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DEVELOPMENT OF ANDROID STUDIO-BASED LEARNING MULTIMEDIA AS A SOURCE OF SELF-STUDY ON THE TOPIC OF THE DIGESTIVE SYSTEM

Hudson Sidabutar¹, Alloy Tifani Singarimbun^{2*}

¹Biology Education Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan, Jalan Willem Iskandar Pasar V Medan Estate, North Sumatera 20221, Indonesia

*Corresponding author: alloybrsingarimbun@gmail.com

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ABSTRACT

This study aimed to determine the feasibility level of digestive system learning multimedia developed using Android Studio as a source of student self-study based on the responses of material experts, media experts, biology teacher, and students. The research used a 4-D model of instructional development design, including the define, design, develop, and disseminate stages, limited to the limited deployment stage to see students' classical learning completeness. Research preparation began in September – January 2022. Product trials are carried out at SMA Negeri 1 Kutabuluh. The results showed that the Learning Multimedia that had been developed was feasible to be used as a source of student self-study because it met the eligibility criteria with an average score of 4.3 from material experts who were included in the very good criteria, an average score of 4.4 from media experts who included in the very good criteria, the average score of 4.9 from the subject teachers included in the very good criteria, and the average score of 4.82 from the large group trial students who were included in the very good criteria. Classical learning completeness of students in a limited distribution got a percentage of 94%.

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INTRODUCTION

The era of the industrial revolution 4.0 was marked by the development of the internet of things in various fields of life. Not yet finished with the era of the industrial revolution 4.0, Indonesia is already faced with society 5.0, which is a human-centered and technology-based concept of society. Advances in information technology are currently reaching all areas of people's lives, including the field of education ([Nastiti & Ni'mal'abdu, 2020](#)). Global demands require the world of education to be able to adapt technological and communication developments to businesses in the learning process ([Aswita, 2017](#)).

A teacher must be committed to being able to create, improve and maintain active, efficient and enjoyable learning with a variety of varied media such as audio, visual and audio visual which are used as independent learning resources ([Arfandi & Samsudin, 2021](#)).

So that education does not lag the development of science and technology, it is necessary to make adjustments, especially those related to teaching factors in schools so that education does not lag behind the development of science and technology ([Wahid, 2018](#)). One of the adjustment factors related to teaching is learning media ([Wahid, 2018](#)). Learning media needs to be studied and mastered by teachers so that they can convey subject matter to students in a good, efficient, and successful manner ([Sudarisman, 2013](#)). Learning media can motivate students in learning, because learning through multimedia invites the interest of students to generate interest in learning, so there is a special pleasure in listening to the lessons being studied by students through the facilities and services provided in multimedia such as animation, video, text, audio, and images ([Sutarno and Mukhidin, 2013](#)). In this case, the teacher's role is required to be able to innovate in delivering learning materials by utilizing existing platforms to support learning ([Wahid, 2018](#)).

Through interviews with students and biology teachers at SMAN 1 Kutabuluh, it was known that biology teachers usually use biology textbooks, videos from the internet as media in learning activities. Even though they have used biology textbooks, videos from the internet as media, the development of learning media in schools needs to be developed in accordance with the demands of the times, namely technology based. Based on interviews with students, the learning carried out is still teacher centered, which means that learning is teacher centered. This is indicated by students tending to be passive because they only listen and pay attention to the

teacher when explaining learning material in class, students also only get material from one source, namely the teacher.

The main purpose of the 2013 curriculum is for students to be able to construct or build their knowledge independently based on existing media or learning resources. The results of interviews conducted on students; the learning media applied by the teacher was only at certain times so that some students responded that the implementation of the learning carried out made it difficult for students to understand the material being conveyed. As a result of the less-than-optimal use of learning media by the teacher, some students feel bored, lazy and sleepy when studying.

The material presented is the digestive system of food, this material requires in-depth understanding, because through interviews from teachers of the field of study, according to the basic competencies in the high school syllabus, students must have the ability to master in analyzing and presenting material on the digestive system of food. This material for the digestive system will be difficult for students to explain only through words because this material is abstract, complex, so that concrete, informative and interesting media are needed so that it can facilitate students' understanding of this material ([Amir et al, 2021](#)).

Based on the characteristics of students in this school, most of the students already have cellphones, students' knowledge and understanding of technology is quite good. However, the development of technology-based learning media is still limited. Responding to these problems, innovative efforts to overcome these problems need to be done with additional technology-based media as learning resources that are different from the learning media used previously. [Hakky et al \(2018\)](#) in their research concluded that technology-based media can increase the effectiveness of the teaching and learning process and increase student learning motivation.

Through the presence of the media that will be designed, the learning process carried out will be in accordance with the implementation of the 2013 curriculum which is student centered. The application of the student-centered learning process is expected to form students able to learn independently which aims to build initiative, independence, self-confidence, responsibility, and self-improvement of students ([Magfirah et al, 2016](#)). Creative use of media will allow students to learn better and can improve their performance in accordance with the goals to be achieved.

The purpose of this development research is to produce application-based learning products using Android Studio that are practical and suitable for students to use as independent learning resources. Android Studio is the official IDE (Integrated Development Environment) for Android application development and is open source or free and certainly easier to code, debug and share on GitHub.

This android application developed will collaborate between video with music sound, audio, animation, and text that can facilitate students in the learning process as an independent learning resource that will provide fun and interesting learning starting from the completeness of the material, the display of the media presented such as media, text, sound effects, and clear video quality, and ease of use.

METHOD

This development research referred to the 4-D teaching material development model (four-D Model) which consisted of four stages, namely the definition stage, the design stage, the development stage, and the dissemination stage (Kristanti, 2017). In this study only up to the stage of dissemination (disseminate).

The subjects in this study were students of class XI MIPA SMAN 1 Kutabuluh determined by the purposive sampling method with a total of 36 students, because overall students of class XI MIPA 1 were a class that already had adequate devices, namely android phones with high enough specifications with standard Minimum 1 GB of RAM and 4 GB of internal memory so that the learning media program that will be developed can run smoothly. Data collection techniques used in this study were interviews, questionnaires, and student learning outcomes tests. Interviews aim to find problems so that they know the right solution to solve problems that arise. The questionnaire aims to determine the feasibility or quality of the product from material experts, media experts, teacher and student responses. Furthermore, the questionnaire that has been filled out will be used as a guide for improvement of the developed learning multimedia, this questionnaire will also be used as a reference for the feasibility of the developed learning multimedia. This study uses a test as a measuring tool for the results of classical learning mastery of class XI MIPA 1 SMAN 1 Kutabuluh which is carried out when learning takes place in the classroom. The test in this study aims to ensure that students can completely master the competency standards of a learning

unit. Thus, the product that has been developed from this research can be said to be suitable for use if the student test results are in accordance with applicable regulations.

Classical learning completeness criteria are met if in the class there are 85% of students have completed learning (Hasibuan et al, 2019). Supporting this statement, Daryanto (2014) also stated that in order to complete classical learning, 85% of the total population of students in the class must complete their studies and 85% of these students must master at least 75% of the learning objectives set.

The instrument used in assessing this learning multimedia product is a questionnaire. In this study, a questionnaire was used to obtain product feasibility data through a material expert validation questionnaire, media expert validation, teacher and student responses, as well as a test instrument for students' classical learning mastery results for the multimedia learning biology to be developed. The type of questionnaire used is a Likert scale with 5 alternative answers made in the form of a checklist.

This research goes through four main stages as shown in Figure 1, namely define, design, develop, and disseminate. In the define stage, front-end analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives will be carried out. At the design stage, the benchmark reference text, media selection, and format selection will be carried out. At the design stage, an initial design will be produced. At the develop stage, expert validation and development trials will be carried out.

Data analysis used qualitative data analysis and quantitative data analysis. Qualitative data analysis was obtained through the define stage, namely through interviews with teachers in the field of biology and students of class XI MIPA 1 SMAN 1 Kutabuluh. The author designed a draft of interactive learning media based on Android applications. The results of the last qualitative data were obtained through the develop stage, namely through criticism and suggestions put forward by experts, the responses of teachers and students were collected to improve this interactive multimedia-based learning media product.

Quantitative data was obtained through the disseminate stage, namely through student learning outcomes tests in the form of multiple-choice questions conducted by students. This quantitative data was also obtained through the Likert scale contained in Table 1 as an assessment score for the validation results by material experts, media experts, teachers and students on the media result.

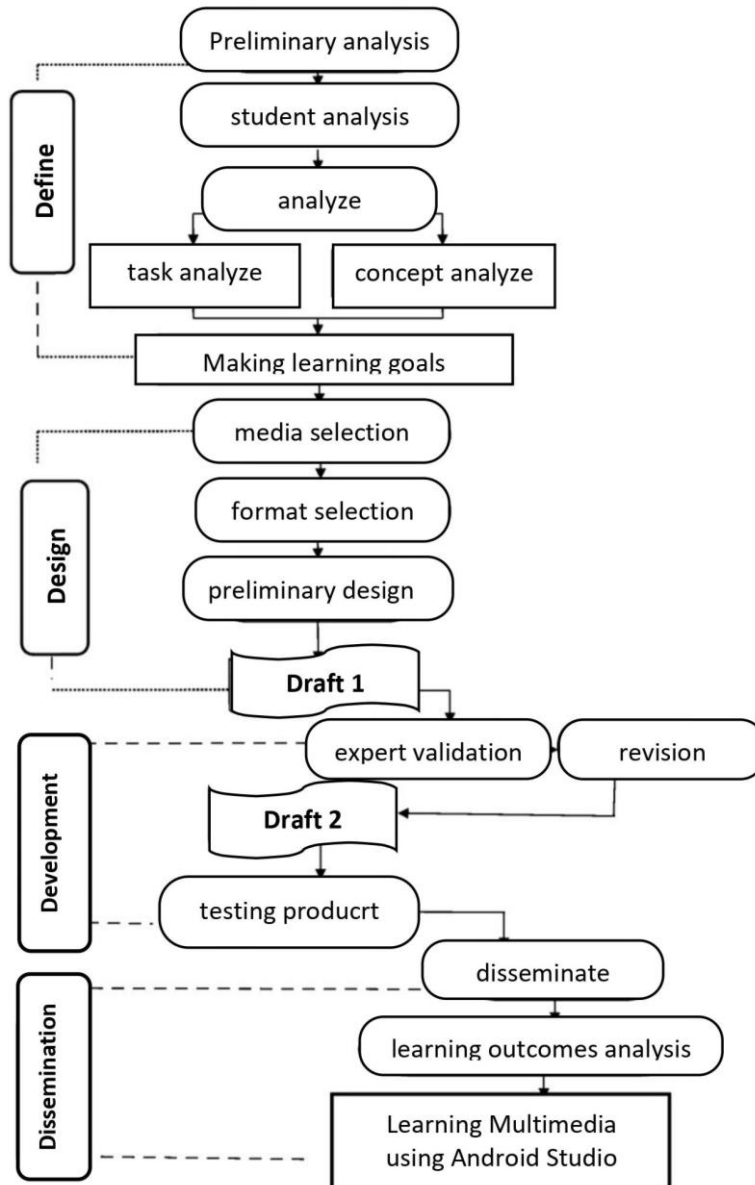


Figure 1. Learning multimedia development research procedures

In this study, the authors used a Likert scale with only 5 choices with quantitative/statistical data analysis. The five-scale conversion uses the conversion reference in the Benchmark Reference Approach (PAP) listed in Table 2.

Table 1. Criteria for Answers to Validation Instrument Items with a Likert Scale.

Respondenrespons	Score
Very less	1
Less	2
Enough	3
Good	4
Very good	5

Obtaining the average score range provided that on the Likert scale the ideal maximum score is 5 and the ideal minimum score is 1. Thus, the calculation of X_i and s_{bi} is obtained. A product developed can be said to be suitable for use if the results of field trials are at least included in good criteria. Based on these provisions, the results of the five scale calculations are obtained as can be seen in Table 3.

Table 2. Quantitative Data Conversion

Value	Score	Criteria
A	$X > X_i + 1,8 S_{bi}$	Very good
B	$X_i + 0,6 S_{bi} < X \leq X_i + 1,8 S_{bi}$	Good
C	$X_i - 0,6 S_{bi} < X \leq X_i + 0,6 S_{bi}$	Enough
D	$X_i - 1,8 S_{bi} < X \leq X_i - 0,6 S_{bi}$	Less
E	$X \leq X_i - 1,8 S_{bi}$	Very less

Note:

\bar{x}_i (average ideal score) = $1/2$ (maksimal score (ideal) + minimum score (ideal)

s_{bi} (standard deviation) = $1/6$ (minimum score (ideal) – minimum score (ideal)

Table 3. Conversion of Quantitative Data into Qualitative Data

Scale	Calculation	Results	Criteria
5	$X > 3 + (1,8 \times 0,67)$	$X > 4,2$	Very good
4	$3 + (0,6 \times 0,67) < X \leq 3 + (1,8 \times 0,67)$	$3,4 < X \leq 4,2$	Good
3	$3 - (0,6 \times 0,67) < X \leq 3 + (0,6 \times 0,67)$	$2,6 < X \leq 3,4$	Enough
2	$3 - (1,8 \times 0,67) < X \leq 3 + (0,6 \times 0,67)$	$1,8 < X \leq 2,6$	Less
1	$X \leq 3 - (1,8 \times 0,67)$	$X \leq 1,8$	Very less

RESULTS AND DISCUSSION

Learning media products based on Android Studio with food digestive system materials have several characteristics, namely: (1) products in the form of software that can be operated using Android devices; (2) the product supports high school biology learning on the food digestive system material; (3) the media can be used and operated inside or outside of Biology learning in schools with or without the presence of the teacher concerned. However, it does not mean that the position and role of the teacher is no longer needed after students use this Android Studio-based learning multimedia. Researchers and students can conduct discussions during school hours or online through WhatsApp groups if there is an explanation of material that is not clear and has not been understood by students; (4) learning can be done offline or not connected to the internet network, (5) this product operates according to the wishes of students and (6) the product presents a product designer profile menu, menu instructions, KI and KD menus for the digestive system, learning objectives menu, a menu of material explanations and videos for learning the digestive system of food, as well as a menu of practice questions in the form of quizzes that are presented in an interesting and interactive way.

The results of interviews through google meet that the need for technology-based media began with the response of students who consider technology-based media to convey material in the process of implementing the learning provided currently not sufficient and still limited. In addition, the implementation of learning that is

applied is still teacher-centered, so it is necessary to do a technology-based innovation in the form of learning multimedia products based on Android Studio.

This learning media product is in the form of a file in the android package (apk) format that can be installed via Google Drive on the student's smartphone, the learning media application will be automatically installed on the device.

The implementation of android studio-based learning as an independent learning resource is carried out face-to-face which is carried out in class XI IPA 1 SMAN 1 Kutabuluh. Independent learning is expected that students are able to learn independently and not depend on others. In independent learning, the researcher acts as a facilitator who helps students when experiencing obstacles and oversees the learning process. Researchers also play a role in preparing students before the learning takes place, such as thanksgiving and greetings, praying and checking student attendance. The next step, researchers provide motivation and appreciation to focus the attention of students by asking questions that have to do with the topic of the material to be studied. This question will be found by students themselves in the developed multimedia.

Students were free to determine and choose what part of the substance is studied and discussed first in every meeting that has been provided in multimedia, for example the material section first or the video section. Students are also given the opportunity to collect relevant information by observing, reading and answering questions as a test of student learning outcomes as well as knowing the extent to which students

development and understanding of the digestive system material is a source of independent learning. The implementation of the learning carried out frees students to conclude and express their opinions regarding the material being taught (Munir, 2012). Researchers also scheduled exercises at home for students by utilizing android studio-based learning multimedia as a source of independent learning.

When opening the learning application, the media display was designed attractively. This can be seen from the collaboration in terms of color, text, images, videos, sound effects, and animations. This learning media was easy to operate by students. The command buttons can be executed properly according to the instructions for using the application. Materials and practice questions in the form of quizzes presented on learning media have been packaged according to the SK/KD.

Multimedia initial display was shown in figure 2. The menu contained in the learning media consists of a profile menu located at the top left of the main display which contains information about the developer of learning media.



Figure 2. Multimedia Initial Display

Furthermore, at the bottom of the profile there is a menu of instructions in Figure 3 which serves to provide a brief description of the function of each menu button on the media, making it easier for users to use learning media. In the upper right corner there is a home menu that takes the user back to the main menu. The left corner and the lower right corner have a back menu to return to the previous view. While the next menu to return to the next view.



Figure 3. Display Menu Instructions

On the initial display, there was a menu that contains core competencies (KI) and basic competencies (KD) in Figure 4 which contains indicators to be achieved in the food digestive system material.



Figure 4. KI and KD Menu Display

Furthermore, there is a goal menu in Figure 5 which contains a series of what must be achieved in the learning given to students.



Figure 5. Learning Objectives Menu Display

The next menu was the material menu in Figure 6 which consisted of 4 meetings, the material menu contains a brief description of the material, accompanied by pictures that support the explanation of the material in Figure 7. The general description of the material can be divided into several parts, namely: (1). Meeting 1 discussed nutrition, food and nutrients, energy needs and balance, and nutritional management and a balanced diet. (2). Meeting 2 discussed the organs and digestive system of food in humans. (3). Meeting 3 discussed the structure and function of the digestive system of ruminants and, (4). Meeting 4 discussed disorders of the digestive system of food.



Figure 6. Learning Objectives Menu Display

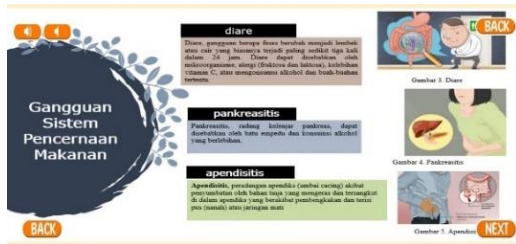


Figure 7. Learning Objectives Menu Display

The innovations developed by researchers in the material section include interactive learning videos, presentation of interesting pictures related to the topic of the lesson, audio to explain the material, there are exercises in the form of tests carried out by students and discussions. So that with this innovation students can use it as an independent learning medium because students can control the learning process according to their abilities, readiness, and desires.

This Android Studio-based media can also help teachers in learning because the teacher's burden to explain repeatedly about the content of the lesson can be reduced. This media also helps the teacher in delivering the material if a material is difficult to explain through words. Teaching can be given when and where it is desired or needed. The length of teaching time can be shortened to deliver a large number of messages and lesson content.

However, the weakness in Android Studio-based media as a source of independent learning was that educators cannot fully control whether participants are not distracted by other applications in Android during the learning process.

Based on [Miftah's research \(2014\)](#) in anticipating these things, it is necessary to equip students before implementing learning such as preparing their learning environment, for example space for studying and sitting position. Next, prepared students, for example providing motivation to create conditions for why it is necessary to know something and other ways that aim to direct attention to certain aspects of the lesson so that the expected learning occurs.

The next menu was the video menu which is presented in the form of sentences, images, animation, and sound, the initial display of the video menu is in Figure 8 while the video content display is in Figure 9.



Figure 8. Initial Video Menu Display



Figure 9. Video Content Display

Discussions related to the digestive system material that have been presented in the material menu will not repeat the same material again on the video menu but reinforce each other. The next menu was the quiz menu in Figure 10 which contained practice questions packaged in the form of multiple choice with options A, B, C, D and E. This quiz aims to ensure students can completely master the competency standards of a learning unit.

The time provided in answering the quiz was 20 minutes with 20 questions. Each question is given 5 points, so if students answer all questions correctly then $20 \times 5 = 100$ points. When starting the quiz, the student's identity must be filled in first. After completing the quiz, the android application will provide all the answers and discussion of each question in Figure 11.



Figure 10. Initial Display of Quiz



Figure 11. Display of Quiz Result

Students who answered incorrectly or correctly can see the correct and correct answers and discussions, so that students really understand the question. In determining the level of eligibility, the resulting product was that the product developed is in accordance with the needs of

students and was worthy of being tested on students as a source of independent learning, then the feasibility of the media can be obtained based on the assessment of teacher and student experts. The results are in Table 4.

Table 4. Results of Android Studio-Based Learning Multimedia Assessment by Material Experts

Aspect	Componen	Number of items	Score
Content	curriculum	3	13
	user	5	21
Total		8	34
Average			4,3
Learning activity	introduction	2	9
	core activity	10	44
	closing	4	17
Total		16	70
Average			4,4

The average total score on the aspect of content quality, which is 4.3, lies in the value of $X > 4.2$ which included in the "very good" criteria and the average total score on the learning aspect, which is 4.4, lies in the value of $X > 4.2$ which is included in the "very good" criteria. It can be concluded that the learning media based on Android Studio was a material for the digestive system that was very suitable to be used for research. The questions presented in the form of

quizzes contained in the learning multimedia based on Android studio have also been validated by material experts so that they are declared suitable to be used to see the percentage of classical learning completeness of students in class IX IPA 1 SMA N 1 Kutabuluh. Comments and suggestions were given by material experts had been considered by researchers for the sake of product perfection.

Table 5. Results of the Android Studio-Based Learning Multimedia Assessment by Media Experts

Aspect	Componen	Number of items	Score
Display	Layout	2	9
	Teks/ typography	3	13
	Image	3	12
	Animation	2	9
	Audio	2	9
	Video	2	10
	Packaging	3	13
	Total		17
Average			4,4
Programing	Utilization	5	22
	Navigation and <i>Interactive link</i>	2	8
	Total	7	30
Average			4,3

Adjusting the conversion of quantitative data to qualitative data, stated that the average total score on the aspect of display quality is 4.4 lies in the value of $X > 4.2$ which is included in the "very good" criteria and the average total score on the programming aspect is 4, 3 lies in the value of $X > 4.2$ included in the "very good" criteria. It can be concluded that the learning media based on

android studio material for the digestive system is very suitable to be used for research.

Biology Teacher Assessment

Based on the assessment of the biology teacher, known that there were two aspects that will be assessed, namely the material aspect and the display and program aspect. Adjusting the

conversion of quantitative data to qualitative data, it was stated that the average total score given by the biology teacher to the material aspect was 4.8, which was located at the value of $X > 4.2$ which included the "very good" criteria.

The average total score on the aspect of the display and program is 5, which lies in the value of $X > 4.2$ which is included in the "very good" criteria. It can be concluded that the learning

media based on Android Studio material for the digestive system is very suitable to be used as an independent learning resource. Overall, the 2 aspects of the assessment by the teacher of the field of study when combined are getting a score of 4.9. This proves that the Android Studio-based interactive media developed by the researcher is suitable for use by students.

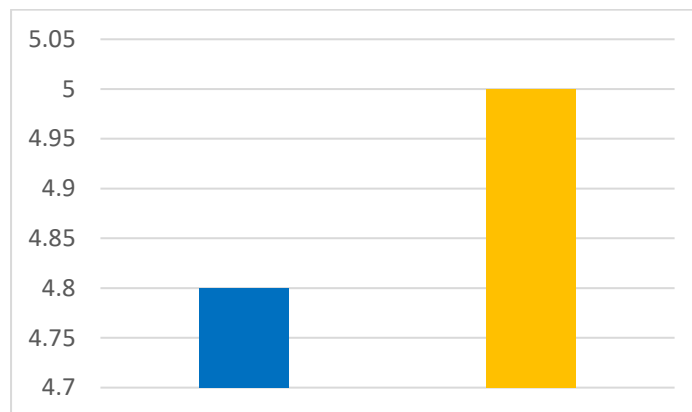


Figure 12. Biology Teacher Assessment in Every Aspect: content (blue); display and program (orange)

Students' respons

Positive comments and suggestions as well as assessments given by students on individual trial, small group trial and large group trial. Figure 13 describes the product developed by the researcher which is highly appreciated by students. Through the developed media, it can help and make it easier for students to learn and become a solution to the obstacles experienced by students during the teacher-centered learning period, students

feel more enthusiastic and can repeat material that has not been understood. The learning media does not require internet quota, so students are free to open the application anytime and anywhere (Amanda et al, 2020). Learning is also not monotonous because the developer contains structured learning menu offerings and improves an attractive and useful android application display for the implementation of learning.

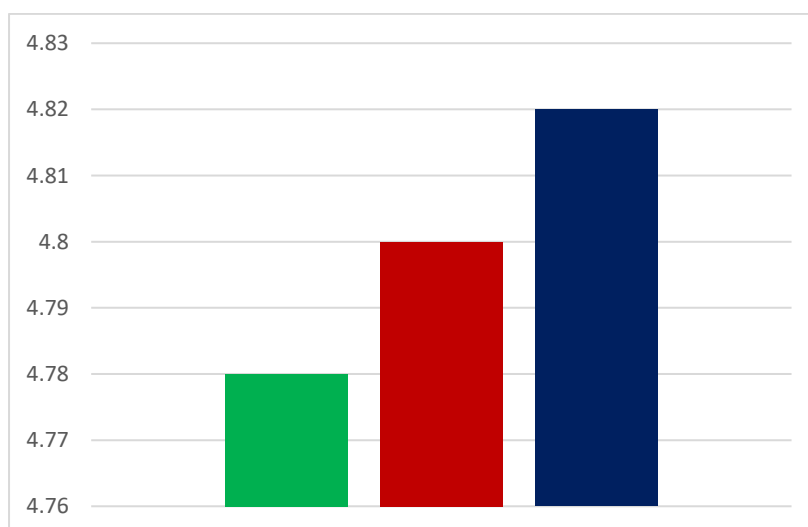


Figure 13. Student responses at three levels of testing: individual trial (green); small group trial (red); group trial (blue)

Through the bar graph above, it can be explained that the multimedia product developed by the researcher is in the "very good" criteria. The total score of the product, especially in the large group trial, was at a value of $X > 4.2$, which was 4.8. This means that this product is suitable for use as a source of student self-study. The X value of 4.8 also explains that the product developed by the researcher is designed according to the needs of students.

In addition, the supporting data that shows the success of student learning and the achievement of learning objectives after using learning multimedia based on Android Studio can be seen from the percentage of the number of students who achieve the minimum completeness score, which is 94% with an average value of 90.13. Based on this value, the product developed by the researcher was declared successful in helping students learn because the percentage of classical completeness proposed by Hasibuan et al. (2019) and Daryanto (2014) of 85% were met. Relevant research by [Ramdani et al. \(2020\)](#) which has tested the feasibility of multimedia through expert validation explains that using Android Studio-based multimedia is feasible and effective to implement in the implementation of learning.

CONCLUSION

Based on the results of the research and discussion that have been described, it can be concluded that the learning multimedia developed using Android Studio has met the eligibility criteria for material expert responses with an average score of 4.3 which is included in the "Very Good" criteria. The learning multimedia developed using Android Studio has met the eligibility criteria of media expert responses with an average score of 4.4 which is included in the "Very Good" criteria.

Based on the teacher's response in the field of multimedia learning that was developed using Android Studio, it was included in the "Very Good" criteria with an average score of 4.9 and included in the "Very Good" criteria with an average score of 4.8 based on student responses. The classical learning completeness of students of class XI IPA SMA N I Kutabuluh after using learning multimedia as a source of independent learning got a percentage of 94%.

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