

## Development of Interactive Multimedia Mobile Learning in Biology Learning at MAN 2 Tuban

Inggreet Ayu Khusnul Khotimah\*, Eka Pramono Adi, Arafah Husna

State University of Malang, Jl. Semarang No. 5 Malang, East Java, Indonesia

\*Author of correspondence, Email: [Inggreetila4@gmail.com](mailto:Inggreetila4@gmail.com)

### Abstract

This development was motivated by the problem that class X MIPA at MAN 2 Tuban had not maximized the use of technology, causing a decrease in student motivation when studying. Student learning motivation is important because it can be a trigger in increasing the completeness of student learning outcomes in class. So the aim of this research and development is to produce interactive mobile learning multimedia that is valid and feasible, especially in learning biology, ecosystem component elements and their interactions. This development involves stages of analysis, design, development, implementation and evaluation following the ADDIE framework. The resulting product has gone through a validation process by media experts and material experts. Testing was carried out on class X MIPA students at MAN 2 Tuban. The results of this development show a high level of validity, with the match percentage from media experts reaching 100%, material experts reaching 97.3%, individual trials reaching 82%, small group trials reaching 93%, and large group trials reaching 89%. Apart from that, interactive multimedia mobile learning can increase the completeness of student learning outcomes so that it can be used in classroom learning activities because it reaches a percentage of 89.64% and is a valid and appropriate qualification.

**Keywords:** Interactive Multimedia, Mobile Learning, Biology

### 1. Introduction

Education is an effort to realize students' active learning process to develop their potential based on law. The development of industry 4.0 has had an impact in various fields, the education sector is one of those affected by the development of industry 4.0. The process in current learning activities utilizes digital technology (Davies, 2015). The learning process is an interactive communication process between students and teachers, it is not uncommon for obstacles to occur in the learning process. These obstacles require an intermediary in the form of media that can facilitate and bridge communication or delivery of material between teachers and students. The use of media itself is intended to create an interesting and dynamic learning atmosphere, which will ultimately have a large positive impact on student learning progress. Students in the education era 4.0 are expected to have skilled skills in utilizing technology, both in searching, managing and conveying information (Aziz, 2018). With the rapid advancement of technology, various media options are available to support the teaching and learning process. The main impact of the evolution of technology is its increasingly widespread use in the world of education, becoming an integral learning tool in the classroom (Sanaky, 2013). One option that educators can utilize to support the student learning process is through the application of interactive multimedia technology that can be accessed via mobile devices, known as mobile learning. Mobile learning is a solution that allows learning to occur flexibly, is not limited to a certain place or time, and can be accessed easily by students (Abdulahak and Darmawan, 2013).

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In class X biology learning at MAN 2 Tuban, the topic highlighted is the component elements of the ecosystem and their interactions. The importance of this element cannot be overstated because biology involves a complex sequence of events. There are many complex phenomena such as processes, cycles and mechanisms, so to understand them an interactive multimedia medium is needed mobile learning to help make it easier for teachers to explain and for students to understand and utilize the material presented cell phone as a means of education. Teachers are required to be able to adapt and be ready to change in the industrial era 4.0 as leaders in learning (Burritt and Christ, 2016). Learning activities at MAN 2 Tuban still use conventional methods or still use LKPD. Apart from that, students lack understanding regarding the component elements of ecosystems and their interactions when carrying out biology learning in class. Therefore, the development of interactive multimedia mobile learning This was created with the main aim of supporting teachers in conveying learning material visually when carrying out the learning process so that students can take advantage of it cell phone as a means to support their understanding of the learning material presented. Emphasis on the use of learning media is an important aspect in the strategy of conveying information to students during the learning process, either through individual approaches, the use of technology, or the learning materials themselves (Degeng, 2013)

Fatmala and Yelianti's (2016) research discusses the lack of time needed for students to study biology material. Meanwhile, there is quite a bit of biology material taught. This causes students' independent learning activities to decrease. So, the use of interactive multimedia is based android can develop student learning activities and also help students understand the concepts of learning material. According to research conducted by Merra, Ulfa and Wedi (2018), students experience difficulties in conceptualize and understand the contents of printed books. However, the use of interactive multimedia based on learning via mobile devices has proven to be effective in improving the learning process, according to the individual needs of each student. Therefore, mobile technology has great potential to improve the overall quality of learning (Warsita, 2018). Therefore, in using interactive multimedia mobile learning can be said to be suitable for use in learning and effective. This can be proven after conducting individual trials obtaining a percentage of 86.25%, small group trials obtaining a percentage of 86.25% and field trials obtaining a percentage of 89.48%. Apart from that, this method has proven to be effective in increasing students' understanding, by achieving a learning completion level of 100%.

Therefore, researchers want to present the title in this research and development with the aim of producing interactive multimedia mobile learning not only feasible but also effective for use in learning activities at MAN 2 Tuban, namely "Interactive Multimedia Development Mobile Learning in Biology Learning at MAN 2 Tuban".

## **2. Method**

This research and development procedure uses research methods Research and Development (R&D). The reason for choosing the ADDIE model is because it suits the needs of developing interactive multimedia for mobile learning, which includes the necessary steps. The ADDIE model consists of five main phases, starting from Analysis (Analysis), Planning (Design), Development (Development), Implementation (Implementation), and Evaluation (Evaluation).

The analysis stage is used to search for and collect information regarding the problems and potential that exist at MAN 2 Tuban at the time of observation. The problem with schools is that they do not have a variety of media and when learning activities take place they only use printed textbooks. This causes students to experience difficulties in understanding and visualize about the component elements of ecosystems and their interactions. So researchers develop interactive multimedia mobile learning as a learning medium in class X MIPA. The design stage is the planning stage for the media that is being developed, including designing elements, preparing element texts, collecting materials for media development and creating interactive multimedia designs using software microsoft power point and iSpring Suite 9. At this development stage the developer uses software support for producing interactive multimedia mobile learning use software Web APK 2 Builder Pro. The implementation phase involves trials material and media testing, at this stage the developer knows that multimedia is interactive mobile learning considered ready for implementation or can be readjusted if weaknesses are discovered in subsequent stages of product development. The evaluation stage takes the form of improvements to the learning media according to the scores, comments and input obtained from student responses as users.

In this research, various types of questionnaires were used, including validation questionnaires from experts in the field of materials and media, as well as response questionnaires from students. The validation questionnaire aims to collect data related to products that have been created by researchers, with material and media experts expected to provide assessments, criticism and suggestions for the product. Next, trials were carried out with one individual student, a small group with five students, and a large group with twenty-two students. The instrument used is a closed questionnaire which includes 12 indicators for material experts, 10 indicators for media experts, and 12 indicators for users. Apart from that, the questionnaire also gave respondents the opportunity to provide evaluations and input on the development of interactive multimedia mobile learning which has been prepared by the researcher. The information collected covers various aspects, both quantity and quality.

Quantitative data was collected through assessments carried out by experts in the field, taking into account aspects of the material, media, and student responses using a Likert scale consisting of five options: strongly disagree, disagree, somewhat agree/fairly, agree, and strongly agree (Servant, 2017). Then, the data is processed to obtain interactive multimedia feasibility level results mobile learning which was developed using a percentage formula in the form of dividing the actual score by the maximum score, then multiplying by 100%. The level of feasibility is known from the interpretation of numbers into categories. These categories include invalid (00.00% - 30.00%), less valid (31.00% - 50.00%), quite valid (51.00% - 70.00%), valid (71.00% -

85.00%), and very valid (86.00% - 100.00%) (Arikunto, 2014). Meanwhile, qualitative data was obtained from notes in the form of criticism and suggestions provided through validators.

In the material expert validation questionnaire, the indicators assessed are content and objective quality indicators, instructional and evaluation quality indicators, technical quality indicators. The media expert valuation questionnaire consists of writing appearance indicators, writing clarity indicators, images and videos, media function indicators, media benefit indicators. The student response questionnaire includes indicators of material

presentation, indicators of learning media design and content quality, student attitudes towards media use, instructional indicators and evaluation. This is used to determine student responses regarding the attractiveness of interactive multimedia mobile learning.

### 3. Results and Discussion

#### 3.1 Result

The result of this development is an interactive multimedia product *mobile learning* which contains elements of ecosystem components and their interactions with research subjects, namely 28 students of class X Mathematics and Natural Sciences at MAN 2 Tuban in Biology subjects. At the mobile learning interactive multimedia design stage, *software microsoft power point* used to add text, set type *font*, size *font*, add pictures, *backsound*, and videos. *Microsoft power point* this can be used to design the previous to be interactive multimedia by utilizing features *hyperlink/action*. After creating the design in *microsoft power point*, followed by creating quiz questions with a total of 20 multiple choice questions using *software iSpring Suite 9*. To create interactive multimedia for Android, researchers use *software Web 2 APK Builder Pro* in developing interactive multimedia *mobile learning*. Then interactive multimedia *mobile learning* can be *download Of cell phone* each user with the application name X2 Ecosystem so that students can get interactive and not monotonous learning.

The advantages of the product developed by researchers are an attractive design appearance, user friendly, completeness of ecosystem component elements and their interactions, the resulting product can display images, video, audio and quizzes. Interactive multimedia *mobile learning* The resulting product only has a size of 76.4 MB, so users don't need to worry about the storage memory on their cellphone which will take up a lot of storage space. Apart from having a small size, it is interactive multimedia *mobile learning* this does not have *bug* or error when using it. Interactive multimedia *mobile learning* This can be used without a network *Wi-Fi* or mobile data. Interactive multimedia *mobile learning* This is visualized as in the image below because it can make it easier for students to explore existing elements easily and students can also get an interactive side during learning.



Figure 1. Welcome Screen and Menu Display

Based on Figure 1, the display is presented *welcome screen* with *button* enter and audio. On *button* Entering this, students will go straight to the display *menu* while on *button* audio, students can choose to enable or disable *backsound* on interactive multimedia *mobile learning*. On display *menu* There are several choices of sub-elements regarding ecosystem components and their interactions, users can choose elements which will be opened first to learn. On *button* home the top part works if you want to return to the view *welcome screen*.

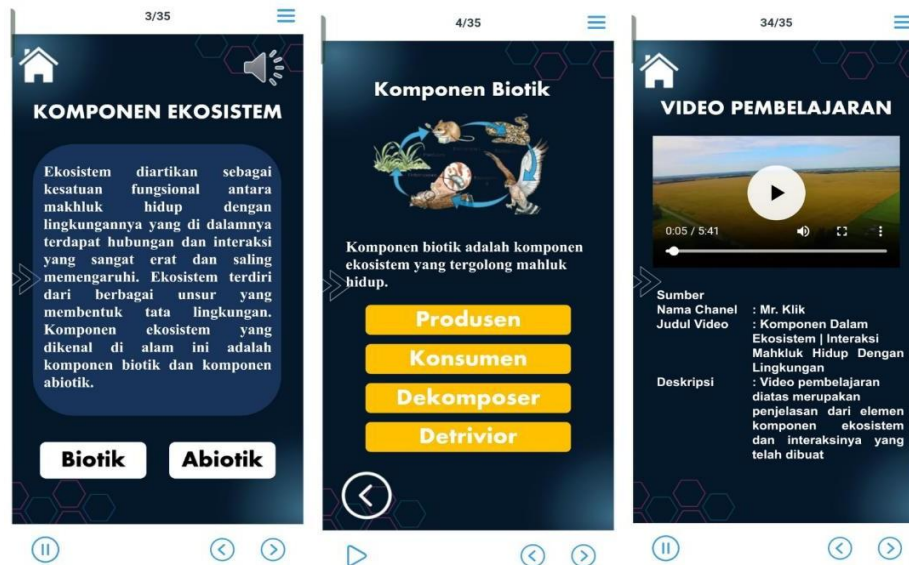


Figure 2. Display of Sub-Elements of Ecosystem Components and Their Interactions

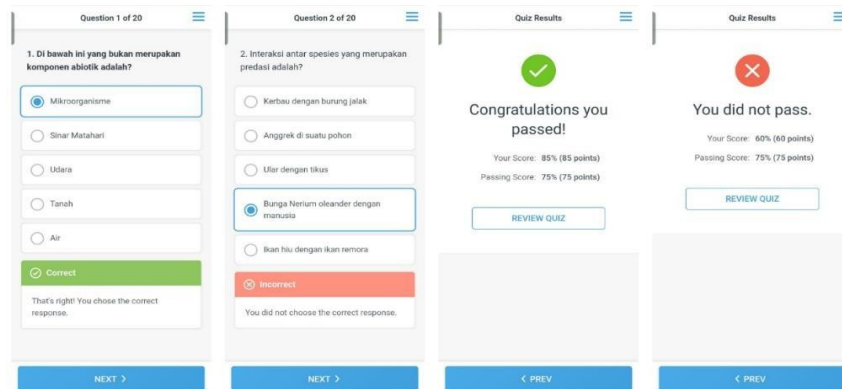


Figure 3. Quiz display

Based on Figure 2, the contents of the sub-elements selected by the user are presented, the element categories (in the form of buttons) in interactive multimedia *mobile learning* used to make it easier for students to explore the sub-elements of ecosystem components and their interactions. Apart from that, this learning video can help students understand the component elements of the ecosystem and their interactions.

Based on Figure 3, a quiz display is presented which contains 20 multiple choice questions. When taking this quiz, students can do it sequentially or randomly. When finished,

students can submit the answers they have chosen. However, if the score obtained is <75 then the student is declared to have not completed the quiz, conversely if the student gets a score >75 then the student is declared to have completed the quiz.

Interactive multimedia *mobile learning* It is prepared and considered by experts in the field of material, media, and obtains responses from students through the use of a Likert scale which includes five levels of assessment, starting from 5 (strongly agree), 4 (agree), 3 (fairly/disagree), 2 (disagree), up to 1 (strongly disagree) (Budiaji *et al.*, 2013). Furthermore, according to (Arikunto, 2014) media validity criteria, if a value is in the range between 86% to 100%, it can be concluded that the value meets the requirements to be considered very valid or suitable for use. Meanwhile, the responses obtained from students during trials carried out in various contexts, whether individual, small or large groups, if they reach the category between 87% to 100%, then fall into the criteria of being very attractive to interactive multimedia. *mobile learning*. Meanwhile, to determine the completeness of student learning outcomes, researchers used pretest and posttest, namely measurements before and after implementing interactive multimedia *mobile learning*.

**Table 1. Presentation of Validation Data from Media Experts and Material Experts**

No.	Validation	Average Percentage	Qualification
1.	Members of the Media	100%	Very Valid
2.	Materials Expert	97.3%	Very Valid
	<b>Mean</b>	98.65%	
	<b>Category</b>	Very valid (can be used without any improvements)	

Source: Processed by researchers (2024)

Based on the overall validation data results of media experts and material experts above, the average percentage result is 98.65% so it can be concluded that interactive multimedia *mobile learning* very valid and can be used in learning.

**Table 2. Presentation of User Response Data (Individual, Small and Large Groups)**

No.	Validation	Average Percentage	Qualification
1.	Group of Individuals	82%	Attract
2.	Small Group	93%	Very interesting
3.	Large Group	89%	Very interesting
	<b>Mean</b>	88%	
	<b>Category</b>	Very Interesting (can be used without it improved)	

Source: Processed by researchers (2024)

Based on the overall user response data results above (individual groups, small groups, and large groups), the average percentage result was 88%, so it was concluded that students' responses found interactive multimedia very interesting. *mobile learning*.

Completeness of student learning outcomes is the minimum level of achievement of the required knowledge competencies. Completeness of student learning outcomes is carried out by providing practice questions/quiz in the form of multiple choice questions, totaling 20

questions. The quiz is taken from the component elements of the ecosystem and their interactions contained in interactive multimedia *mobile learning* with a maximum score of 100. To obtain data on the completeness of student learning outcomes, researchers used pretest and posttest, namely to find out before and after using interactive multimedia *mobile learning*. Below are the results of data analysis of completeness of learning outcomes and average class scores:

**Table 3. Results of Analysis of Completeness of Student Learning Results (Pretest)**

Students Achieve Complete	Amount Overall Students	Percentage Completeness	Shoes KKM
22	28	78,57%	75

Source: Processed by researchers, 2024

**Table 4. Results of Analysis of Completeness of Student Learning Results (Post Test)**

Students Achieve Complete	Amount Overall Students	Percentage Completeness	Shoes KKM
25	28	89,28%	75

Source: Processed by researchers, 2024

Based on the results of the data in table 3, it shows that the number of students who achieved completion was 22 children with a percentage of completeness of student learning outcomes before using interactive multimedia. *mobile learning* amounting to 78.57%. Meanwhile, the data results in table 4 show that the number of students who achieved completion was 25 children with a percentage of completeness in student learning outcomes after using interactive multimedia. *mobile learning* amounting to 89.28%. This indicates that multimedia is interactive *mobile learning* can play a role in increasing the number of students who reach learning achievement standards, so that it becomes an important element in improving student learning achievement and assessing the effectiveness of learning.

Next, the average score in one class is calculated to find out whether the criteria for completing the learning outcomes have been achieved or not. Below are the results of data analysis of class average scores:

**Table 5. Results of Analysis of Completeness of Student Learning Results (Pretest)**

Total score All student	Amount Overall Students	Average value Student	Qualification
2.430	28	86,78%	Height

Source: Processed by researchers, 2024

**Table 6. Results of Analysis of Completeness of Student Learning Results (Post Test)**

Total score	Amount	Average value	Qualification
All student	Overall Students	Student	
2.510	28	89,64%	Very high

Source: Processed by researchers, 2024

Based on the data results in table 5, the percentage of average class scores before using interactive multimedia can be obtained *mobile learning* amounting to 86.78%. Meanwhile, the data results in table 6 can be obtained as a percentage of the class average value after using interactive multimedia *mobile learning* amounting to 89.64%. This indicates that multimedia is interactive *mobile learning* can help increase the average class score so that it becomes one of the success factors in increasing the completeness of student learning outcomes and learning can be assessed as effective.

### 3.2 Discussion

#### *Feasibility of Interactive Multimedia Mobile Learning*

Development of interactive multimedia mobile learning It has passed a strict validation process by experts and received positive responses from students as users. From these results, it can be concluded that this mobile learning interactive multimedia meets the standards required to be used in a learning context. Validation was carried out directly involving Lecturers at the Department of Educational Technology, State University of Malang using a questionnaire, and the results showed a validity level of 100% with an assessment in the "very valid" category, and did not require additional improvements. Media experts also provided overall positive feedback on the quality of the media developed, stating that it was good and appropriate for use in research.

The next step is validation of the material carried out by the Biology subject teacher for class X MIPA at MAN 2 Tuban. The evaluation results show that the questionnaire validity percentage is 97.3%, with a very valid category, and the media can be used without the need for additional improvements. Material experts commented that the elements were in accordance with the curriculum and learning demands. The entire questionnaire results from expert validators are used by researchers as guidelines in product development and revision. Revisions are carried out to improve the quality of the media products being developed to make them better.

Next, interactive multimedia mobile learning It was tested first on a group of individuals consisting of 1 student in order to determine the response of students as users. Based on the questionnaire, student responses in individual groups included interest in developing interactive multimedia mobile learning with a percentage of 82%. Comments and suggestions provided by individual groups are provided by interactive multimedia mobile learning It is enough to help students understand the material and can make teaching and learning activities more efficient, especially in understanding more deeply about what ecosystem components

are and their interactions. Meanwhile, for input, the student suggested: add backsound/music in interactive multimedia mobile learning.

Then interactive multimedia mobile learning tested on a small group of 5 students to determine the response of students as users. Based on the questionnaire, student responses in small groups are very interesting in developing interactive multimedia mobile learning with a percentage of 93%. Comments and suggestions provided by small groups are provided by interactive multimedia mobile learning This means students can learn easily anywhere and anytime. On development multimedia interactive mobile learning by using smartphone which has several advantages that computer devices don't have, namely being more space friendly (doesn't use too much storage memory cell phone), can save time, does not require cables to be installed so that multimedia is interactive mobile learning can be used anywhere and anytime (Crompton & Burke, 2018).

Next, the learning media was tested on a large group consisting of 22 class X Biology students. Results from large group trials to determine student responses as interactive multimedia users mobile learning. Based on the student response questionnaire in large groups, it is very interesting to develop interactive multimedia mobile learning with a percentage of 89%. Based on the overall results of user response data, an average percentage of 88% can be obtained so that it can be concluded that student responses find interactive multimedia very interesting. mobile learning.

#### *Learning Effectiveness in Using Interactive Multimedia Mobile Learning to Achieve Complete Learning Outcomes*

The effectiveness of this learning can be measured through the completeness of student learning outcomes. Completeness of student learning outcomes and class average scores are obtained from the results of multiple choice questions through practice Google Form done by students. These practice questions are given before and after using interactive multimedia mobile learning used to find out the comparison of media usage.

Student learning outcomes are measured using multiple choice questions through practice Google Form created by researchers, this includes all material on ecosystem components and their interactions. The number of students who achieved completeness before using interactive multimedia mobile learning were 22 children with a percentage of 78.57%. Meanwhile, the number of students who achieved completeness after using interactive multimedia mobile learning were 25 children with a percentage of 89.28%. This shows that the existence of interactive multimedia mobile learning can help increase numbers students who achieve complete learning outcomes so that they become one of the success factors in increasing the value of students' learning completion results and learning can be assessed as effective. In previous research conducted (Saifudin, Susilaningsih and Wedi, 2020), the use of interactive multimedia-based mobile learning was considered to be able to provide facility to students without being limited by time and location (Surahman and Surjono, 2017).

Before utilizing interactive multimedia mobile learning, students' learning achievement level reached 86.78%, but after adopting this technology, the achievement level increased to 89.64%. These results indicate that the use of interactive multimedia mobile learning makes a significant contribution to increasing student learning completion. This very high level of completion confirms the effectiveness of interactive multimedia mobile learning in supporting

effective learning and improving the quality of student learning outcomes. This finding is in line with previous research which also shows that interactive multimedia mobile learning is effectively used in classroom learning contexts (Yusuf, Toenlio and Wedi, 2017).

After using interactive multimedia mobile learning, the results of students' learning completion have increased in value due to interactive multimedia mobile learning. Students get an overview or visualization of the material on ecosystem components and their interactions so that students can understand the material provided easily. Most of a person's knowledge is obtained through visual experience, where information is obtained with a proportion of around 75%, followed by hearing with a proportion of around 13%, and tactile and tactile experiences which are only around 6% each (Husamah, 2013).

#### 4. Conclusion

This research and development has produced interactive multimedia mobile learning to increase student motivation in learning biology, ecosystem component elements and their interactions so that they become a trigger for increasing the completeness of student learning outcomes. Based on the research results, it can be concluded that multimedia is interactive mobile learning. This is valid and suitable for use in biology learning of ecosystem component elements and their interactions in class X MIPA MAN 2 Tuban. Suggestions for future research include adding variations of animation that are more relevant to the material, to increase attractiveness and relevance to the content. Interactive multimedia mobile learning it can also be implemented in other subjects and grade levels by interested researchers.

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