiently in learning. Modules resulting from professional 3D page flip applications can help students access learning materials (Oktasari et al., 2018). According to Raihan et al. (2018) learning that uses professional 3D page flip applications helps teachers convey subject matter to students. This Professional 3D Page Flip application can visualize ecological material and environmental changes, so that it can help increase student motivation and learning outcomes.

The advantage of professional 3D page flip applications is that they can be used to create teaching materials with 3D effects in the form of e-modules or e-books (Diana, 2022). Professional 3D page flip applications are able to make display modules attractive with animations, images, videos in various formats in the form of Exe, Zip, Html, 3D, screen savers and so on (Fitri et al, 2019). The appearance of the mobile learning-

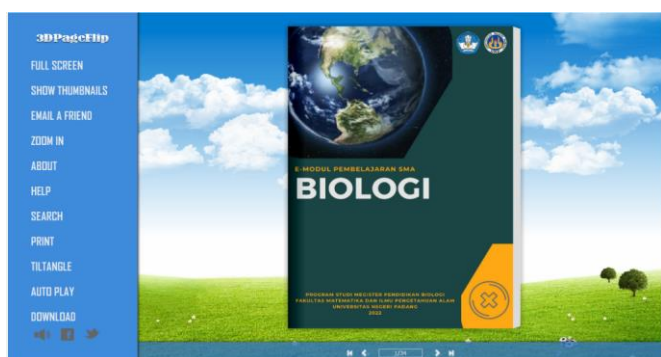based E-Module was created using the 3D Page Flip Professional application, which can be seen in Figure 1.

Figure 1. The display of the cover and menu of the E-Module is based on mobile learning using the 3D Page Flip Professional application

In the E-Module product development stage, there are several steps that need to be carried out. The first stage carried out is self-assessment (Self evaluation). The results of the self-assessment on the E-Module can be seen in Table 1.

Table 1. Results of Self-Evaluation

Repair	Follow-up
Mobile learning-based e-modules do not yet have a back cover	Make Back Cover on E-Module
E-Module based on mobile learning does not yet have a list of tables	Make a list of tables in the E-Module
There are no pages for mobile learning-based e-modules	Completing the page on the E-Module
Mobile learning-based e-modules do not yet contain videos that are in accordance with the learning material discussed	Add videos that match the learning material
Mobile learning-based e-modules do not yet have a glossary	Make a glossary on E-Modules

Based on the results of self-validation (self-evaluation), improvements were made in the form of adding covers, page numbers, glossaries along with image and video descriptions in the description of the material in the mobile learning-based E-Modules that have been developed. According to Agustine et al. (2014) self-evaluation (Self evaluation) aims to self-check regarding the development of the e-module, whether it is in accordance with the diactive, constructive, and technical aspects that are correct and appropriate, then proceed to the next stage.

In the next stage, validation of the E-Module is carried out to a team of experts or experts (Expert review). The development of mobile learning-based E-Modules is designed to help students and teachers in the learning process. For this reason, the validation stage is

carried out to a team of experts or experts (Expert review). The validation results for a team of experts or experts (Expert review) can be seen in Table 2.

Table 2. Results of the Analysis of the Validity Test of E-Modules Based on Mobile Learning

Assessment Aspects	Value (%)	Category
Construct	88.00	Very Valid
Content	91.67	Very Valid
Graphics	87.50	Very Valid
Language	91.67	Very Valid
Total	358.84	Very Valid
Average Validity Value (%)	89.10	

Based on the results obtained from the validation process, an average value of 89.10% is obtained with a very valid category. This is supported by the opinion of Arikunto (2013) which states that if a data obtained from an average assessment of a product being developed is valid, it can be said that the product has been able to have an impact in the form of an overview of the objectives of the development that is appropriate and correct. with facts and circumstances. The validation aspects carried out in the development stage are viewed from 4 aspects, namely: construct aspects, content aspects, graphic aspects and language aspects. For more details on each of these aspects are described as follows.

Construct Aspect

The construct aspect of the mobile learning-based E-Module is declared valid with a validity value on the construct aspect of 88.0% with a very valid category. In line with the opinion of Arikunto (2013) stating that a data generated from a product is valid, it can be said that the product being developed has provided an overview of its development goals correctly and in accordance with the facts and actual conditions. Mobile learning-based e-modules that fulfill the construct aspect are designed to be used on cellular mobile phones. This E-Module contains visual media components in the form of images, text, videos and is designed based on the learning outcomes.

Content Aspect

The content aspect of the mobile learning-based E-Module was declared valid by the validator. The validity value on the diactive aspect is 91.67% in the very valid category. Based on the criteria for the content aspect, it is known that the developed E-Module is in accordance with the syllabus and student characteristics and can assist in the learning process so that students understand the material more easily. This is in line with Daryanto (2013) stating that the E-Module is said to be self-contained if all the required learning material is contained in the E-Module.

Graphical Aspect

The graphical aspect of the mobile learning-based E-Module is declared valid with a technical validity value of 87.50% in a very valid category. The terms or criteria for graphical aspects are related to writing, images, videos and the appearance of a product (Trianto, 2012). Based on the criteria on the graphical aspect, it can be stated that the mobile learning-based E-Module developed uses a type and size of letters that can be read clearly and the use of appropriate punctuation. Furthermore, the presentation of images in the mobile learning-based E-Module already has an explanation, size, and is in accordance with the material presented. Described by Febrianti (2021) states that E-Modules developed using the 3D Page Flip Professional application are equipped with graphical aspects or visualization of images and videos of the products made, can make students understand the material being studied because it can stimulate students' sensory organs with the presence of video in the E-Module. In accordance with the opinion of Prastowo (2015) which states that the presentation of images is needed to support and clarify the content of the material, as well as to increase reader interest. In the graphical section, it can be concluded that the developed mobile learning-based E-Module has an attractive cover and content appearance.

Language Aspect

The language aspect of the mobile learning-based E-Module is declared valid with a technical validity value of 91.67% with a very valid category. The language used in the mobile learning-based E-Module is in accordance with good and correct Indonesian standards. According to Hamdani (2011) the language aspect is an aspect that needs to be considered in the preparation of teaching materials and the language used should be simple and easy to understand. Based on the material developed, the mobile learning-based E-Module is stated to have presented clear learning outcomes and subject matter, materials and evaluations that are in accordance with learning outcomes, have developed the correct concept.

The four aspects of evaluating the validation of the E-Module that have been described are a unified whole and mutually support one another to develop a good mobile learning-based E-Module that complies with the rules. This is in line with the research of Misbah et al. (2021), that the validity of the E-Module is seen from several aspects, namely the language aspect, the content aspect and the graphical/display aspect contained in the E-Module.

Then a one-to-one evaluation is carried out, which is an assessment carried out with representative users, namely 3 students with different levels of ability to provide input regarding the product that has been developed. Based on the results of one-to-one evaluation validation, information was obtained that the mobile learning-based E-Module that had been developed received a positive response from students. This can be seen from the results of the analysis which shows that the completeness of the components, language, presentation, and graphics have been fulfilled and properly available.

The practicality assessment of the mobile learning-based E-Module is carried out in stages. The first assessment was carried out in a small group evaluation. The number of students in the small group evaluation test (small group) is 15 people in which there are students with different levels of cognitive ability, namely low, medium, and high who are members of one class. Evaluation of small group evaluations (small group) is carried out through a practical questionnaire instrument given to students which aims to see the practicality of mobile learning-based E-Modules. The results of the small group evaluation analysis can be seen in Table 3.

Table 3. The results of the Mobile Learning-based E-Module Practicality Test in small group evaluations.

Aspect	Value (%)	Criteria
Ease of use	82.85	Very Practical
Usage Time Efficiency	84.30	Very Practical
Benefit	85.25	Very Practical
Average (%)	83.60	Very Practical

Based on the practicality evaluation results the small group (small group) got an average score of 83.60% in the very practical category. This is based on ease of use, efficiency in use, attractiveness, easy to interpret and has equivalents. These results indicate that the mobile learning-based E-Module that has been developed is practical and can be used for trials to the next stage, namely the assessment phase (Assessment Phase) in field trials or large groups (field tests).

Assessment Phase

In the assessment phase carried out is an assessment of the mobile learning-based E-Module which includes practicality tests by students and practicality tests by teachers. At this stage the activity carried out was an assessment of mobile learning-based E-Modules with a larger sample, in this case 2 classes were used. The results of the practicality test analysis in the field test can be seen in Table 4.

Table 4. The Results of the Mobile Learning-based E-Module Practicality Test in Field Tests

Aspect	Value (%)	Criteria
Ease of use	90.00	Very practical
Usage Time Efficiency	87.85	Very practical
Benefit	89.00	Very practical
Average (%)	88.95	Very practical

Based on the results of practicality in the large group evaluation (field test) an average value of 88.95% was obtained in the very practical category. These results indicate that mobile learning-based E-Modules are very practical to use by students in implementing learning process activities. Then a practicality assessment is carried out by the teacher. This activity was carried out to see the practicality of mobile learning-based E-Modules. This assessment was carried out by a teacher in charge of biology in class X SMA N 1 Bayung Lencir. E-Module practicality data by teachers were obtained from mobile learning-based E-Module practical instrument sheets given to teachers. The results of the analysis of the practicality of the E-Module data can be seen in Table 5.

Table 5. The Results of the Mobile Learning-Based E-Module Practicality Test by the Teacher

Aspect	Value (%)	Criteria
Ease of use	95.00	Very practical
Usage Time Efficiency	87.50	Very practical
Benefit	95.00	Very practical
Average (%)	93.75	Very practical

Based on the results of practicality by the class X biology teacher, the score was 93.75% in the very practical category. The practicality test results show that mobile learning-based E-Modules are very practical to use by teachers in implementing learning activities. It is also based on ease of use, efficiency in use, attractiveness, easy to interpret and has equivalence (Dewi et al., 2019).

Based on the results of the large group evaluation assessment and the biology teacher in class X. The mobile learning-based e-module that was developed provides convenience in terms of its use. This convenience is due to the presentation of material using language that is easy to understand and uses clear font sizes. This is in line with the opinion of Nugraha et al. (2013) stated that one of the conveniences obtained by users is language standards or readability of teaching materials seen from the use of good and correct language in accordance with KBBI, the use of simple and uncomplicated language will facilitate students' understanding of the material presented.

In terms of usage efficiency, mobile learning-based E-Modules are classified as very practical. This shows

the use of this E-Module according to the time available. The use of E-Modules does not involve a long time and does not interfere with other learning times so that it can be said that the mobile learning-based E-Modules developed are efficient in their use. Added by Sukardi (2012) states that practicality can be seen from the implementation time which should be short, fast, and precise.

Based on the aspect of attractiveness, the developed mobile learning-based E-Module has a very practical category. The developed E-Module has an attractive appearance so as to increase student interest in learning, where students can be directly involved actively, creatively in discovering their knowledge and understanding in the learning process. This is one of the driving factors in improving understanding and student learning outcomes in learning. In line with research conducted by Sarah et al. (2016) the use of e-modules can improve learning outcomes and make it easier for students to understand subject matter because it is equipped with learning videos and can create learning experiences, arouse curiosity, and excitement in students through investigative projects in learning.

Based on the aspect of ease of interpretation, mobile learning-based E-Modules have very practical criteria. This is because the use of E-Modules is easily understood by teachers and easily interpreted by students.

In the aspect of equivalence, mobile learning-based E-Modules have very practical criteria. This shows that the E-Module has equivalent material with the teaching materials that are commonly used, so that it can be an alternative teaching material in the learning process. This e-module has presentation of material that is relevant to the syllabus, so that it can be used as one of the variations of teaching materials used in biology learning on ecology and environmental change. Sukardi (2012) states that teaching materials can be said to be equivalent if they can be used as substitutes or variations in learning according to students' learning needs.

Based on observations made when carrying out practicality tests, it appears that students are very happy and enthusiastic in learning by using mobile learning-based E-Modules. This was added by the presence of students who thought that mobile learning-based E-Modules were very interesting to read and very relevant to use for learning. This is because the learning materials in the E-Module can be used on their respective Android and iOS-based smart phones or via computers and laptops. In line with this opinion, Calimag et al. (2014) stated that one device that can be used for educational purposes is a smartphone based on Android or iOS.

Conclusion

Based on the development that has been carried out, it is concluded that the E-Module based on mobile learning using the 3D Page Flip Flip Professional application that has been developed has validity in a very valid category based on validator assessments, and has practicality in a very practical category based on teacher and student assessments at SMA N 1 Lime Shadow.

Acknowledgments

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