23 (3), 2022, 824-832

Jurnal Pendidikan MIPA

e-ISSN: 2550-1313 | p-ISSN: 2087-9849

http://jurnal.fkip.unila.ac.id/index.php/jpmipa/

Development of Android-Based Interactive Multimedia to practice Critical Thinking Skills on Mutation Materials

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Abstract: The purpose of this study was to determine the feasibility and response of students to interactive multimedia based on android containing critical thinking skills on mutation material. This type of research is research and development (R&D), this research was developed using the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The sample in this study were 10 students of MAN 2 Semarang. The results of the study: 76% of media experts, 81.81% of material experts, 90% of critical thinking experts, 91.61% of teacher responses, and 92.66% of student responses to interactive multimedia applications. Based on the results of the study, it can be concluded that android-based interactive multimedia to train critical thinking skills on mutasu material is very feasible to be used as teaching material.

Keywords: critical thinking skills, interactive multimedia, development research.

Abstrak: *Tujuan penelitian ini adalah untuk mengetahui kelayakan dan respon siswa terhadap multimedia interaktif berbasis android bermuatan kemampuan berpikir kritis pada materi mutasi. Jenis penelitian ini yaitu research and development (R&D), penelitian ini dikembangkan menggunakan model pengembangan ADDIE (Analysis, Design, Development, Implementation, Evaluation). Sampel pada penelitian ini yaitu 10 siswa MAN 2 Semarang. Hasil penelitian : ahli media sebesar 76%, ahli materi sebesar 81,81%, ahli berpikir kritis sebesar 90%, tanggapan guru sebesar 91,61%, dan hasil respon siswa terhadap aplikasi multimedia interaktif sebesar 92,66%. Berdasarkan hasil penelitian dapat disimpulkan bahwa multimedia interaktif berbasis android untuk melatih kemampuan berpikir kritis pada materi mutasu sangat layak digunakan sebagai bahan ajar.*

Kata kunci: *keterampilan berpikir kritis, multimedia interaktif, penelitian pengembangan.*

▪ INTRODUCTION

The era of 21st century knowledge begins with the existence of complex links to science with various problems, one of which is critical thinking that is imposed on students as one of the main skills (Ngurahrai et al., 2019). The process of filtering news or information is obtained from someone with critical thinking skills (Muliawati & Norra, 2021).The importance of higher thinking skills is included in several criteria points for the ability of junior high school students in the form of the ability to reflect on problem solving skills and resolution as well as knowledge, formation, application and thinking skills in innovative, creative, logical and critical ways (Jamil et al., 2019). The following are indicators of critical thinking according to (Facione, 2011) namely interpretation, analysis, inference, evaluation, explanation, and self-regulation. Students basically have critical thinking skills such as having the ability to ask questions, classify, hypothesize, interpret and observe. But sometimes this ability is not well developed, so there is a need for a method to develop these critical thinking skills (Hastuti, 2014).

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DOI: http://dx.doi.org/10.23960/jpmipa/v23i3.pp824-832
Received: 14 April 2022
Accepted: 20 June 2022
Published: 29 June 2022

The results of preliminary observations at MAN 2 Semarang on July 21, 2021 found that students were less active in learning because the lecture method was still applied by some educators but in an effort to arouse interest in learning it was categorized as sufficient. The weaknesses of the lecture method are also in the form of one-way learning activities and are only aimed at the teacher, there are still many students who do not understand the material the teacher is teaching, some students only memorize the material, do not understand the concept and the majority are less active students.

Starting from students' problems, students need a learning resource that makes it easier for students to understand the material, especially mutation material. Biology subject is a science that involves various interactions and pathways that take place in organisms in their environment, but not all of them are always possible to be shown directly to students such as mutation material (Hestari, 2016). The presence of interactive multimedia can assist teachers in explaining scientific phenomena which are mostly abstract and require tools to eliminate abstractions so that students can understand good and correct scientific concepts (Sukariasih et al., 2019).

Consider biology material as a relatively abstract concept that requires the use of learning tools to facilitate students in learning because it is computerized (Lu Atun Nisa et al., 2019). As shown in research (Hestari, 2016) stated the results of interviews with high school teachers that using power point slides, pictures, or asking students to arrange nitrogen bases using paper that was cut out to provide mutation material with a percentage result of 63.33% of student questionnaires obtained Mutation material is difficult to understand because learning is less interesting so students feel bored and tend not to pay attention.

Based on the results of interviews conducted on November 3, 2021 with Mrs. Reskiyati, M.Pd. who is a biology teacher at MAN 2 Semarang that learning resources are based on LKS, textbooks and sometimes PPT and videos. Mrs. Reskiyati, M.Pd. explained that students experienced difficulties, especially in studying mutation material on things that were abstract and needed learning media that could make students understand and help students on mutation material. Mrs. Reskiyati, M.Pd. also explained that critical thinking skills are very important to be trained in the future.

Critical thinking is very important in biology learning because students are strived to get maximum academic results in the form of paradigms, beliefs and insights (Khasanah et al., 2017). Students' critical thinking skills can be trained by applying assessment, deciding, categorizing, selecting, paying attention and other mental processes (Khasanah, 2018). The use of computer media (multimedia) can integrate molecular animation and video demonstrations in improving problem solving. In addition, the use of multimedia also improves misconceptions and misinterpretations that occur in previous learning (Saselah, 2017). Research (Husein et al., 2017) states that the effectiveness of interactive media is higher than without the application of the media so that the development of Android-based interactive multimedia is important.

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Good learning media can not only provide effectiveness, but can also keep up with technological developments (Norra, 2020). Android-based interactive multimedia development can be applied effectively and efficiently in creating learning that is easy to use by students. The ease of using Android-based learning media in the form of various features offered that can be developed in learning. The results of the research by Safitri et al. (2013) found that 85% of learning outcomes increased in the material taught by applying Flash-based interactive media(Eka, 2020). The use of good and adequate learning media is expected to stimulate students' attention, thoughts and interests so that the learning process can run well and not be boring

▪ METHOD

The type of research used in this research is Research and Development (R&D). According to Briggs at Harjanto, the model includes a series of step-by-step processes for the realization of a process, such as needs analysis, media selection, and evaluation (Jaknov, 2008). There are many development models that can be used, one of which is the system instruction development model (Molenda, 2003). This model was developed by Molenda, also known as Model. The model has several stages: (A) analysis, (D) design, (D) development, (I) implementation, and (E) evaluation. For more detail, see in Figure 1.

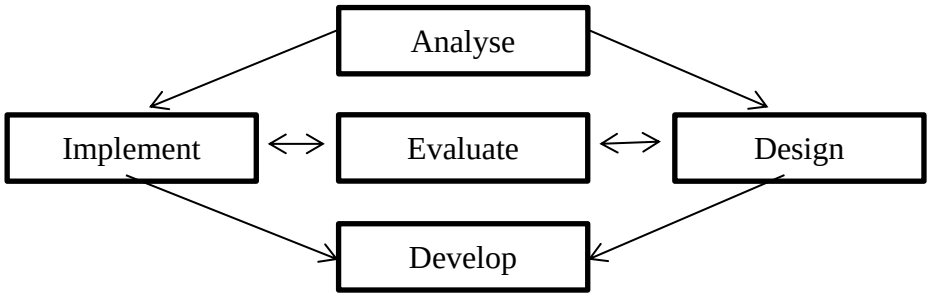

Figure 1. Design ADDIE (Branch, 2009)

This research was carried out at MAN 2 Semarang, which is located in the city of Semarang and the subjects of the research were students of class XII in the academic year 2021/2022. The population of this study were all students of XII MIPA MAN 2 Semarang. The sample of this research is the students of class XII MIPA, totaling 10 students. The sampling technique used is simple random sampling, namely the taking of sample members from the population is carried out randomly without regard to the strata in a population (Sugiyono, 2019).

Data collection techniques in this study, namely using observation, interviews, and questionnaires. Data analysis techniques This analysis is in the form of a descriptive percentage numbering. The measurement scale is applied from the Sugiyono (2016)

Data collection techniques in this study, namely using observation, interviews, and questionnaires. Data analysis techniques This analysis is in the form of a descriptive percentage numbering. The scale of application of the Sugiyono (2016) model, among others: (1) Very not poor, (2) Not Good, (3) Enough), (4) Good, (5) Very Good. The results of validating the data obtained qualitatively to get the value obtained (X), divided by the maximum score (N), then multiplied by 100% as a fixed number. The calculation results are interpreted into criteria using intervals, including: (1) 75%-100% is very feasible, (2) 51%-75% is feasible, (3) 26%-50% is less feasible, (4) 0%-25% is very less feasible. The developed interactive multimedia deserves to be assessed if the proportion is obtained from 61% validation and can be applied as a learning resource.

▪ RESULT AND DISSCUSSION

The Development of Android-based Interactive Multimedia

The resulting product is an Android-based interactive multimedia that can be used to study mutation material. The media developed is as a medium for student self-study that can be applied flexibly with mutation materials in accordance with the 2013 Curriculum. Product development uses the ADDIE development model with the exposure process in the form of:

Analysis Stage

This stage is in line with the procedure. This research was carried out by interviewing biology teachers and observing at MAN 2 Semarang. Observations were made on July 21, 2021 which were carried out directly to see the learning process. Observations were made to review the media, the state of teaching materials and the learning process. As a result, it was found that textbooks and worksheets became the main teaching materials in the classroom.

Interviews were conducted with biology teacher Mrs. Reskiyati, M.Pd on November 3, 2021. The interviews aimed to identify materials and analyze requirements as a basis for making. Based on the results of interviews with Reskiyati, M.Pd. who is a biology teacher at MAN 2 Semarang that learning resources are based on LKS, textbooks and sometimes PPT. Mrs. Reskiyati, M.Pd. explained that students had difficulties, especially on things that were abstract and needed learning media that could make students understand and help students on mutation material. Mrs. Reskiyati, M.Pd. also explained that critical thinking skills are very important to be trained in the future. The application of learning resources using Android-based interactive multimedia in biology learning has never been applied in the learning process.

Design Stage

Media applied interactive multimedia based on android. The application was made using Adobe Animate 2019 software. The design was made using Corel draw 2019. As for publishing it into .apk format with the help of the AIR SDK on Adobe Animate 2019. The selection of the android application compiler format is aligned with the development requirements so that it can be used easily by students with the content format in the form of Profile, KI/KD, Instructions for use, Concept map, Material, Videos, Practice questions, Quiz and Reference

Development Stage

This stage is a path to product perfection developed during the product design stage and in obtaining products that have been reviewed in harmony with expert comments and suggestions. At this stage in the form of an evaluation in concluding that the feasibility of the product developed to be applied as a learning resource, then a revision was applied referring to the comments and suggestions of the validator team. Verification is applied in the form of media and material experts. The following is an example of interactive multimedia interactive multimedia based on android to practice critical thinking skills on mutation material

Figure 1. The content of the content section of the material menu that contains interactive materials and content

Figure 2. The content of the content section of the material menu that contains materials and animations

Implementation Stage

The interactive multimedia application was given a response from the Biology teacher, namely by Mrs. Reskiyati, M.Pd. The biology teacher's response was applied in reviewing the alignment of Android-based interactive multimedia applications containing critical thinking skills on mutation material as learning resources for class XII students in the form of analysis of ease of application, quality, use and product content. The implementation or implementation phase is a product trial that has been developed on a number of respondents in the form of biology teachers and class XII students on a small scale, namely 10 students. At this stage, respondents provide input and criticism of the developed application referring to the criteria that have been prepared by previous researchers.

Evaluation Stage

Evaluation is applied in reviewing respondents' evaluation of the feasibility of interactive multimedia. This process takes place from the first stage of the research to the fourth stage. The results of the assessment are in accordance with the data obtained from data analysis and the feasibility of the respondents refers to the specified requirements. For the overall product evaluation, interactive multimedia application suggestions and comments are very important

Expert validation and Student Responses After Implementing Android-Based Interactive Multimedia

Based on the results of the validity, then each expert and biology teacher has his own assessment details. The results of the analysis of media expert data, there are 2 aspects that fall into the very feasible category and 2 aspects that fall into the decent category. The highest validation value with 86.66% on the aspect of product use and the lowest with 70% on the aspect of product design. Overall, the results of the assessment of all aspects obtained a total score of 76%, in terms of the feasibility category according to (Riduwan, 2009) in the category very suitable for use in learning. The aspect of using the product got the highest score, namely 86.66%, which indicates that this interactive multimedia in the use of the product is appropriate as a learning medium. This is in accordance with Armansyah's (2019) statement regarding the purpose of using interactive multimedia, namely to make it easier for students to learn the material and aids to clarify the presentation of the subject matter.

The results of media expert data analysis, there are 2 aspects that fall into the very feasible category. The highest value is found in the aspect of ease of use with a value of 77.50% so that it can be said, while the lowest feasibility value is in the aspect of critical thinking ability with a value of 84.28%. Overall the results of the assessment of all aspects obtained a total score of 81.81%, in terms of the feasibility category according to (Riduwan, 2009) in the very feasible category. The high feasibility of the content aspect in the validation of material experts on Android-based interactive multimedia because the material contained in the media is in accordance with the concept of mutation. Appropriate media must be in accordance with the material and learning objectives achieved, according to Sumiati's (2007) statement that the use of learning media includes learning tools and available learning resources according to the content or material and learning objectives (Amrulloh et al., 2013).

The results of media expert data analysis, there are 2 aspects that fall into the very feasible category. The points evaluated by critical thinking experts are in the form of four points in line with the opinion of Facione (2011) with various points that contain indicators. The highest score, which is 100%, is obtained at the interpretation point, while the lowest score, which is 80%, is at the inference point. The evaluation results from all aspects get a total score of 91.42%, in terms of the feasibility category according to Riduwan (2009), it is included in the very feasible criteria.

Criticisms and suggestions from biology teachers, namely the questions presented in interactive multimedia are good and enough to trigger critical thinking skills, but it is necessary to increase the cognitive level on quiz questions and practice questions. Kurniawati et al (2009) explained that students should be given the opportunity to apply ideas to higher classes in each semester so that students will feel accustomed to distinguishing opinions and facts, beliefs and knowledge, truth and lies, reality and appearance. One way to train critical thinking skills is through the learning process (Nuryanti et al., 2016). Andraini et al (2021) explain that students' critical thinking skills can improve if they are continuously trained.

The results of the data analysis of the biology teacher's responses, there are 5 aspects that fall into the very feasible category. The highest value is in the aspect of ease of use with a value of 95%, while the lowest feasibility value is in the aspect of critical thinking ability with a value of 80%. Overall the results of the assessment of all aspects

obtained a total score of 91.61%, in terms of the feasibility category according to (Riduwan, 2009) in the very feasible category. The ease of use aspect gets the highest score, this shows that interactive multimedia has good quality in its use which is easy to use anywhere and anytime. This is in accordance with (Husein et al., 2017) that interactive learning media has the advantage of being able to be opened via smartphones so that students are easier to use.

Data from the results of small-scale field trials obtained 3 aspects that fall into the very feasible category. The aspect that gets the highest score is the usability aspect with a value of 94%, while the lowest value is in the graphic aspect with a value of 80%. Overall, the results of the small-scale student readability test obtained a total score of 92.66%, in terms of the feasibility category according to (Riduwan, 2009) in the very appropriate category for use in learning. This is also supported by research (Rachmadtullah et al., 2018) which shows that in learning, the role of Android-based interactive multimedia is increasing nowadays, because interactive multimedia consists of several components (text, images, animations, graphics, audio and video). designed to complement each other so that it becomes a strong and precise system.

▪ CONCLUSION

Based on the results of the research obtained, it can be said that the research on developing interactive multimedia applications based on Android is in the very feasible category. This can be seen based on the value of the material feasibility test of 81.81%, media experts 76%, media experts 76%, critical thinking experts by biology teachers by 90% and biology teacher responses of 91.61%. Student responses to interactive multimedia applications based on Android can be required to be critical of material that is considered feasible with a value of 92.66%.

There are limitations in this study, namely interactive multimedia based on Android to train students' critical thinking skills on mutation material only up to the student response stage and only on mutation material so it needs to be followed up on other materials. This Android-based interactive multimedia application has an impact and can make it easier for students to understand material that can be done anywhere and anytime and can train students in critical thinking.

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