INVOTEK

Jurnal Inovasi Vokasional dan Teknologi

http://invotek.ppj.unp.ac.id/index.php/invotek

Vol. 24, No. 2, June 2024

ISSN: 1411 – 3411 (p)
ISSN: 2549 – 9815 (e)

Android Technology in Interactive Learning for Multimedia Animation Courses

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Doi: https://doi.org/10.24036/invotek.v24i2.1176

Abstract

Interactive learning media is a tool used to deliver learning content by presenting concepts in an engaging manner that can stimulate interest and participation in learning activities to achieve objectives. This study aims to design interactive learning media for the multimedia animation course, making the learning media more varied and enabling students to learn independently. In designing this android-based interactive multimedia, the researcher used adobe flash with the multimedia development life cycle (MDLC) method, which consists of six stages: concept, design, material collecting, assembly, testing, and distribution. The design results in an android-based interactive multimedia application that provides learning and information about the multimedia animation course, including the semester learning plan for the multimedia animation course, teaching materials, practice questions, and multimedia videos. This product has been validated by two validators: a media expert validator and a material expert validator. The media validity assessment score by the media expert validator is 97% (valid), and the material validity assessment score by the material expert validator is 91% (valid), resulting in an overall average score of 0.94, which is considered valid and suitable for use. The practicality test of the developed learning media was conducted with multimedia lecturers, resulting in a score of 98% (very practical), and with Informatics Engineering Students at Ibn Sina University, specializing in multimedia, with 20 participants achieving a score of 90.77% (very practical). The overall average score is 94%, indicating that the media is very practical. Therefore, it can be concluded that the android-based learning media for the multimedia animation course at Ibn Sina University is highly valid and very practical.

Keywords: MLDC, Learning Media, Android, Adobe Flash.

1. Introduction

The education sector is influenced by the development of information and communication technology during the teaching and learning process [1]. One of the government's efforts to advance and educate the nation is through education, as a country can be considered advanced when it prioritizes education [2]. One application of technology in the field of education includes the utilization of multimedia facilities and Internet media in the learning process. In developing this learning media, the author uses the multimedia development life cycle (MDLC) system development method, which consists of 6 stages: concept, design, material collecting, assembly, testing, and distribution [3]–[5].

More than 50% of students in the Information Engineering Study Program at Ibn Sina University already have jobs, so sometimes students who work at night cannot attend classes. The use of learning media is considered important so that the learning process is not too abstract, has variety, and can be accessed anytime and anywhere. Learning media is used by teachers to convey information to their students to stimulate students' interest in learning [6]. It is hoped that interactive learning media can clarify, facilitate, and make the learning message delivered by lecturers to students more attractive, thus motivating learning and making the learning process more efficient. According to Raharjo, teaching and

Received date 05/06/2024, Revised date 30/06/2024, Accepted date 06/07/2024

P-ISSN: 1411-3414
E-ISSN: 2549-9815

learning activities will be more effective and easier if assisted with visual aids, where 11% of learning occurs through hearing, while 83% occurs through sight. Furthermore, based on his research, it is stated that only 20% of what is heard is remembered, but 50% of what is seen and heard is remembered [7]–[9].

From several explanations mentioned above, in reality, the utilization of android-based learning media does not align with the development and advancement of information technology that can be used to support the delivery of learning objectives through the learning media used. Delivery of material that requires media, if presented without media, will make learners not understand the material well in the learning process [10]–[12].

Based on field observations, the phenomenon found in the learning process in the Multimedia Animation class of the Informatics Engineering Study Program at Ibn Sina University includes limitations in providing learning media, resulting in lecturers not finding the right way to present material that cannot be delivered through lectures and note-taking methods, as many of the students are working and often miss classes. This phenomenon has negative impacts on students, causing them to repeat the material and leading to passive participation in lectures as they spend more time listening

Learning media that have not been maximized in the learning world, such as PowerPoint, are used by lecturers in the learning process as supplementary media in the classroom and for student self-study. This media has the drawback of containing only learning material without supporting animations and exercises/quizzes, resulting in a lack of student interaction in lectures [13]–[15].

Interactive learning media is crucial during the learning process because not all subjects can be understood merely by reading; some require media to present abstract concepts that are difficult for students to understand. Therefore, interactive learning media is expected to present abstract and difficult-to-understand concepts, facilitating concept comprehension [16], [17].

Research validating the effectiveness of learning media in improving student learning outcomes includes a study conducted by Wijaya on the effectiveness of using android-based mobile learning Media. In this study, it was proven that student motivation and learning outcomes in the field of Indonesian language and literature increased with the use of Android-based mobile learning. The learning process became more flexible and efficient with this media [18]. Additionally, research on the effectiveness of android-based learning game media on the learning outcomes of Javanese language for fifth grade students in the Budi Utomo Cluster, Mijen District was also conducted by Aditya, where it was proved that student learning outcomes in Javanese language learning could be significantly improved with the use of Android-based games. Students became more motivated and actively engaged in the learning process [19].

Based on the explanation above, this research aims to design interactive learning media for multimedia animation courses that can support students to learn independently, develop, and evaluate learning applications so that the delivery of material requiring media enables students to understand the material well in the learning process. The main objective is to improve students' understanding of animation theories and to assess the validity and practicality of android-based applications as learning media in this context. By presenting comprehensive teaching materials into multimedia animation teaching, this research seeks to provide a more engaging and effective learning experience for students.

2. Methodology

The development of learning media is closely related to the suitability of the model and method in the learning process. A good learning process involves good planning and media that align with the learning theme. Therefore, to ensure that the developed learning media align with the learning topic, which is Multimedia Animation, the media must meet the learning objectives. In this study, the method used is the multimedia development life cycle (MDLC).

Multimedia development life cycle (MDLC) is a method that consists of six stages: concept, design, material collecting, assembly, testing, and distribution, as shown in Figure 1. These stages do not necessarily have to be sequential in practice and can be interchanged. The stages of the MDLC method are as follows [20]–[22]:

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E-ISSN: 2549-9815

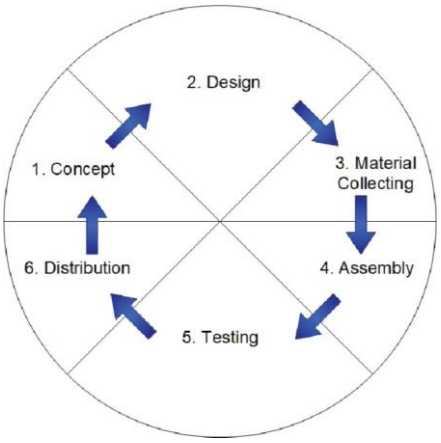

Figure 1. MDLC Development Stage

The development stages in the multimedia development life cycle (MDLC) are as follows [23].

- Concept: The initial stage in the MDLC cycle is the concept stage. The determination of the application's purpose and its users begins at this stage.
- Design: What needs to be done is facilitated by a mature concept. Detailed specifications regarding project architecture, appearance, material requirements, and style are created at the design stage. Story sequences or descriptions of each scene are depicted using storyboards at this stage, allowing users to understand them by including all multimedia objects and links to other scenes.
- Material collecting: The stage of collecting materials that meet the requirements is called Material Collecting. These materials include images, photos, animations, videos, audio, and texts, whether they are already complete or still need modification according to existing needs. These materials can be obtained for free or ordered from other parties according to the design made in the previous stage.
- Assembly: The creation of all multimedia materials is carried out at the assembly stage. The design stage, such as storyboarding, underpins the application to be created. Authoring software, such as macromedia director or adobe flash, is usually used at this stage.
- Testing: To ensure that the multimedia application production results are in accordance with the plan, testing is conducted. Alpha testing and beta testing are the two types of tests used. Each page, button function, and produced sound are displayed during alpha testing. The application will be immediately fixed if there is a malfunction. Beta testing will proceed if it passes the alpha testing. Once it passes alpha testing, it proceeds to beta testing, which is performed by users with questionnaires about the application. Content and media validation analysis is based on validator assessments. In the research conducted by Ridwan Aiken's V statistic is formulated as follows:

$$V = \sum s/[n(c-1)] \quad (1)$$

Explanation:

$s = r - l_o$
l_o = the lowest validity rating (in this case, = 1)
c = the highest validity rating (in this case, = 5)
r = the number given by an evaluator

The result of the Aiken's V calculation ranges from 0 to 1, and a value of 0.6 can be interpreted as having a fairly high coefficient; thus, a value of V 0.6 and above is categorized as valid [24].

- Distribution: The final stage in the multimedia development cycle is this stage. The application can be distributed after it is declared fit for use. In this stage, the application will be stored in storage media such as CDs, mobile devices, or websites. If the storage medium is not sufficient to accommodate the application, the application will be compressed. This stage also includes evaluation. Evaluation is highly needed for the development of previously created products to make them better. In this stage, the practicality test of the learning media is also conducted. Practicality analysis uses questionnaires to assess the benefits of the product, using the following formula [25]:

$$\text{Practicality score} = \frac{\text{Total score obtauned}}{\text{Highest score}} \text{x } 100\% \quad (2)$$

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3. Result and Discussion

3.1 Results

In the creation of this interactive multimedia, the author utilized the multimedia development life cycle (MDLC) method. The stages of the multimedia development life cycle are as follows:

3.1.1 Concept

In this stage, the following are the concepts used when designing the application:

- The application concept is an android-based interactive learning media to provide learning and information about multimedia animation courses, such as semester learning plans for multimedia animation courses, teaching materials, practice questions and videos about multimedia. The benefits of this application make it easier for students to get information about teaching materials for Multimedia Animation courses anywhere and anytime and help the learning process faster and easier.
- Application users are students.
- Description of the application created in the multimedia animation course at the Faculty of Engineering, Ibnu Sina University. The application can be operated on android devices.

Table 1 shows the key components and specifications of the application, including the title, intended users, and the types of multimedia elements integrated into the design. It highlights how the application will function to enhance learning through interactivity, multimedia support, and accessibility for students studying the multimedia animation course at Ibnu Sina University.

This table serves as a conceptual foundation for understanding the structure and content of the application, which is designed to be both educational and user-friendly, providing a seamless experience for students accessing course materials and interactive elements through their android devices.

Table 1. Description Concept

Item	Description
Title	Interactive learning media for multimedia animation course based on android
Users	Students of Ibnu Sina University
Image files	Obtained from the internet and also from the university
Audio files	Instrumentals in MP3 format
Animation	Animated button effects
Interactivity	Main menu buttons, next, back, home

3.1.2 Design

In the second stage, it is useful to create a detailed specification of the appearance, architecture, style, and material requirements for the program. The design stage is one of the important stages in developing a learning media application, where specifications regarding the appearance, menus served and required ingredients to be prepared. On this stage, designers and developers work together to create a visual and functional design of each display, use storyboards and navigation structures, as well as designing intuitive and interactive user interfaces (UI). Display design with storyboard and navigation Structure is a visual tool that helps in planning each activity in the application, shows how the user will interact with the application from one menu to another as shown in Figure 2. Navigation structure defines user flow in the application.

The flowchart provided illustrates the navigation structure and sequence of menus for an animation education program. Figure 3 below is a detailed explanation of each step in the flowchart:

- Start
  This is the initial point where the program begins.
- Home page
  Users are directed to the home page of the program. Here, they likely see an overview of the program and options to navigate to different sections.
- Decision point: home
  A decision point where the user decides whether to navigate to the home menu (indicated by "YA" which means "Yes") or proceed to the next menu option directly.

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- Finish
  This marks the end of the program navigation, where users have completed their learning path.

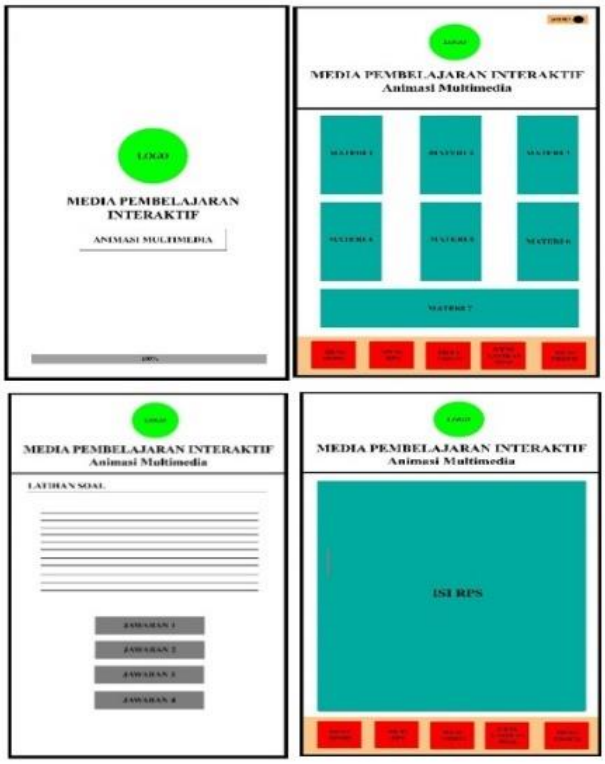

Figure 2. Storyboard

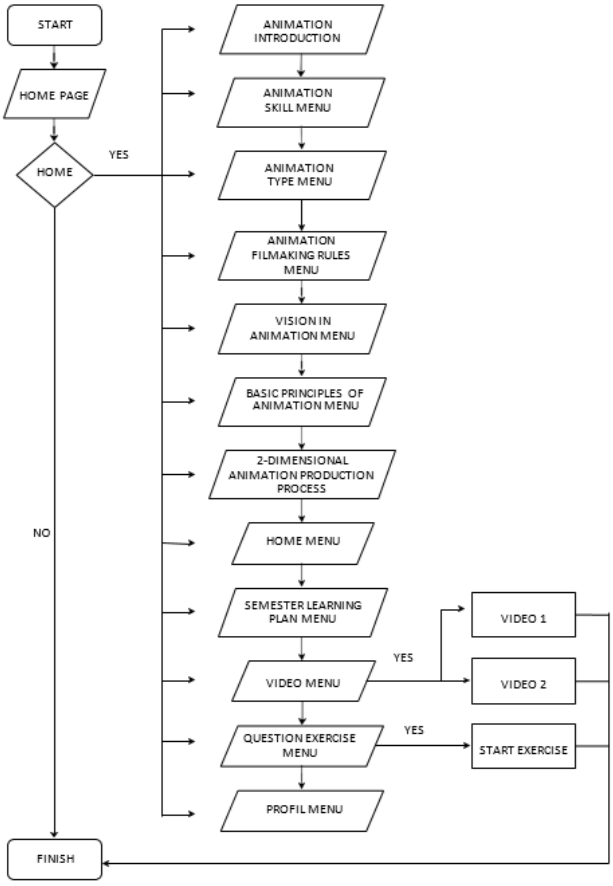

Figure 3. Flowchart Diagram.

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3.1.3 Material Collecting

In this third stage, it serves as the gathering of all the requirements or materials needed for a program. These material requirements can be in the form of photos or images, audio, video, or animations. The Material collecting stage is fundamental to the success of the program as it provides all the necessary components that will be used in the development and presentation of the content. By meticulously planning, sourcing, creating, and organizing materials, this stage ensures that the program has a rich and high-quality multimedia foundation. This thorough approach not only enhances the user experience but also supports the educational and functional objectives of the program.

3.1.4 Assembly

The Assembly stage is the fourth phase of the program development lifecycle, where the conceptual designs are transformed into a functional program. This stage builds upon the completed storyboard, flowchart, and navigation structure from the design phase. The focus is on implementing the program according to the predefined specifications and ensuring that all components work together seamlessly.

In this fourth stage, it serves as the phase of program development based on the completed storyboard, flowchart, and navigation structure from the design phase as shown in Figure 4.

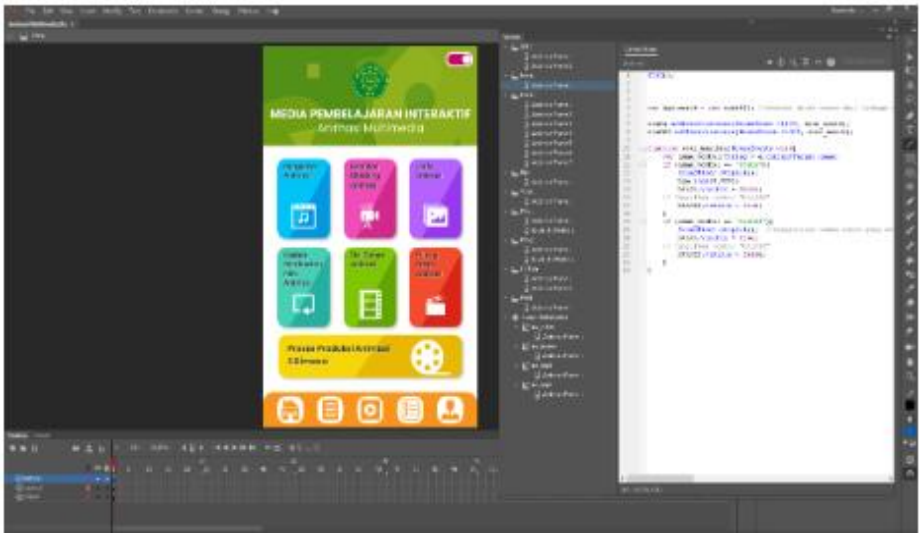

Figure 4. Program Development

3.1.5 Testing

Black box testing is a software testing method that focuses on testing application functionality without knowing the internal details of the code or internal structure of the application. This testing is carried out by checking the input and output of the application and ensuring that the application functions according to the expected specifications as shown in Table 2.

Table 2. Black Box Testing Results

Scenario	Expected Outcome	Test Result
Click on/off audio button	Audio on/off	As expected
Click introduction to animation button	Display material 1	As expected
Click skills in animation button	Display material 2	As expected
Click types of animation button	Display material 3	As expected
Click animation film creation principles button	Display material 4	As expected
Click vision in Animation button	Display material 5	As expected
Click basic principles of animation button	Display material 6	As expected
Click 2D animation production process button	Display material 7	As expected
Click semester learning plans button	Display semester learning plans	As expected

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Click video button	Display video	As expected
Click practice questions button	Display practice questions	As expected
Click profile button	Display profile	As expected

Based on the validity test that has been conducted, the results indicate that the media is suitable for experimentation without revision. The results of the validation data analysis can be seen in Figure 5.

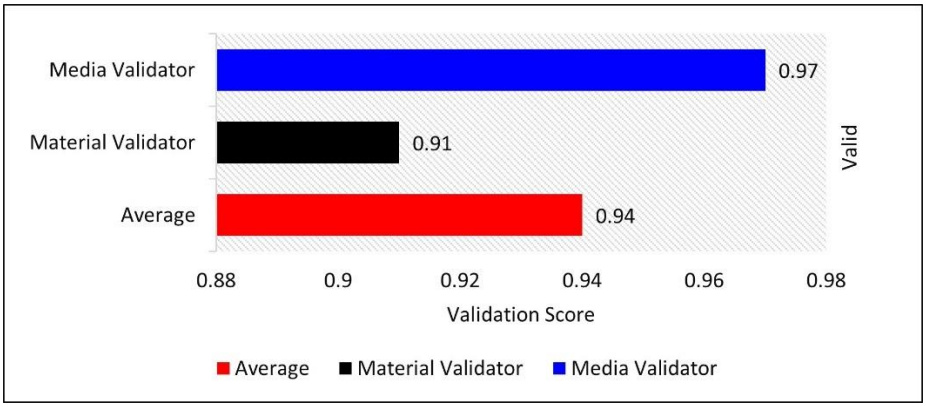

Figure 5. Validation Score of Validators

From the table above, it is found that the media created is valid for use as instructional media at 0.97, and the material used is also valid at 0.91 thus, it produces an average validity of 0.94, which is suitable for use.

3.1.6 Distribution

The distribution stage can be considered as an evaluation stage that is useful for developing the designed program and can be used as feedback so that the next program can be better. In this process, the completed program is copied to the user's android device, and then installation is carried out. For distributing the master file, it is done to the lecturer who teaches the course. To run this learning media program, an Android smartphone with the following specifications is required, namely; (1) Processor: dediacated cortex A8 (intruction set ARMv7) clock 800 MHz, (2) RAM: 512 MB minimum, (3) Memory: 1 GB (recommended), (4) System operations: minimum android 2.2 Froyo.

The practicality of android-based learning media by students and lecturers was assessed using a practicality test questionnaire. The results of the practicality analysis can be seen in Figure 6.

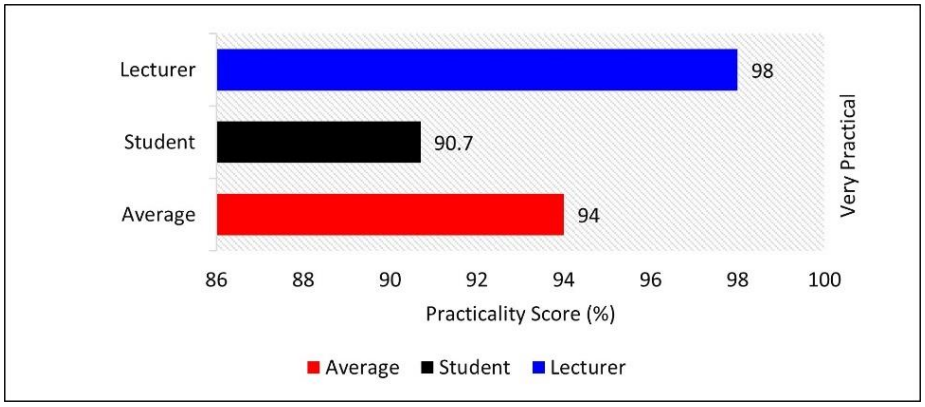

Figure 6. Practicality Score of Respondents

From the table above, it is found that 98% of the assessment of lecturers through practicality questionnaires about the developed media is highly practical for use as a learning medium. The total results of student assessments through practicality questionnaires about the developed learning media by the researcher obtained an average of 90.77%, indicating it is highly practical, resulting in an overall average of 94%, which is declared highly practical.

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3.2 Discussion

Learning media is an intermediary that connects the message deliverer to the message recipient, in this case, the message is in the form of learning material to achieve a goal related to educational programs [26]. Multimedia animation is a course that discusses introduction to animation, skills in the field of animation, types of animation, principles of making animation films, vision in animation, basic principles of animation, which are needed when pursuing a career in animation. Interactive learning media is highly required during the learning process because not all lesson materials can be understood by just reading but require media to present something that is abstract and difficult for students to understand.

Based on the research findings conducted by researchers, it is evident that android-based learning media significantly impacts the understanding of students in multimedia animation courses at the Informatics Engineering Program, Ibnu Sina University. This is evident from the validity test results of the learning media, which yielded an average score of 0.94, indicating high validity. Additionally, the practicality test results showed that 94% of the media was considered highly practical for use in learning.

The development of android-based learning media is considered suitable and effective in improving student learning outcomes, with an average final score of 85%, indicating a high level of student completion. The average final score of 85% is derived from the post-test results of students who used the android-based learning media [27]. These results indicate an improvement before and after using the media, which is in line with other findings that state interactive media, such as applications, have a significant impact on student learning outcomes [28]. The android-based learning media not only facilitates more interactive material delivery but also provides a more enjoyable and effective learning experience for students. By utilizing multimedia features such as animation, videos, and direct interaction, students can more easily understand complex and abstract concepts. According, the use of multimedia in learning can enhance students' understanding by combining various forms of information such as text, images, and sound simultaneously [29]. The use of this media also allows students to learn independently, anytime and anywhere, thereby increasing flexibility in the learning process. This is very important in the context of modern education, where students often have to balance time between learning, extracurricular activities, and other personal responsibilities. This is supported by research conducted by Shadiev et al. [30] which found that technology-based learning media provides flexibility in learning time and place for students, ultimately increasing their motivation and learning outcomes. Additionally, the Android-based learning media is also equipped with various interactive exercises and evaluations that help students measure their understanding directly. With immediate feedback from the media, students can quickly identify and correct their mistakes, making the learning process more effective and efficient. According to Gagne et al. [31], feedback is a crucial element in the learning process that helps students correct mistakes and reinforce their understanding. From the teacher's perspective, this media also offers significant benefits. Teachers can easily update learning content according to the latest developments in the field of animation and adjust teaching methods based on the needs and abilities of students. This not only enhances the quality of teaching but also helps teachers stay relevant and up-to-date with technological and industry developments. In line with this, research by Huang et al. [32], shows that the use of technology in learning allows teachers to be more adaptive in delivering material and more responsive to student needs.

In conclusion, the development and implementation of android-based learning media in the Multimedia Animation course at the Informatics Engineering Program, Ibnu Sina University, have been proven to have a significant positive impact on students' understanding and learning outcomes. With high validity and practicality, this media is not only effective in improving student learning outcomes but also supports the creation of a more dynamic, flexible, and interactive learning process. This is consistent with previous research findings that show the use of interactive media can significantly enhance student learning outcomes. In this study, the validity of Android-based learning media for teaching purposes is notably high, leading to increased student understanding. The flexibility of using this learning media presented in teaching also results in a very high level of practicality, as demonstrated by the trial results.

4. Conclusion

Based on the research and development results of android-based learning media in the multimedia animation course conducted by researchers in the computer engineering study program at Ibnu Sina University. Validity testing, on the development of android-based learning media was tested by media expert validators and material expert validators. The validity assessment results of the media by media expert validators in android-based learning media are 97%, thus can be declared very valid, and the validity assessment results of the material by material expert validators in android-based learning media are 91%, thus can be declared very valid. Practicality testing, on the development of android-based learning media tested through questionnaires distributed by multimedia lecturers with a result of 98%, thus can be declared very practical. Questionnaires were also given to 20 Multimedia students in the computer engineering Study Program at Ibnu Sina University with a result of 90.77%, thus can be declared very practical.

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