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DEVELOPMENT OF E-MODULE FLIPBOOK ON SCIENCE LEARNING TO SUPPORT SUSTAINABLE DEVELOPMENT GOALS (SDGS) FOR ELEMENTARY SCHOOL STUDENTS

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Abstract: One of the Sustainable Development Goals (SDGs) goals is to improve the quality of learning. However, school teachers have not integrated the SDGs into the learning process. Therefore, applying the SDGs in school learning is important for students to understand global issues and overcome everyday challenges. This research aims to develop a flipbook-based science e-module that is feasible for achieving the Sustainable Development Goals (SDGs) for elementary school students that is valid and practical. This type of research is development research by adopting the Brog and Gall model. The data collection technique used is quantitative and qualitative data analysis. The subjects of this research were grade VI students at SD Negeri 3 Bandungrejosari Malang City. The instruments used in this study were interview and questionnaire instruments. The material expert validation assessment results obtained a score of 87.9% in the "very feasible" category. The average assessment of language experts shows a percentage of 94.6%, which is classified as "very feasible." Media experts also assessed the science e-module with a "very feasible" category with a feasibility level of 97.1%. The teacher's practicality questionnaire showed an average percentage of 86% with the category "Practical." Furthermore, based on the assessment of ten students after the science e-module trial, the average practicality reached 96.8% with the category "very practical." This research can be a reference for other researchers in developing SDGs-based science e-modules. So, it can be concluded that developing flipbook-based science e-modules to achieve the Sustainable Development Goals (SDGs) for elementary school students is feasible and can be used in the learning process.

Keywords: E-module, Electromagnetic, SDGs

INTRODUCTION

The United Nations established the Sustainable Development Goals (SDGs) in 2015 as a global initiative to mobilize collective efforts to eliminate poverty, preserve the environment, and ensure universal well-being and peace by 2030. Comprising 17 interconnected goals, these SDGs recognize that progress in one area has implications for others, underscoring the importance of holistic development that integrates social, economic, and environmental sustainability (Stead, 2019; van Niekerk, 2020). In line with this, education is recognized as a crucial sustainable goal, as affirmed by the 21st-century agenda. The media has embraced credit ty as a fundamental principle in the nation's education development (Wahyudin, 2018).

The Sustainable Development Goals (SDGs) are essential in elementary school education for several reasons (Nazar, Chaudhry, Ali, & Faheem, 2018). Firstly, they introduce elementary school children to significant global issues such as poverty, hunger, health, education, environmental sustainability, and gender equality. This exposure helps children understand real-world problems and fosters social awareness and empathy towards others (Mtoward8). Secondly, the SDGs promote the development of crucial 21st-century skills, including problem-solving, critical thinking, collaboration, communication skills, and digital literacy. By integrating the SDGs into the elementary school curriculum, students can cultivate these skills early in their future lives (Crawford, Higgins, & Hilburn, 2020). Third, the SDGs provide a relevant and meaningful framework for elementary school students ' daily lives and help them comprehend how waste management, cleanliness, and health are connected to sustainable development goals. This contextualization offers more meaningful learning experiences and student motivation, increasing the integration of SDGs into elementary school education plays a crucial role in shaping a generation that values global issues, possesses a holistic understanding of sustainable development, and is prepared to contribute towards achieving the SDGs (Bruns, Macdonald, & Schneider, 2019; Kwee, 2021; Thamrin, 2020).

In elementary school education, science subjects have a connection to the Sustainable Development Goals (SDGs) because many daily life activities are scientifically related. One way to incorporate SDGs into science learning is by utilizing materials related to electromagnetism. Adriyawati, Utomo, Rahmawati, and Mardiah (2020), the study of magnets can contribute to understanding renewable energy concepts like wind and water energy used in power generation. By engaging in this lesson, students can grasp how generators employ magnetic fields to generate electrical energy, thereby understanding the significance of renewable energy sources in attaining affordable and sustainable energy goals.

Moreover, the application of magnets in various technologies, such as electric motors and compasses, offers tangible examples of how magnets contribute to the sustainable development of technology and infrastructure. Exploring these examples can ignite students' interest in science and technology while fostering an understanding of the significance of innovation in sustainable development. The study of magnets in elementary school not only imparts fundamental knowledge about magnet properties and applications but also instills in students an appreciation for the role of sustainable development in achieving the SDGs. This understanding is intended to shape students into environmentally conscious individuals motivated to actively safeguard our planet (Chawla, 2007; Quigley & Lyons, 2017). One approach to incorporating the SDGs into elementary school learning activities involves the utilization of flipbook-based E-Modules. Flipbooks are captivating and eerie mediums for conveying messages through simple animations (Prasetyono & Hariyono, 2020; Suryani & Ardianto, 2019). In the context of education, flipbooks offer engaging tools for visualizing complex concepts and inspiring students through visual and creative learning experiences. However, the integration of SDGs-based electronic media has yet to be fully explored in teaching electromagnetic materials within the elementary school curriculum.

The observations conducted at SDN Bandungrejosari 3 in Malang City reveal a limited and less innovative use of learning media in schools. This limitation directly impacts pre-students' sensation of the presented materials, leading to boredom among students. Consequently, student enthusiasm for learning declines, making it difficult to achieve learning objectives and resulting in decreased learning outcomes. In the other revolution, uranology pl, terminology played a role in various aspects of life, including education. Therefore, it becomes imperative for schools to incorporate digital-based, innovative, and engaging learning media to enhance student motivation. Moreover, teachers should strive to deliver electromagnetic materials that not only focus on theoretical concepts but also align with the principles of the SDGs (Dessouky, Gholikhani, Tahami, & Khalili, 2019; Gholikhani, Tahami, Khalili, & Dessouky, 2019).

This research is closely related to a previous study conducted (Roemintoyo & Budiarto, 2021), which demonstrated that students have a positive perception of the opportunities presented by flipbooks as digital learning media. Furthermore, (Suryani & Ardianto, 2019) developed digital flipbook learning media that significantly improved student scores and effectively conveyed information in the classroom. Similarly, (Rei2) conducted development research using the ADDIE model, creating Kvisoft Flipbook Maker media based on a scientific approach for Theme 8 (Our Friendly Environment), sub-theme 1 (Humans and the Environment), Learning 3 and 4. The results indicated that the Kvisoft Flipbook Maker media, developed with a scientific approach, was deemed valid and practical for learning activities. Additionally, Hardiansyah (2022) developed learning media

for science lessons, specifically focusing on cycles (me using the ADDIE model. The study concluded that the Flipbook learning media for the fourth-grade Science curriculum at SDN Poja II Sumenep was suitable for use in teaching and learning teaching and learning: Teaching primary learning research is the development of e-modules for science, specifically emphasizing electromagnetic materials. Furthermore, these e-modules not only cover the concepts of electromagnetism but also establish the concepts of electromagnetism and a flipbook-based e-module that nonces students' understanding of the SDGs by applying electromagnetic principles electromagnetic principles appliestudents' understanding of SDGs mental research.

METHODS

The research process in this study adheres to the Borg and Gall model, which comprises ten stages. These, which comprise the developmental process using the Borg and Gall model, encompass the collection of research information, planning, the development of initial product prototypes, preliminary field testing, revisions of the main product, primary field trials, revisions of the operational product, operational field testing, final product revisions, and the subsequent deployment and implementation phase, as outlined in table 1.

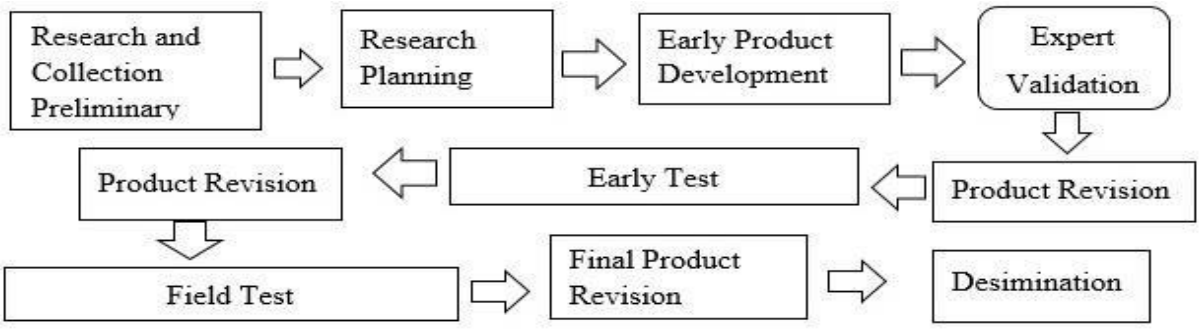

Figure 1. Stages of Development Research by Borg and Gall

Based on Figure 1, there are ten stages of Borg and Gall development. However, this study modified this stage, analysis, and development stage. The analysis stage involves a series of activities that include analyzing the curriculum, characteristics of study student elementary students, andes and their use in learning at SDN Bandungrejosari 3. In the design stage, researchers plan the development of learning e-modules using flipbooks. This process includes selecting and creating materials that will be presented in the e-module. Researchers chose electromagnetic material as the focus of the study. Furthermore, researchers create learning media by selecting images or animations, determining color choices, animation effects and found ts, and selecting any content or material conveyed through the media. During the development stage, researchers made validation instruments in the form of

assessment questionnaires by linguists, media, material, and practicality questionnaires for teachers and students. The flipbook-An expert lecturer validated the flipbook-based e-module developed questionnaire tab1. TheTableticTablepracticalrried out by involving teachers and students. The results of the validity test and practicality test were used to improve the e-module to produce a valid and practical e-module.

The research utilized two instruments, namely interviews and questionnaires, to gather data. The interviews were conducted to gain insights into the specific e-module requirements of schools. On the other hand, the questionnaires were used to assess the validity and practicality of the e-module. The validity of the e-module was evaluated based on input from expert validators with expertise in the aial, language, and media. Additionally, the practicality of the e-module was assessed by collecting feedback from teachers and students.

Tabel 1. Questioner Instrument for Experts

Aspect	Indicator
Medium	Motivates students
	Appropriateness of image size and type with standards
	Vi.deo by the material
	Usability
	Accessibility
	Design
Language	Sentences do not cause double meanings.
	Writing by Indonesian language rules
	By student characteristics
	Communicative
	Coherence
Content	By learning objectives
	Suitability and depth of material
	Material is easy to understand
	The material contains SDGs

(BSNP, 2006)

RESULTS AND DISCUSSIONS

This research produces a science e-Module using a flipbook application as its product. This module focuses on electromagnetic material and is intended for grade VI elementary school students. The purpose of preparing Science e-Modules is to support the achievement of Sustainable Development Goals (SDGs). The proDeveloping-module follows the se-module analysis, design, and

development, adopting the Borg and Gall framework. At the analysis stage, the focus was on analyzing the existing problems at SDN Bandungrejosari 03. The observations and interviews showed that the problem identified was Century's lack of learning resources in the form of modules. Furthermore, a 21st-century study was conducted, which showed that the module currents were in printed form with a monotonous appearance, less attractive, and had not encouraged students to participate and think critically actively. Therefore, efforts to participate and think critically actively about the goals of the Sustainable Development Goalsbye Development Goals (SDGs) have also not been considered in learning activities. Based on the needs analysis results, product development was carried out with a focus on e-Modules-specific needs analysis results. The goal is to provide e-modules that are more interactive and interesting and support the development of environmental literacy skills.

After conducting the problem and d needs analysis, the next step is to plan the design of SDGs-based science e-Modules. Several activities were carried out in the science e-Modules product development planning stage. We will collect various reference sources used in the science e-Module material about magnets. These reference sources were selected by referring to the basic competencies and materials in the 2013 curriculum for grade VI, especially those related to environmental life and literacy. They can be connected to Sustainable Development Goals (SDGs). The science e-Module was prepared by determining the parts presented in the module. These parts include the cover, instructions for using the e-Module, basic competencies of science along with indicators of competency achievement, learning objectives, and learning activities that will be carried out. Activities will be designed according to the theme of SDGs and environmental literacy. The flipbook application is used in the process of preparing this e-Module. After the e-Module has been designed, the file is saved in PDF format and then transferred to the Flipbook application to produce the module in electronic form. Figure 2 shows the results of this e-Module development.

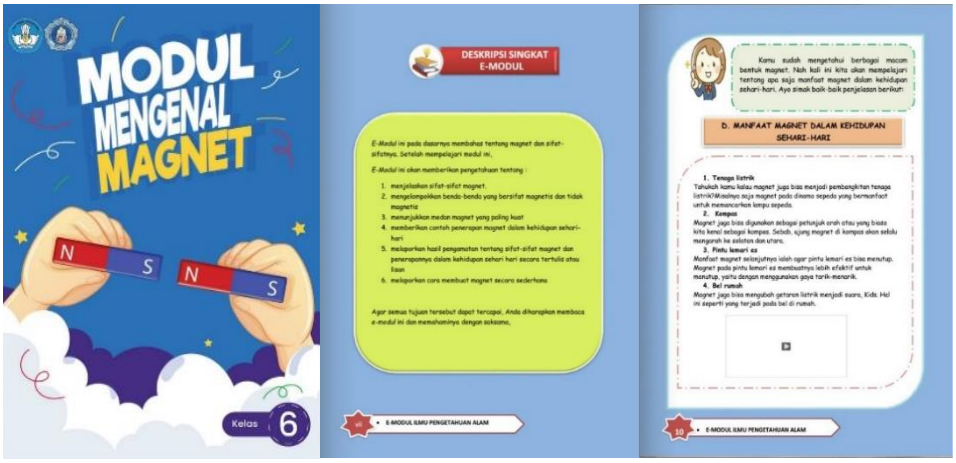

Figure 2. SDGs-based science e-modules

Based on Figure 2, the material expert validation assessment shows results with a score of 87.9%, which states that the Science e-module is feasible with a "very feasible" feasibility level. ." trial experts recommend adding examples of natural phenomena in the form of videos from YouTube, as in evaluation questions and providing games that can motivate students. The average result of the linguist's assessment confirms that the Science e-module created using the Flipbook application is also feasible with a feasibility level of "very feasible." Linguists suggest that the use."f spelling be adjusted. Furthermore, based on the average assessment results of media experts, Science e-modules made using the Flipbook application are also declared feasible with a feasibility level of "very feasible" with a percentage of 97.1%. Media experts inMedia experts suggest increasing font size, providing Google Form links to facilitate question processing, and including the author's identity in the evaluation of the teacher's response to the Science E-Module using the Flipbook application, which was assessed using the teacher's practicality questionnaire, an average percentage of 86% was obtained in the "Practical" category. The suggestions given by the teachers are to shorten the link to the flipbook using bit.ly and improve the appearance of the flipbook to make it more attractive. Furthermore, based on the."assessment results of ten students after testing the Science e-Module, the average practicality was 96.8% with the category "very practical." Therefore, this Science e-Module can be used in the learning process because it has a high level of practicality.

Discussion

Science e-module based on Sustainable Development Goals (SDGs) is an electronic module developed using an attractive, easy-to-use flipbook application. Flipbook media has several advantages, such as more interactive visualization, can be accessed through various digital devices such as laptops, tablets, and smartphones, and is easy to use digunakan (Astuti, Fitriana, Ahmad, Ermawati, & Hasan; Ningrum & Ambarwati, 2023). By utilizing flipbook-based e-books, learning can overcome learning problems that are sometimes monotonous and boring. Using information technology in learning can increase the effectiveness of the learning process and the accessibility of learning materials (Hattangdi & Ghosh; Levina et al., 2017). Thus, learning materials become more meaningful and easily understood by students (Eady & Lockyer, 2013; Rasmitadila et al., 2020; Wekke & Hamid, 2013). The development of SDGs-based electromagnetic e-modules is important because it can integrate scientific learning with pressing global issues, foster students' awareness of sustainability, integrate contextual learning, and help students become proactive agents of change (Shulla, Filho, Lardjane, Sommer, & Borgemeister, 2020).

The feasibility of flipbook-based e-module learning media based on the Sustainable Development Goals (SDGs) can be evaluated through a media, material, and language validation test.

In this study, the validators involved were expert lecturers who had shown that the validation test result was 97.1% in the "Very Appropriate" category. This is due to several factors, such as learning media in flipbook e-modules that can motivate students, image sizes, and fonts by the standards. These learning videos are based on the ease of use and designs that are by findings in line with research conducted by bytes that media feasibility is influenced by technical quality such as the size and type of font, the integration of the colors used, the suitability of the images/animations used, and the suitability of sound and mus, ic. In addition, media aspects such as visible, attractive, simple, and useful displays also play a role in determining the feasibility of learning media. The use of appropriate and interesting media can motivate students to be actively and enthusiastically involved in the learning process (Dewi, Adnyani, & Wahyuni, 2020; Saputri, Rukayah, & Indriayu, 2018; Wahyuningtyas, Bintartik, & Putra).

The results of the validation test by material experts showed a percentage of 87.9% with the category "Very Feasible." The assessment of feasibility of the material in the e-module was assessed based on suitability to learning objectives, depth of material, suitability to SDGs, relevance to student characteristics, communication skills, and interrelationships between sections. Previous research by Susby anti, Yennita, and Azhar (2020) also showed that the reading's truth, depth, and clarity determine the material's validity. The evaluation of validation by linguists showed a perc with the category "Very Appropriate." The language valida." on assessment is based on the criteria of sentences that do not cause double meaning (Abdurrahman & Dewi Lengkana, 2022) and writing by Indobyles (Munthe, Silaban, & Muchtar). The results of the practicality evaluation by the teacher showed a percentage of 96% in the "Very Practical" category. In addition, the evaluation results by students obtained a percentage of 96.8% in the "Very Practical" category. The practicality of e-modules can be seen from the characteristics of user-friendly modules (Husna, Kusasi, & Zuwida; Purnamasari & Risqa; Susanti et al., 2020). Developing SDGs-based science e-modules on electromagnetic material has proven valid and practical.

CONCLUSION

Material expert validation assessment results obtained a score of 87.9% in the "very appropriate" category. The average assessment of linguists shows a percentage of 94.6%, which is classified as "very adequate." Media ." parts also assessed the science e-module in the "very feasible" category with a feasibility level of 97.1%. The teacher practicality questionnaire shows an average percentage of 86% in the "Practical" category. Furthermore, based on the assessment of ten students after testing the science e-module, the average practicality reached 96.8% in the "very practical"

category. Based on this, it can be concluded that the development of a Science E-Module using the Flipbook application for learning SDGs-based Electromagnetic material for class VI students at SDN Bandungrejosari 3 Malang City is considered feasible and can be used in the learning process.

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