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Mobile Learning "Asmeralda" for Teaching Static Fluid at Senior High Schools

Iman Alkautsar* and Mita Anggaryani
Physics Education, Faculty of Mathematics and Natural Science
Universitas Negeri Surabaya, Surabaya, Indonesia
iman.18053@mhs.unesa.ac.id

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Abstract

This study applied Research and Development (R&D) method for developing a mobile learning media for teaching static fluid material, namely "Asmeralda" (Aplikasi Mobile Learning Fisika Fluida). This study aims to assess the feasibility of "Asmeralda" implemented in Physics class. In developing "Asmeralda", this study follows the ADDIE steps: Analysis, Design, Development, Implementation, and Evaluation. The data collection used questionaries and interviews. The participants in this study consist of expert lecturers and senior high school students in Surabaya. The results show a positive response towards "Asmeralda" as mobile-based learning media for teaching static fluid. The average feasibility assessment according to expert lecturers as media validators: the material is 91% very feasible, the media is 92.8% very feasible, and the assessment is 91.7% very feasible. The media, according to students, is 92% feasible, 94% practical, and 90% effective. Based on these results, it can be concluded that the mobile-based learning media "Asmeralda" is feasible for teaching static fluid material at Senior High School. However, this conclusion is based on one case in one school in Surabaya. Further study in implementing Asmeralda and mobile learning is crucial for a better strategy in developing media-based computer information.

Keywords: Mobile Learning; Static Fluid; Learning Media

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INTRODUCTION

The development of science and technology requires improving the quality of education by utilizing current technology to be realized in the teaching and learning process. Some important concepts in science are difficult to explain verbally, so using media is needed to make them manifest in visual form so that it is easier to understand (Korganci et al., 2015).

According to Thinley (2014), nowadays, technology in schools is used to improve effective and better learning processes. Teachers are required to have the expertise to innovate in education, and one of the innovations in education is learning media development (Neo Palelupu & Cholik, 2014).

According to Kristanto (2016), learning media are all things that can send messages and make students' thoughts and feelings interested in learning so they can achieve learning goals. Learning media is an essential component of learning resources because the influence of learning media can determine educational success. Learning media in

the learning process can increase student interest in learning (Siskawati, 2016).

Learning media can be a source of information on learning materials and a source of practice questions to support the teaching and learning process. Learning media can increase student motivation and interest in learning so that the learning materials taught can be easily understood (Islahudin et al., 2017).

Mobile learning is an example of learning media in the field of technology. The use of mobile learning is a step forward in education, which is currently moving towards a modern and digital direction. According to Darmawan (2013), mobile learning is a learning option that is not bound by space and time, so it is very flexible. Mobile learning is expected to complement classroom learning and help students learn independently material that is less mastered without being limited by space and time (Fatimah & Mufti, 2014).

Physics is a branch of natural science closely related to interactions and phenomena in life. According the purpose of studying physics, students can understand scientific events, laws, theories, and facts based on scientific processes or experiments to be accounted for (Novianti & Sarkim, 2017). Several factors make students like and hate a lesson. More precisely, four factors make a student love/hate a subject based on the National Assessment of Educational Progress (2013) research results by the National Center for Education Statistics U.S., which are: students' interest in a material being taught, students' understanding, class atmosphere and assignments, and the last is the teacher. The survey forced physics teachers to innovate in developing something so that physics lessons become more attractive and understandable so that students can like physics lessons as they should.

Previous research that supports this research is Robika Alkadri's research (2017) with the title "Creating Android-Based Mobile Learning Media for Physics Subjects in Class XI SMA, with the result that mobile learning media is valid with an average of 86.64%, and gets the predicate is very practical with an average of 90.33% and practical with an average of 88.38%. The second research that supports is the research conducted by Astuti et al. (2017) with the title "Development of Android-based Mobile Learning Physics Learning Media," which obtained the results of the research that the average percentage value of the validation assessment was 85.25% and included in the valid category. Based on the results of research and discussion, it can be concluded that the Android-based mobile learning media application is already valid for use in physics learning. The third research that supports is by Almira Eka Damayanti et al. (2018) entitled "Feasibility of Physics Learning Media in the Form of Android-based Pocket Books on Static Fluid Materials". Damayanti et al. (2018) argue that an android-based physics pocketbook is appropriate for use as a learning medium. Based on the explanation that has been mentioned. Based on the explanation that has been mentioned, the researcher wants to carry out research on the development of mobile learning "Asmeralda" (in Indonesian "Aplikasi Mobile Learning Fisika Fluida") on static fluid materials. The purpose of the study is to determine the feasibility of applying the "Asmeralda" mobile learning media as a physics learning medium on static fluid material.

METHOD

Research and development (R&D) is a research method used to produce specific products and test their effectiveness (Sugiyono, 2019). This research procedure adapts the ADDIE development model, a development model consisting of five stages consisting Analysis, Design, Development, Implementation, and Evaluation. The

research flow is shown in Figure 1. Data collection in the field was carried out with a limited trial, with 34 students of class XI-MIPA 1 as participants.

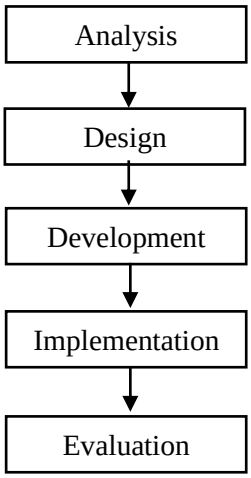

Figure 1 Research Flow

The data analysis techniques used are quantitative analysis and qualitative descriptive analysis. Both techniques are intended to obtain a perfect understanding of the data. This research produces quantitative data and qualitative data. Quantitative data was obtained through a device validity test by two expert lecturers and a questionnaire response of 34 XI-MIPA 1 students. In contrast, qualitative data were obtained from interviews with ten students at random regarding the experience of using "Asmeralda" mobile learning. The validation results from two expert lecturers were used to determine the feasibility of the media and materials in the "Asmeralda" mobile learning before being tested in the field. In contrast, the results of the 34 student response questionnaires were used to determine aspects of feasibility, practicality, and effectiveness. The interview results will get qualitative descriptive data which is used as a reinforcement of the quantitative data that has been obtained previously.

Questions in the instrument are adapted to the media developed. The scores obtained from the questionnaire were analyzed using a Likert Scale consisting of the following categories: (1) strongly disagree, (2) disagree, (3) moderate, (4) agree, and (5) strongly agree (Irianti & Wijaya, 2017).

Data analysis from the questionnaire obtained in the form of a score was carried out using the Percentage from Sugiyono (2019), namely,

$$\text{Feasibility percentage} = \frac{\text{total score of respondents}}{\text{maximum score}} \text{x} 100\%$$

The category table feasibility assessment is used to determine the feasibility of a trial device (Asyhari & Silvia, 2016). The assessment criteria used for experts and students are the same; more details can be seen in Table 1.

Table 1 Feasibility Scale

Percentage	Category
81%-100%	Very Feasible
61%-80%	Feasible
41%-60%	Fairly Feasible
21%-40%	Less Feasible
0%-20%	Very Less Feasible

RESULT AND DISCUSSION

The results of this research are mobile learning in the form of a static fluid physics application that is feasible to be tested on students at school and can be used as an additional independent learning resource for students in class XI.

Mobile learning development uses assistance from coded applications, web-based online software development and programming processes using puzzles, making it easier for beginners who do not have programming/coding skills but want to create applications.

The development of "Asmeralda" mobile learning is carried out by implementing several menus in one application so that students can access learning materials and videos more easily without leaving mobile learning.

Analysis

In the modern era and the 4.0 industrial revolution, which dashes, the teaching-learning process must also adapt to the

times, especially in physics. The development of mobile learning is one of the innovations that aim to help students learn independently, especially in physics material, to help students understand learning more efficiently. So appropriate, effective, and practical learning media are needed. Before making learning media, researchers must know the initial understanding and problem experience needed by students who are learning media targets (Sukiman, 2012). With the high intensity of smartphone use in high school students, the researchers saw it as an opportunity to make smartphones a tool for learning.

The needs analysis was conducted by interviewing two physics teachers in class XI regarding the learning. Based on the interviews, two physics teachers stated that online learning is less effective because the lesson hours are too short, and the students lack interest in learning. There are too many sub-chapters on static fluid, with eight sub-chapters, so students need sources of learning materials. The two physics teachers of class XI agreed to develop static fluid learning media as additional student learning materials. The learning media used is mobile learning to solve the problems experienced, namely the lack of learning hours and the lack of student interest in learning when learning online. The presence of mobile learning can help learn and allow students to learn anywhere and anytime (Fatimah, 2014). Using appropriate learning media can increase interest and become a stimulus for learning activities, and it can even affect the psychology of students while studying (Arsyad, 2015). Optimizing the use of learning media can help the teaching and learning process get optimal results (Nurdyansyah, 2019).

Design

Media development is called the stage of designing learning media and realizing it into an actual display (Prasetya and Kusdinar, 2016).

The design phase includes the development of the "Asmeralda" learning media and the feasibility instruments contained in the "Asmeralda" mobile learning itself. The design process is an essential point in making mobile learning so that students can make students interested in learning and not dull; this is what makes researchers choose components in the design carefully. The mobile learning theme "Asmeralda" is blue, representing the water as one of the main ingredients in static fluids. The researchers also designed a simple application display to make it easier for students to use mobile learning. The home screen only consists of four menus, namely: (1) Learning Materials, (2) Learning Videos, (3) Quizzes, and (4) Info. This also makes developing mobile learning files very light, around 11 MB (MegaByte) and is expected to be installed on all student smartphones without worrying about memory capacity.

The design process is carried out using various supporting applications such as Corel Draw 2021 for editing icons and images, Filmora X for editing learning videos, Quizziz as a medium for quizzes, and Kodular as the development of mobile learning into a complete application that can be downloaded and operated by students. This application has several menus, such as subject matter, learning videos, quizzes, and info. Researchers want to develop learning media that are all in one, aiming to make learning media more practical and efficient. After all the aspects needed in mobile learning have been completed, all these aspects will be combined in a code to become a complete application and ready to be validated by two expert lecturers as validators.

Development

The development stage is stage to consists development topic and the development of the prototype (Anwar et al., 2021).

Before being tested on students, the learning media was validated by two expert lecturers as validators. Figure 1 displays learning media created and ready to be downloaded in .apk file format.

Figure 1 Asmeralda Learning Media Display, (a) Initial Display, (b) Home Screen, (c) Display Between Sub-Chapters On The Material & Video Menu, (d) Material Display, (e) Learning Video Display

Mobile learning "Asmeralda" consists of subject matter, learning videos, quizzes, and info. Static fluid subject matter consists of 8 sub-chapters and is in pdf format. Learning videos are integrated with YouTube, so students do not need to open YouTube and watch on "Asmeralda" mobile learning. There are ten questions in the quiz with various difficulty levels, and the quiz is integrated with Quizziz; it aims to make the quiz exciting and not monotonous. The info menu contains information about essential competencies and the researcher's data.

Two expert lecturers carried out the validation test of the "Asmeralda" mobile learning media device. The mobile learning device was free from errors in the material and media. After the validation process was completed, it would be determined whether the learning media was worth testing for students or needed. Undergo revision until the learning media can be said to be feasible and with minimal errors.

The validation test is carried out by submitting learning media and the tools such as materials, videos, and quizzes which expert lecturers will then assess. Expert lecturers also tried to install "Asmeralda" mobile learning to test the use of mobile learning and assess the appearance or design of "Asmeralda" mobile learning. After the validation process has been completed, two expert lecturers will fill out a questionnaire submitted by the researcher as material for the final validation assessment on the learning media device.

The validation questionnaire includes the feasibility of the material and media aspects of the "Asmeralda" mobile learning. The media aspects include (1) display/interface design, (2) icons, (3) colour selection, and (4) application technicalities. The material aspect includes (1) the content of the learning material and (2) the content of the learning video, this includes the selection of images, the choice of words, and the formulas in the material and videos.

Based on the validation tests that have been carried out, "Asmeralda" mobile learning gets a 92% feasibility score, so it is worthy of being tested on students and becomes an independent learning media for students. The result of the experts' validation is presented in Figure 2.

The results of the validation, according to Figure 2 are as follows: on the media feasibility assessment, validator 1 gets a score of 90%, and validator 2 gets a score of 96%, the second criterion of the value of the validator is included in the "very feasible" category. The assessment of the feasibility of the material from validator 1 gets a score of 86%, and validator 2 gets a score of 91%, both scores for the feasibility of the material are included in the "very feasible" criteria. Overall, the average value of the two expert lecturers as media and material validators scored 91% with the "very feasible" criteria. Thus, the "Asmeralda" mobile learning media is feasible and can be tested on field students with minimal material and media errors and attractive designs.

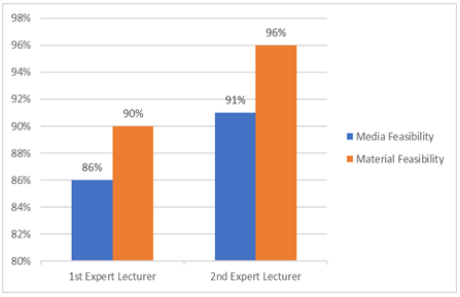

Figure 2 Feasibility Value of Media and Materials by Expert Lecturers

These results follow previous research conducted by Robika Alkadri (2017), Astuti (2017), Almira Damayanti (2018), and research conducted by Handayani (2021). The three studies that have been conducted conclude that the learning media developed is feasible to use. For Handayani's (2021) research, learning media is feasible and can increase students' conceptual understanding and motivation. Based on relevant research studies, it can be concluded that attractive and valid mobile learning-based learning media can improve students' understanding of learning materials and be used as independent study materials.

Implementation

The implementation phase was carried out in 2 days. Previously the researchers had asked permission from the physics teacher who taught class XI-MIPA 1 to ask for the lesson hours to be used as research. However, due to the covid-19 pandemic, learning was implemented with a student quota of 50% by division according to odd-even student absentee numbers. The previous lesson hours were 45 minutes but became only 30 minutes. Physics only got 60 minutes of learning time in class because physics only had 2 hours of lessons per week. This makes

physics teachers feel very lacking in teaching.

On the first day of the field test, those who attended the class were absent, with 50% of the total number of students or 17 students from 34 students in class XI-MIPA 1. Class testing lasted for 60 minutes according to the physics subject hours in the class. Before asking students to install and test the "Asmeralda" mobile learning, the researchers provided a stimulus first by conducting questions and answers about learning media and static fluid materials to students. Then the researcher began introducing the "Asmeralda" learning media, and the students seemed enthusiastic to try it immediately. First, the researcher provided a google drive link for students to download the "Asmeralda" mobile learning file, and then the researcher invited students to install and test it out. The researcher also explains how to use it, which is as easy as the general application.

In the trial process, the researcher invited students to ask if there were problems with the learning media or if there were still confused, but no students asked. Hence, the researchers took the initiative to ask some students if there were any problems (bugs, glitches, etc.) in the application and students' answers. Nothing, but when playing the learning video, it is about 10 seconds long enough for the video to start running. 2-3 students only experience this, and other students play the video normally. After testing the learning media, the researcher asked students to fill out an assessment and testimonial questionnaire after using the "Asmeralda" mobile learning media. After all, filling out the questionnaire, the researcher interviewed five students about their experience of using as well as criticism or suggestions on the "Asmeralda" mobile learning media, the interview process was used as a qualitative assessment of the learning media. On the first day, the field test process was completed in about 50 minutes. These activities were repeated on the second day to get the field test results on students with odd absent numbers and the time for the field test to finish was a little faster, which was about 45 minutes.

From the results of field tests on 34 students of class XI-MIPA 1, quantitative data was obtained on student response questionnaires after using the "Asmeralda" mobile learning, which included several aspects, namely: (1) Interface & Design, (2) Content & Materials, (3) Technical, (4) Implementation, and (5) User experience. The results of student responses for these five aspects can be seen in the graph in Figure 3.

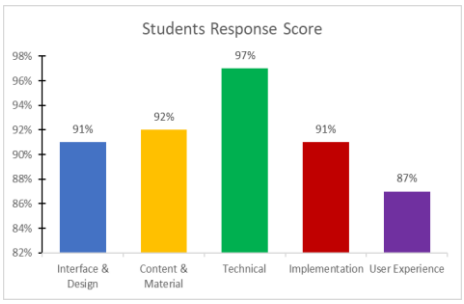

Figure 3 Students' Response Scores on Five Aspects of The Assessment

Interface & design aspects include display design, menu layouts, colours, icons, and backgrounds. This aspect gets a score of 91%. Content & material aspects include the content of learning materials and learning videos, including word selection, pictures, and text readability for students. This aspect gets 92% in the technical aspect, including technical matters in "Asmeralda" mobile learning, such as file size, smooth installation process, menus in mobile learning, and interaction between menus. The technical aspect scored 97% and became the aspect with the highest score among the other five aspects of the assessment. Implementation aspects include student responses after reading

the material, watching learning videos, doing quizzes, and intensity of use. The implementation aspect gets a score of 91%. The user experience aspect includes assessing the overall experience of using mobile learning. The user experience aspect gets a score of 87%.

These five aspects are summarized to measure the feasibility, practicality, and effectiveness of "Asmeralda" mobile learning. Interface & design scores and technical scores as an assessment of practical aspects. Score content & material, implementation, and user experience as an assessment of the effectiveness aspect. The effectiveness and practicality scores are averaged and will get a feasibility score for "Asmeralda" mobile learning. The score results can be seen in the graph of student responses in Figure 4.

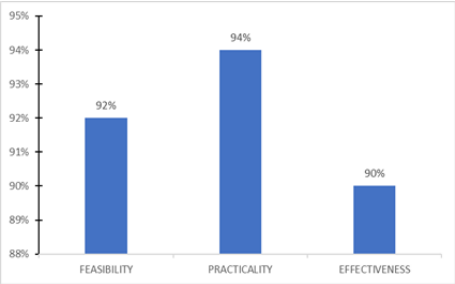

Figure 4 Students Response Results

The field test data obtained a feasibility score of 92%, a practicality score of 94%, and an effectiveness score of 90%. The three aspects of the assessment are included in the criteria of "very feasible", "efficient", and "very effective" because they are in the score range of 81%-100%. The results of student responses from the questionnaire that has been carried out can be seen that students are interested in "Asmeralda" mobile learning and increased understanding of static fluid material, "Asmeralda" mobile learning can also be used as student learning material independently because it can be used anywhere and anytime.

After carrying out the trial and filling out a response questionnaire, the researcher asked ten randomly selected students to conduct interviews related to experiences or reviews using "Asmeralda" mobile learning. Interviews were conducted to reinforce the results of the assessment of student responses. The following are examples of interviews with two out of ten students interviewed.

Q1: *What do you think about learning Physics by using Asmeralda?*
A1: *It is simpler because you only need one source. You do not have to bother looking for materials and learning resources one by one (videos, materials, quizzes)*
A2: *learning to use Asmeralda is very interesting. The material is easy to understand, with this mobile learning,I understand more about the material because it has been summarized in it.*

Q2: *What made you like "Asmeralda"?*
A1: *It is easy to understand and use, the application is not heavy for the phone. There are text and video versions.*
A2: *because this application is obvious, the content of the material is explained through learning videos, and there are questionsfor practice*

Q3: *What do you dislike or do you think need to be improved on "Asmeralda"?*
A1: *learning videos that may not be animated (or maybe they can be made like a BIG Course), the UI (User Interface) still looks stiff (it is good, but the resolution level needs to be fixed because it looks broken), lacks menu/back buttons.*
A2: *Maybe it is in the writing of the formula which still looks a little blurry, and the switching between menus is still not smooth*

Q4: *What feature/menu do you like the most in "Asmeralda" mobile learning?*

A1: *The material because the language is easy to understand and is presented quite attractively*
A2: *The menu that I like the most is the material menu and learning videos because they are very useful for me if I do not understand the content of the material taught by the teacher at school.*

Q5: *What features/menus need to be added in "Asmeralda"?*
A1: *The need for discussion on practice questions in the quiz (quizziz)*
A2: *simulation or practicum features to better understand the real-life application*

Q6: *Do you think "Asmeralda" deserves to be an addition to your study material?*
A1: *For me, this application is very appropriate to be able to clarify the explanation given by the teacher at school.*
A2: *It helped me a lot because when I get dizzy from reading many books, "Asmeralda" is suitable for use because the explanations are simple but easy to understand.*

The results of interviews that have been conducted with ten students highlight that the mobile learning media "Asmeralda" helps students understand static fluid material with existing learning materials and videos. Students also said that "Asmeralda" mobile learning is feasible as an independent study material in static fluid material because it can be used anywhere and anytime. The interviews as triangulation data strengthen the results of questionaries.

Evaluation

The evaluation stage is the last in the ADDIE model development research. The evaluation was carried out to improve and review the development of "Asmeralda" mobile learning. From the results of the validation test by expert lecturers and field tests on 34 students of class XI-MIPA 1, it can be seen that the results are quite similar; it shows that the "Asmeralda" learning media can be used as one of the student learning materials independently in addition to the textbooks provided by the school. According to Leschke and Friesen (2014), mobile-based learning media can make learning more modern, from learning using books to digital. This is supported by Crompton et al. (2016), who argued that mobile-based learning increases exponentially.

CONCLUSION

Based on the research results on the "Asmeralda" mobile learning media, validation results were obtained from two expert lecturers with an average score of 91% and obtained the "very feasible" criteria and can be tested on students. In the field test results on 34 students of class XI-MIPA 1, 92% on feasibility, 94% on practicality, and 90% on effectiveness. The three aspect scores are included in the criteria of "very feasible", "efficient", and "very effective". Thus, it can be concluded that the mobile-based learning media "Asmeralda" is feasible for teaching static fluid material at Senior High School. However, this conclusion is based on one case in one school in Surabaya. Further study in implementing "Asmeralda" and mobile learning is crucial for a better strategy in developing media-based computer information. As a recommendation for future study in a similar learning media development, it is important to provide a "simulation" menu so that one mobile learning can load all learning menus into one that is more effective and practical.

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