

Development of android-based learning media on tool sterilization materials

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ABSTRACT

According to the analysis of student needs for sterilization material for tissue culture courses, it shows that learning media still has a limited role in the learning process. In terms of material and visualization, the learning media used cannot be explained in detail. Students still don't understand the material and really need Android-based learning media that is more flexible and well visualized. The purpose of this study was to find out the analysis of student needs, the design of instructional media, the level of feasibility of learning media from experts and the responses of lecturers and students as well as evaluations of students. The research method used is R&D, ADDIE Model (Analysis, Design, Development, Implementation, and Evaluation). The results of the study were 96.70% of students needed Android-based learning media, media content designs namely: Instructions for Use, CP-MK, References, Materials, Videos, Exercises, Developer Profiles and EXIT. The feasibility level of the media is categorized as very feasible, the results of material experts are 100%, media experts are 96.5% and learning design experts are 94.5%. then the lecturer response was 83% and the student response was 92.52% included in the very decent category. then the evaluation stage obtained an n-gain score of 0.60 categorized as quite effective. The limitation of the research problem is that the material developed is limited to the topic of tool sterilization for tissue culture courses and the development used is limited to the evaluation stage, namely the media effectiveness testing stage.

Keywords: development, learning media, tool sterilization

INTRODUCTION

The development of information and communication technology (ICT) is very influential in everyday life for all people, both students and students. as said by Kumalasan (2018) Technological developments that continue to increase have an important effect on the world of education, including in learning. One of the most obvious examples is the level of development of smartphone devices that are increasingly sophisticated and relatively inexpensive, this has triggered an increasing number of smartphone users. Smartphones, especially Android, are one type of information technology application in the world of education that is currently in great demand. Smartphones that run an operating system similar to computers are known as Android smartphones (Abildinova et al., 2016).

Along with the increasing number of smartphone users in various circles, even among students who only use it for social media (Facebook, Instagram, Line and WhatsApp) and only for playing games. This will interfere with student learning concentration and reduce interest in looking at textbooks. Students will prefer to stare at their smartphone screens for hours which causes students to focus more on their smartphones and even leads to addiction. Overcoming this, it would be better if smartphones were used as learning resources, Marlina et al (2018) stated that the role of technology in learning can improve the quality of student learning and also make students more interested in viewing learning material. Syarisma, (2020) states that learning material is a form of material or a set of learning materials to assist educators in teaching and learning activities

which are systematically arranged to meet predetermined competency standards. In conveying learning material educators definitely need learning media.

Learning media are all forms of materials used to assist teachers in carrying out teaching and learning activities in the classroom. The material in question can be in the form of written or unwritten material. According to [Sanjaya \(2016\)](#), learning media is one form of learning resources which can be in the form of textbooks, modules, video programs, films, slide programs and so on that are used to store learning messages. Good learning media must be able to present learning media that are in accordance with the demands of the curriculum, follow the development of science and technology (IPTEK), and can bridge learning so that the competencies that have been set can be achieved.

Learning media is an integrated part by lecturers, which must be prepared by lecturers in tertiary institutions because each university has independent higher education standards that are set, compiled, and developed by universities. According to the Ministry of Education and Culture Regulation No. 50 of 2014 concerning the Higher Education Quality Assurance System that every tertiary institution must prepare teaching materials that are in accordance with the conditions of students in institutional tertiary institutions.

Based on the results of a needs analysis through a questionnaire distributed to 60 students of the Biology Study Program class of 2019 class A to class D, Medan State University, it was found that as many as 80% of students answered that in learning activities the learning media used were limited, because the lecturer only used books or PowerPoint to explain and deliver lecture material so that learning variations become monotonous. The impact of these findings resulted in students having difficulties in learning material for sterilizing tools. If explained in general, namely by using books or PowerPoint, it turns out that as many as 61.70% of students feel bored/bored in learning.

The tissue culture course is one of the compulsory courses that students include in the KRS. In the learning process about tissue culture, especially regarding tool sterilization, as many as 51.70% of students answered that their lecturers had used an android-based application as a learning medium, but the learning media used by lecturers was videos from YouTube. After further analysis, the video from YouTube only shows reading tutorials but there is no sound explanation from practitioners then only accompanied by music. The video content that will be included in the application is the original voice explanation. The lack of content from YouTube videos and only accompanied by music and text, without sound explanations this will lead to misconceptions for students, so it is necessary to add or complete content to be inserted in the application, so that the tool sterilization tutorial is visualized properly. The learning experience gained by students is in the form of cognitive mastery and psychomotor skill mastery. The conclusion from the results of the questionnaire was that 96.70% of students really needed Android-based learning media on tool sterilization material.

Apart from that, to strengthen the data, the results obtained were the results of oral question-and-answer interviews with tissue culture lecturers conducted via zoom. Overall the lecturer said that the lecturer used various types of learning media, namely in the form of PowerPoint, Virtual Meeting (Zoom), E-Learning (Sipda), Ebooks and Videos from YouTube. From the learning media used, not all students are active/interactive, only some are active and some are not. For students who are not active, maybe this is less interesting for students, or the delivery of material by the lecturer is not good. The conclusion from the interview results is that lecturers strongly support the development of Android-based learning media. Because technology is currently developing, this can help improve students' knowledge skills to understand how to properly sterilize tools, especially for students who are visual types.

The learning style of students is one of the characteristics of learning that relates to absorbing, processing, and communicating this information. A very important learning method is style learning. Some students excel at studying by observing how others do it. They like how information is presented in a consistent manner. The students enjoy writing down what the instructor says during the lesson. Visual learners are distinct from auditory students, who rely on hearing. Meanwhile, Kinesthetic students prefer direct involvement in learning (Sari, 2014).

Tool sterilization is a process to kill all micro-organisms in the laboratory equipment/materials. Sterilization has an important role in the success of tissue culture techniques because it is closely related to contamination (Prayoga, 2015). Therefore, this material requires a good understanding in detail so that there are no mistakes in carrying out the sterilization action. For this reason, it is necessary to have interesting and easy to understand learning media because if only using conventional media such as print media, students will be bored and bored of seeing language concepts that are very standard and difficult to digest, especially the visual images presented are of course very limited to one dimension so that Many students think that learning tissue culture is difficult.

One way to change the mindset of students that tissue culture material is difficult is to use learning aids during the teaching and learning process in class by changing conventional media to using one of the Android-based smartphone media. As (Harahap et al., 2020) states that Tissue Culture is considered difficult for students to understand, because to understand Tissue Culture material a basic understanding is needed and learning media are needed that are interesting and easy to understand because if you only use conventional media such as print media, students will get bored and tired of seeing language concepts that are very standard and difficult to digest, moreover the visual images presented are of course very limited to one dimension only so many students think that

learning tissue culture is difficult. In the process of learning, media or learning materials play a crucial role. Learning is an exchange cycle data, making the educator a facilitator not a wellspring of learning for understudies. Learning will produce nothing without learning materials. Learning materials are an important source of material for educators in carrying out the learning process. Without teaching materials, educators will experience difficulties in achieving learning objectives. In principle, the teacher must always prepare teaching materials in the implementation of the learning process (Aisyah et al., 2020). According to Supardi et al. (2017), experiments and demonstrations make learning more effective and encourage students to actively develop their intellectual potential. Android-based learning media can be used in learning activities because it is quite effective in improving student learning outcomes, and can increase the effectiveness and efficiency of learning (Munandi, 2013). Making learning media based on Android that is easy to use and apply is AppyPie.

AppyPie is a website that provides templates for making Android applications for free and paid. AppyPie can support the process of making learning applications based on Android, Mac OS, Windows Phone, Blackberry, and HTML 5. The advantages of AppyPie compared to other applications are that it does not require coding (programming language) in making applications, provides templates in making Android applications for free and the file size is not too large so it is easy to operate on a smartphone (Chusni et al., 2018).

Based on previous research conducted by Aulia & Aina (2016) conducted research on the development of interactive multimedia learning media, the results obtained were that the learning media could be run using a CD whose contents were in the form of material explanations and tissue culture videos, especially on the topic of sterilization. CDs are difficult for students to access, this is an obstacle for students to broaden access to material. Pambayun et al. (2021) also conducted research on interactive learning media

for plant tissue culture. The results obtained were that the learning media only contained text material content, especially sterilization material. For visualization is very supportive of tissue culture material. This is evidenced by [Batubara's research \(2017\)](#) which displays learning media in the form of videos using LCDs, the results obtained are that learning video media is suitable for use by students, but the practicality of learning media is still not in accordance with the demands of science and technology development. The development of science and technology is very important in developing learning media, this is what [Hartini et al. \(2019\)](#) in their research, namely the development of a virtual laboratory on the topic of tissue culture which provides animation simulations in carrying out sterilization, but the application cannot be accessed via Android. Android smartphone containers make it easy for students to be able to access learning. In the research conducted by [Astuti \(2017\)](#) the results showed that the android-based mobile learning media that he had made, this media was included in the good category so that android-based mobile learning media could be used in learning, but did not contain tissue culture material, especially tool sterilization. For this reason, it is necessary to develop Android-based learning media on device sterilization material, learning media that are

developed are adjusted to the proportion of needs and characteristics of students, namely containing video visualization and material that can be accessed easily by students.

Based on the problems above, the purpose of this research is to find out the analysis of student needs, to know the design of the content design of learning media content, to know the feasibility level of the validation results of material experts, media, and learning design, to find out the results of lecturers' responses to the tissue culture course and students, to find out the results of student evaluations of the development of Android-based learning media.

METHOD

Sample collection

The type of research used in this study is Research and Development (R&D), which is a research method used to produce certain products and test the effectiveness of these products through analysis of needs and problems in the field. The product to be developed and tested for its effectiveness is an Android-based learning media for tool sterilization. In this research the development model used is the ADDIE model because it is more rational and more complete and can be used to develop various forms of products such as learning media ([Sugiyono, 2015](#)).

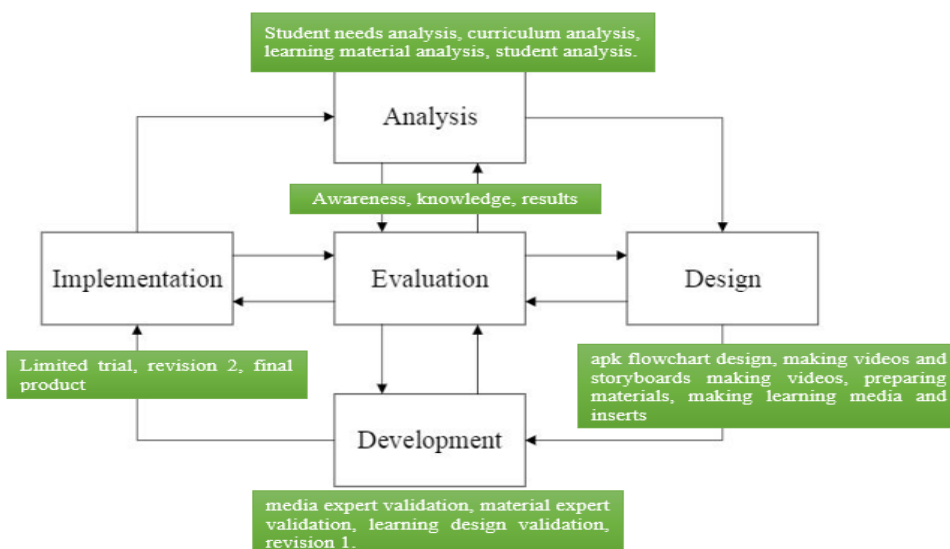


Figure 1. Research design diagram.

The research subjects were expert validators (materials experts, media experts and learning design experts), lecturers in tissue culture courses and students majoring in biology at Medan State University. The object used in this study is the development of an Android-based AppyPie application on tool sterilization material. A diagram of the ADDIE development model that was carried out can be seen in Figure 1.

Data collection techniques are questionnaires, tests, and documentation studies. Data analysis techniques are assessment (material experts, media experts, and learning design experts), then lecturer and student responses to the developed learning media, and student evaluation.

The technical steps for analyzing quality data for the assessment of experts, lecturers and students' responses are:

1. Change the qualitative data using a Likert scale with the provisions in Table 1.

Table 1. Questionnaire Assessment Criteria

Criteria	Scoring
Very Good	5
Good	4
Enough	3
Less	2
Very Less	1

Source: [Sudijono \(2010\)](#)

2. After the data is collected, the data obtained from the assessment sheet by material experts, media experts, learning design experts, lecturers and students who are carried out using a Likert scale will be calculated according to the level of feasibility according to [Sugiyono \(2015\)](#) with the formula:

$$P = \frac{f}{N} \times 100\%$$

Information:

- P = Category percentage
- f = Number of selected scores
- N = Total score ideal

3. The determination of the validation criteria is as follows:
 - a. Determine the lowest score, namely:
 Lowest score = Lowest weight x Number of indicators.

- b. Determining the highest score, namely:

$$\text{Highest score} = \frac{\text{Highest weight} \times \text{Number of indicators}}{\text{Number of indicators}}$$

- c. Determine the range of scores/scales, namely;

$$\text{Scale Range (RS)} = \frac{m(n-1)}{n}$$

Information :

m = many indicators

n = Number of alternative answers

- d. According to [Sudijono \(2010\)](#) the determination of the validation criteria is determined in the following way, for example:

- i. Determine the ideal score (maximum score) that is : $\frac{5}{5} \times 100\% = 100\%$

- ii. Determine the ideal score (minimum score) that is: $\frac{1}{5} \times 100\% = 20\%$

4. From the results of calculations using the above formula, the number is generated in percentage and interpreted qualitatively in sentences. The interpretation of the feasibility level of material experts, media experts, learning design experts and the responses of lecturers and students is in Table 2.

Table 2. Criteria for the Percentage of Assessment of Experts, Lecturer and Student Responses.

Interval Presentase	Criteria
$84 < \% \text{ score} \leq 100$	Very worth it
$68 < \% \text{ score} \leq 84$	Worthy
$52 < \% \text{ score} \leq 68$	Decent enough
$36 < \% \text{ score} \leq 52$	Not feasible
$20 \leq \% \text{ score} \leq 36$	Very Inappropriate

Source: [Sudijono, 2010](#)

The technique of analyzing student evaluation data is to see an increase in student learning outcomes can be calculated by the following formula:

$$N - \text{Gain} = \frac{\text{Skor Postest} - \text{Skor Pretest}}{\text{Skor Ideal} - \text{Skor Pretest}}$$

RESULTS AND DISCUSSION

The product produced in this development research is an android-based learning media that is used by students in studying tissue culture courses on tool sterilization material.

Based on ADDIE's development steps prior to product development, a needs analysis, curriculum analysis, learning material analysis and student analysis were carried out. The results of these series of activities serve as the basis for developing Android-based learning media. As [Shehab & Boujaode \(2016\)](#) stated that needs analysis, curriculum, learning materials and students produce data in the form of a list of knowledge and skills that students have not yet mastered and need to master. So that from the data obtained it is known what needs to be developed to help increase student knowledge and skills regarding the importance of Android-based learning media in the learning process

Based on the results of student needs, there were 60% of students who had difficulty learning material for sterilizing tools, this factor came from the limited learning media used in the learning process. The implications for the future of these findings are that students lack cognitive mastery and psychomotor skill mastery, due to a lack of visualization of abstract material on tool sterilization material. Material sterilization equipment requires a good understanding in detail so that errors do not occur in carrying out the sterilization action. For this reason, it is necessary to have learning media that are interesting and easy to understand because if you only use conventional media such as print media, students will get bored and bored seeing language concepts that are very standard and difficult to digest, especially the visuals. the images presented are of course very limited to one dimension so that many students think that learning tissue culture is difficult. As [\(Harahap et al., 2020\)](#) states that tissue culture is considered difficult for students to understand, because understanding tissue culture material requires a basic understanding of several other branches of science such as plant morphology physiology, plant anatomy, genetics, laboratory techniques and other branches of science.

Based on the results of curriculum analysis, it is known that learning activities using the Indonesian National Qualifications Framework

(KKNI) curriculum and also Semester Learning Plans (RPS) have predetermined learning outcomes. As said by [Harahap & Sihombing \(2022\)](#) that this learning analysis is carried out to find out what aspects must be mastered by students. The learning aspect in question is learning achievement that has been stated in the semester learning plan. One of the achievements of these competencies is that students must be able to understand the basic principles of tissue culture, understand instrument sterilization techniques and understand instrument sterilization procedures. However, this is not in line with the student's learning experience in terms of cognitive mastery, namely students do not understand the sterilization technique of tools in tissue culture and also students' psychomotor mastery within the limitations of videos watched on YouTube which do not contain visuals. aspects and a detailed explanation of the instrument sterilization procedure. This is in line with [Anggraeni & Kustijono \(2013\)](#) which states that video tutorials must contain or include visualizations, audio and text that can improve students' understanding in the learning process.

Based on the results of the analysis of learning materials, it is known that there are students' learning difficulties in understanding the material for sterilization of tools, sterilization of tools is a material that is closely related to contamination. The use of android-based learning media is a solution to the problem of difficulty understanding tool sterilization material because the learning media is packed with core content including materials and videos that can help these students. As [\(Calimag et al., 2014\)](#) states that learning media is a type this allows students to learn not limited by time and place with the app which is interesting.

Based on the results of student analysis, it was found that students who took the tissue culture course had unique characteristics that there were students with visual, audio and kinesthetic types. If the students who are audio and visual types can capture the material only through the explanation of the lecturer's

exposure through a zoom meeting, but if the type of student is a kinesthetic type that requires practicum or movement, it will be difficult to understand the material for sterilization of tools. The limited learning media used in the learning process also found a solution for selecting learning media that was tailored to the characteristics of students to be able to solve the problem, namely by utilizing one of the Android-based smartphone media. Android-based learning media can be used in learning activities because it is quite effective in improving student learning outcomes, and can increase the effectiveness and efficiency of learning (Munandi, 2013). Making learning media based on Android that is easy to use and apply is AppyPie. Choosing to use appypie because course achievements can be achieved by utilizing the feature of inserting material and videos on appypie, namely the achievement of students being able to understand the process and how tool sterilization works in tissue culture.

In the design stage, the results of the learning media that have been designed are obtained. The contents of this learning media are developer profile, audio button on/off Instructions for use, course achievements and indicators, references, material on sterilization of tools, direct video shoot of instrument sterilization procedures, exercises and exit buttons. The design of learning media products can be seen in Figure 2-10.



Figure 2. Scene Home.

Based on Figure 2 it can be seen that the image is the Home section of the application, where in this scene there are 10 buttons namely:

Profile, Audio off/on, Instructions, CP-MK, Reference, Material, Video, Exercise and Exit.



Figure 3. Instructions for use.

Based on Figure 3, it can be seen that the image is a Instruction Menu that provides an explanation of the instructions for using each button or menu available in the application.

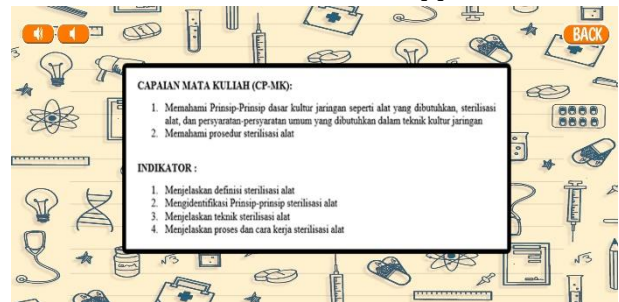


Figure 4. Scene CP-MK & Indicator.

Based on Figure 4, it can be seen that the image is a Course Achievement Menu and Indicators, namely presenting things that users need to know about course achievements that users will get when using the application.



Figure 5. Scene Material.

Based on Figure 5 it can be seen that the image is a Material Menu containing subtitles of materials that can be read by the user as a learning resource.



Figure 6. Scene Video.

Based on Figure 6, it can be seen that the figure is a video menu that presents tutorials on sterilizing tools in tissue culture.

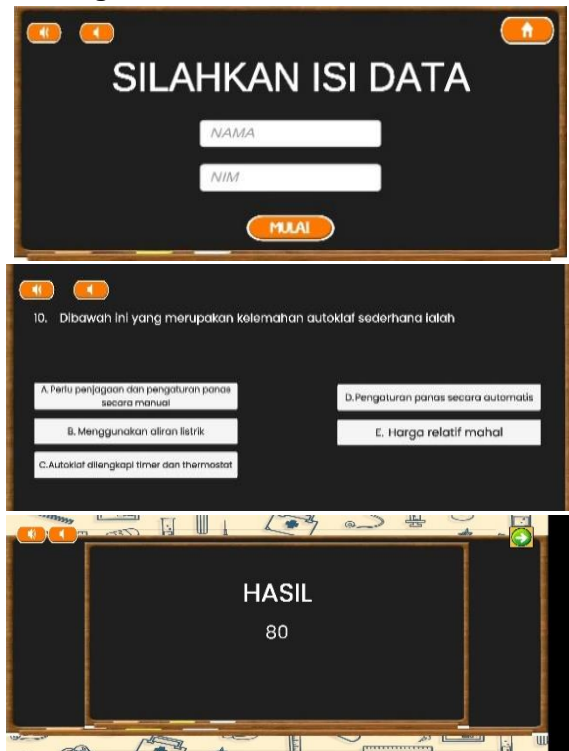


Figure 7. Scene Exercises.

Based on Figure 7, it can be seen that the image is a training menu, that is, in the initial training scene, the user must enter data in the form of a name and nickname and click the start

button. After that the user can answer the questions, the questions are in the form of multiple choices and at the end of the training scene there is a score that the user gets when he finishes working on the questions.



Figure 8. References.

Based on Figure 8 it can be seen that the Reference Menu is a menu that contains sources of quotations presented in the material scene, namely the sources come from journals or books.



Figure 9. Developer profile.

Based on Figure 9 it can be seen that when the user or application user clicks the profile menu button, the application will go to the profile scene, in this scene displays the profile of the developer or application developer as a learning medium.



Figure 10. Exit button.

Based on Figure 10 it can be seen that it is an exit button from the application. Based on the results of the design carried out, the advantages of this application include: (1) this application is designed to contain visualization of tool sterilization material, (2) the application can be used even though the device is not connected to the internet network.

According to Fransisca et al., (2019) explained that in order to design good media, we must pay attention to several important points that can make the media good for implementation in the world of education. As for these points, namely: 1.) Learning media is easily accessible anywhere and anytime; 2.) Learning media can facilitate work in understanding and studying learning material in a learning media; 3,) The material used must be in accordance with the curriculum used for learning subjects in the media; 4.) Learning media must be easy to use for ordinary users, don't let media that should be easy but make it more difficult for users in appearance and effectiveness of other uses; and 5.) Media that is made must prioritize simplicity and its use.

From these advantages, it is hoped that this media can be useful for students. As stated by Harahap & Salsabila (2022) that the combination of colors in the design as well as visualizing objects, can provide a real picture and provide a clearer and more precise explanation meaning so that it can stimulate students' thinking skills.

Android-based learning media that have been designed need to go through the develop stage, namely the validation stage by the validator team, which are expert lecturers who have the competence to provide an assessment of the learning media that has been developed to assess the advantages and disadvantages of the developed product (Sugiyono, 2015).

The role of educational technology basically has the potential to influence the teaching and learning process, as stated by Mustafa & Suryadi (2022) that the potential for educational technology can improve the quality of education and learning from time to time and is able to facilitate learning in various conditions encountered. The use of educational technology in general is to make it easier for students to access learning resources that are not limited by distance and time, so that learning can run effectively and efficiently and the quality of education will get better in the future.

At the development stage, the results of the

assessment were obtained by material experts, learning design experts and media experts. The results of the assessment from material experts are included in the very feasible category. The results of the material expert assessment can be seen in Table 3.

Table 3. Results of material expert assessment.

Aspects	Before Revision (%)	After Revision (%)
Material suitability	92,5	100
Systematics of material delivery	90	100
Learning media efficiency	100	100
Language	94,2	100
Total Percentage	94,17%	100%
Category	Very worth it	Very worth it

Based on Table 3 the results of the assessment by material experts on android-based learning media on equipment sterilization material, the percentage before the revision was 94.17% included in the "Very Eligible" criteria, while after the revision the percentage was 100% included in the "Very Eligible" criteria so that the product developed can be declared eligible to be used as an android-based learning media.

Furthermore, the results of the assessment by media experts are included in the "very feasible" criteria. Suggestions given by validators for better quality of learning media are: Adding material subtitles icon, adding application usage instructions and evaluation. and zoom in on the animated images of autoclave parts. The results of the assessment by media experts can be seen in Table 4.

Table 4. Media expert assessment results

Aspects	Before Revision(%)	After Revision(%)
Appearance	83	100
Illustration	90	100
Color composition	80	90
Selection of font type and size	90	100
Eligibility of images and animations	80	93
Use of music and sound	86	93

Text legibility	90	100
Total Percentage	85,5%	96,5%
Category	Very worth it	Very worth it

Based on Table 4 the results of the assessment by media experts on android-based learning media, it can be seen that the percentage before being revised was 85.5% which was included in the "Very feasible" criteria. Meanwhile, after the revision, the percentage of 96.5% is included in the "very feasible" criteria.

Then the results of the assessment by learning design experts get the results that the learning media products are included in the very feasible criteria. The validator's suggestions that have been validated are in the material section of the tool sterilization work procedure, add photos or pictures of activities in the laboratory, this is to strengthen the visualization of the learning media. The results of the assessment of learning design experts can be seen in Table 5.

Table 5. Results of assessment of learning design experts.

Aspects	Before Revision(%)	After Revision(%)
Content eligibility	70	92
Validity	71	97
Total Percentage	70,5%	94,5%
Category	Worthy	Very worth it

Based on Table 5 the results of the assessment by the learning design expert, it can be seen that before the revision a percentage of 70.5% was included in the "Eligible" criteria, then the product was revised according to the advice of the learning design expert and given back for reassessment by the learning design expert, and the percentage of the assessment results obtained. learning design experts after the revision, namely 94.5% included in the "Very Eligible" criteria. The results of this study are in line with research conducted by [Oktarina et al., \(2018\)](#) which shows the results that Android-based learning media is feasible and can be used in teaching and learning activities.

At the implementation stage, the results of the responses from lecturers who teach tissue culture courses are obtained and also to get

student responses when using Android-based learning media applications. Implementation of learning media or the application of learning media in order to improve the quality of learning ([Hidayanti, 2021](#)).

Table 6. Lecturer response results.

Aspects	Score (%)
Learning media display	76
Material Presentation	90
Total Percentage	83%
Category	Worthy

Based on Table 6, the results of the lecturer's response to the developed android-based learning media obtained a total percentage score of 83% which was included in the "Appropriate use" criteria. The assessment of the lecturer's response to the product developed is also influenced by proficiency in operating a smartphone, taste and expertise in a field.

Table 7. Student response results.

Aspects	Score (%)
Learning media display	92,66
Material Presentation	92,30
Total Percentage	92,52%
Category	Very Worth it

Based on Table 7, the results of student responses to the developed android-based learning media get a percentage of 92.52% which is included in the "very appropriate" criteria. [Martono & Nurhayati \(2014\)](#) say that mobile learning applications based on Android can be used as flexible learning media. According to the findings of this study, only 7% of students do not enjoy using mobile learning applications, indicating that the use of mobile learning applications can make learning more adaptable.

Student responses are very positive towards the use of learning media because students are given the opportunity to actively participate in the learning process using Android-based learning media, both individually who can watch through videos and read material on Android-based learning media. Learning media must also pay attention to the user's encouragement to use it so that it increases the

user's interest in using the media (Suparmi et al., 2019). Materials and videos on the media are presented more attractively with additional images and animations so that they can motivate students to practice understanding the concept of sterilization of tools. In accordance with the opinion of Novitasari (2020) that android-based learning media can present more interesting concepts due to a combination of interesting images, animations and sounds so that students are more interested in understanding the material. This supports the results of Nurhairunnisah's research which states that, "Android-based interactive teaching media is considered effective for improving students' understanding of the concept of network culture" (Nurhairunnisah, 2017).

At the evaluation stage, it is carried out to obtain the effectiveness of learning media products, by giving pretest and posttest to students. The students involved are students who are taking tissue culture courses, totaling 39 people. Based on the data, the N-Gain results from the pretest and posttest results can be seen in Table 8.

Table 8. Recapitulation results of N-Gain.

Average	Description	Criteria N-Gain
Average pretest	67.94	Medium
Posttest average	87.82	(Quite Effective)
Average N-Gain	0.60	
N-Gain Percentage	60%	

Based on Table 8, it can be seen that the average pre-test score was 67.94 and the average post-test score was 87.82. If calculated using the N-Gain formula, the Gain Result is 0.60 or in the percentage of N-Gain is 60%. It can be concluded that the N-Gain results are included in the criteria of being moderate or quite effective.

The results of this evaluation are in line with the results expressed by Jabbour (2014) that technology-based learning media can increase learning motivation and make learning more interesting and fun and can have an influence on improving learning outcomes. The developed learning media can increase learning motivation

and cognitive learning outcomes because the media is developed in accordance with the thinking level of students. The level of human thinking follows the stages of development starting from concrete thinking to abstract thinking, starting from simple thinking to complex thinking. The use of learning media is closely related to the stages of thinking because through learning media, abstract information can be concretized, while complex information can be simplified.

CONCLUSION

Based on the research and discussion, it can be concluded that the analysis of student needs shows that 80% of the use of learning media in the learning process is still limited. Then 60% of students still find it difficult to understand the material for sterilization of tools. The conclusion from the results of the questionnaire is that as many as 96.70% of students need Android-based learning media in tool sterilization material.

The design of the content design that is included in the Android-based learning media application, namely the developer profile, Audio on/off button Instructions for use, course achievements and indicators, references, material on sterilization of tools, direct video shoots of instrument sterilization procedures, exercises and exit buttons.

The results of the expert's assessment of the development of Android-based learning media are the results of the material expert's assessment included in the "very feasible" criteria in terms of material presentation, Furthermore, the results of the media expert assessment included in the "very feasible" criteria in terms of application design, and the results of the learning design expert assessment. included in the "very feasible" criteria in terms of the presentation of learning.

The results of the lecturer's response on the Android-based learning media that were developed got a "feasible" recommendation to be used in the learning process on tool sterilization material, and the student response results stated that the Android-based learning media was in the

"very feasible" category to be used as a learning medium. The results of the pretest-posttest evaluation with the n-gain test get an average n-gain score of 0.60 which is classified as "medium" or already effective enough to be used as a learning medium.

The suggestion in this study is that the Android-based learning media that has been developed is expected to be developed even better in the future to become an Android-based learning media as well as a better sophistication system in accordance with the revolution of the times such as a means of interaction between users when using learning media, especially on tool sterilization material.

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