Design of Mathematics Interactive e-modul Based on Batak Culture by using I-Spring Suite

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Abstract. One of the supporting factors for successful classroom learning is the availability of learning resources that are in accordance with the characteristics and ways of thinking of students. Learning resources that are very trendy at this time are electronic modules (e-modules) combined with local cultural characters. In this study, an interactive e-module of mathematics based on Batak culture has been designed using the I-Spring Suite application. Based on the results of the initial analysis conducted by the research team on schools and students, it is known that students do not yet have up-to-date teaching materials that are in accordance with their thinking abilities. Therefore, in this project an e-module has been designed that can be used anywhere and anytime using a smartphone. Students and teachers are very enthusiastic about using the module, as seen from the increasing interest and passion for learning

Keywords: e-modul, Mathematics, Bataks Culture, I-Spring Suite.

1 Introduction

In several countries, the concept of inclusive education programs integrated into the school curriculum is being massively promoted. This includes Indonesia, which has implemented it through the independent curriculum launched in 2021. In mathematics education, inclusive education can be realized through the utilization of various learning resources to strengthen students' literacy and numeracy skills, in accordance with the mandate of the independent curriculum [1]. A study by [2] explain about learning resources can be defined as instructional materials used by students to gain knowledge, information, or understanding of a subject. The types of learning resources include human-based resources, reading materials, educational videos, images, television, or other sources that provide information or guidance for learning [3]. Diverse and engaging learning resources make learning easier for students to understand. If learning resources are interesting, interactive, and fun, students will be more enthusiastic

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and motivated to learn. Therefore, it can be concluded that learning resources are all types of materials or instructional resources used in the teaching and learning process to help students understand and master the lesson content.

One of the approaches to teaching mathematics, besides equipping students with skills through practice, discussion, and discovery, is by utilizing innovative and systematic electronic modules (e-modules) for students [4]. Learning through e-modules using the Problem-Based Learning model is considered highly appropriate, as students will experience the relevance of learning materials to real-life situations without always relying on the teacher [5];[6].

The development of e-modules, combining learning models, technology utilization, and the incorporation of various literacy skills, has progressed rapidly. This also applies to e-modules specifically for mathematics education [7]. Continuous innovation in developing educational media is necessary to keep up with and address students' loss of competence. Various challenges encountered in the process of teaching mathematics lead to poor academic performance and a lack of innovative thinking skills among [8]. Common issues found in the classroom, such as students' lack of interest in learning mathematics and the perception that mathematics is unimportant, result in low motivation to learn. Students' difficulties in understanding mathematical problems can prevent them from responding to the teacher's questions. Student enthusiasm for learning remains low, and some students score below the Minimum Competency Criteria (KKM) in daily assessments. The use of Batak culture-based e-modules, aided by ISpring Suite, can help overcome the challenges of mathematics education. Many students experience difficulties and lack motivation in learning mathematics. By integrating familiar Batak cultural elements and the interactive PBL method, this e-module can help students overcome these obstacles.

Additionally, it can enhance 21st-century competencies: PBL is an effective method for developing essential skills for the 21st century, including critical thinking, creativity, and teamwork. In an increasingly complex world, these skills are vital for personal and professional success. Batak culture is rich in traditions, values, and symbols that can be integrated into mathematics education. The use of local cultural elements not only makes the material more contextual and relevant to students but also enhances their sense of pride and cultural identity. In the context of rapid globalization, it is important for students to maintain and appreciate their cultural heritage. Integrating local culture into education can also address the cultural alienation often experienced by the younger generation.

2 Literature Review

2.1 Batak Culture-Based Interactive Mathematics Module

The development of interactive e-modules in education has become a significant research focus in recent decades. Educational technologies like iSpring Suite allow the creation of engaging and interactive educational content. In the local Indonesian context, integrating local culture into mathematics learning materials offers a contextual approach that is relevant to students [9]. This study examines the development of an interactive Batak culture-based

mathematics e-module using iSpring Suite, exploring the state of the art in educational technology, interactive e-modules, and the integration of local culture into education.
Technological advancements have revolutionized how educational content is delivered. Platforms like iSpring Suite provide tools to create interactive learning content, including videos, quizzes, simulations, and animations. Several studies have shown the effectiveness of using this technology in enhancing student engagement and understanding [10];[11]. Specifically, iSpring Suite has been used in various studies to create adaptive and interactive learning modules. Research on interactive e-modules in mathematics education shows that multimedia use can improve students' motivation and academic performance. For example, a study by [12] found that interactive modules enhance the understanding of mathematical concepts and problem-solving skills. Interactive e-modules not only present information visually and auditorily but also allow students to actively participate in the learning process through simulations and interactive quizzes.

The integration of local culture into education has been recognized as an effective method for making learning more relevant and contextual. Several studies suggest that using local cultural contexts can increase student engagement and help them see the relevance of learning materials to their everyday lives [13];[14]. Batak culture, with its rich traditions and values, offers many opportunities for integration into mathematics education. Several studies have explored the use of interactive e-modules in education and the integration of local culture, but few have combined both with specific technology such as iSpring Suite. A study by [15] explored the integration of Batak culture into education but not in the context of interactive e-modules. On the other hand, [16] study demonstrated the effectiveness of interactive e-modules in mathematics education but did not highlight the aspect of local culture**.**

2.2 Characteristics of Modules

Compared to other teaching materials, modules have specific attributes or characteristics. Here are the characteristics of modules:

a. Self-Instruction: A module must facilitate independent learning without requiring assistance from others. To achieve this, the module should include:
    1. Clear learning objectives that cover Competency Standards and Basic Competencies.
    2. Learning materials divided into small, easily understandable units, with examples and illustrations that support understanding.
    3. Practice problems and assignments that allow the teacher to evaluate students' understanding.
    4. Content that relates to the students' environment and situation.
    5. Simple and communicative language use.
    6. A summary of the material.
    7. Assessment tools for students' self-evaluation.
    8. Feedback on students' assessments.
    9. Information on references or additional resources supporting the learning material.

b. Self-Contained: The module must include all the necessary learning materials to allow students to fully understand the subject matter comprehensively. This ensures that students can learn thoroughly because all learning materials are available in one package.

c. Stand-Alone: The module should not rely on other teaching materials or media, so students do not need to use other materials to understand and complete the tasks in the module.
d. Adaptive: The module must be able to adjust to scientific and technological developments and be compatible with various hardware. Adaptive modules will remain relevant over time.
e. User-Friendly: The module must be easy for users (students) to understand. Instructions and information should be simple, easy to comprehend, and use common terms familiar to students.

Mastery Learning means that every student in the class you teach will fully understand the material before moving on to the next topic[17];[18].

2.3 Electronic Module (e-Module)

An electronic module (e-module) is a method of presenting self-learning materials that are structured into specific learning units, delivered in an electronic format, and link each learning activity with navigational tools to enhance student interaction with the program. Additionally, e-modules incorporate tutorial videos, animations, and audio elements to enrich the learning experience, thereby increasing the level of student interactivity [19]. The use of e-modules positively impacts students' self-learning abilities through electronic media. E-modules play a significant role in the learning process due to their ability to improve the effectiveness of education. They assist students who face difficulties during the learning process and make it easier for them to understand lesson materials in a structured and systematic manner, presented in an orderly format [20].

A good electronic module has several characteristics, including the ability to foster self-learning, independence, adaptability, and user-friendliness. In delivering lessons through electronic modules, these characteristics are similar to conventional modules, such as self-learning capability, independence, adaptability, and user-friendliness:

1. Self-learning capability is a crucial characteristic of electronic modules and must always be present. Clear instructions are required in electronic modules so that students can easily use them and have a solid understanding of the learning objectives and outcomes they must achieve.
2. Independence refers to the completeness of the material in the electronic module, allowing students to comprehensively understand the content.
3. Self-sufficiency emphasizes that the electronic module should be standalone, not relying on other teaching materials or additional supporting equipment.
4. Adaptability is the module's ability to adapt to the development of science and technology, ensuring its continued relevance. A good electronic module must adjust to the applicable developments in science and technology. The module should align with advancements in knowledge and technology, making it suitable for use [21]; [22].
5. The final characteristic, user-friendliness, requires the electronic module to be easy to use. Every instruction and piece of information in the electronic module should be helpful and user-friendly [23].

3 Method

This research adopted the ADDIE model, focusing on two components: analysis and design. In the first stage, an analysis was conducted on the research subjects, namely students and teachers at SMA Negeri 5 Medan, located at Jl. Pelajar No.17, Teladan Tim., Kecamatan Medan Kota, Kota Medan, Sumatra Utara 20216. The analysis aimed to assess the initial conditions and needs of students and teachers. These initial conditions at the school were used as a baseline to move on to the next stage. The initial conditions have been presented in the results of this research. Based on this analysis, a focus group discussion (FGD) was conducted to determine the draft of the module to be designed. Points discussed in the FGD were translated into the initial design of the electronic module. Several design choices, such as the layout, content of the learning material, interactive design, and presentation techniques, were developed at this stage [24]; [25]. Subsequently, the module was validated by several experts to determine its effectiveness and usefulness.

4 Result and Discussion

4.1 Initial Analysis

The initial stage of this research involved analyzing the problems encountered by the partners, both in the teaching process and in the availability and needs of teaching support devices. This analysis phase was conducted through a Focus Group Discussion (FGD), as shown in **Figure 1**.

Fig. 1. Focus Group Discussion (FGD) as part of the problem analysis stage with the research subjects

Based on observations of the research subjects and discussions with the research team, several issues related to the needs and challenges faced by teachers and students at the school were identified. One of the problems encountered was the lack of up-to-date and easy-to-understand learning resources that aligned with students' abilities. By "up-to-date," it is meant that frequent curriculum changes and modifications to the mathematics learning content resulted in the current learning resources being less suitable. Some of the content found in the textbooks is no longer taught in class. Similarly, new material has not yet been included in those books. Through discussions with experts and the research team, it was decided to develop a highly interactive and student-friendly learning module. This module contains content that is presented in an engaging and easy-to-understand manner. Furthermore, the use of technological applications to support the development of the module was also applied.

4.2 Design

Following the analysis stage, the next step is the Design stage. In this stage, the researchers designed several aspects required in this research, including 1) Media selection, 2) Content planning, 3) Language design, and 4) Instrument design. The design details for each aspect are explained as follows:

1. Media Selection: The application used for the module design is iSpring Suite. As shown in Figure 2, this application requires support from Microsoft PowerPoint.

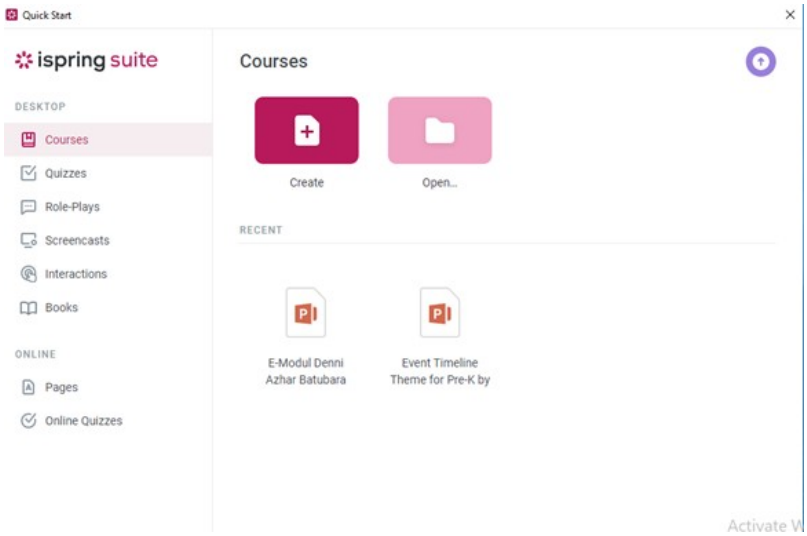

Fig. 2. The initial view of Ispring Suite application

Microsoft PowerPoint is used to design the cover, main menu, information, usage instructions, and content from the initial to final slides, as well as to integrate various elements such as images, text, audio, and video into a comprehensive learning media.

Integration Steps for the Module with iSpring Suite:

1. If you do not have the iSpring Suite application, download the application on your laptop by accessing https://www.ispringsolutions.com/ispring-free link and register with your email account.
2. To start creating the module, first create a PowerPoint or search for PowerPoint templates on https://slidesgo.com/, and choose the design you like.
3. Search for instructional icons on the https://www.iconarchive.com/news.html and download the icons.
4. Next, find references for the content of one lesson in PowerPoint.
5. Once you have selected the design, create the physics content in PowerPoint (adjust it to the material), select the text size, and the color of the text.
6. Then, activate the features in the instructional icon by clicking on the icon, then insert and choose action.
7. After all instructions have been completed, the next step is to click iSpring Suite 11 and publish it.
8. Next, download the Website 2 APK Builder Pro application to turn the module into an app that can be installed on Android, available https://websitetoapk.com/.
9. After downloading, upload the HTML or PowerPoint file you created to Website 2 APK Builder.
10. Run the app on your smartphone.

a. Cover

At the initial stage (before validation), the cover was designed without images, and the title was placed in the center at the top of the cover as shown **in Figure 3a**.

Fig. 3. (a) Cover Design for the e-Module; (b) main menu design

b. Main Menu

The main menu consists of six sub-sections: 1) Information, 2) Learning Objectives, 3) Introduction, 4) Content, 5) Quiz, 6) Developer, as shown in **Figure 3b**.

c. Information

The information section includes two main points: 1) Learning Instructions and 2) Usage Instructions, as shown in **Figure 4**.

Fig. 4. Module Design: Usage Instructions and Information

d. Introduction

Before entering the learning content, students are presented with an introduction to guide their thinking based on the material to be studied. This introduction includes students' learning experiences related to the topic of quadratic equations. Students are guided through everyday experiences related to Batak culture and connected to mathematical topics, as shown in **Figure 5**.

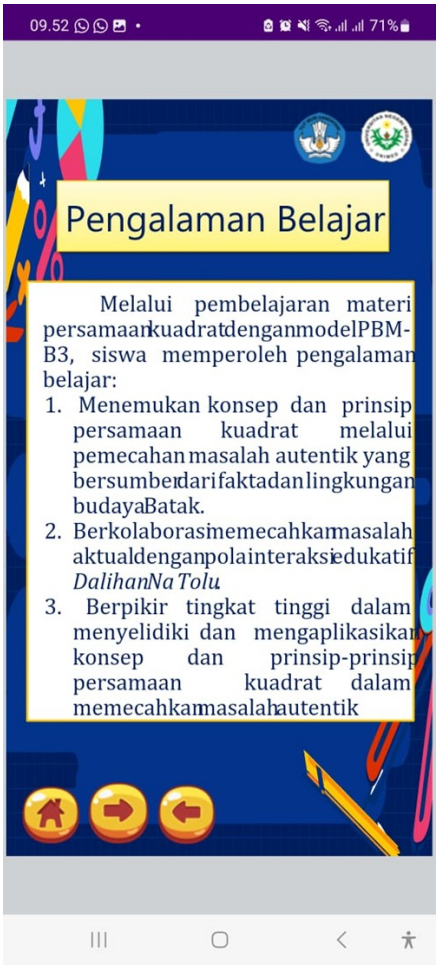

Fig. 5. Introduction Design

Fig. 6. Content Design

e. Content

The content section is divided into four subtopics: 1) The Definition of Renewable Energy, 2) Energy Equations, 3) Forms of Energy, 4) Energy Sources, as shown in **Figure 6**.

4.3 Discussion

The development of an interactive Batak culture-based mathematics e-module aims to increase students' motivation and understanding of mathematics learning, especially in regions with a strong Batak cultural presence. This study is based on several findings that students often face difficulties in understanding mathematical concepts due to limited learning resources that meet their needs and rapid curriculum changes. This aligns with previous findings that outdated learning media is one of the causes of declining student motivation.

Integrating Batak culture into the e-module is an innovative solution for creating more relevant and contextual learning experiences for students. Other studies have shown that using local cultural elements in education can help students see the relevance of learning materials to their everyday lives, as well as enhance their cultural identity. In this case, the rich traditions, values, and symbols of Batak culture become important elements integrated into this mathematics e-module, making the learning material not only more contextual but also fostering a sense of pride in the students' cultural identity.

The use of iSpring Suite in developing the e-module provides flexibility in presenting learning materials interactively through a combination of videos, animations, simulations, and interactive quizzes. Technologies like iSpring Suite have proven effective in enhancing student engagement and learning outcomes, as evidenced by previous research. Wang et al. (2019) [12] stated that interactive e-modules can improve students' understanding of concepts and problem-solving abilities, especially in mathematics learning. This shows that interactive learning media can make learning more meaningful and enjoyable for students.

The instructional model used in this e-module is Problem-Based Learning (PBL). PBL is known as an effective instructional model for developing 21st-century skills such as critical thinking, creativity, and teamwork. According to Jamila et al. (2022) [5], PBL allows students to be more engaged in learning because the material they study is relevant to real-world problems they face. In this context, students are not only required to memorize concepts but also to apply those concepts to solve everyday problems.

One of the strengths of this culture-based e-module is its ability to increase student motivation. Several studies have shown that engaging and interactive learning resources can make students more motivated to learn as well as fostering their critical thingking skills [26]. In this study, observations showed that students became more enthusiastic about participating in mathematics lessons after using the e-module. They were more interested in learning because the materials were presented using a cultural approach familiar to them. In addition, the use of technology in the form of e-modules also supports effective self-learning, allowing students to study anytime and anywhere according to their needs.

Positive responses from teachers also confirm that this module is effective in supporting classroom learning. Teachers' positive perceptions of the module's impact, often referred to as 'performance expectancy,' will not only boost their intention to use the module but also enhance their engagement with the instructional materials, ultimately leading to more effective teaching [27]. Furthermore, the module promotes student self-learning, enabling teachers to concentrate on their role as facilitators who guide the learning process instead of merely delivering content. This shift is in line with contemporary educational practices that emphasize the importance of active student participation in learning.

5 Conclusion

This research shows that the development of an interactive Batak culture-based mathematics e-module with the assistance of the iSpring Suite application can be an effective solution to address the challenges of mathematics learning in schools. Integrating local culture into the learning materials enhances relevance and connections to students' daily lives, while interactive learning technology improves student engagement and understanding of the concepts being taught. The use of a problem-based learning (PBL) model also helps students develop critical and creative thinking skills that are highly needed in the 21st century. Positive responses from students and teachers reinforce these findings, indicating that this e-module can be more widely applied in educational contexts to improve the quality of mathematics learning in Indonesia

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