

## Development of Android Application on Digital Literacy: The Use of Technology Media for High School

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### ABSTRACT

Learning materials for Biology were still arranged in the form of hard-copy books in a State High School Langsa. Meanwhile, in the digital era, learning resources must be available in digital form and can easily be accessed on any electronic gadget, such as smartphones. Moreover, digital literacy competence becomes an urgent priority for students to achieve learning goals. This study aims to develop an Android-based application containing the topic of biodiversity based on local potentials. Also, it determines students' digital literacy in using the platform. This study applied the ADDIE model as the instructional design, which involved 29 first-year high school students. The data were collected through validation sheets of relevant experts and rubrics of digital literacy skills. The data were then analysed by scoring the validation results and statistical Cluster Test. The results show that the validations done by Android and learning material experts (83.33 and 87.55) are strongly valid, with no revision required. The same validation (94.58) is also found by testing the 29 samples. The Cluster Test divided two groups into Group 1, having no technology mastery (5 students) and Group 2, having the capability to use technology (24 students). The significance test on each indicator of digital literacy resulted in a significance value of 0.01, 0.00 and 0.00, which was lower than the degree of freedom of 0.05. Therefore, both groups have different digital literacy skills in the use of technology. The developed android media is limited to the material of cultural biodiversities by integrating local potencies on flora and fauna living in mangrove areas.

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## 1. INTRODUCTION

Information and communication technology (ICT) development in the 21st century is quite rapid. It affects the acceleration of information in the learning process, which must adapt to the current condition. The pandemic of Corona Virus Disease (COVID-19) has a major impact on the implementation of education (Zahro & Lutfi, 2021). The pandemic forces teachers and students in educational institutions to get accustomed to using online media (Permana et al., 2021). Either online or offline, almost all learning carried out almost regularly applies technology devices such as computers, laptops and smartphones. The utilization of information technology during the pandemic period is indeed significant, yet, it must adapt to the characteristics of the students' needs (Aznam et al., 2021).

Technological devices such as smartphones with the Android operating system are widely used as a learning medium, which creates learning activities applicable anywhere (Kuswanto, 2019); (Smaldino et al., 2019). The Android operating system itself has become the fastest-growing operating system (Schwarz et al., 2013). The mobile technology devices like Android smartphones have become a necessity to facilitate learning activities in class. It is no wonder that Android-based learning applications have emerged as the latest trend in teaching and learning (Aripin & Suryaningsih, 2019).

Mobile Android-based applications developed are demandable (Aripin, 2018) ; (Janpla et al., 2015) and informative and comprehensive (Azizah, 2018); (Rattanachai et al., 2015); (Sari et al., 2019). In general, students already have Android smartphones, so the development of the media will greatly assist students in learning (Wulandari, 2020). Media can encourage the creation of quality and meaningful learning for students. Android-based learning media have several advantages: an attractive interface with 3D animation, a remotely accessible system and recognizable menus (Sukmawati, 2016). Media is one of the intermediary learning resources that aid the teaching and learning process between teachers and students become easier (Fawziah et al., 2018).

According to a recent study (Hasyim et al., 2020), students at Vocational High Schools benefited from the introduction of android-based learning media since it made textbook content more accessible. The created android media for this research project sought to bridge the gap between textbook information and local expertise on cultural differences. This research focused on the mangrove forest in Langsa, where a variety of coastal plants and animals are considered culturally significant. The learning process has been rapidly expanding since the use of media and technology in classrooms. Developmental research's useful output is stimulating new approaches to education (Silalahi, 2017). It's possible that creating the Android apps that students need to enhance their education may be a breakthrough in this area (Putra et al., 2019). For example, in the field of biology, there is room for growth in which local potentials-based learning materials might be incorporated. This innovation will allow students to tailor their education to their own experiences and observations of the world. Contextual learning can be achieved by the incorporation of local wisdom into educational media (Deda & Maifa, 2021).

Students of High School in Langsa still referred to hard-copy textbooks as the main media for learning. Android-based media were required to be developed to ease students in learning; Android-based media eased the learning as they integrated the learning material with real-life experience. In this study, developing Android-based media enabled the integration of learning material with local potencies. Here, the key to implementing Android-based media is competence in using a gadget. The digital literacy skills among high school students in Indonesia are still relatively low (Perdana et al., 2019). Digital literacy is an individual's ability to understand and use technology optimally (Akbar & Anggaraeni, 2017). Students should be able to see changes in learning, which are all integrated with technological devices, making digital literacy a priority skill that must be mastered by them. The skill can provide new challenges for students in optimizing the use of technology to obtain information in learning activities. It turns into a guarantee that mastering ICT in learning will enable students to have competencies in global competition (Eliana et al., 2016). Using technology and communication applied

by students as a source of learning media can potentially increase literacy skills in ICT (Restiyani et al., 2014). Contrarily, due to the limitations of the learning media used, students encounter difficulties in understanding learning materials (Marpaung & Pongkendek, 2021). Based on the descriptions above, this study aims to determine the effectiveness of Android applications in the topic of biodiversity sourced from regional potential. In addition, the Android implemented in the learning activities is to determine digital literacy skills of using technology, which becomes the main competency the students must master in the digital era.

## 2. METHODS

### 2.1 Type of Research

The type of this study is Research and Development (R&D). This study's instructional development design applied Analysis, Design, Development, Implementation, and Evaluation (ADDIE).

### 2.2 Research Subject

The subjects of this study were the first-year students of Government High School Students Number 5 Langsa majoring in Natural Sciences (IPA). The subjects consisted of the classes of IPA 3 and IPA 4, where 29 students became the respondents. This study was carried out from June to September 2021.

### 2.3 Development Model

The stages of the development design model ADDIE are described as follows (Branch, 2009):

1. Analysis: This stage analyzes media required to be developed in online learning, analyzes students' background knowledge, and discusses learning materials and assignments based on the lesson plans used by the teacher.
2. Design: This phase sets the subject matter of Biodiversity based on the Core Competence, Basic Competence and Learning Objectives. The learning materials are integrated with the local potential regarding Biodiversity.
3. Development: This stage applies computer software for Android application developers to design an application with the format Android Package (APK), which can be installed in smartphones' Android operating system. The design is validated by Android and learning material experts as well as limited test respondents.
4. Implementation: This stage involves the implementation of the designed Android media to the first-year students of IPA at SMAN 5 Langsa. It is to determine digital literacy skills in using media technology devices.
5. Evaluation: This stage is done to discover the effectiveness of the Android media design.

The stages of development in the design are shown in Figure 1.

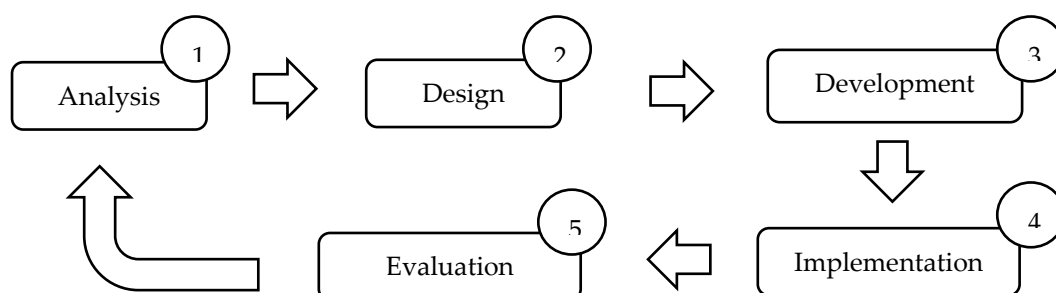


Figure 1. ADDIE Model

## 2.4 Instrument

The instruments in this study are as follows:

1. Validation Instrument is a data collection technique by distributing questions to respondents in research to explore detailed information (Kurniawati & Baroroh, 2016). The validation instrument used in this study included Validation Instrument by Android Experts, Validation Instrument by Learning Material Experts and the Test for Respondents. The grid of instruments is displayed in Table 1.

**Table 1.** Grid of Validation Instruments by Android Experts, Learning Material Experts and Test Respondents

Indicators of Application	Indicators of Learning Materials	Indicators for Testing Respondents
1. Characteristics of Application	1. Content of Learning Materials	1. Design of Media
2. Content of Application	2. Presentation of Learning Materials	2. Language
3. Interface of Application	3. Systematics of Learning Materials	3. Learning Materials
4. Design of Application	4. Weight of Learning Materials	4. Learning Supplements
		5. Self-study References

2. Rubric Assessment is used to measure student performance based on standards and achievement indicators having ranking criteria. In this study, the rubric measures the students' digital literacy in using media technology devices.

## 2.5 Technique of Data Analysis

The analysis of Android media development used scoring data from the validation of the assessment sheet. The feasibility scale of the validation results with their criteria is presented in Table 2. By applying the software Statistical Package for the Social Sciences (SPSS) for Windows, the data analysis of digital literacy was done through Cluster Analysis Test to cluster the analysis results based on digital literacy skills.

**Table 2.** The Criteria for Determining the Validation Results of Android Application

Scoring Interval	Criteria	Eligibility
81-100	Strongly Valid	No Revision Needed
61-80	Valid	No Revision Needed
41-60	Somewhat Valid	Revision Needed
21-40	Invalid	Revision Needed
0-20	Strongly Invalid	Revision Needed

Source: (Hidayati et al. 2019)

## 3. FINDINGS AND DISCUSSION

### 3.1 Development of Android Application

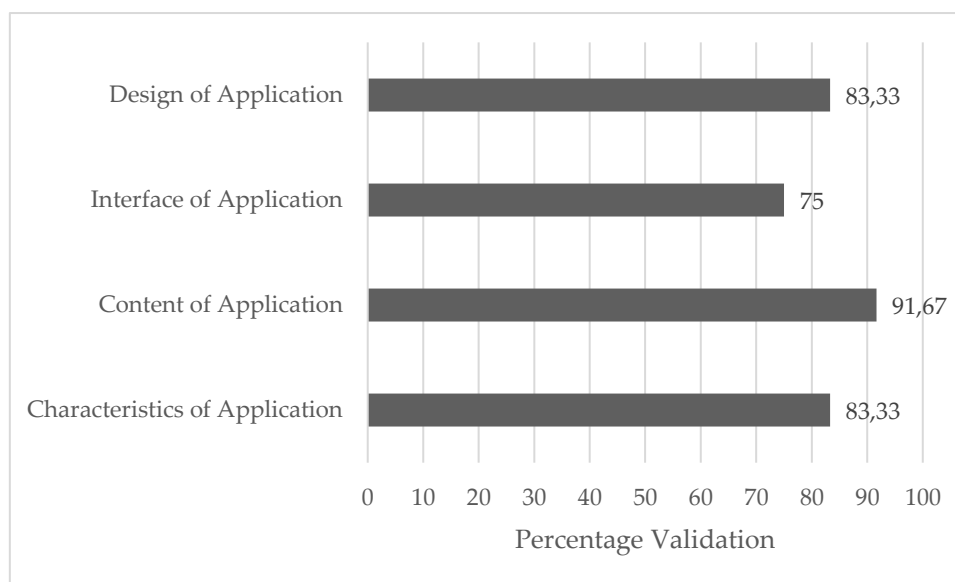
The development of the Android application in this study is based on the stages of the ADDIE model. The results of the first stage, Analysis, showed that the students needed the easiness of installing Android applications on smartphones, which was accessible in offline mode. Besides, the discussion of the learning contents and evaluation followed the subject matter contained in the biology textbook for first-year students, particularly Biodiversity. The second stage, Design, managed the achievement of learning objectives on the topic Biodiversity, which referred to the standards for Core Competency, Basic Competence and Learning Indicators. The Android application design has a uniqueness in adding

the topic mentioned, which was sourced from the local potential. In this case, the biodiversity of flora and fauna in the mangrove forest of Kuala Langsa.

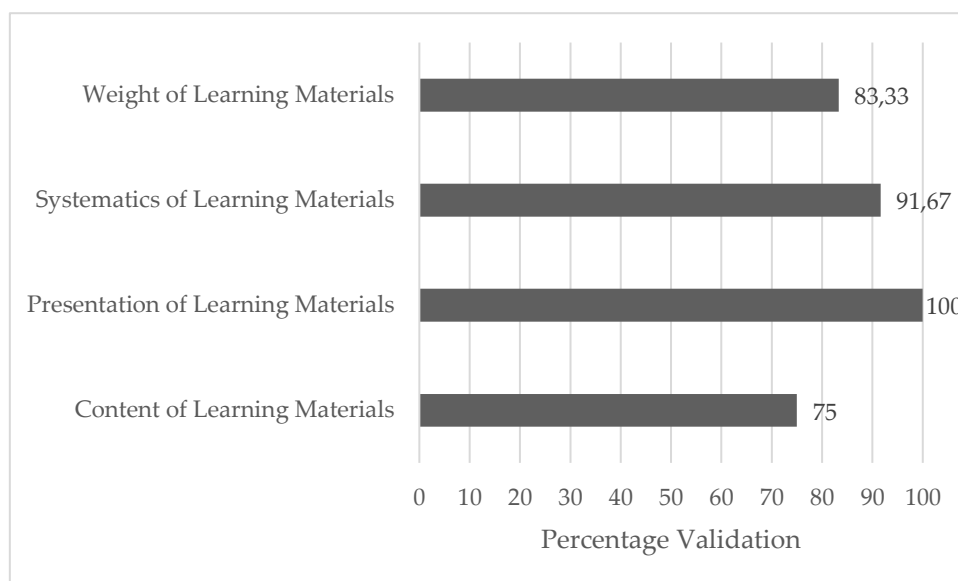
In the next step, "Development," an IiSpring Suite.10 APK Java SE Runtime Environment computer programme was used to build the Android app. Android Media Biologi (A-medBIO) is the name of the app that was made. It can be installed on all types of smartphones that use the Android operating system up to version 10. Also, both the installation and the function are done offline. The results of making the Android app were then checked by experts in media and learning tools and by the people who used it. In the fourth stage, "Implementation," the Android app that was made was used in the classes of IPA 3 and IPA 5 for learning and teaching. As has been said, the goal of this stage is to find out how well the kids know how to use media technology. Based on how they used technology, the data showed that their skills fell into two main groups, which you can see in Tables 4 and 5. The success of the Android app is then decided in the last step, Evaluation.

The validation results by the Android experts in Stage 1 gained a score of 60.42, which was somewhat valid and needed revision. In Stage 2, the improvement occurred, where the score was 83.33. It was strongly valid and did not require revision. Meanwhile, the validation results by the learning material experts retrieved a score of 87.5, which was strongly valid and did not need to revise. Additionally, the results test respondents obtained a score of 94.58, which was strongly valid and had no revision. The scoring results from the validators can be examined in Table 3.

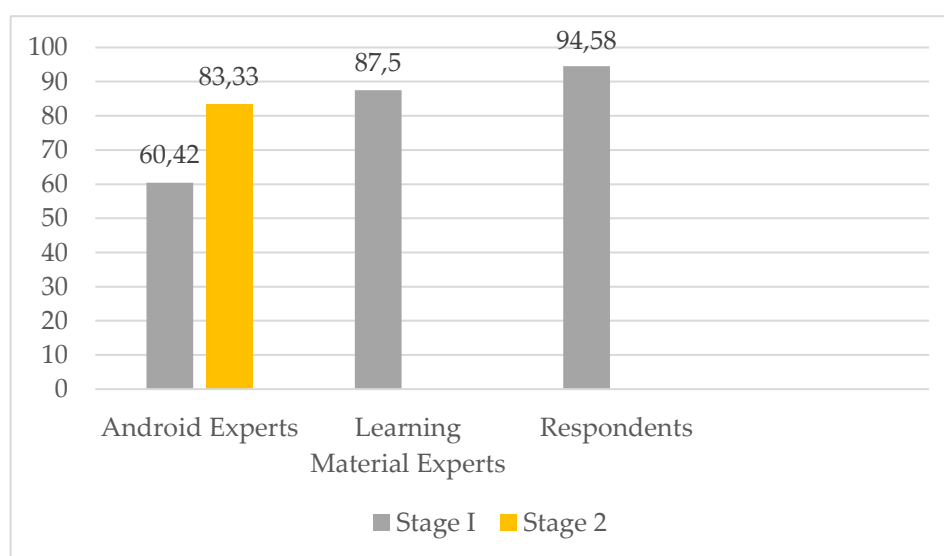
Furthermore, the Android experts' validation results were based on each indicator's score. They were the Android applications' characteristics (83.33), content (91.67), interface (75), and design (83.33). In addition, the validation results by learning material experts for each indicator were 75 for the content, 100 for the presentation, 91.67 for the systematics (91.67), and 83.33 for the weight (83.33). The assessment of the first validators is in Figure 1, while the assessment of the second validators is in Figure 2. The results of validation done by the Android Experts, learning material experts and test respondents are shown in Figure 3.



**Figure 2.** The Validation Results by Android Experts on Each Indicator



**Figure 3.** The Validation Results by Learning Material Experts on Each Indicator



**Figure 3.** The Results of Validation by the Android Experts, Learning Material Experts and Test Respondents of the Development of Android Application

### 3.2 Digital Literacy: The Use of Media Technology

29 first-year IPA students of SMAN 5 Langsa were assessed for their digital literacy using the Android application. Three main indicators to assess their digital literacy, namely understanding the basic technology use, using several choices of technology media and developing products of technology media. The Cluster Analysis Test grouped the students based on the indicators mentioned as shown in Table 3. In addition, the significance value of the students' digital literacy in using technology media is served in Table 4.

**Table 3.** The Cluster Test of Student Grouping Based on the Indicators of Digital Literacy

Indicators	Final Cluster Center	
	Group 1	Group 2
Clustered Members	5	24
Understanding the Basic Technology Use	1.25	-261
Using Several Choices of Technology Media	2.15	-448
Developing Products of Technology Media	1.63	-340

**Table 4.** The Cluster Test of the Significance of Digital Literacy Skills in Using Technology

Indicators	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Understanding the Basic Technology Use	9.54	1	0.68	27	13.9	0.01
Using Several Choices of Technology Media	28.0	1	0.00	27	4.25	0.00
Developing Products of Technology Media	161.1	1	0.44	27	36.5	0.00

Based on Table 4, it can be seen that digital literacy in using technology media is divided into two main groups. Group 1, which was consisted of 5 students, retrieved all positive results (1.25, 2.15 and 1.63). In other words, Group 1 does not know the basic technology, does not use several media technologies and does not develop products of technology media. Meanwhile, Group 2, which was consisted of 24 students, gave all negative results (-261, -448 and -340). Therefore, Group 2 knows the basic technology, uses several technology media and develops products of technology media. Moreover, the Cluster Test of the significance in Table 5 brought a significance value of sig.0.01, sig.0.00 and sig.0.00, which was lower than the degree of freedom (df) 0.05. Thus, it can be concluded that the two groups have different digital literacy in using technology media.

The Android application developed has a novelty in the biodiversity topic. The learning materials for flora and fauna were taken from the local potential of the Kuala Langsa mangrove forest, so the students would more easily understand the materials. This is in line with the study of (Sukirno et al., 2020), who develop contextual teaching materials to study the biodiversity topic materials and the environment around students. In terms of learning biology, specifically in the same topic, high school students require a software-based learning module to enhance their learning outcomes (Suryanda et al., 2018). Furthermore, (Candeias et al., 2019) promote APK-based applications to follow developments in the digital era as all instructional media now integrated lead to electronic devices. Therefore, distance online learning implements some electronic-based media (Lestari & Muchlis, 2021), which are operated on Android-based smartphones (Saselah et al., 2017). Such an operating system easily helps developers of Android applications due to its open source (Kurniati et al., 2015). Too the Android operating system is widely used because it has rich features and easy operation (Elayan & Mustafa, 2021).

Variations of software used for learning will facilitate students in understanding the learning materials being studied (Nasution, 2018). In this case, the A-medBIO was developed to encourage the students to learn the biodiversity topic. That their habit of using smartphones when learning in class or at home to look for sources of information on learning assignments also contributes to the positive finding. In addition, the easiness of installing Android applications without using the internet network also backs the research result (Kurniati et al., 2015) propose. This corresponds to the constraints on the use of online Android applications, where sometimes network connections have problems, such as the availability of student's internet data plan when using the media for learning. Online learning media may cause learning conditions in the classroom to be inconvenient if technical problems occur (Afgani, 2008).

Furthermore, the validation results of Stage I proceeded with the revision of the application since the validators referred to the low score of the application interface. They suggested adding a contrasting color display and layout for the content of learning materials. After the revision in Stage 2, the application has a good interface with a strong validation, making it unnecessary to be revised. In short, the results of all validators show a strong validation with no revision feasibility. Hence, A-medBIO is feasible as a learning media in biology, particularly in the diversity topic, for first-year IPA students at SMAN 5 Langsa. According to (Saputra et al., 2020), the practicality of media can be reviewed from the use, understanding and interest of students. In the end, the development of technology-based media creates a flexible learning process (Solikhin & Wijanarko, 2021)

The students' digital literacy in using the Android application can be seen from 29 students selected as the research sample. Twenty-four of them in Group 2 have thoroughly mastered the use of technology. This is corroborated by the results of the interview with the biology teachers for first-year students stating students are accustomed to using smartphones to find related information from the material studied. (Rachman et al., 2019) agree that digital media are preferred by students when studying in class, rather than traditional ones. The use of digital media is centred on the teaching and learning activities of students who use digital devices based on information technology (Rachman et al., 2019). The most mastered aspect of digital literacy of the 24 students in understanding the basic technology use and using several technology options. The mastery of digital literacy in learning provides an atmosphere of easy, fast and fun activities for students, thus, three domains of learning outcomes are achievable (Harjono, 2019). Digital literacy in the use of ICT can let students obtain information more effectively, efficiently and helpfully (Sujana & Rachmatin, 2019)

The difference in student literacy of the two groups is significantly seen in the five students who have not mastered the use of media technology devices following the aspect of competence. The results of the study were analyzed based on several factors – the absence of smartphones the occasional use of smartphones belonging to friends or family at home, the low speed in operating smartphones, and less contact with technological activities. The factors are in line with the statement of (Syarifuddin, 2014), who ascertains that economic and geographical factors generate the gap of mastering digital literacy and using technology devices, which in turn, requires students cognitive and technical skills (Sujana & Rachmatin, 2019)

The low digital literacy of students needs stimulation by providing technology-based learning media like utilizing Android applications, thus, they get used to the implementation of digital technology devices at school or home (Raihanah et al., 2020). The use of which can strengthen digital literacy. Moreover, (Novitasari, 2019) emphasizes that the stimulation of digital literacy should refer to aspects of student achievement and development in using technology. The use of technology media as student activities must be frequently integrated, predominantly in operating the features of a smartphone, both offline and online. According to (Helaludin, 2019), improving students' skills in using technology during learning activities must be carried out repeatedly and continuously (Paakkari et al., 2019) since such activities may strengthen their digital performance. (Rachman et al., 2019) believe that the ability to master digital literacy is when the students can use technological devices and find information in learning activities appropriately. Accordingly, it can be concluded that digital literacy in using technology media brings a good result, especially for the first-year, IPA students at SMAN 5 Langsa. It is necessary to habituate and continuously utilize Android applications on every topic in biology class.

#### 4. CONCLUSION

The results of research on the development of Android applications are based on the validation results by Android experts, learning material experts and test respondents. The developed Android-based media focused on the material of local cultural diversities of flora and fauna inhabiting the area



of mangrove forest in Langsa. The application can be offline installed on smartphones despite the fact that the application is not widely disseminated as an online open source application. The results were strongly valid, with no revision required. In addition, the results of the statistical test, the Cluster Tests showed that Group 1 consisted of five students who do not master basic technology use, while Group 2 comprised 24 students who had mastered technology media. Additionally, the results of the significance of the Cluster Test on each indicator of digital literacy in using technology provided a significance value of sig.0.01, sig.0.00 and sig.0.00, which was lower than the df 0.05. To conclude, both groups have different digital literacy in technology media use. Based on the study, the further issue for the study is developing an Android-based for the entire material from the textbook. Then, digital literacy competence is also an urgent issue for further investigation.

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