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Development of Science Mobile Learning as an Innovation in Learning Media in Elementary Schools

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Abstract: Learning media innovation in the current era is starting to develop towards the use of technology. The learning media that is starting to develop today is mobile learning which can be installed on a smartphone. The use of mobile learning is inseparable from the rapid development and use of smartphones among students. Therefore, to reduce its negative impacts, it is necessary to develop mobile learning as a learning media so that students can use their smartphones to help the learning process. This study aims to develop valid and practical science mobile learning that can be used to help the science learning process at the elementary school level. This type of research is R&D with the ADDIE method. The location of the research is at Hamzanwadi University with the research subjects being science education and PGSD students at Hamzanwadi University. Analysis of research data using V'Aikens related to media validity and practicality analysis related to the practicality of learning media. The results of the analysis show that the developed science mobile learning is valid feasible and practical to use in the science learning process in elementary schools.

Keywords: Elementary school; Learning media; Mobile learning; Science

Introduction

In this 21st century learning era, many learning media have been developed to help and facilitate learning. Several types of learning media already exist, such as teaching aids, virtual laboratory media, augmented reality media, virtual reality media, and so on. In traditional learning using a blackboard, printed teaching material have changed using technology. The integration of technology in learning has grown rapidly (Nugroho et al., 2023; Samitra et al., 2024). Development or use of digital learning resources is an attempt to improve the quality of education. These new digital technologies can bring about new changes for education (Fajri et al., 2024). Learning media is very important to help the learning process. Learning media delivers learning materials that can channel messages, attract students' attention, and enable them to receive the material being studied better (Nurleni et al., 2022). In science lessons, learning media functions as a means of visualizing the learning process (Adam et al., 2023). Learning media is a tool that can facilitate the learning process to increase student motivation and learning outcomes (Kartini & Putra, 2022).

The use of learning media will be able to help convey abstract concepts so that the learning process becomes more effective. This will slowly attract students' interest in learning and will have an impact on better learning outcomes. The use of learning media can affect a person's high-level cognitive skills such as problem-solving, hypothesis testing, decision-making, evaluation, and self-reflection (Hasanah et al., 2023). Learning media is used as a teacher's aid to support classroom learning. The use of learning media that is adjusted to students' abilities is expected to achieve the learning objectives that have been designed (A'yun & Wilujeng, 2024). Learning media can be an integration

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of several media such as text, audio, and video, and can also be in the form of computer program engineering that can be used by individuals for learning or practicum. Learning can be oriented toward results, more inclusive, without any barriers of time, distance, and space. Learning media is very useful because it is interactive and flexible, and the use of several media to increase students' motivation and interest in learning (Ugwuoke et al., 2023). Increasingly advanced technological developments have spurred the development of increasingly advanced learning media as well. Teachers can use technology as a learning medium to convey knowledge to students (Rukmana & Salirawati, 2024).

Several learning activities have started using smartphone-based media. This is inseparable from the rampant development of smartphones, especially among students. To reduce the negative impact of smartphones on students, it would be good to use them in the learning process. Smartphone-based learning media is a breakthrough in learning that can be used to stimulate and encourage students to understand the subject matter (Azmi et al., 2020). The use of smartphone learning media commonly called mobile learning allows lessons to be carried out anywhere and anytime (Hardiansyah et al., 2022). This smartphone-based learning media is an alternative to reduce the negative impact of smartphone use. Student addiction to smartphones needs to be addressed by making smartphones an interesting learning medium. The use of smartphones makes students' interest or motivation to learn low. Therefore, student learning motivation also needs to be considered.

On the other hand, Science is a learning that has many abstract concepts, and sometimes students feel that science lessons are very monotonous if they only rely on the delivery of material by teachers. Science learning is related to the interaction between students and science is related to natural phenomena and systematic conditions so the role of students is needed to improve their learning experience (Husaen & Yuliani, 2023). This is an obstacle in the science learning process so innovation is needed in its implementation. One solution is to create learning media that is by technological developments (Laelasari et al., 2023). Along with that, 21st-century learning is not only about making students understand the material but also leads to high-level thinking skills. Science learning will be more varied meaningful and interesting if it is based on learning media that has elements of text, sound, images, and video. So that students can get a real picture of what is being learned (Irfan et al., 2019).

According to current views in science learning, science teaching should place more emphasis on students' acquisition of information (transmission of knowledge view) and more emphasis on students' understanding and use of knowledge, ideas, and scientific inquiry processes (constructivist view of knowledge). Learning with media will direct the learning process to be more advanced than just explaining science content. There are 2 types of learning media, namely interactive and non-interactive types. In the non-interactive type, messages are presented in a predetermined manner, regardless of what students do during learning; examples include animations, videos, textbook sections, and illustrations. In the interactive type, the words and images presented depend on the actions of students during learning, examples include conducting simulations or virtual experiments (Ferreira et al., 2013). According to Piaget, elementary school students are at the stage of cognitive development, namely the concrete operational stage. Therefore, learning media are needed that encourage students to participate actively so that they have direct experience that helps students understand the material (Safira et al., 2021). The use of mobile learning media is a learning solution in the independent curriculum era because mobile learning has the advantage of being accessible anywhere and anytime (Hiasa et al., 2023). This research is important to be conducted so that teachers can design innovative learning media and can utilize students' addiction to smartphones to be more useful in science learning. This research is also different from other studies that design learning media with coding. The development of this media only uses simple software, namely PowerPoint, ISpring Suite, and Web 2 apk builder.

Method

This type of research is development research with ADDIE design (Analyze, Design, Development, Implementation, and Evaluation). This mobile learning was developed with 3 software, namely Powerpoint, Ispring Suite, and web 2 APK Builder.

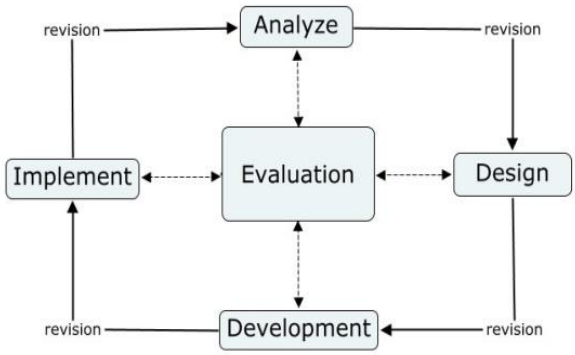

Figure 1. ADDIE type development research

Based on Figure 1, it can be explained as follows: the first stage of the research is analysis. At this stage, preliminary study activities, needs analysis, and literature studies are carried out. The next stage is design. At this stage, activities such as designing the initial draft of mobile learning, designing instrument grids, and so on. The next stage is Development which is related to the creation of mobile learning with the planned software. After the mobile learning had been developed, a trial was conducted on students of the Science Education and Elementary School Teacher Education study programs at Hamzanwadi University. This stage is the implementation of mobile learning. After the trial was completed, an analysis of the trial results and evaluation was carried out to improve the product. This mobile learning was validated by 3 experts in the field of science education and its practicality was obtained from 6 prospective science teacher students with a student response questionnaire. Validity analysis using V'Aikens and the practicality of the learning media were analyzed descriptively and quantitatively through categorization. The level of practicality refers to the five criteria: not practical (0-54); less practical (55-59); quite practical (60-75); practical (76-85); and very practical (86-100) (Alwi et al., 2020).

Result and Discussion

The development of this Science mobile learning uses a combination of several software such as PowerPoint, Ispring Suite 11, and Web 2 APK Builder 4.0. The initial stage of media development is an analysis of several things such as the essential concept of Sciences at the elementary school level because elementary school learning uses thematic learning concepts related to Science must be selected and classified into class levels. After the essential concept of Science is obtained, a preliminary study is carried out through literature reviews and discussions with teachers regarding the needs of learning media so that mobile learning can be utilized and is indeed needed.

The next stage is the design of Science mobile learning through PowerPoint. The essential concept of Science that has been covered based on the class level is then made in PowerPoint with the design seen in Figure 2. At this stage, the logo/icon design for Science mobile learning is also carried out. The Science mobile learning that is developed can be operated on smartphones that use the Android system.

After completing the design of the Science mobile learning on PowerPoint, the development stage is carried out. This development stage is related to creating a product that can be installed on an Android smartphone. The Science mobile learning that has been designed on PowerPoint is then published or formatted into HTML using Ispring Suite 11. After being formed in HTML format, the Science mobile learning is then converted into an Android application in .apk format using Web 2 APK builder 4.0. This development stage also contains validation activities for learning media by 3 experts in the field of science education. The results of the validation analysis using V'Aikens are presented in Table 1.

Based on the analysis in Table 1, it can be seen that the media display aspect is categorized as very valid with an average V'aikens score of 0.92. Some input from the validator regarding the media display is that the media identity is clarified, and only the university logo and the developer data are also stated so that the media ownership is clear. In the software aspect, there is no input and the validity category is also very high with a score of 0.92. The last aspect related to the material has some input from the validator such as the description of each symbol being completed and the sample questions are increased. Apart from that, all the validity categories in the material aspect are very valid with a V'Aikens score of 0.90. This shows that the developed science mobile learning is valid and suitable for use by considering several validator inputs.

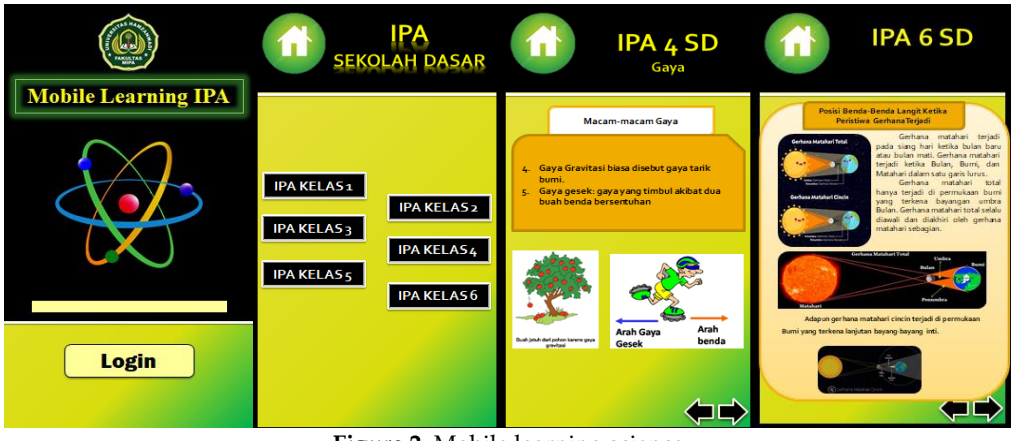

Figure 2. Mobile learning science

Table 1. Validity of mobile learning with V'Aikens analysis

Aspect	Indicators	V'Aikens Score	Average Score for Each Aspect	Validity Criteria
Media Display	Media Identity	1.00		
	Text	1.00		
	Color	0.83	0.92	Very Feasible
	Layout	0.78		
	Video and Animation	0.89		
	Navigation	1.00		
Software	Installation and Performance	0.83	0.92	Very Feasible
	Creativity and Innovation	1.00		
Material	Truth and Accuracy	1.00		
	Coverage and Suitability of Material	1.00		
	Symbols, Equations, and Units	1.00	0.90	Very Feasible
	Language	1.00		
	Examples and Questions	0.50		

Next, a trial was conducted related to the practicality of mobile learning science. This practicality test involved 4 prospective science teacher students. The aspects observed were media effectiveness, media interactivity and readability, media efficiency and creativity of the media developed. The results of the practicality test analysis are shown in Table 2 below.

Table 2. Practicality of science mobile learning

Aspect	Practically Score			
	Teacher I	Teacher II	Teacher III	Teacher IV
Effective Interactive and Readability Efficient Creative	97.73	90.91	93.18	84.09
Category	Very Practical	Very Practical	Very Practical	Practical

The aspect of media effectiveness is related to the science material and questions in mobile learning. The interaction and readability aspects are related to the font size, button functions, symbols, and components in science mobile learning that contain text, audio, video, and animation. The third aspect is the efficiency of mobile learning related to media installation, the use of media online and offline, and the use of media in certain conditions. The last aspect is creativity related to media design and the suitability of science mobile learning with technological developments. From these four aspects, it can be concluded that science mobile learning is already practical to use in learning. Even from the 4 teachers who were used as test subjects, 3 teachers considered this media very practical with a practicality score above 90.

Based on the results of the validity and practicality analysis, it is concluded that science mobile learning is valid and practical to use in learning. This science mobile learning is by existing technological developments and can reduce the negative impact of smartphones on students because this science mobile learning can be used to help students learn. Mobile learning can be used to deliver learning materials help students understand the material and foster student interest in participating in learning activities (Hidayah et al., 2023). This mobile-based learning media is designed to be a source of student learning that can be accessed anywhere and anytime according to user needs (Fujiawati et al., 2023). Mobile learning has been adjusted to the learning styles and needs of students so that they can learn according to their level of understanding which ultimately improves learning outcomes or conceptual understanding of the material being studied (Kurnia et al., 2024). The use of mobile learning helps the teaching and learning process become more comfortable and enjoyable (Sihombing et al., 2023).

Interactive mobile learning as a learning resource has several advantages, one of which is the atmosphere of students' affection and attention to learning. Learning that can create a new and interesting learning

atmosphere and can help teachers deliver material that is difficult to teach (Prihartina et al., 2023). This science mobile learning-based learning media is a solution in this era of technological development. In addition to this media being practical to use anywhere and anytime, this science mobile learning can also be an alternative so that students are not addicted to games on their smartphones so that their smartphones can be used to support the learning process. This science mobile learning can also be an independent learning media for students. Using engaging and interactive learning media is crucial to boosting students' enthusiasm and motivation for learning (Khasanah & Setyasto, 2024). The appearance is adjusted to the cognitive level of students at the elementary school level so that it is more interesting and motivates students to learn. Android-based mobile learning modules are effectively used in the learning process. Mobile learning generates a very positive response from students which has an impact on learning interest, class activities, and improving learning outcomes (Nuri et al., 2023).

Conclusion

Based on the results of the development and analysis of the developed learning media, it was concluded that science mobile learning is categorized as valid/feasible and practical to use in the science learning process at the elementary school level. This learning media is an innovation in the use of learning media in elementary schools.

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Author Contributions
Preparation and development of mobile learning, Z.H. and N.; Validation, Review, and Editing, N., L.Z., and N.A.; Data Collection and analysis, Z.H. and N.A.; Writing original draft article, Z.H. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
The authors declare no conflict of interest.

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