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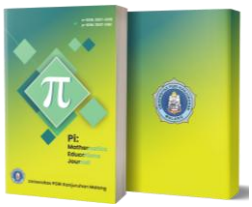

Development of E-modules Based on Articulate Storyline 3

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ABSTRACT
This research aims to craft an e-module developed using Articulate Storyline 3, focusing on integer concepts, specifically designed for seventh-grade junior high school students. Mathematics, as a crucial component of Indonesia's educational curriculum, is often perceived as complex and monotonous by students, necessitating innovative approaches in learning. This e-module is expected to emerge as a groundbreaking tool that stimulates students' enthusiasm in exploring the subject matter. To achieve this, the study adopts a Research and Development (R&D) approach, implementing the ADDIE model, which consists of initial analysis, conceptual design, development, real-world implementation, and comprehensive evaluation. Validation results indicate that the e-module achieves a remarkably high validity level of 95.19%, a practicality score of 83.33%, and an effectiveness rate of 87.85%. Beyond merely meeting validity criteria, the e-module is meticulously designed to ensure accessibility for students while proving to be a powerful tool in enhancing their academic performance. Thus, this Articulate Storyline 3-based e-module is envisioned as a revolutionary learning instrument—an engaging and interactive medium that supports the achievement of learning objectives related to integers at the junior high school level.

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1. Introduction

Mathematics is an important component of the education curriculum in Indonesia. It serves not only as a tool for solving everyday problems but also as one of the essential foundations that students must master. Mathematics is not just a tool for solving complex problems, but also serves as a universal language that facilitates communication and collaboration across disciplines. The logical and critical thinking skills honed through mathematics learning provide a strong foundation for pursuing careers in science, technology, engineering, and various other fields [1]. This knowledge is crucial and cannot be ignored. In reality, the majority of students view mathematics as a complicated and exhausting intellectual obstacle, leading to a significant decline in their interest in the subject. Mathematics can support students in developing critical, analytical, systematic thinking skills, as well as collaboration abilities [2]. Previous research has focused more on achieving cognitive learning outcomes,

such as conceptual understanding and procedural skills, rather than on developing critical thinking skills. Mathematics learning in the classroom tends to be individualistic and focused on right-or-wrong answers, limiting students' opportunities for discussion and collaboration. Critical thinking and collaboration skills are essential 21st-century competencies that students need to possess. Research is needed to examine how mathematics learning can be designed innovatively to not only improve learning outcomes but also develop students' critical and collaborative thinking skills.

The basic material taught in junior high school includes integer numbers, which is an important part of the curriculum that students need to master. Integer numbers are crucial because they encourage students to engage in critical thinking processes [3]. The material on integer numbers can analyze students' numerical problem-solving abilities [4]. Students are expected to be able to solve problems related to integer numbers and numerical activities [5].

One of the issues faced by students in understanding the concept of integer numbers is the lack of learning resources available to them [6]. Students are less motivated and find it difficult to understand the material on integer numbers because teachers still use conventional teaching materials. It is essential for a teacher to have extensive knowledge and creativity to effectively convey knowledge to students with the right approach while crafting high-quality teaching materials, which poses a significant challenge in the education sector. The ability to select teaching materials carefully is a crucial factor that determines the smoothness of the teaching and learning process. Superior teaching materials should not only align with the curriculum but also be flexible enough to keep pace with advancements in science and technology, one example is e-modules. Utilizing advanced technology to design interactive teaching materials in the form of e-modules developed through Articulate Storyline 3 represents an innovative leap in the transformation of learning, serving as an engaging and effective learning resource. E-modules present material through visuals, animations, simulations, and interactive exercises that help students understand integer concepts more concretely. These features also play a role in increasing students' motivation and engagement in the learning process. The integer module is considered easy to understand, uses simple language, and has an attractive appearance, making it a suitable learning medium [7].

E-modules are a form of digital module that presents various components, including text, illustrations, diagrams, animations, and video displays, with greater flexibility of access. This advantage makes it a tool that encourages students to be more independent in absorbing knowledge without the constraints of space and time [8]. E-modules are one of the digital learning tools designed to maximize effectiveness and efficiency in the learning process while instilling a sense of independence in students. In line with the principles upheld in the 2013 Curriculum, this e-module serves as a bridge for students to explore material more flexibly and interactively [9]. E-modules are a breakthrough in technology-based learning that emerges as an evolution of conventional modules, offering a more dynamic learning experience that stimulates curiosity. With their advantages in providing richer interactivity, e-modules can bring teaching materials to life, making the learning process more engaging and less monotonous [10]. E-modules are digital learning platforms specifically designed to facilitate students' academic journeys in achieving learning outcomes. Their presence is expected to spark curiosity, ignite a passion for learning, encourage active involvement, and deepen students' understanding of the material they have explored [11]. A high quality e-module must possess several distinctive features, including the ability to guide students independently (self-instructional), present material comprehensively without relying on other sources (self-contained), be usable without

external assistance (stand-alone), be flexible in adapting to user needs (adaptive), and be user-friendly and easy to operate by anyone [12].

Articulate Storyline 3 is a revolutionary software designed specifically to facilitate learning creators in the digital era, whether they are just starting or already skilled. With its advanced features, this platform allows for more dynamic and interactive information delivery, creating a more vibrant communication bridge between users [13]. Articulate Storyline is an interactive multimedia application that can be utilized by both teachers and students, featuring a user-friendly interface similar to Microsoft PowerPoint [14]. The outputs from using Articulate Storyline 3 can take the form of websites, CDs (Compact Disks), LMS (Learning Management Systems), Word documents, and HTML5 formats that can be used as Android applications [15]. The use of Articulate Storyline 3 has proven to provide significant benefits due to its interactive nature and its ability to integrate well into digital learning [16]. The use of visual representations, animations, and interactive simulations in Articulate Storyline 3 facilitates students' understanding of integer concepts, as these features can transform abstract ideas into more concrete and engaging learning experiences.

Considering the presented context, this study aims to develop an interactive e-module based on Articulate Storyline 3 for teaching integers to junior high school students. The study also aims to examine the feasibility of the developed e-module in terms of validity, practicality, and effectiveness. The use of the interactive e-module is expected to enhance student motivation and engagement in the learning process. The e-module helps students understand the abstract concept of integers through visualization, animation, and interactive simulations. This study is expected to provide a more effective method to address problems in mathematics learning at school.

2. Methods

The research approach applied in this study adopts the Research and Development (R&D) model, an exploratory strategy oriented towards innovation and continuous improvement. In accordance with the ideas put forward by Sugiyono [17], R&D is a method aimed at designing a learning innovation while also testing its effectiveness. This research focuses on the development of digital teaching materials in the form of e-modules packaged with Articulate Storyline 3 technology, specifically to deepen the understanding of junior high school students regarding the concept of Integers. In the process, this research adheres to the ADDIE framework, a systematic model that includes the stages of analysis, design, development, implementation, and evaluation (Analysis, Design, Development, Implementation, and Evaluation). The stages of the ADDIE development model carried out by the researcher are as follows: 1). Analysis: the researcher conducts a needs analysis to identify problems in learning integers for seventh-grade junior high school students and the learning objectives to be achieved. 2). Design: the establishment of learning objectives and the initial design of elements, the initial appearance of the e-module, menu, materials, practice questions, as well as animations and music to be applied. All of these designs are still conceptual. At this stage, the researcher also creates the necessary research instruments. 3). Development: the process of developing the designed learning media is carried out. In the development of the e-module, the researcher will create the e-module using the Articulate Storyline 3 application. Additionally, this stage also includes initial testing to ensure that all features operate well. Feedback and validation from experts will be collected to make necessary improvements. 4). Implementation: Implementation is carried out by disseminating the e-module to a small group of students in the seventh grade at Al-Mubarok Islamic Junior High School as the initial trial subjects. 5. Evaluation: The researcher then conducts a refinement process by reviewing and making modifications or improvements to

the designed and developed e-module to optimize it in supporting learning based on suggestions from validators and input from users during the trial process. The e-module in this study is tested on a small group of seventh grade students at Al-Mubarok Islamic Junior High School.

This research involves several parties as the main subjects, namely two validators who act as content and media experts, a small group of seventh grade students at Al-Mubarok Islamic Junior High School as trial participants, and a mathematics teacher who acts as an observer. To obtain accurate data, various measurement instruments are used, including validation sheets, practicality sheets, and student response questionnaires. The validation sheets are specifically given to content and media experts to assess the quality and suitability of the developed e-module to obtain the validity score of the e-module based on certain established criteria. The practicality sheets are given to the observer during the trial process to obtain the practicality score of the e-module. The response questionnaire is given to students to gather their opinions about the e-module, including aspects of appearance, material presentation, and benefits obtained after using the e-module to assess the effectiveness of the e-module in learning. To analyze the extent to which the e-module meets the aspects of validity, ease of use, and effectiveness, this research utilizes numerical data collected through instruments such as validation sheets, practicality sheets, and student response questionnaires. All obtained data are then processed and analyzed using a Likert scale approach as the measurement method.

3. Result and Discussion

The interactive e-module based on Articulate Storyline 3, which focuses on integer number material, is designed by adopting the systematic ADDIE approach, which includes the stages of Analysis, Design, Development, Implementation, and Evaluation to ensure its quality and effectiveness in learning. The analysis results regarding the problems and learning objectives in integer number education for seventh-grade students at SMP Islam Al-Mubarok indicate that students experience boredom and lack motivation during the learning process. This suggests the need for a more engaging and innovative approach to enhance student involvement and create a more enjoyable learning atmosphere. The use of conventional and less engaging teaching materials is one of the factors contributing to students' boredom in the learning process. Monotonous and less varied teaching methods can reduce students' interest in learning, leading them to feel unmotivated and less engaged in learning activities. Referring to the analysis results, the researcher designed a digital learning media in the form of an e-module based on Articulate Storyline 3, focused on integer number material with the aim of fostering interest and increasing students' enthusiasm for learning. By adopting an entertaining interactive concept, this e-module is designed to create a more dynamic and engaging learning experience, allowing students to be more actively involved in the learning process and gain a deeper understanding of the material being studied.

The next step is to design the visual and functional structure of the e-module using Articulate Storyline 3, resulting in a final output in the form of a web-based file in HTML format. This format allows users to access the e-module directly through a browser without the need to install additional applications. The e-module is packaged with an exciting adventure theme, complete with an interactive button labeled "Start," which serves as the main gateway to various features within the e-module. The content is systematically designed, including elements such as a cover, introductory menu, learning objectives, usage guidelines, interactive material presentation, links to additional learning resources, and practice questions equipped with automatic answer keys, allowing students to evaluate their

own understanding. Additionally, animations and background music are incorporated to create a more lively and enjoyable learning atmosphere.

Figure 1. Initial Display of The Game

In Figure 1, the animation of the developed e-module is displayed, featuring a title accompanied by a 'Start' button that is directly linked to the next page. The design of this cover page is intended to capture students' attention and provide a positive initial impression of the material to be studied. Furthermore, the e-module also includes the learning objectives, as shown in Figure 2.

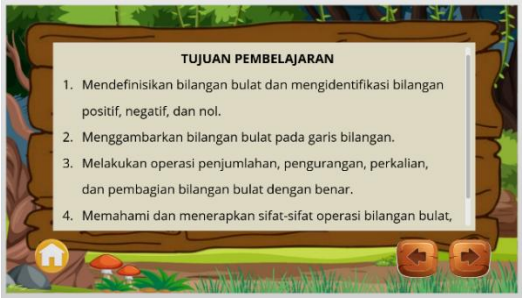

Figure 2. Learning Objectives

The illustration in Figure 2 outlines the learning objectives intended to be achieved in this e-module. These objectives have been designed to align with the current curriculum structure, ensuring that the material presented remains relevant and adheres to the educational standards in place. It is hoped that students, through the e-module, will understand the material in accordance with the established learning objectives.

Figure 3. Exercise Questions

Figure 3 displays the exercise questions that students will work on. The e-module is also equipped with an answer key to assist them in checking their work. The practice problems included in the e-module encompass questions of varying difficulty levels low, medium, and high allowing for an assessment of students understanding.

Figure 4. Game Link

Figure 4 contains a link to a game where students can answer questions while playing a quiz. This link is designed to enhance interactivity and student engagement, with the aim of reinforcing their understanding of the material that has been taught.

The next stage is the development phase, which aims to produce a viable e-module on the topic of integers. The researcher conducts validation tests by two validators, who are experts in media and content. The validation of the e-module includes a validation sheet that covers aspects of media practicality, media design, content quality, and interactive features. The results of the e-module validation can be seen in Table 1.

Table 1. Results of the validation test

Yes	Validator	Total Score	Percentage	Category
1	Media Expert	50	96,15%	Very Valid
2	Content Expert	49	94,23%	Very Valid
	Total	**99**	**95,19%**	**Very Valid**

The average validation test score obtained from two validators reached 95.19%, which falls into the very valid category. This indicates that the e-module has met the feasibility standards and can be used as an effective learning medium. According to research conducted by Rismayanti, the feasibility of the e-module emphasizes that this module can serve as a means of exploring knowledge for students, providing a fresh, interactive, and more engaging learning experience compared to conventional methods [18]. According to Salsabila and Syaban, interactive e-modules are teaching materials that are suitable for use as educational resources due to their comprehensive, clear, visually appealing content, and their simple design, making them easy for students to use [19].

The implementation was carried out by testing the e-module on a group of five seventh-grade students at SMP Islam Al-Mubarok, selected as the experimental group in a limited scale. The testing of the e-module began with a review session, where students were invited to revisit the concept of integers that they had previously learned as a foundation before exploring the material in this interactive e-module. Next, students were given an explanation about the e-module, including its objectives and how to use it. Students were given the opportunity to use the e-module for learning directly. In addition, they were asked to watch videos related to integers that could be accessed through the provided YouTube link. They were also asked to complete exercises and play games included in the e-module. The implementation stage is a crucial step in testing the practicality of the e-module during the trial process. The practicality of the e-module was assessed through a practicality sheet given to the observer or mathematics teacher at SMP Islam Al-Mubarok during the learning trial. Data from the practicality sheet will provide an overview of the ease of use and clarity

of the material for students. The results of the analysis of the e-module's practicality can be seen in Table 2.

Table 2. Results of the practicality test

Observer	Total Score	Percentage	Category
Mathematics Teacher	30	83,33%	Very Practical

The use of e-modules in learning has proven to be very practical, with a score of 83.33%. According to Astutik, the practicality of e-modules can impact their effectiveness, as the ease provided to students through the use of media is significant. A well-designed learning approach can have a significant impact on improving students' academic achievement, opening opportunities for them to understand the material more deeply and effectively [20]. Nur Khofiyah states that the practicality of media will assist students in facilitating their learning process [21].

In the evaluation phase, an in-depth assessment was conducted to measure the effectiveness of the Articulate Storyline 3-based e-module in supporting learning. This assessment is based on the analysis of data obtained from student feedback questionnaires after they interacted with the e-module. A summary of the analysis results is presented in Table 3.

Table 3. Results of the effectiveness test

No.	Students	P/L	Total Score	Percentage	Category
1	ANF	L	23	85,71%	Very Effective
2	ANS	P	25	89,28%	Very Effective
3	AM	P	24	85,71%	Very Effective
4	FAP	L	26	92,85%	Very Effective
5	GR	P	25	89,28%	Very Effective
	Total		**123**	**87,85%**	**Very Effective**

The results of the effectiveness analysis indicate that the use of e-modules based on Articulate Storyline 3 is very effective, with a score of 87.85%. According to Sa'diyah, the application of e-modules is considered effective and efficient as an innovative replacement for conventional books, as well as as a reliable source of information if it meets testing criteria and is, of course, paperless, making it environmentally friendly [22]. Salsabila and Syaban add that this interactive e-module can support teachers in the learning process, as the learning system that utilizes technology makes learning activities more effective and allows for the optimal achievement of learning objectives [19].

The material on integers is a fundamental foundation that students must master as a starting point for understanding further material in mathematics lessons. Many students find this material difficult and confusing, especially the operations involving positive and negative integers. Seventh-grade students tend to prefer playing and quickly become bored with things that are less interesting to them. To address this issue and help students learn about integers in a fun way, the use of mathematics learning media in the form of an Articulate Storyline 3-based e-module can be an effective solution.

The analysis of validity, practicality, and effectiveness shows that the interactive e-module based on Articulate Storyline 3 is feasible to be used as a learning medium. The validity of the e-module is reflected in the alignment of the material with the curriculum, systematic presentation, and the use of language that is easy to understand. Practicality is evident in its accessibility, which allows students to use the e-module independently both at school and at home. Effectiveness is demonstrated through improvements in learning outcomes, motivation, and student engagement. These findings are consistent with previous studies which emphasized the advantages of e-modules developed with Articulate Storyline 3 in optimizing the learning process [2], [23].

Features such as visualization, animation, simulation, and interactive exercises play a crucial role in bridging the abstract concept of integers with students' concrete understanding. The interactive and engaging design enhances learning interest while reducing the potential for misconceptions that often occur in conventional teaching. Challenges appear in school policies that restrict the use of mobile phones, yet this limitation is addressed by allowing students to access the e-module at home. Observations reveal that student enthusiasm remains high, motivation improves, and active participation is sustained.

This study confirms that interactive e-modules are an innovative solution to enhance student motivation and understanding of integer material. The development of similar e-modules for other topics carries strong potential to expand digital learning innovations that are more effective, adaptive, and students-centered.

4. Conclusion

The development of an interactive e-module based on Articulate Storyline 3 for junior high school students on integers has proven valid, with content aligned with the curriculum, systematically structured, and presented in accessible language. Its practicality is demonstrated by its ease of use and accessibility, enabling students to learn independently both at school and at home. Its effectiveness is reflected in improved learning outcomes and high student motivation.

Visualization, animation, simulation, and interactive exercises effectively bridge the gap between abstract integer concepts and concrete understanding. Restrictions on mobile phone use at school present a challenge, but access at home maintains student enthusiasm, motivation, and active participation. The interactive e-module serves as an innovative and effective tool to enhance mathematics learning, with potential for expansion to other topics and support for adaptive, engaging, and student-centered digital learning.

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