IMPLEMENTATION OF THE ADDIE MODEL FOR DEVELOPING MULTIMEDIA LEARNING MEDIA AND GAMIFICATION ON SPACE OBJECTS MATERIAL IN ELEMENTARY SCHOOL

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Abstract

Teaching material in learning outer space objects (PBLA) is an interesting and important topic for elementary school students to master. However, traditional methods in PBLA learning are often ineffective in increasing students' awareness and interest. Interactive multimedia learning uses a variety of technologies such as video images, and animation, as well as gamification elements such as points, levels, and rewards. Therefore, this research focuses on developing interactive multimedia learning and gamification to increase elementary school students' awareness and interest in PBLA. This research is research into the development of learning media using the 4D Method (Define, Design, Develop and Disseminate) type Research and Development (R&D) and conducting field tests in class VI UPTD SDN 40 Negeri Katon. The research results showed that the validity of interactive PowerPoint learning media based on a scientific approach in learning material at UPTD SDN 40 Negeri Katon elementary school was based on the results of an assessment from media experts of 94.45% and an assessment of material experts of 97.45% in the very appropriate/very valid category. The practicality of learning media is stated to be practical based on the suitability of the material provided. This is proven by the teacher response results being 98% and the student response results being 100%. This research produces gamification learning media using interactive PowerPoint based on a scientific approach that is valid and practical to use. It is hoped that the results of this research can contribute to the development of more effective and interactive curriculum and learning methods to increase students' awareness and interest in PBLA material.

Keywords: *4D Method, Gamification, Interactive Learning, Multimedia Technology, Space.*

1. INTRODUCTION

Education is a sector that really determines the quality of a nation. The world of education demands innovation and creativity that can support improving the quality of education. Technological developments are in line with improving the quality of education as stated in Indonesian Government Regulation Number 32 of 2013, amendment to Government Regulation number 19 of 2005 in chapter 4 concerning National Standards. Education regarding process standards, states that the learning process in educational units is carried out in an interactive, inspiring, fun, challenging manner, motivates students to participate actively, and provides sufficient space for initiative, creativity and independence in accordance with talents, interests and physical development as well as the psychology of students.

The use of media functions as an intermediary tool for delivering learning material so that it can be accepted by students more easily in the learning process, and requires the use of appropriate media that can attract students' attention. The use of learning media in the teaching and learning process can generate new desires and interests, as well as raise students' learning motivation. The rapid development of technology has had a positive impact on the teaching and learning process. Every teacher is required to master technology in order to provide interesting and active learning media for students. This is stated in Law No. 14 of 2005 that teachers are obliged to improve and develop academic qualifications and competencies on an ongoing basis in line with developments in science, technology and art. One example of commonly used learning media is interactive power point [1].

Media are all forms and channels of conveying messages or information from the message source to the recipient that can stimulate the mind, arouse students' enthusiasm, attention and will so that students are able to acquire knowledge, skills or attitudes that are in accordance with the purpose of the information conveyed [2]. One of the main functions of learning media is as an intermediary that is able to convey messages or information so that it can support and have a good impact on the quality of learning [3]. The choice of media type must also pay attention to the characteristics of students according to their level of cognitive development [4]. One of the learning media that is developmentally appropriate

elementary age children's cognitive abilities, namely learning media power point.

Gamification in this learning uses media power point This is designed for interactive learning, in presentation media power point designed and equipped with a controller that can be operated by the user so that users can choose what they want for instructions for use, materials and practice questions [5]. Power point Interactive is one of the media categories of multimedia. Apart from the use of media, the success of learning can also be seen from the use of appropriate models or approaches in learning. Learning Natural Sciences (IPA) regarding outer space objects is a field of study that focuses on understanding phenomena and objects that are outside the Earth's atmosphere. It includes various subdisciplines such as astronomy, astrophysics, cosmology, and planetary science. In an educational context, the aim of this learning is to provide comprehensive knowledge about the structure, dynamics and evolution of the universe, as well as the phenomena that occur in it [6]. Thus, it is necessary to use interactive learning multimedia in the form of gamification to attract students' attention and increase student activity in learning, so that the material presented by the teacher can be well received by students.

2. LITERATURE REVIEW

a. Constructivism Theory

Constructivist learning theory is a pedagogical approach that emphasizes students' active role in constructing their own knowledge rather than passively receiving information from teachers. This theory is based on the idea that learning is an active process where students or learners integrate new experiences with the knowledge they already have, forming a more complex and deeper understanding of the world around them. The basic principle of constructivism theory is to focus on children's cognitive development [7]. What is meant is to suggest that children build their understanding through active interaction with the environment. On the other hand, Vygotsky emphasized the importance of social and cultural interactions in cognitive development, introducing the concept of the "zone of proximal development" where optimal learning occurs when students work with help from more experienced others. Apart from the basic principles of constructivism theory, the teacher's role as a facilitator or guide is the main resource knowledge. Teachers help students by providing a rich and supportive learning environment, challenging students with open-ended questions, and encouraging exploration and critical thinking. Teachers also direct students through scaffolding, namely providing support tailored to students' individual needs until they are able to carry out tasks independently [8]. With the teacher's role in applying the basic principles of constructivist theory, learning activities in a constructivist approach often involve collaborative projects, group discussions, experiments and independent research. For example, students are required to be able to investigate real problems, ask questions, develop hypotheses, and find their own answers through investigation and reflection. Project-based learning and problem-based learning are two strategies commonly used in constructivist education. Furthermore, assessment in constructivism is more formative and authentic in nature which aims to understand the student's learning process and provide feedback that helps students improve their understanding as students. Assessment does not only focus on the final result, but also on the process and efforts made by students. Constructivism theory is able to increase student engagement, deeper understanding, critical thinking abilities, and collaborative skills [9]. This happens because students are actively involved in learning, students will be more likely to be motivated and have the ability to apply their knowledge in real world situations. Constructivist learning also allows students to develop metacognitive skills, such as planning, monitoring and evaluating the learning process. Overall, constructivist learning theory emphasizes the importance of students' active involvement in the learning process, social interaction and critical reflection. By providing rich and contextual learning experiences, constructivism seeks to build deeper and more meaningful understanding for students. This theory emphasizes that learning is a dynamic and continuous process, where students are able to form and reformulate their knowledge based on their experiences and interactions with the world.

b. Gamification

Gamification is a learning strategy that combines elements and principles from games, such as scoring systems, levels, and rewards, into contexts that would not otherwise be present. directly related to the game [10]. In its application, gamification is expected to help businesses achieve various goals, such as increasing engagement, expanding reach, and ultimately increasing sales. The essence of using gamification is to create a more interactive and interesting experience for customers when interacting with products/services. In this way, customers feel more connected to the brand and ultimately increase their loyalty to the brand. Gamification also has important elements such as making a good design, making the game according to the campaign, and making a leaderboard. Good design allows customers to easily follow the flow of the game, while games that match the campaign allow customers to be actively involved in the learning process. Leaderboards, in turn, allow customers to compete and increase their awareness of the brand [11]. Apart from that, gamification can also help increase students' awareness and interest in space material by using interactive multimedia and gamification elements such as points, levels and prizes.

Gamification is the use of games, approaches and game elements into different game contexts [12]. In other words, gamification is the integration of game elements and thinking into non-game activities. Gamification is a powerful tool for providing education and training in companies. Consider formal definitions of games in educational contexts such as: players, thinking activities, abstract challenges, rules, interactivity, feedback, measurable outcomes, and emotional reactions all contained within a single structure. Abstract games show certain characteristics of real life and they present a different reality. The challenge element makes players encouraged to achieve certain goals. Interactivity in games occurs between players, the game system, and between players. Positive or negative feedback influences a player's gaming behavior. Players react emotionally to different parts of the gaming experience. Gamification uses these game-based dynamics to engage and not just view. Gamification presents an attractive aesthetic interface that influences how players play the game. The most important component of gamification is how it promotes thinking games, turning it from an everyday activity into an opportunity to learn and develop [13]. From the above definitions, it can be concluded that gamification is the application of techniques and strategies from a game into a non-game context that aims to solve a problem. This kind of method works by making the material or technology more attractive by encouraging the user to engage in the desired behavior. The purpose is to increase engagement, motivation, and performance from users. The use of gamification in learning will increase motivation in learning both in formal and informal conditions [14].

c.   Authoring tools: Power Point

Microsoft Powerpoint is one of the most popular and versatile presentation software, widely used in various contexts, including the world of education. In learning media, PowerPoint offers many features that can increase the effectiveness of teaching and learning [15]. The following is a detailed explanation of how the Power Point application is used in learning media:

1. Structured Information Delivery: Power Point allows teachers and lecturers to organize lesson material in a structured and systematic manner. Each slide can function as a logical unit of information, making it easier to present a concept or topic in a gradual and organized manner. This helps students to follow the learning flow more easily and understand the material better.
2. Visualization and Multimedia: One of the main advantages of PowerPoint is its ability to integrate various types of media such as text, images, graphics, video and animation. This visualization is very helpful in explaining complex concepts that may be difficult to understand through text alone. For example,

animation can be used to dynamically depict scientific processes or changes in statistical data.
3. Interactivity and Student Engagement: PowerPoint also supports interactive elements that can increase student involvement in the learning process. Features such as hyperlinks, action buttons, and interactive quizzes enable presentations to be more dynamic and participative. This helps maintain students' attention and make learning more interesting.
4. Flexibility in Teaching: PowerPoint rovides flexibility in teaching methods. Teachers can adapt presentations for various student learning styles, be they visual, auditory, or kinesthetic. In addition, materials already created in PowerPoint are easy to update or modify as needed, allowing for quick adaptation to curriculum changes or the latest developments in a particular field.
5. Support for Distance Learning: In the context of distance learning, PowerPoint becomes a very useful tool. Presentations can be shared digitally with students via online learning platforms, allowing them to access the material anytime and anywhere. The voice narration feature in PowerPoint also allows teachers to record their explanations, so that students can listen to the explanations independently [16].
6. Development of Presentation Skills: Using PowerPoint is not only beneficial for teachers, but also for students. Creating PowerPoint presentations as part of an assignment or project helps students develop their presentation and communication skills. These skills are essential for success in a variety of professional and academic fields.
7. Evaluation and Assessment: PowerPoint can also be used as an evaluation and assessment tool. Teachers can arrange quizzes or tests that are integrated into presentations. Additionally, presentation slides can be used to review material before exams, helping students prepare better
8. Improved Collaboration: With the sharing and collaboration features built into PowerPoint, students can work together on group projects more efficiently. They can share presentation files, provide feedback, and work on the same slides simultaneously, both in class and online.

Overall, Microsoft Powerpoint is a very powerful and versatile tool instructional Media. This not only facilitates effective information delivery but also enriches students' learning experience through various interactive and multimedia features. Thus, with proper use, PowerPoint can help create a more dynamic, interesting and effective learning environment. If it is related to the material to be presented, namely regarding Space Objects, the

power point used can be seen at the following link https://s.id/PPT_BendaLuarAngkasa_RiyadhFirdaus

3. METHODS

By using the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation, this research was included in development research (RnD). This stage is very important to ensure that the product being developed suits user needs and field characteristics, according to Lee & Owens. The ADDIE model is a systematic approach to creating effective and efficient teaching materials. This method can be seen in Figure 1
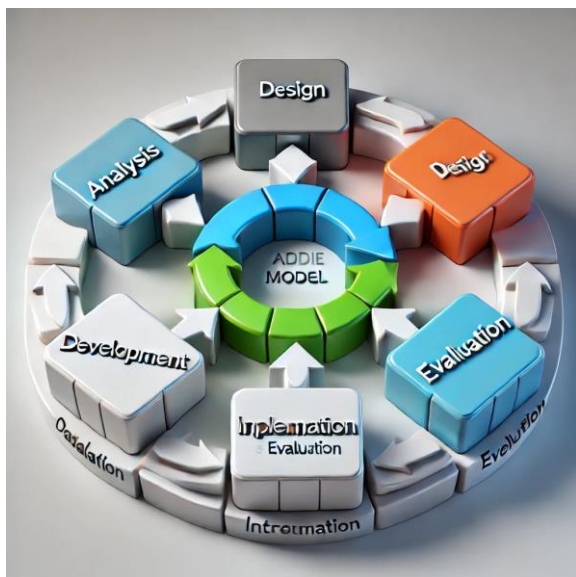

Figure 1. Model ADIE

In the analysis stage, researchers analyze the requirements to ensure that the product to be created will meet user needs. This stage involves collecting relevant data and information to create interactive PowerPoint learning media. The results of this analysis stage will be the basis for designing and developing effective media that meets the requirements of teachers and students. At the design stage, researchers design the concept, content, and visual appearance of learning media to ensure that it is interesting and effective during the learning process. This interactive PowerPoint media design must be created in an attractive way and in accordance with the needs of elementary school students. With good design, students will be more focused and interested in the material being taught, increasing understanding of the concepts presented. Researchers organize material, create attractive slide presentations, and prepare validation tools at the

development stage. To ensure the quality and suitability of the content, the material created must be validated by media and material experts. After that, the implementation phase is carried out by testing the learning media in the classroom to see how the media are used in learning and how effective they are in increasing student engagement and understanding. The final stage of this process is evaluation, where students are given practice questions to measure their brand understanding. This evaluation process is very important to evaluate how well the learning tool is functioning and provide suggestions for further improvement.

4. DISCUSSION

Gamification is an innovative method to increase student engagement and understanding of space objects. According to the journal Interactive Learning Environments, gamification uses dynamic media formats such as animation and simulation to help students understand complex astronomy concepts and can increase student engagement and learning outcomes by making learning more interesting and challenging [18]. The use of interactive multimedia learning that uses gamification has succeeded in improving student learning outcomes in elementary schools. English language education programs that use gamification can be modified to teach space objects and students can earn badges and points based on how well they understand the material [19]. Several other articles discuss the use of augmented reality (AR) in STEAM learning in elementary schools. AR can be used to display three-dimensional planetary models that students can explore, increasing their engagement and understanding of space [20]. Overall, there are many benefits from developing interactive multimedia learning media with gamification for educational material on space objects in elementary schools [21.22,23,24]. This method not only makes students more motivated and more engaged, but also makes their understanding of complex concepts easier and more enjoyable. Studies show that this technology can revolutionize science education at the elementary level.

5. IMPLEMENTATION

The results of Interactive Learning Multimedia Development Products in the form of Gamification can be seen in figures 2, 3 and 4 as follows.

The use of interactive learning media in the form of gamification was then tested directly on elementary school students in the learning and teaching process.

Figure 2. Initial View

Figure 3. Examples of Interactive Teaching Materials

Figure 4. Gamification of Interactive Learning Multimedia

6. EVALUTION

Data collection techniques are methods used to collect data or information. This technique requires strategic and systematic steps to obtain valid data that corresponds to reality. Data analysis techniques used by researchers is descriptive analysis. According to [25] (Harjanto, 2023) descriptive analysis is a form of research data analysis to test the generalization of research results based on one sample. Data collection techniques that will be used in research are interviews, questionnaires, documentation. [26]

Interview: the interview technique is used as a data collection technique if the researcher wants to conduct a preliminary study to find problems that must be researched and to find out things from respondents in more depth. The interview was conducted with Mrs. Tri Damayanti, S.Pd., SD as a class VI teacher at UPTD SDN 40 Negeri Katon. 2.

Questionnaire: a questionnaire is a list of questions given to other people willing to provide responses according to the user's request [20] Nirmala, N. S., & Istianah, (2020). Researchers used techniques in the form of distributing questionnaires to obtain data and information regarding teacher needs and student needs. **Documentation:** documentation is notes, written documents or images that have been collected during the research.

Based on the data that has been obtained, researchers then develop products that suit the needs of teachers and students. Then the researcher created a validation questionnaire which was given to media experts, material experts, teacher and student responses. The data obtained was then analyzed by calculating the average score obtained. Descriptive analysis that describes the feasibility of interactive PowerPoint learning media based on the scientific approach being developed.

Table 1. Guidelines for Evaluation Scores of Media Members, Material Members, and Teacher Responses

Score	Description
5	Very Good
4	OK
3	Enaogh
2	Less
1	Very Less

Based on table 1 of the guidelines for giving scores to media experts and material experts, there are 1-5 scores, namely very poor, poor, sufficient, good and very good.

Tabel 2. Kriteria Interpretasi Kepraktisan Media

Penilaian	Kriteria Kualitatif
81-100	Very Practical
61-80	Practical
41-60	Quite Practical
21-40	Less Practical
0-20	Impractical

Based on table 3, there are 5 levels of eligibility criteria for learning media, namely not feasible, not feasible, quite feasible, feasible, and very feasible.

Table 3. Media Eligibility Criteria

Eligibility Criteria	Tingkat Kelayakan
85,01%-100%	Very Good, No Revision
70,01%-85%	Decent, but needs minor revisions
50,01%-70%	Decent enough, needs moderate revision
30,01%-50%	Not feasible, needs major revision besar
01,00%-30%	Ineligible, or cannot be used

Based on table 3, there are 5 levels of eligibility criteria for learning media, namely not feasible, not feasible, quite feasible, feasible, and very feasible.

7. RESULT

Based on the results of interviews with class VI teachers at UPTD SDN 40 Negeri Katon, researchers obtained information regarding the need for learning media that is relevant to student characteristics and the lack of availability of learning media. Teaching and learning activities still often use conventional learning media such as textbooks and so on. Teachers admit that if they use conventional learning media, many students experience difficulties in understanding the material presented by the teacher. Apart from that, students also feel bored, so they are less enthusiastic about participating in teaching and learning activities. Results of the analysis of needs for

class VI teachers carried out at UPTD SDN 40 Negeri Katon. Based on the results of the teacher needs analysis, information was obtained from the class VI teacher that in learning about "Space Objects" class VI UPTD SDN 40 Negeri Katon the teacher had not used interactive powerpoint media as a learning medium. Therefore, teachers agree with the development of interactive PowerPoint learning media based on a scientific approach, especially in learning the material "Outer Space Objects". Meanwhile, the results of the analysis of the needs of class VI students at UPTD SDN 40 Negeri Katon stated that teachers had not used interactive PowerPoint learning media in the learning process. Apart from that, students admitted that they often felt bored and less active in the learning process. Thus, the researcher intends to develop interactive PowerPoint learning media based on a scientific approach to the material "Outer Space Objects" in class VI UPTD SDN 40 Negeri Katon and 100% of class VI students agreed to develop this media.

The steps for developing interactive PowerPoint learning media based on a scientific approach are as follows [28]:

a. Look for a template that suits your needs. characteristics of elementary school students on the "Slidesgo" website, then download the template and open the template, it will automatically go to Microsoft PowerPoint.

b. Arranging covers, material on Microsoft PowerPoint, equipped with games and quizzes.

c. On the slide containing the material, insert the steps of the 5M scientific approach (observe, ask, try, reason and communicate).

d. Search for animated images using the website,

e. Add the downloaded animated image by clicking the insert menu, select picture.

f. Each slide has an "action" in the insert menu so that it can be clicked and then moved to the desired slide.

g. Powerpoint is equipped with audio by clicking on the insert menu, selecting audio from file, then selecting the audio to be added (the audio has been downloaded first).

h. Insert a video related to the material, click the insert menu, select video from file, then select the audio you want to add (the audio has been downloaded first).

i. Animation is added to each PowerPoint slide, so that the PowerPoint looks more interactive.

j. Add the identity of the creator of interactive PowerPoint media based on a scientific approachAfter the learning media product has been created, it is then validated by media experts.

The validation results obtained by media experts and material experts can be seen in table 4.

Table 4. Validation Results of Media Experts and Material Experts.

Table 4. Validation Results of Media Experts and Material Experts

No	Ahli	Skor Validator	Skor Maksimal	Persentase Skor	Rata-Rata
1	Media	56	60	93,3%	94,95%
2	Materi	58	60	96,6%	97,45%

Based on table 4, the results of validation by media perts and material experts have been carried out, getting an average of 94.95% from media experts and an average of 97.45% for material experts. The results of calculating the reliability value between media validators 1 and 2 received a value of 98.3%, it was stated that the value was reliable because it was ≥75%. The results of calculating the reliability value between material validators 1 and 2 received a value of 99.2%, it was stated that the value was correct reliable because ≥75%. Next, make improvements to the product being developed according to suggestions and input from media validators and material validators. Researchers conducted a trial by applying interactive PowerPoint learning media based on a scientific approach to teaching and learning activities in class VI on the topic "Outer Space Objects". The use of media can attract students' attention.

Table 5. Recapitulation of Teacher and Student Response Questionnaire Results

Responden	Skor
Teacher	98%
Student	100%

Based on table 4, the results of validation by media perts and material experts have been carried out, getting an average of 94.95% from media experts and an average of 97.45% for material experts. The results of calculating the reliability value between media validators 1 and 2 received a value of 98.3%, it was stated that the value was reliable because it was ≥75%. The results of calculating the reliability value between material validators 1 and 2 received a value of 99.2%, it was stated that the value was correct reliable because ≥75%. Next, make improvements to the product being developed according to suggestions and input from media validators and material validators. Researchers conducted a trial by applying interactive PowerPoint learning media based on a scientific approach to teaching and learning activities in class VI on the topic "Outer Space Objects". The use of media can attract students' attention.

8. CONCLUSION

An interactive PowerPoint learning media product based on a scientific approach to learning the material "Outer Space Objects" has the characteristics of making it easier for teachers to deliver the material, making it easier for students to understand the material, this digital-based media adapts to technological developments and can be used over a long period of time. This interactive PowerPoint learning media based on a scientific approach is designed with an attractive and interactive design.

Apart from the material, it also includes games and quiz questions that can encourage students to think critically. Powerpoint is equipped with music and additional dubbing which explains the scientific steps so it can be done creating interaction between learning media and students. The validity of interactive PowerPoint learning media based on a scientific approach in learning the material "Outer Space Objects" in class VI elementary schools is based on the results of assessments from media experts of 94.45% and assessments of material experts of 97.45% in the very appropriate/very valid category. The practicality of learning media is stated to be practical based on the suitability of the material provided. This is proven by the teacher response results being 98% and the student response results being 100%.

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