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DEVELOPMENT OF AN ANDROID-BASED RAIMA APPLICATION MEDIA TO IMPROVE STUDENTS' MASTERY OF CONCEPTS

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Abstract
With the presence of technology, teachers must be able to balance and utilize technology in the learning process. One implementation of technology is the development of learning media. However, there is still a lot of learning in elementary schools that does not fully use technology-based media. All subjects, especially science subjects, require the use of media. This is because material science still contains abstract objects that are difficult to define. The aim of this research is to determine the feasibility and effectiveness of media on food chain materials in improving the concept mastery of fifth grade elementary school students. The R&D (Research and Development) method was used in this research, with the ADDIE development model which consists of five stages, namely: analysis, design, development, implementation, and evaluation. The research was carried out at one of the elementary schools in Rancaekek District, Bandung Regency, West Java, with research subjects involving material expert validators, media experts, teachers and 26 class V students. Data collection techniques in this research were interviews, observations, questionnaires and tests in the form of questions. tests given to students. This research resulted in a product in the form of an Android-based media application which was carried out a feasibility test by giving a questionnaire to validators and received a very feasible category. Then pretest and posttest results by design one group pretest-posttest, got significant results that show there is a difference in the results pretest and posttest, this means that student learning outcomes have increased. So it can be concluded that the product developed by researchers is very suitable for use as a learning medium and is able to improve students' mastery of concepts.
Keywords: *media; android applications; science subjects; mastery of concepts*

Abstract
Dengan hadirnya teknologi, guru harus dapat mengimbangi dan memanfaatkan teknologi dalam proses pembelajaran. Salah satu implementasi teknologi adalah pengembangan media pembelajaran. Namun, masih banyak pembelajaran di sekolah dasar belum sepenuhnya menggunakan media berbasis teknologi. Semua mata pelajaran, terutama mata pelajaran IPA, membutuhkan penggunaan media. Ini karena materi IPA masih mengandung objek-objek abstrak yang sulit didefinisikan. Tujuan dari penelitian ini untuk untuk mengetahui kelayakan dan efektivitas media pada materi rantai makanan dalam meningkatkan penguasan konsep siswa kelas V SD. Metode R&D (Research and Development) digunakan dalam penelitian ini, dengan model pengembangan ADDIE yang terdiri atas lima tahapan yaitu: analysis, design, development, implemention, dan evaluation. Penelitian dilaksanakan di salah satu Sekolah Dasar Kecamatan Rancaekek Wetan Kabupaten Bandung, Jawa Barat dengan subjek penelitian melibatkan validator ahli materi, ahli media, guru dan 26 siswa kelas V. Teknik pengumpulan data pada penelitian ini dengan melakukan wawancara, observasi, angket dan tes berupa soal tes yang diberikan kepada siswa. Penelitian ini menghasilkan sebuah produk berupa media aplikasi berbasis Android yang sudah dilakukan uji kelayakan dengan memberikan angket kepada validator dan mendapatkan kategori sangat layak. Kemudian hasil *pretest* dan *posttest* dengan desain *one group pretest-posttest,* mendapat hasil signifikan yang menunjukkan adanya perbedaan dari hasil *pretest* dan *posttest,* artinya hasil belajar siswa mengalami peningkatan. Sehingga dapat disimpulkan bahwa produk yang dikembangkan peneliti sangat layak digunakan sebagai media pembelajaran dan mampu meningkatkan penguasan konsep pada siswa.
Keywords: media pembelajaran; aplikasi android; mata pelajaran IPA; penguasaan konsep

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Introduction

All fields are affected by technological advances, including education. Technological advances play an important role in the field of education and have a big impact on learning activities. With the emergence of increasingly sophisticated technology, teachers not only have to be professionals, teachers also have to be able to balance and utilize technology in the learning process (Maulani et al., 2022). With advanced technology, future classrooms will no longer consist of cubicles. Students can choose when and where they want to study. In addition, teaching will not be limited to the process of conveying information, but also needs to teach students how to obtain information. Therefore, multimedia devices are very important to achieve this goal (Anuar et al., 2019). Learning media development is one way technology is used in education. Achieving learning goals is an indicator of educational success (Siti Deti Nurhamidah et al., 2022). A number offactors, one of which is that learning media greatly influences the achievement of learning objectives.

Learning media is one of the tools that educators can use to present material so that students are interested and involved in learning (Wulandari et al., 2023). Learning media can be used to visually represent or explain concepts that are difficult to understand, both written and verbal. Learning media has a big influence on learning activities because media is one of the determinants of whether the learning process is good or not. The use of learning media can determine whether the teaching process is successful, effective and interactive or not. Learning that uses media is very important (Abdurrochim et al., 2022; Saniah, SL, & Pujiastuti, H., 2021).Learning media becomes a bridge for teachers to be able to help teachers provide information that has not been or has not been conveyed to their students (Catur Prasetiyo & Yuliawati, 2021).

As technology advances, teachers will be able to use it for learning. Teachers can provide varied learning media that can foster students' interest in learning (Azizah, 2023). The sophistication of computers and rapidly advancing technology can now be utilized for the development of learning media (Said et al., 2021). However, in reality, according to the findings of researchers in one of the elementary schools in Sukamanah District, teachers only use student textbooks to explain the material during the learning process. This makes students easily bored, students' interest and understanding of the lesson becomes low. Something static and formal like a textbook will not arouse their interest (Latif et al., 2023). Students' interest and interest in learning will be affected if learning media is not used enough. Putri & Nurafni (2021)stated that the lack of focus and interest in students' learning was caused by the inadequate use of learning media. As a result, students get bored easily and are not interested in learning. Thus, if the learning process is allowed to continue, it will result in the learning objectives not being achieved.

The need to use media to understand the content of each subject. One of them is Natural Sciences (IPA) subjects. These subjects are defined as science knowledge competencies, which means the ability to understand certain concepts and information related to science material that students must learn through relevant learning activities and expressed in a certain scale of grades or performance (Adi Merta et al., 2020).

The information that students capture is influenced by their understanding of a subject, so this is important.The main goal of learning is that students are able to understand the concepts of the material being taught. Student concept mastery is defined as the student's ability to understand lesson material (Rahmah et al., 2018). Students' mastery of concepts determines the level of success of students' participation in learning activities and successThe extent to

which teachers are able to increase student enthusiasm, encouragement, interest and learning outcomes through classroom management depends on how well students understand the topics being taught. Therefore, mastery of concepts is very important for every student to have (Juneli et al., 2022).

Science is one of the subjects that requires visualization. Discusses various objects and phenomena that cannot be understood only by text (Wusqo et al., 2021).One of the topics discussed in elementary school science is the food chain. Creatures are eaten and devoured in a certain order is known as a food chain. Food provides energy for living things. Energy is essential for all living things to survive. In the food chain, living things act as producers, consumers and decomposers. There are three categories of consumers: level 1, level 2, and level 3 consumers. Food chain material is complex material for elementary school students because this material relates to interconnected living things, such as plants and animals. Therefore, so that students can understand the subject matter, appropriate learning media is needed. The right learning media will help students understand the lesson material (Aeni et al., 2022).

Considering the characteristics of 21st century students, they are very familiar with technology. Mobile phones (HP) or smartphones are no longer foreign objects for elementary school children (Aeni et al., 2023). According to (H. P.S. Muttaqin et al., 2021) in fact,more actively use Android devices because they tend to use them more often than books. Taking this into account, creating technology-based learning media such as Android-based media could be an alternative. Fikri et al. (2021) explains the two main principles of learning media, namely: (1) students can access it anytime and anywhere as a source of independent learning; and (2) teachers can use it as a learning resource when teaching students. In line with what was said by Wiranda & Masniladevi (2020) Android-based learning media is attractive to students because it pays attention to the daily routines of those who use smartphones more often.

Technology-based learning media can be a breakthrough that helps overcome problems in the world of education (Heswari & Patri, 2022). Android-based application media can be used and developed as learning media via smartphone (Fitriyani et al., 2023). Using smartphones to create learning media can increase students' interest in learning (Savitri & Karim, 2020). By using Android-based media in learning, students will get greater benefits from using their smartphones for learning purposes. The use of Android-based application media can increase students' responsiveness to reduce boredom during learning (Nur Aeni et al., 2022).The use of smartphone applications for learning which is more profitable than traditional learning indirectly increases student involvement in learning (Ismail, 2017). Some of the advantages of Android-based learning media applications are attractive designs, including images, animations, colors and text (Anita Adesti & Siti Nurkholimah, 2020).

Based on the explanation above, researchers are interested in developing an Android-based learning media. The development of Android-based application media products is not the first time. Several studies that are relevant to this research include those conducted by Hartana et al. (2022) shows that the validity of Android-based learning media about the human digestive system is "Very Good". Android-based learning media theincreasing student motivation and learning outcomes. Thus, this media is suitable for use as a learning medium. Furthermore, research conducted by Firdaus et al. (2022) media and materials experts praised the Android-based learning application that had been produced. This media has received feasibility and effectiveness in the medium category, which shows that the application can be used well during learning. Presearch from Siti Deti Nurhamidah et al. (2022) that the use of Android-based learning media on solar system material is very useful and practical for increasing students' understanding. This media obtained a high level of feasibility, based on the results of the pretest

and posttest, it received a higher score after using Android-based learning media. Therefore, this media is ideal for use as a teaching aid to help students develop their understanding of the subject matter.

However, several studies conducted have not displayed 3D images in the applications they have created. This is important because students can see 3D images, as if the objects looked real, students can also listen to explanations of the material in the video, so it can help students understand the material. The learning media developed is the Android-based RAIMA Application Media. This Android-based application media development includes a 3D display along with explanatory videos and games. Researchers developed this media to make it easier for students to understand the material, especially complex food chain material. Material that is abstract, complex and difficult to understand requires appropriate media according to learning needs (Muktiani et al., 2022).

This research developed a product with the aim of finding out the feasibility and effectiveness of media on food chain material to improve the concept mastery of fifth grade elementary school students.

Research methods

Type of research used in research This uses R&D (Research and Development) which will produce the final product in the form of Android-based application media. The R&D method is a research and development method used to produce products or develop products and to test how effective the product to be made is (Ersila et al., 2023). This research was conducted in the 2023/2024 academic year at one of the elementary schools in Rancaekek District, Bandung Regency, West Java. A total of 26 fifth grade elementary school children, instructors, media experts and material experts were used as research subjects. The research procedure used in this research is the ADDIE development model. The ADDIE model consists of five stages, namely, 1) Analysis, 2) Design, 3) Development, 4) Implementation, and 5) Evaluation.

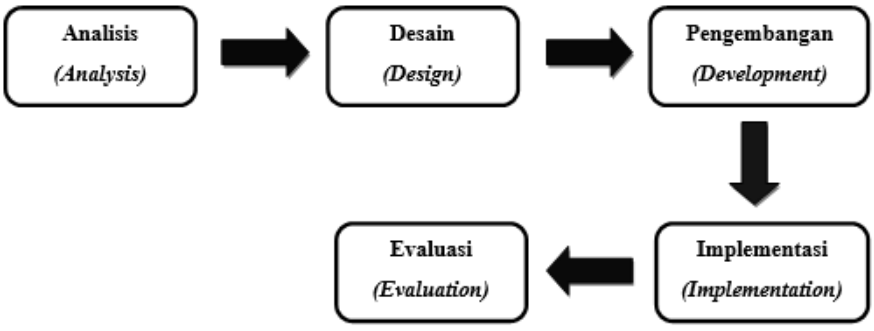

Figure 1.ADDIE Development Model

The first stage (Analysis), analyzes student learning needs, student characteristics, and the learning environment. At this stage, observations and interviews were carried out with class V teachers. The second stage (Design), carried out a design for the product to be developed. The third stage (Development), at this stage, realizes the previous product design into real media and is ready to be used. Next, a product feasibility test is carried out in terms of validation aspects carried out by material expert validators and media experts. The fourth stage (Implementation), after the media has been validated by experts, the media is then tested on teachers and students. Product trials were carried out to determine the feasibility and

effectiveness of the media in increasing the understanding of class V students. The fifth stage (evaluation),Activities are carried out to collect input and suggestions for the learning media created.

Qdata collection techniques using observation,interviews, questionnaires and tests. The instruments used were interview sheets, expert assessment questionnaire sheets and teacher responses and test questions. This research uses qualitative and quantitative descriptive analysis techniques. Qualitative data analysis in the form of criticism and suggestions from material experts and media experts to follow up on products based on validation results. Qualitative data was obtained from interviews, observations, questionnaire results from material and media experts and teacher responses. Meanwhile, quantitative data analysis interprets data into numbers. Quantitative data was obtained from validation scores from material experts and media experts, teacher response questionnaires and student test results which were calculated using descriptive statistics presented in tabular form.

Results and Discussion

In this digital era, learning in schools must be adapted to the demands of the times, educators must be able to utilize technology so that learning becomes interesting and fun for students. One of them is by developing Android-based learning media. The solution that is considered appropriate for improving student learning outcomes is developing Android-based learning media (Seftiana, 2022).

From the results of observations and interviews that have been conducted, it can be seen that in this elementary school, learning activities only focus on textbooks, even though facilities such aswifi is available. However, these facilities have not been fully utilized for learning. Based on this, researchers developed Android-based learning media in the form of Android-Based RAIMA Application Media Development to Improve Students' Mastery of Concepts. This research uses the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation and Evaluation.

At the analysis stage,identification of what kind of learning media will be developed by analyzing learning needs, student characteristics and the learning environment. The analysis stage is the initial stage for making initial observations with the aim of finding and exploring information about the use of learning media in the field (Yallah & Huda, 2022). During this stage, researchers looked for information about the learning media that students needed. Researchers conducted observations and interviews with class V educators. The results of the interviews showed that when the learning process took place they still often used the lecture method, students' textbooks remained the main learning source and learning media used during the learning process. Then it was proven that when conducting observations it was seen that students were less involved in learning, students showed signs of boredom and were less involved in learning. They also tend to be passive and some do not pay attention to the teacher. Student involvement is based on active student activity and student interest in learning (Muttaqien, 2017). This is a factor that causes learning to become monotonous and students' low interest in learning. So learning media is needed to convey material in an interesting way and foster student interest and facilitate student understanding of the material. The availability of learning media can help improve learning outcomes, encourage students to participate more actively in class, and make learning more interesting (Maulidia et al., 2023). Next, learning media that is attractive to students is determined through analysis of student characteristics. Based on observations and interview results, quite a few students already have smartphones at this elementary school. During break time, students are adept at using their smartphones to play

games, watch YouTube and open other applications. Students can even play with their smartphones for a long time because the display on the smartphone makes students interested in using it. Lee & Hancock (2023) suggests that the results of a recent nationally representative survey of American teenagers found that elementary school students (ages 8 to 12) spend an average of four hours online a day. Then analyze the learning environment, determine the media that can be used according to the situation and conditions of the school environment. Based on observations and interview results regarding facilities and infrastructure, WiFi is provided in schools and almost all students have smartphones. However, interview results show that teachers have not fully utilized technology in learning. In fact, the conditions of the learning environment that are already supportive can be utilized by teachers to make the learning process interesting. Thus, because schools already support the use of smartphones as learning media, such as Android-based applications, researchers are interested in developing technology-based learning media.

After the analysis stage is carried out, then the design stage follows. Starting from making the first step, namely creating a design for learning media. Before making a product, a design stage is carried out to ensure that the media to be created meets the needs of the subject (Yallah & Huda, 2022). The product that will be made will include material regarding the food chain. The design begins with (1) creating a flowchart and storyboard for an Android application media product. Making flowcharts and storyboards as a step guide for designing media in a sequential and directed manner (Purba & Sujatmiko, 2023) (2) create a PowerPoint design according to the selected material, (3) prepare several images, 3D images, icons, videos, materials and background sound to support the appearance of the application to make it more attractive. (4) prepare several tools that support developing products such as Power Point 2019,İspringsuite 11 and Website 2 APK Builder, (5) designed the validation tools needed to assess the quality of the product being created as well as the pretest and posttest questions needed to measure the effectiveness of the product.

Enterat the media development stage based on previous designs. Realizing flowcharts and storyboards into real media and ready to be used is carried out at the development stage (Afriani et al., 2022). At the design stage, what was previously prepared was inserted into Power Point 2019 and arranged according to the flowchart. Next, the Power Point display is edited using iSpringSuite 11. In iSpringSuite 11, select the player menu and slide properties menu to change the screen appearance on Android and add background sound. Then, select the publish menu to convert the PowerPoint file into an HTML link. The HTML link is entered into Website 2 APK Builder to convert it into an application that can be used on Android. The application created is called the RAIMA application. The following is a media display of the Android-based RAIMA application.

Figure 2. Initial display of the application

Figure 3. Main menu display

Figure 4. Display of material options

Figure 5. Material display

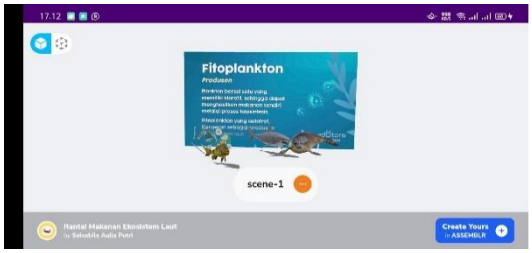

Figure 6.3D views and explanatory videos

In **figure 2**. the application's main menu contains learning objectives, instructions for use, materials, games, bibliography and developer profile. Then in the food chain material in **Figure 6.** the researcher included a 3D display along with an explanatory video. With the RAIMA application media, it is hoped that it will make it easier for students to understand food chain material.

Furthermore,researchers validate the media products developed. Media must go through a validation process before feasibility testing is carried out (Ramadhani & Rahayu, 2022). Validation is an examination of some content given to validators (experts in the field) to evaluate learning media with the aim of determining whether the learning media is in accordance with the needs of student users or not (Nisa' & Nugroho, 2023). Validation is carried out by material experts and media experts. Expert lecturers in the science field of study as material expert validators and lecturers who have skills in the media field as media expert validators. The following are validation results from material experts and media experts.

Table 1. Validation results by validators

No.	Validator	Score		Percentage	Category
		Total	Maximum score		
1.	Material expert	105	110	95,45%	Very worthy
2.	Media expert	1,212	1,260	96,19%	Very worthy

Material validation uses a validation sheet containing 11 statements. Based on the validation results, the percentage is 95,45% with a very feasible category. Then the validation sheet used in media validation contains 16 statement items. Based on the validation results, a percentage of 96,19% was obtained with a very feasible category. Thus, the Android-based RAIMA media application can be said to be suitable for use because of its attractive appearance and design and ease of use. It also contains material suitable for science learning in elementary schools.

Next is the implementation stage, which begins after the validator deems the product feasible and ready to use. Furthermore, products in the form of media can be tested on teachers and students. The aim of this trial is to determine the suitability of the RAIMA application media as a learning tool and its efficacy in improving the understanding of class V students. The

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teacher was given a questionnaire and class V students consisting of 26 people received pretest and posttest questions as part of the assessment process. The following are the results of the response questionnaire given to teachers.

Table 2. Teacher response questionnaire results

No.	Response Questionnaire	Score		Percentage	Category
		Total	Maximum score		
1.	Teacher	46	50	92%	Very worthy

In the table above, the percentage obtained is 92% in the very feasible category. This shows that the Android-based RAIMA application media is suitable for use as a learning tool. The data above is in line with research conducted byAlfra Siagian et al. (2023) that the development of Android-based learning media is very feasible and has received a good response from users and the existence of this learning media can help and support learning.

The next stage is conducting a pretest and posttest on students. The pretest and posttest were given to 26 class V students. The pretest questions were given early because they were to measure students' understanding abilities at the beginning of learning regarding the concept of food chain material before using the RAIMA application media. Then, when learning, students are directed to use the RAIMA application media. After learning is complete, students are given another test, namely a *posttest*, to determine students' understanding of the concept of food chain material after using the RAIMA application media during learning. Furthermore, because the number of subjects was less than 50 people, the researchers carried out a normality test on the *pretest* and *posttest* data using the Shapiro-Wilk test. The hypothesis used is H_0 indicating that there is no difference between the pretest and posttest scores, and H_1 indicates that there is a difference between the pretest and posttest scores.

Tests are carried out to ensure whether the data is normally distributed or not. The requirement for hypothesis testing is to accept H_0 if the probability value obtained exceeds or is equal to the significance level ($p=value \geq \alpha$), then the data is not normal. Meanwhile, if the data is normally distributed, reject H_0 if the probability value obtained is smaller than the significance level ($p=value \leq \alpha$). The pretest and posttest normality tests gave the following results.

Table 3. Normality Test Results

	Statistics	df	Sig.
Pretest	.948	26	.208
Posttest	.940	26	.132

The data is normally distributed, meaning that H_0 is rejected and H_1 is accepted, according to the normality test results shown in the table above showing the Sig value. or significance, for pretest and posttest data is ≥ 0,05. After obtaining normally distributed data, a Paired Sample T-test was carried out to determine whether there were differences in student scores before and after using the Android-based RAIMA application media during the learning process. This test is also intended to evaluate how effective the media is in improving students' mastery of concepts.

The hypothesis used is H_0 : there is no difference in students' initial abilities and after using the Android-based RAIMA media application, and H_1 : there is a difference in students' abilities before and after using the Android-based RAIMA media application. The test criteria are to accept H_0 if the opportunity value obtained is more than or equal to the significance level ($p=value \geq \alpha$) and reject H_0 if the opportunity value obtained is smaller than the significance level

(p=value≤α). Next, the pretest and posttest results are compared so that they can be known. How effective is the Android-based RAIMA application media in improving students' mastery of concepts. The following are the results of the *Paired Sample T-test.*

Table 4. ResultsPaired Sample T-test

	Mean	N	Std. Deviation	Std. Error Mean	Sig.(2-tailed)
Pretest	51.73	26	15,871	3,113	,000
Posttest	79.23	26	9,767	1,915	

The results of the Paired Sample T-test show that the probability value is sig = 0,000 < 0,05, meaning that H_0 is rejected. So it can be said that there is a significant difference between students before and after using the Android-based RAIMA application media. The mean value obtained was 51,73 for the pretest and for the posttest it was obtained 79,23. With this, it can be seen that after using the Android-based RAIMA application media, students' scores increased so it can be said that the Android-based RAIMA application media was able to increase class V students' mastery of concepts in food chain material.

The final stage of this research is evaluation. The evaluation stage is where activities are carried out to collect input and suggestions for the learning media created (Safitri et al., 2023). The research results show that the Android-based RAIMA application media has a good level of media feasibility and effectiveness. The validation results carried out by media and material experts show the level of suitability of the media. Then the results of the pretest and posttest of students who experienced improvement before and after using the Android-based RAIMA application media also showed the effectiveness of the media.

The Android-based RAIMA application media has been said to be effective as a learning medium in improving students' mastery of concepts, apart from the improvement in pretest and posttest results, as well as because of its attractive appearance. The RAIMA media application is equipped with 3D image displays, videos, text material and games that can attract students' attention. An attractive display of learning media will help increase student concentration and student motivation towards learning (Agustira, S., & Rahmi, R., 2022). Because it is presented in an attractive and fun display, learning media applications help students remember what the teacher (Fikri et al., 2021).

The presence of government mediaAndroid-based learning, teachers feel more helped in conveying knowledge when Android-based learning resources are available and students are also wiser in using technology for learning. In line with opinion Afriani et al. (2022)that the existence of Android-based learning media helps teachers convey material more easily and teachers can also introduce technology-based learning media to students.

This research is in line with previous research conducted by Khasanah et al. (2023) Teachers and students consider SIAR media to be "very appropriate" media. Android-based learning media developed with the help of Ispring Suite 10 and Wesite APK 2 Builder. Further research from Rahayu et al. (2022) shows that because Android-based learning material is provided in an interesting and fun way, students are better able to remember the material taught. Thus, class V students' mastery of food chain material can be improved by using the Android-based RAIMA application as a learning medium.

Conclusion

Development of Android-based RAIMA application media for learning that is feasible and effective to use. Validation results from media and material experts as well as teacher responses in the very appropriate category show the suitability of the media. At the same time,

there was a significant increase in media efficacy shown by the pretest and posttest results. This shows that the Android-based RAIMA application media can improve students' mastery of concepts and is suitable for use as a learning tool for science subjects for food chain material in class V elementary schools.

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