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Android-Based Mobile Learning Supported the Independent Learning of Senior High School Students in Covid-19 Pandemic

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Abstract. The development of technology has a very wide impact in various aspects of life, as well as in educational world. The integration of technology in learning will greatly support learning, especially independent learning during the Covid-19 pandemic that has hit the world today. Android was one of the most popular mobile phone operating systems that can be used to facilitate mobile learning (m-learning). The purpose of this study was to develop valid and practical android-based m-learning media which is applicable for high school students. The development of this media follows the ADDIE model with five- stages progression, namely Analyze, Design, Develope, Implement, and Evaluate. The results showed that the m-learning media that used the android application (BioApss: Plant Tissue) was declared valid by expert validators with a validity level of 4.56. The media practicality test based on the responses of teachers and students at SMA Negeri 6 Maros shows that the BioApss: Plant Tissue was practical with 86.16% of respondents giving a positive response. This shows that the developed m-learning media is suitable to support independent learning, especially during the Covid-19 pandemic.

Keywords: mobile learning, learning media, android, independent learning.

INTRODUCTION

Along with the development of the globalization era, technology plays an important role in all aspects of human life in the fields of economy, politics, arts, culture and even in education. The role of technology is very important, including in the world of education to help the teaching process in educational institutions. In everyday life, many students encountered various types and good technology products that can be used as learning applications.

Due to the conditions of the Covid-19 pandemic that has hit the world, students at high school level need to take advantage of technology as a medium or learning resource to support independent learning. Learning media helps the students to understand the lesson easily, and allows students to better master the learning objectives.

Likewise in Biology learning, appropriate learning media are needed to support students to learn independently. Basically, biology learning has unique material characteristics that require a multimedia role to teach it. One of the technology tools that can be used is a mobile phone that supports audio-visual presentation of material. Today, our society has entered the first generation of

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mobile learning, as it is still in the early stages of development. However, there are billions of mobile devices in use worldwide (Ally and Prieto, 2014).

The development of digital technology in the form of mobile is growing rapidly. One of the most commonly used mobile devices is a smartphone (Crompton and Burke, 2018). Nearly 90% of students had already owned a smartphone or some even have more than one cell phone (Wong, et al., 2010; Bhati & Song, 2019). The more students who own and use mobile devices, the greater the opportunity to use technology devices in the educational world. Learning media that utilize cellular phone technology is called mobile learning (m-learning) (Gonzalez, et al., 2015). M-learning tends to use mobile devices such as cellphones, smartphones, PDAs, and so on (Davidson, 2006).

The survey shows that 71.3% of students have smartphones only, 27.7 have tablets while only 1% of students do not have any of them (Emran et al., 2016). M-learning is an alternative development of learning media. One of the basic considerations for the development of mobile-based teaching media is flexibility in accessing information anytime and anywhere (Calimag, et al., 2014). The presence of mobile learning is intended as a complement to learning and provided opportunities for students to learn material that is not well mastered anywhere and anytime (Wirawan, 2011; Tolawo et al, 2014). Judging from its effectiveness in learning, smartphone technology based on Android mobile has the benefits to provide new learning and experiences since students are often directly involved in learning activities (Kim, et al., 2013).

The results of the observations showed that students have not been able to fully understand biology material, especially on the subject of plant tissue, where most of the plant tissue material is considered abstract, such as parenchyma tissue, meristem tissue and many other materials that are difficult to understand due to the absence of learning media assistance. In face-to-face learning, this is reflected in the tendency of students to be passive in learning. Students are still confused in positioning themselves as learning subjects. Students are also lack of motivation to be actively involved and explore their insights. The teacher has made a serious effort to facilitate the students by using video, power point presentation, and supporting books or textbooks. However, various obstacles arise in using these media. In the use of video and power point presentation media, LCD projector tools are needed. These schools are lack of LCD projectors, they have to share in using the same LCD projector with other classes. Especially during the Covid-19 pandemic, where students were required to learn from home with a more dominant portion of independent learning. This condition requires the presence of m-learning to help students learn independently from home.

The presence of m-learning is expected to be able to support the concept of lifelong education. The nature of open source based mobile learning allows everyone to develop and use it according to their learning needs and wants (Goksu and Atici, 2013; Huang, et al., 2014). With its various benefits and advantages, m-learning is

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expected to be a new innovation in alternative learning sources that can promote the students' motivation, the efficiency and effectiveness of the learning process and increase students' learning outcomes in Indonesia in the future (Valk, et al., 2010; Cabanban, 2013).

Based on the reviews described above, it was necessary to develop android-based m-learning media for high school students. The hope is, when m-learning is used by students, the Covid-19 pandemic condition which requires students to study from home does not reduce the quality of learning.

METHODS

This research was conducted in Research and Development design to develop android-based m-learning media for high school students, especially on Plant Tissue subject. The product of the development of this android-based m-learning application is called BioApps: Plant Tissue which is tested for validity by expert validators and in limited trials (small scale) in class XI Senior High School 6 Maros to determine the level of practicality. The Android-based learning media development model in this study refers to the ADDIE model. This model employs a five-stages progression, namely (1) analyze, (2) design, (3) develope, (4) implement, and (5) evaluation.

The data were collected through interview, observation, and questionnaires. Interview and observation methods are used as basic materials for the development of instructional media. The questionnaire method was used to assess the feasibility of learning media in terms of validity and practicality.

The validity test calculates the average score of all validators, then adjusted to the validity category of the product, referring to Sugiyono (2010), namely the teaching material product is said to be valid if it is in the range of $4 \leq Va \leq 5$ valid category and $Va = 5$ category is very valid. The practicality test calculates the average value of the response score of teachers and students, then adjusted to the category of media practicality referring to Ridwan (2010), namely the product of teaching materials is said to be practical if the results of teacher and student responses are in the $70\% \leq R < 85\%$ positive category or $85\% \leq R$ is very positive so it can be categorized to be practical.

RESULTS

The teaching material product in the form of the BioApp Application: Plant Tissue was developed by utilizing images, simulations and videos as supporting media and practice questions in the form of multiple choice. This application is designed for android with the following details: (1) The file size is not more than 11 MB and uses 22 MB of RAM, (2) it can be operated online and offline. Applications used in the process of making Android-based learning media include Canva, Android Studio, Word to HTML, FireBase, OUCH, and Flaticon.

BioApp development stage: Plant Tissue is carried out according to a previously designed concept. BioApp development: Plant Tissue is carried out by

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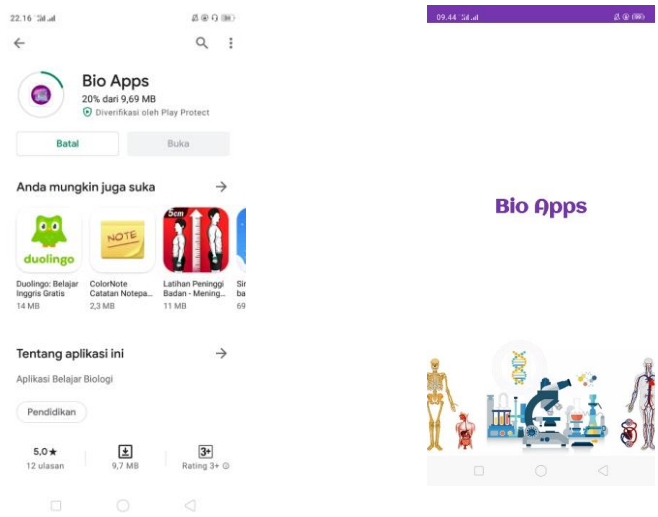
paying attention to, (1) the suitability of the material in BioApp: Plant Tissue with learning objectives, (2) the relevance of evaluation questions with learning objectives (3) the congruity of the video with the material (4) BioApp supporting features: Plant Tissue . The appearance of BioApp: Plant Tissue being developed is as follows:

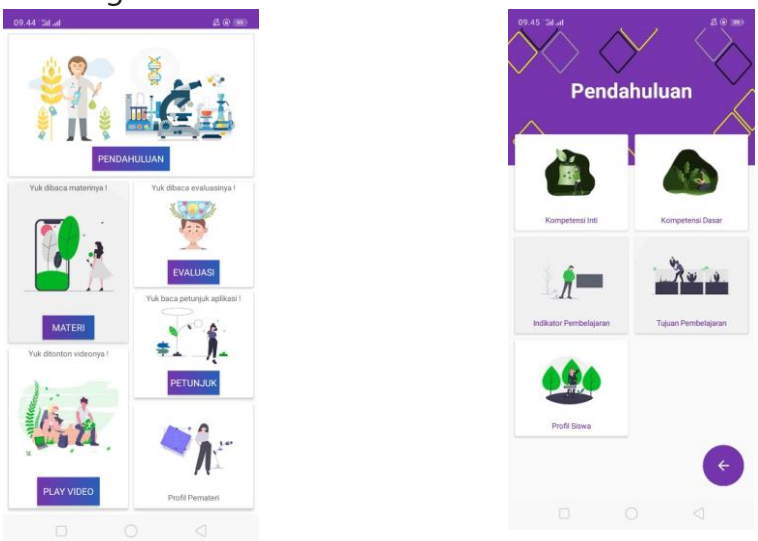
BioApp splash screen: Plant Tissue is the initial display of the application before logging in. Splash screen BioApp: Plant Tissue and loading screen BioApp: Plant Tissue can be seen in Figure 1



a b

Figure 1. a. Display of BioApps Application: Plant Tissue in Playstore, b. BioApp Loading screen: Plant Tissue

The main page is the main display in BioApp: Plant Tissue to include existing features. The introduction contains core competencies, basic competencies, learning indicators, learning objectives and student profiles. The main page and introduction design is presented in Figure 2.



a b

Figure 2. a. Main page display, b. Introductory page view

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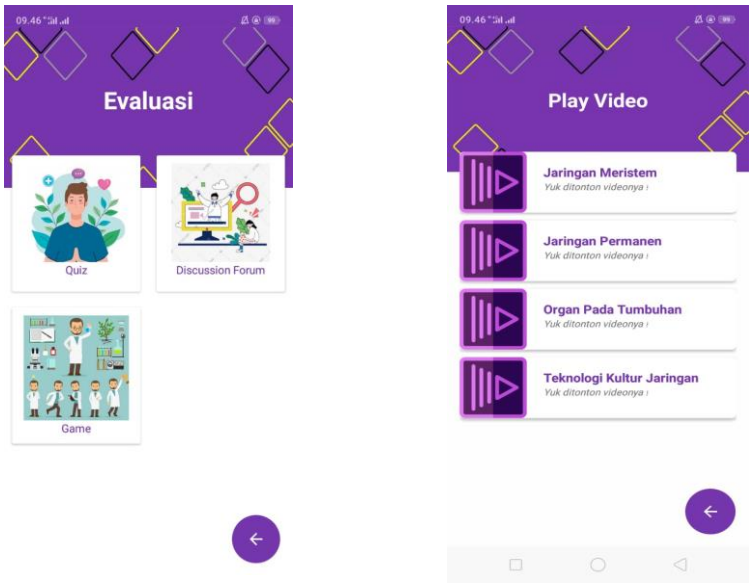
The material page consists of several sub-materials. The material page design can be seen in Figure 3.

a b

Figure 3. a. Display material page, b. Sub material page display

The evaluation page contains questions that cover learning objectives. The video page displays videos related to learning material. The evaluation page design and video can be seen in Figure 4.



a b

Figure 4. a. Evaluation page display, b. Video page view

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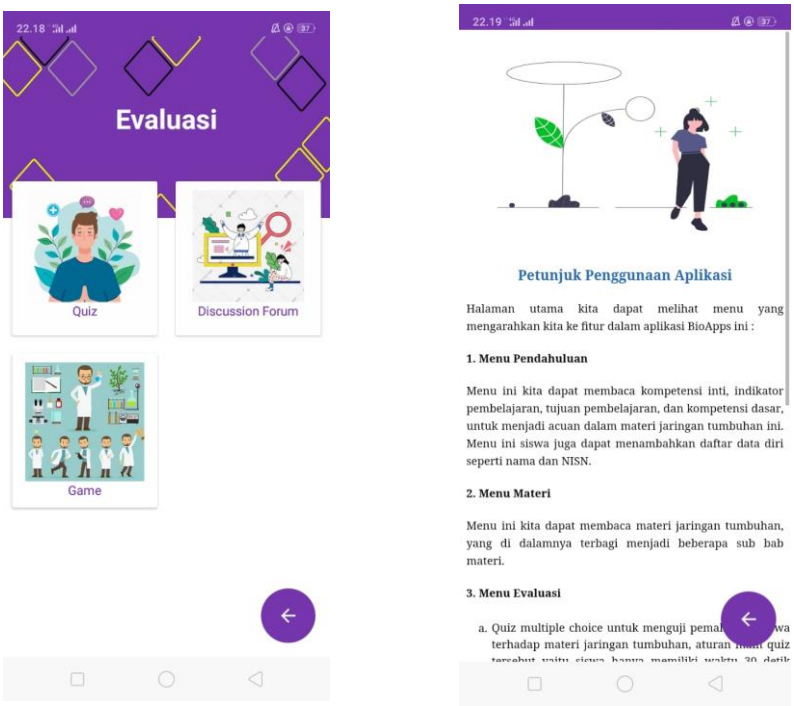
The game page contains questions with difficulty level which is easier than the evaluation questions. The manual page contains the tutorials of using the BioApp application: Plant Tissue. Game design and its tutorials are presented in Figure 5.



a b

Figure 5. a. Game Page Display, b. Application Guide Page Display

BioApp validation test: Plant Tissue is conducted to determine product weaknesses and deficiencies. Wahono (2006) states that the validity criteria for a learning media include software engineering, visual communication design and learning design. The results of the validity test is presented in table 1.

Table 1. Results of data analysis of media validity

No.	Assessment Aspects	Average Validator Ratings	Category
1	Content	4.50	Valid
2	Constructivism Paradigm	4.50	Valid
3	Media	4.27	Valid
4	Language	5.00	Valid
	Average	**4.56**	**Valid**

Based on the assessment results of the BioApp: Plant Tissue from two validators in table 1, there are four assessment criteria which each represent each statement given in the BioApp assessment instrument: Plant Tissue, namely 4.50 material, 4.50 constructivist paradigm, 4.27 media, and 4.83 language. while the overall average value is 5.00. This value falls into the very valid category ($4.5 \leq Va \leq 5$). So, after reviewing all aspects, it can be concluded that BioApp: Plant Tissue on the developed plant tissue material is declared proper and applicable after revising

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according to the suggestions given by the two validators. Small scale trials and revisions were used to determine the practicality of BioApp: Plant Tissue. The results of the teacher's response to BioApp: Plant Tissue are presented in Table 2.

Table 2. Data Analysis Results Teacher Response to Media Practicality

No.	Assessment Aspects	Average (%)	Category
1	Learning Display	83.3	Practical
2	Content Eligibility	85.7	Practical
3	Software Engineering	92.5	Practical
4	Constructivism Paradigm	90.0	Practical
5	Layout	96.6	Practical
6	Operation System	96.6	Practical
7	Language	82.3	Practical
	Average	**89.6**	**Practical**

Table 2 shows that based on the teacher's response, BioApp: Plant Tissue is stated as very practical category with an average overall value of 89.6% by looking at the 75.6% - 100% practicality category, While the results of student responses to BioApp: Plant Tissue can be seen in Table 3.

Table 3 Results of Student Response Data Analysis

No.	Assessment Aspects	Average (%)	Category
1	Material Relevance	88.4	Practical
2	Layout	91.7	Practical
3	Operation System	81.7	Practical
4	Constructivism Paradigm	78.5	Practical
5	Language	90.5	Practical
	Average	**86.16**	**Practical**

Table 3 shows that the summary of the student responses instrument to BioApp: Plant Tissue is stated as very practical category with an overall average value of 86.16% by looking at the 75.6% - 100% practicality category, so it can be stated that BioApp: Plant Tissue is practical in terms of student responses.

DISCUSSION

Based on the analysis that has been done, it is necessary to have a learning media that can attract students' interest in learning so that a learning objective can occur. The use of learning media is expected to increase student success in mastering the subject matter. Muyara & Fajartia (2017) say that learning media plays an important role in determining the success of a learning process.

The process of making the application follows a five-stages progression. Firstly, it is the needs analysis stage. In this stage the material development carried out by researchers according to basic competencies. The material chosen is based on material analysis because there are some materials that are difficult to understand so that additional features such as pictures and videos are needed to ease and facilitate students to understand the material. Secondly, the design stage. In this stage the researchers focused on designing the media to be produced. After obtaining data,

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analyzing student needs and adjusting the subject topics needed in developing learning media, then designing the product of BioApp: Plant Tissue. Thirdly, In the development phase, the BioApp: Plant Tissue media was validated by two expert validators to obtain the validity of good learning resources. In general, suggestions and input from the two validators regarding learning resources, namely writing and typing, layout color composition, adding sources to images, and video quality. The next stage is called implementation stage, where students and teachers are asked to download the BioApp learning media: Plant Tissue on the playstore, then fill out the teacher and student response instruments to test the practicality of learning media.

Lastly, The evaluation of the implementation of learning media. Based on the analysis of practicality test data, it can be concluded that through the responses of teachers and students, the BioApp: Plant Tissue learning media is practical. Inline with the opinion of Widoyoko (2014) that variations between positive and negative statements are carried out so that the respondent is really careful in reading every statement on the questionnaire so that the respondent is not imprecise and inaccurately filling out the questionnaire.

The results of the validation of learning media with an overall score of validator (4.56) with a valid category, this refers to the range of categories ($4 \leq Va < 5$) so, it can be concluded that the BioApps: Plant Tissue learning media is valid. Therefore, the research can be continued to the limited field trial stage to measure the practicality of the media by the perspective of teacher and student responses. The practicality of BioApp: Plant Tissue is represented from the responses of teachers and students. Based on research on teacher and student responses to BioApp: Plant Tissue, there are several aspects that are given to teachers and students, namely aspects of the device, learning offerings, material feasibility, constructivist paradigm, design and language / communication. This is in accordance with the opinion of Fatimah & Mufti (2014), which states that the use of Android-based learning media produces very good quality criteria (SB) with a percentage of 89.09%. The limited test was carried out to 6 students and categorized in Very Good (SB) criteria with a percentage of 93.78%. While the the extensive test is distributed to 30 students and the result of the test is categorized in Very Good criteria (SB) with a percentage of 96.30%.

Based on the results of the practicality test analysis of teachers' and students' responses, the BioApp learning media: Plant Tissue is practical. The practicality of this media can be seen in terms of use, especially in the learning process. Teachers and students can use BioApp: Plant Tissue by downloading and installing directly from the *playstore* and can be used anywhere and anytime and accompanied by learning videos to make it easier for students to master the subject matter.

BioApps: Plant Tissue is designed by considering the content and design contained within. In content, BioApps: Plant Tissue is adapted to the existing curriculum and syllabus in digital simulation subjects. In this application there is a menu of biology class XI material which can be a source of independent student

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learning both in the learning process and outside the learning process. The material presented is a summary material that is easy to learn and practical to carry anywhere so that learning is expected to be more effective. Meanwhile, the design of BioApps: Plant Tissue is more emphasized on the appearance of the BioApps design: Plant Tissue. The attractiveness of physical appearance greatly affects the learning process, the more attractive the appearance of the media is, the more motivated students are to learn so that it affects student learning outcomes (Resiani, et al., 2015). Subject matter is arranged according to the skills or knowledge students learn. These materials are in the form of text, images, animation, video, and exercises that can increase student motivation and interest in learning (Chattwanatta & Nilsook, 2017; Satyaputra and Aritonang, 2014).

BioApps: Plant Tissue developed in this study cannot be run on all types of mobile devices considering that this application can only be run on Android-based mobile devices. Therefore, it is hoped that the development of similar applications that can be run on devices with different operating systems and on different materials can be expected. With the development of learning applications on mobile devices, it is hoped that it can increase the benefits of mobile devices in education and provide student learning motivation. In addition, the existence of applications like this can provide an interesting and new learning experience for students.

One of the advantages of this application is also that it is easy to use, because the BioApps application: Plant Tissue can be used as a learning resource to drill the information about the subject matter. The appearance of the design is very attractive in terms of color, writing, images and animation. This media is easy to operate, understand by students, the buttons in this media work properly according to the instructions for using the media. In addition, the questions used for the competency achievement test were at the cognitive levels of C1 (Memory), C2 (understanding), C3 (Application), C4 (analysis), C5 (Evaluation), C6 (Creating). The choice of cognitive level is adjusted to the cognitive development of students at the formal operational stage. According to (Santrock, 2011), at this stage, the pupil has started to think more abstractly, idealistically and logically.

CONCLUSION

Based on the results of the research conducted, it can be concluded that the Android-based M-Learning (BioApp: Plant Tissue) media is valid and practical. The use of these learning media as a support for independent learning is expected to attract students 'interest and attention and can also improve students' mastery of biology subject matter, because it can explain abstract material to students. This is very helpful for students to learn because they are no longer limited by space and time. Further research needs to be carried out to test the effectiveness of the BioApp: Plant Tissue media in increasing student learning independence and understanding.

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