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The Development of Science Learning Media Using Android Applications in Solar System Subject

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Abstrak

Penelitian ini menggunakan metode Penelitian dan Pengembangan atau disebut R&D (*Research and Development*). Model pengembangan yang digunakan dalam penelitian ini adalah ADDIE (*Analysis, Design, Development, Implementation, and Evaluation*), namun peneliti hanya membatasi sampai tahapan *development* atau pengembangan. Penelitian ini bertujuan untuk menghasilkan dan menguji kelayakan media pembelajaran IPA berbasis android pada mata pelajaran tata surya khususnya pada kelas VI SD. Teknik pengumpulan data yang digunakan ialah studi literatur serta angket/kuesioner. Uji kelayakan produk dilakukan oleh ahli media dan ahli materi. Teknik analisis data dilaksanakan secara kualitatif dan data kuantitatif. Berdasarkan uji kelayakan yang dilakukan oleh para ahli, dapat diketahui bahwa hasil validasi oleh ahli media memperoleh rata-rata sebesar 4,69 sehingga menunjukkan kategori “Sangat Layak”, kemudian pada hasil validasi oleh ahli materi memperoleh rata-rata sebesar 4,32 sehingga masuk dalam kategori “Sangat Layak”. Berdasarkan data tersebut, maka dapat disimpulkan bahwa media pembelajaran IPA berbasis aplikasi *android* pada mata pelajaran tata surya layak digunakan sebagai media pada pembelajaran IPA khususnya materi tata surya.

Kata Kunci: Media, Aplikasi, Android, Tata Surya

Abstract

This research uses R&D (Research and Development). The model used in this research is ADDIE (Analysis, Design, Development, Implementation, and Evaluation), but the researcher only limits it to the development stage. This study aims to produce and test the feasibility of Android-based science learning media in solar system subjects, especially in the sixth grade. Data collection techniques used is literature studies and questionnaires/questionnaires. The product feasibility test is carried out by media experts and material experts. The data analysis technique was carried out qualitatively and quantitatively. Based on the feasibility test conducted by the experts, it can be seen that the validation results by media experts obtained an average of 4.69 which indicated the "Very Worthy" category, then the validation results by material experts obtained an average of 4.32 so it entered in the "Very Worthy" category. Based on these data, it can be concluded that the Android application-based science learning media in the solar system subject is appropriate to be used as a medium for learning science, especially the solar system subject.

Keywords: Media, Applications, Android, Solar System

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INTRODUCTION

Ilmu Pengetahuan Alam (IPA) also known as Natural Sciences is one of several lessons that must be mandatory in elementary schools and is also one of the fields of science that makes the natural environment around us the object of study (Sahibu & Disyan, 2018: 245). This is in line with the thoughts of Irfan et al. (2019: 19) who state that science is studies that occur in nature. Science learning in elementary schools uses general science concepts whose subjects have not been separated. In the science learning, students are expected to have many opportunities to develop skills by carrying out various activities, including researching various scientific facts, especially those related to daily life, observing various objects or natural events, practicing the application of scientific concepts in everyday life, and doing various activities or science experiments (Miftianul & Gunawan, 2020: 169).

The implementation of science learning in elementary schools has its challenges to be able to become subjects that can equip students with a conceptual understanding of the natural environment. Based on the research conducted by Dedynggego et al. (2015: 46)) the delivery of science material in the Solar System subject is still through books or two-dimensional images so students have to imagine for themselves how rotation, revolution, and so on can occur in the solar system. The Solar System is real matter and exists all around us but is abstract. This means that the solar system has a form but it is impossible for the teacher to bring the original form of the solar system. Suprihatin in Suryandaru & Setyaningtyas (2021: 6041) states that teachers are expected to be able to apply interesting learning and which can lead to motivation to learn or motivate students. Since the material in the Solar System is abstract, teachers need to make appropriate efforts so the abstract material can be easily understood and understood by students. Learning media is one of the means to convey information about a learning concept that can be received very well (Sari & Setiawan, 2018:101). Wahyu et al., (2020: 108) revealed that many studies prove that the use of learning media can change the learning patterns, in the sense that students who were previously objects become the main subjects of learning to make learning more interactive, participatory, and collaborative. Nadjurodin (2015: 13) suggests that the function of learning media is to increase students' motivation to learn, clarify and complete the information provided verbally, as well as create enthusiasm and reduce student boredom while studying. According to Annisa (2019: 26), current learning media still use the conventional media of books and wall Images or still images, thus making the learning atmosphere monotonous and less interesting. This is in line with Suparman et al., (2020: 251) who revealed that in general learning in elementary schools still uses conventional learning where teachers still use the lecture method so that students in a class are less active and less enthusiastic.

It is not only influenced by effective communication to achieve optimal learning, but it is also necessary to pay attention to the media used by teachers in delivering learning materials (Muttaqin et al., 2021: 2). Learning media according to Prasetyo (2017: 15) is a tool that has a function in conveying learning messages. The implementation of media in learning or teaching activities does not intend to replace the role of the teacher, but to complement and assist teachers in delivering material or information (Hasan, 2021: 224). Learning media according to Arsyad in Abdullah, (2017: 43) has various types, including visual media, audio-visual, multimedia, and reality. The benefit of using audio-visual learning media in classroom learning will make learning more interesting, effective, and efficient to provide new experiences for students (Rosidah, 2016: 124).

Advances in science and technology influenced the use of teaching aids in various schools and other educational institutions (Muhson, 2010: 1). Tahl & Ginting, (2019: 114) revealed that recently many learning media have been integrated with information technology to make it easier for students and teachers to access the media. Aquami in Vivi (2021: 1343) states that the excess use of technology in learning makes student performance better. Technology-based learning media is considered capable of being a good learning media because it is easy to use, can be used continuously, does not require a lot of space to store media, and will not be damaged due to weather factors. Based on this, the researcher wants to develop an android application-based

science learning media on the subject of the Solar System learning application will be made attractively by combining entertainment elements, namely a combination of text, images, audio narration, and animation to provide support for visualization of the solar system. This is in line with the thoughts of Maesaroh et al. (2016: 6) who revealed that learning media with Images and sound will make it easier for students to remember the material that has been conveyed by the teacher. Android is a Linux-based operating system designed for touch screen mobile devices such as smartphones and tablets. The current Android operating system has developed rapidly (Widiastika et al., 2020: 48). The existence of Android can simplify our activities and can be used as an innovation in various ways. According to Zuliana in Ibrahim & Ishartiwi (2017: 81), android has advantages including being able to take a comprehensive approach, an open-source, free platform, and also has a populist operating system. Android is very close to students' daily life. In addition to functioning as a communication tool, Android also has the chance to be developed into interactive learning media which is useful for students (Isma Ramadhani Lubis & Jaslin Ikhsan, 2015: 192).

METHOD

This study uses the Research and Development method called R&D. The model of development used in this research is ADDIE (Analysis, Design, Development, Implementation, and Evaluation), but researchers only limit it to the development stage. This study aims to produce and test the feasibility of Android-based science learning media in solar system subjects, especially in sixth-grade elementary students. The researcher uses literature studies and questionnaires to collect the data. The product feasibility test is tested by 2 lecturers of the University of Muhammadiyah Surakarta as media experts and material experts. The data analysis technique was carried out qualitatively and quantitatively. Qualitative data were obtained from criticism and suggestions/input from media and material experts. Meanwhile, quantitative data were obtained from the results of the instrumented assessment on science learning media based on android applications in the Solar System subjects from media and material experts using a Likert scale. The data that has been obtained based on the feasibility test is then analyzed by finding the ideal mean (M_i) and Standard Deviation (SB_i) Then the score obtained is converted into a 5-scale.

$$M_i = \frac{1}{2} \times (\text{maximum score} + \text{minimum score})$$

$$SB_i = \frac{1}{6} \times (\text{maximum score} - \text{minimum score})$$

RESULT AND DISCUSSION

The study aims to produce media products and test the feasibility of Android-based science learning media in solar system subjects, especially in class VI SD. The first stage carried out by the researcher was the analysis stage. Needs analysis is carried out by conducting literature studies and questionnaires. Based on the results of the analysis of the literature study, it was found that students still had difficulties in learning science, especially the Solar System. Solar System material is abstract material. The teacher still conveys the material monotonously by using the lecture method and still images so that the students in the class are less enthusiastic and less active in asking the teacher. Since the material contained in the Solar System is still abstract, it requires appropriate teacher efforts so the material can be understood by students. Learning media is a means of delivering information about learning concepts that are very well received. In the second stage or the design stage, the researcher makes a product design. At this step, the researchers began to compile materials and quizzes that were adapted to basic competencies, indicators of competency achievement, and learning objectives. In addition, the researchers also prepared several fonts, images in png format, backgrounds, and icons that will later be used as navigation buttons. In the third stage or the development stage, there are several applications and software needed to develop research products. Some of them are Microsoft PowerPoint 2016, CorelDraw,

Canva, iSpring Suite version 10, and Website to APK Builder Pro. The most frequently used software is Microsoft PowerPoint 2016, which acts as the main software in product design. The following is the design on the product start page that was developed.

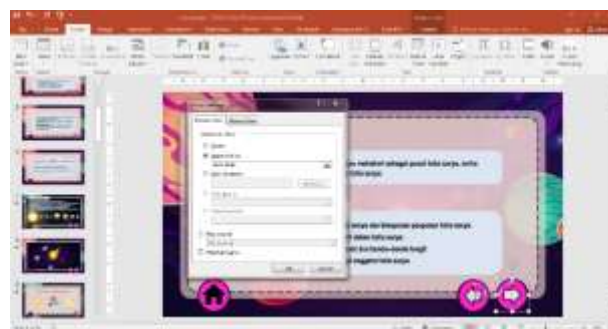


Picture 1. Product Preview Design

After all the designs have been created in PowerPoint 2016, the next step is to create a quiz using the iSpring Suite application as shown in Picture 2. Then after the quiz is completed, the navigation buttons on each slide are enabled so they can be pressed according to the button directions as in Picture 3.



Picture 2. Create Quizzes



Picture 3. Activate Navigation Key Function

After the above steps are completed, the next thing to do is to publish the file that has been created as shown in Picture 4. Then the published file is uploaded to the Website to APK Builder Pro software to produce a file with the apk format, which is the final format that will be available later and could be installed on the smartphone as Picture 5.



Picture 4. Publishing File

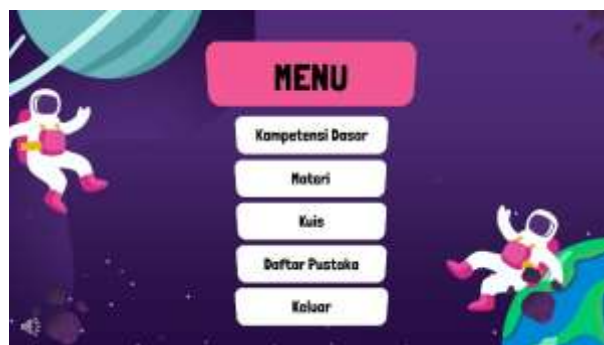


Picture 5. Uploading Files to Apk

The final media product developed by the researcher is a media that collaborates with various types of interesting images, writings, audio, and video in apk format with the name Ayo Belajar Tata Surya and has a file size of 36.2 MB with 36 pages and can be run at least on Android version 5.0 otherwise known as the Lollipop version. The final result of the media product is described in the following figure.



Image 6. Start Page



Picture 7. Menu Page



Picture 8. Objectives Menu



Picture 9. Bibliography Menu



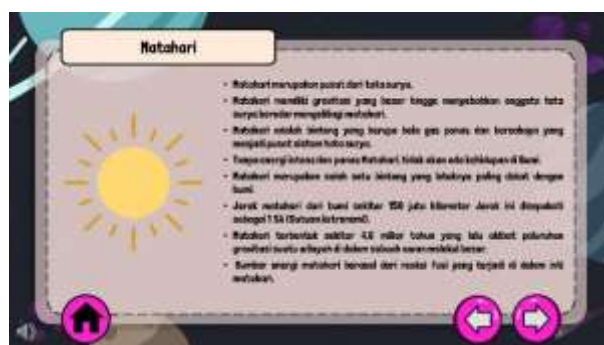
Picture 10. Quizzes Menu



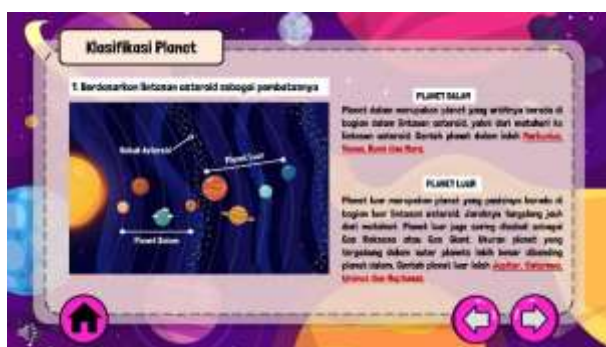
Picture 11. Subject Menu



Picture 12. Solar System Menu



Picture 13. Sun Menu



Picture 14. Planet Menu



Picture 15. Satellites Menu

After the media has been developed is installed or set in such a way, then it is tested on media and material expert validators to determine the feasibility level of the application. Validation was carried out by 2 lecturers at the University of Muhammadiyah Surakarta. The media was validated by Mr. Almuntaqo Zainuddin, M.Pd. as a lecturer in Media and Learning Resources courses; ICT media; Computer. The material was validated by Anatri Desstya, S.T., M.Pd. as a lecturer in the subject of Basic Science Concepts; Elementary science learning; Elementary science education; Elementary Mathematics, and Natural Sciences Curriculum Study. After getting validation from the 2 experts, then the data obtained was processed. Analysis of research data was carried out quantitatively. Quantitative analysis was carried out on the data obtained from sheets that were validated by media experts and material experts. The analysis of the expert validation data is based on the conversion of the questionnaire that has been used. The data is in the form of a rating scale consisting of five scales, namely very worthy, worthy, enough, less worthy, and very less worthy as described in Table 1.

Table 1
 Conversion of Scale into Score Scale

Scale	Criteria	Value Interval	Score
5	Very Worthy	$> M_i + 1,5 SB_i$	$> 4,0$
4	Worthy	$M_i + 0,5 SB_i \leq \text{to} < M_i + 1,5 SB_i$	$3,3 \leq \text{s.d.} < 4,0$
3	Enough	$M_i - 0,5 SB_i \leq \text{to} < M_i + 0,5 SB_i$	$2,7 \leq \text{s.d.} < 3,3$
2	Less Worthy	$M_i - 1,5 SB_i \leq \text{to} < M_i - 0,5 SB_i$	$2 \leq \text{s.d.} < 2,7$
1	Very Less Worthy	$< M_i - 1,5 SB_i$	$< 2,0$

On the media expert validation sheet, there are 16 indicators with 4 aspects assessed by the validator including media appearance, quality, effectiveness, and efficiency. The media display aspect consists of 7 indicators, the media quality aspect consists of 4 indicators, the media effectiveness aspect has 2, and the media efficiency aspect has 3 indicators. This is as written in table 2 below:

Table 2
 Media Expert Validation Indicators

Aspect	Indicator	Score
Media Display	1. Image usage	4
	2. Background selection	5
	3. Selection of font	5
	4. Color composition	5
	5. Images relate and support clarity	5
	6. Attractive program design	5
	7. Regular page design	5
Media Quality	8. Ease of operation	5
	9. Media very flexible	4
	10. Can be used repeatedly	5

Aspect	Indicator	Score
Media Effectiveness	11. On target and well-received	5
	12. Effective and efficient in the development and use of learning media	4
	13. Creative in ideas and pouring ideas	5
Media Efficiency	14. Media Efficiency about time	5
	15. Media efficiency to space	5
	16. Media efficiency in terms of cost	4

Then the data obtained from the media expert validator is converted into a 5-scale score. Based on the validation from the media expert, the data calculation is obtained as follows:

Table 3
Data of Media Expert Validation Results

No.	Aspect	Aspect Indicator Items	Total Score	Average Per Aspect Criteria	Criteria
1.	Media Display	1, 2, 3, 4, 5, 6, 7	34	4,86	Very Worthy
2.	Media Quality	8, 9, 10, 11	19	4,75	Very Worthy
3.	Media Effectiveness	12, 13	9	4,5	Very Worthy
4.	Media Efficiency	14, 15, 16	14	4,67	Very Worthy
Average				4,69	Very Worthy

Based on table 3 above, the Media Display aspect obtained an average of 4.67 per aspect with the "Very Worthy" category. The average in the aspect of Media Quality is 4.75 with the "Very Worthy" category. In the aspect of Media Effectiveness obtained an average of 4.5 with the category "Very Worthy". The Media Efficiency Aspect obtained an average of 4.67 with the "Very Worthy" category. The overall assessment results on the developed media obtained an average of 4.69 which was in the "Very Worthy" category.

On the material expert validation sheets, there are 18 indicators with 5 aspects of assessment, including the relevance of the material, the presentation of the material, the language, the accuracy of the material, and the evaluation of learning. The material relevance aspect has 5 indicators, the material presentation aspect has 5 indicators, the linguistic aspect has 2 indicators, the material accuracy aspect has 2 indicators, and the learning evaluation aspect has 4 indicators. This is as written in the following table:

Table 4
Material Expert Validation Indicators Aspect Indicator

Aspect	Indicator	Score
Material Relevance	1. Material according to basic competencies	4
	2. Material according to the indicator of competency achievement	5
	3. The material is in accordance with the learning objectives	4
	4. The truth and accuracy of the concept	4
	5. The truth and accuracy of the theory	4
Material Presentation	6. The material presented is clear and systematic	4
	7. material is presented in an interesting way	5
	8. Completeness of supporting materials	4
	9. Encouraging students to know the contents of learning media	5
	10. Stimulate student engagement for independent learning	4
Language	11. The language used is easy to understand	5
	12. The description of the material is very good	4
Material Accuracy	13. Accuracy of drawings and illustrations of the material	4
	14. The accuracy of the terms used	4

Aspect	Indicator	Score
Learning Evaluation	15. Quiz instructions are easy to understand	4
	16. Questions according to basic competency	5
	17. Questions according to indicators of competency achievement	5
	18. The questions that hone higher-order thinking skills	4

The data obtained from the material expert validator is then converted into a 5-scale score. Based on the validation from the media expert, the calculation of the data is obtained as follows:

Table 5
Material Expert Validation Results

No.	Aspect	Indicator Item	Total Score	Average Per Aspect	Criteria
1.	Material Relevance	1, 2, 3, 4, 5	21	4,2	Very Worthy
2.	Material Presentation	6, 7, 8, 9, 10	22	4,4	Very Worthy
3.	Language	11, 12	9	4,5	Very Worthy
4.	Material Accuracy	13, 14	8	4,0	Worthy
5.	Learning Evaluation	15, 16, 17, 18	18	4,5	Very Worthy
Average				4,32	Very Worthy

Information obtained based on Table 5 states that the Material Relevance aspect obtained an average score of 4.2 and was included in the "Very Worthy" category. The Linguistic Aspect obtained an average of 4.5 with the category "Very Worthy". Aspects of Material Accuracy got an average of 4.0 with the category "Worthy". While the Learning Evaluation aspect obtained an average of 4.5 and was included in the category "Very Worthy". The results of the overall assessment by material experts obtained an average of 4.32 so it was included in the "Very Worthy" category.

Table 6
Overall Product Test Results Test Average

Test	Average	Category
Media Expert Validation	4,69	Very Worthy
Material Expert Validation	4,32	Very Worthy

Based on table 6, it can be seen that the validation results by media experts got an average of 4.69 and indicated the "Very Worthy" category. Then the validation results by material experts got an average of 4.32 so it was included in the "Very Worthy" category. Based on these data, it can be concluded that the Android application-based science learning media on solar system subjects is appropriate to be used as a medium for science learning, especially the solar system material.

CONCLUSION

The result of this research is to produce a product Android application-based science learning media for solar system subjects, especially for sixth-grade elementary school. The final media product developed by the researcher is a media that collaborates with various types of interesting images, writings, audio, and video in apk format with the name Let's Learn the Solar System which has a file size of 36.2 MB with 36 pages and can be run at least on Android version 5.0 otherwise known as the Lollipop version. The application is then tested on validators of media experts and material experts to determine the level of feasibility. Based on the results of the validation carried out by media experts, an average of 4.69 was obtained, indicating the "Very Worthy" category, then the validation results by material experts obtained an average of 4.32 so it was included in the "Very Worthy" category. Based on these data, it can be concluded that the Android application-based science learning media on solar system subject is appropriate to be used as a media for science learning, especially in the sixth-grade solar system subject.

Android-based application media for the science subjects of the solar system subject is a learning media that can be used as a game tool as well as to increase student understanding. The development of this educational application is expected to create a pleasant learning atmosphere and help the student learning process. This corresponds to the opinion of experts that the use of learning media with visual media in the learning process in the class according to Rosidah (2016: 124) will make learning more interesting, effective, and efficient to provide new experiences for students, especially elementary school students. Learning media in general are all tools that can be used in the teaching and learning process that can stimulate thoughts, feelings, skills, and attention so that they can improve the learning process in students (Mutia & Naeklan, 2021: 37).

Several studies are also relevant to the making of this media, namely the research conducted by Muttaqin et al., (2021: 7) entitled the making of android-based interactive learning media in science subjects with the subject of animal breeding for sixth-grade elementary school students aiming to obtain interactive learning media valid and practical android-based on science subjects, the subject of animal breeding for sixth-grade elementary school. Second, the research conducted by Miftianul & Gunawan (2020: 169) entitled the development of android-based learning media on solar system material for elementary school students aims to develop android-based learning media on solar system material for elementary school students, especially for sixth-grade. The results of previous research are strong evidence that this media can improve the understanding of solar system material in elementary school students. That way, the media that researchers develop is expected to help support learning and can increase students' knowledge and curiosity about the material of the solar system can also increase.

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