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Development of Electronic Modules in Education to Understanding through Physical Activity

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Abstract: This study aims to develop an E-Module for Physical Education (PE) learning, focusing on table tennis for seventh-grade students. The development model used is a modification of the Borg and Gall model, consisting of ten stages: potential and problem identification, data collection, product design, design validation, design revision, product trial, product revision, usage trial, usage revision, and mass production. The E-Module integrates various multimedia elements such as text, images, videos, animations, and audio to enhance student engagement. The validation results showed that the E-Module was highly valid, with scores of 92% for content experts, 95% for media experts, and 91% for language experts. The practicality test indicated that the E-Module was highly practical for use, with a score of 90%. The effectiveness test, based on small-scale and large-scale trials, showed scores of 82.5% and 90%, respectively, indicating that the E-Module was very effective in improving students' understanding of table tennis techniques and strategies. In conclusion, the E-Module proves to be an effective, flexible, and accessible learning tool that supports the implementation of the Merdeka Curriculum in PE learning, particularly in table tennis.

Keywords: Module; Merdeka Curriculum; Physical Education; Table Tennis

Introduction

Merdeka curriculum emphasizes flexibility, student autonomy, and the development of 21st-century skills, allowing students to choose learning materials that align with their interests and talents (Pokhrel, 2024) . This student-centered approach aims to foster creativity, critical thinking, and independence in learning (Umar et al., 2023). However, the implementation of Merdeka Curriculum faces challenges, particularly in the area of PE, where limitations such as a lack of sports facilities in rural areas, as well as limited teacher training and resources, create barriers to effective physical education (Fitriati et al., 2023). While these challenges may be more prominent in traditional sports settings, the advancement of digital tools and the integration of technology offer significant opportunities to overcome them. E-Modules, or electronic modules, can bridge this gap by offering interactive and engaging learning experiences that do not rely solely on physical resources.

E-Modules are a modern educational solution that integrates various forms of media, such as text, images, video tutorials, animations, and audio elements, into a cohesive digital learning platform (Batubara et al., 2024). This multimodal approach makes learning more engaging and accessible for students, particularly in subjects like PE, where hands-on experience is crucial. In the case of table tennis, for example, an E-Module can offer students comprehensive lessons on basic skills such as serving, rallying, and scoring (Arifin & Ariswan, 2023). These lessons can be enhanced with instructional videos demonstrating proper techniques, animations showing ideal movement patterns, and audio guidance to explain the mechanics of each action. Furthermore, interactive quizzes and self-assessments embedded within the module allow students to test their knowledge and receive immediate feedback, which reinforces their learning and helps them identify areas for improvement. This feature is crucial in fostering self-directed learning, a key aspect of Merdeka Curriculum, where students are encouraged to take charge of their own educational journey (Nisa et al., 2024).

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The benefits of using E-Modules in PE are numerous. One of the main advantages is the flexibility it offers. Traditional sports lessons, especially for activities like table tennis, often require specialized equipment and facilities, which may not be available in all schools, particularly in remote or underserved areas (Hills et al., 2015). E-Modules can help overcome this by providing students with theoretical knowledge and practical exercises that can be completed anywhere, whether at home or in the classroom (Machfud et al., 2023). Students can watch instructional videos, review images, and complete quizzes without the need for physical equipment. Moreover, E-Modules can be designed to function offline, making it easier for students who may have limited internet access to still benefit from the learning materials. This accessibility is especially important in Indonesia, where internet connectivity can be inconsistent in rural areas.

In addition to accessibility, E-Modules also support differentiated learning. Every student learns at their own pace, and an E-Module allows for this kind of individualized learning experience (Masykur et al., 2024). Some students may require additional time to master the basics of table tennis, while others may progress more quickly. The E-Module can cater to these varying learning speeds by offering more in-depth explanations or additional challenges based on students' performance (Rimatuzzahriah et al., 2024). For example, if a student struggles with the concept of proper grip or stance, the E-Module can provide further video demonstrations or offer targeted practice exercises. On the other hand, students who excel at the material can move ahead to more advanced topics, such as strategies for competitive play or different types of serves, without waiting for the rest of the class to catch up (Heiss & Oxley, 2021; Rizvi & Nabi, 2021).

An essential component of the E-Module for table tennis is the integration of formative assessments. These assessments, such as quizzes, interactive tasks, or even video submissions where students demonstrate specific skills, provide students with instant feedback. This feedback is crucial for reinforcing learning and allowing students to track their progress over time. For instance, after learning the proper technique for serving, students can take a quiz to test their understanding of the rules and mechanics of serving in table tennis. If they answer incorrectly, the module can offer corrective feedback and guide them to revisit the lesson. Such immediate responses are not always possible in traditional classroom settings, where teachers may not have the time to give individualized feedback to every student.

In conclusion, the development of E-Modules for PE, specifically on table tennis for grade VII students, represents a powerful way to address the challenges of limited resources in schools while aligning with the goals of Merdeka Curriculum. By integrating multimedia and interactive elements, E-Modules offer students a flexible, accessible, and engaging learning experience. They provide opportunities for self-directed learning, allow for personalized progress at individual learning speeds, and support the development of critical skills like digital literacy, problem-solving, and collaboration. With the increasing reliance on technology in education, E-Modules can transform the way PE is taught, making it more adaptable to the needs of today's students while preparing them for the future. By bridging the gap between theoretical knowledge and practical application, E-Modules can ensure that students develop not only the technical skills needed for table tennis but also the values of discipline, teamwork, and perseverance that are crucial in sports and life.

Method

This study uses the Research and Development (R&D) method to develop an E-Module for PE learning, focusing on table tennis for seventh-grade students. The development model used is a modification of Borg and Gall. The research is conducted at Junior High School 1 Kerinci, Jambi. Research instruments include validation sheets by experts in content, language, and media, as well as student responses. Data is analyzed both qualitatively and quantitatively using a Likert scale. The study is scheduled to take place from September to November 2024. Here for details, you can see the Table 1.

Table 1. Research Stages

Stage	Description
Analysis of Potential & Problems	Identifying issues such as limited resources and passive student participation.
Data Collection	Literature review on E-Module development and interactive elements for table tennis content.
Product Design	Development of the E-Module through pre-production, production, and post-production stages using Canva and flipbook.
Design Validation	Expert reviews from content, media, and language specialists to ensure the module's quality and relevance.
Design Revision	Improvements made based on expert feedback to refine the content and design.
Product Trial	Small-scale trial in the classroom to gather feedback from students and teachers.
Product Revision	Revisions based on trial feedback to enhance effectiveness and user experience.
Usage Trial	Large-scale trial to assess the E-Module's impact on student learning in real classroom settings.

Result and Discussion

This research developed an E-Module for the subject of PE focusing on table tennis for 7th-grade junior high school students. The E-Module was designed specifically for 7th graders and can be used by both teachers and students to enhance the learning process and meet the learning objectives. The development process followed a modified version of the Borg and Gall model, as adapted by Sugiyono (2016), which consists of 10 stages: potential and problem identification, data collection, product design, design validation, design revision, product trial, product revision, usage trial, usage revision, and mass production. The developed E-Module is packaged in a barcode format for easy access by users. This module includes not only text and images but also videos, audio, and other interactive elements, making it a comprehensive and engaging tool for PE learning. Below is a detailed explanation of each stage in the development process.

Potential and Problems

This analysis focused on various aspects, including student performance, the learning process in the classroom, available facilities, and the learning media currently used. The findings from observations and interviews indicated that students struggled to absorb information effectively due to limited learning resources, which mainly consisted of printed textbooks. Additionally, the learning process was mostly teacher-centered, leading to passive student participation. Furthermore, the school's limited facilities made the learning process less effective. This analysis revealed a need for innovative teaching materials to address these issues.

Data Collection

During the data collection phase, the researcher reviewed existing literature on the development of E-Modules, specifically focusing on integrating interactive and engaging elements into the learning process. A detailed study was conducted on the content to be included in the PE E-Module, ensuring that it was both relevant and engaging for 7th-grade students. The study also explored how flipbook-based electronic modules could be effectively used to enhance the interactivity and appeal of educational materials.

Product Design

The design and production of the E-Module followed a three-stage process: pre-production (planning and drafting the content), production (creating the content), and post-production (editing and packaging). In the pre-production stage, the learning objectives and competencies were defined, including key topics such as basic table tennis techniques, game strategies, and the importance of fair play. During production, the E-Module was designed using Canva to create an attractive and professional layout, which was then exported as a PDF. The PDF was subsequently converted into a flipbook format using the Hyzine PDF to Flipbook tool, enabling the integration of videos, audio, and other interactive features. Lastly, a barcode was created to facilitate easy access to the module. The content of the E-Module included clear and concise explanations of table tennis techniques, game strategies, and sportsmanship. Visual aids such as images and videos were incorporated to support the learning material. Interactive elements, including quizzes, simulations, and practice exercises, were added to engage students and allow them to assess their understanding of the material actively.

Design Validation

Design validation involved expert reviews by specialists in content, media, and language. The goal was to assess the E-Module's effectiveness and identify areas for improvement. The validation was conducted by three experts: a content expert, a media expert, and a language expert. These experts provided valuable feedback that helped refine the module's content and design, ensuring that it met the required standards of quality and educational effectiveness.

Design Revision

Following expert validation, revisions were made to address the feedback and suggestions provided by the reviewers. This stage involved adjusting the content, layout, and interactive elements to enhance the overall quality of the E-Module. The revised version was then prepared for initial trials.

Product Trial

A small-scale trial of the E-Module was conducted with a group of students to gather initial feedback. This trial aimed to assess the usability and effectiveness of the E-Module in the classroom setting. The feedback collected from both teachers and students helped identify areas for further improvement and refinement.

Product Revision

Based on the feedback from the small-scale trial, further revisions were made to improve the E-Module. These revisions were aimed at enhancing the user experience, addressing any issues raised during the trial, and making the module more suitable for large-scale implementation.

Usage Trial

A larger-scale trial was conducted with a broader group of students to assess the E-Module's

effectiveness in a real classroom environment. The results of this trial provided valuable insights into the module's overall impact on student learning and its practical application in the classroom.

Final Revisions

Based on the feedback from the usage trial, final revisions were made to address any remaining issues. These revisions focused on optimizing the module's content, design, and usability to ensure that it met the learning objectives and provided an engaging learning experience.

Mass Production

Once all revisions were completed and the E-Module was deemed ready for use, the final product was produced in bulk and distributed to schools. The E-Module was made available for use in the PE classes of Junior High School 1 Kerinci, ensuring that it could be used effectively in the teaching and learning process.

Validity, Practicality, and Effectiveness of the Developed E-Module for PE on Table Tennis.

a) Validity Test

The validity test aimed to assess the quality and suitability of the developed E-Module. The module underwent validation by experts in content, media, and language. The results of the expert evaluations are as follows pada Table 1.

Table 1. Validation results

Test	Score	Max Score	%	Info
Validity (Content Expert)	55	60	92%	Very Valid
Validity (Media Expert)	57	60	95%	Very Valid
Validity (Language Expert)	35	40	91%	Very Valid

b) Practicality Test

The practicality test was conducted to evaluate how easy and effective the E-Module was for teachers to use in the classroom. The results showed a score of 36 out of 40 (90%), indicating that the E-Module was highly practical and user-friendly. This result confirmed that the E-Module was well-received by teachers and could be easily integrated into the teaching process. For more details, please see Table 2.

Tabel 2. Practicality results

Test	Score	Max Score	%	Info
Practicality (Teacher)	36	40	90%	Very Practical

c) Effectiveness Test

The effectiveness test aimed to determine how well the E-Module helped students understand the material. This test was conducted in two stages: a small-scale trial and a large-scale trial.

Small-Scale Trial

The small-scale trial involved 15 students from Junior High School 1 Kerinci. The results showed a score of 494 out of 600, which corresponds to 82.5%. This score indicated that the E-Module was effective in enhancing students' understanding of the material. Based on the feedback, further improvements were made to address minor issues.

Large-Scale Trial

The large-scale trial involved 77 students, and the results showed a total score of 2766 out of 3080, which corresponds to 90%. This high score indicates that the E-Module was "very effective" in improving students' understanding of table tennis techniques and strategies. The students found the E-Module easy to navigate, and the content was clear and engaging, contributing to a positive learning experience. The results from both trials confirmed that the E-Module was an effective tool for enhancing student learning in PJOK, particularly in the topic of table tennis. For more details, please see Table 3.

Table 3. Small- and Large-Scale Effectiveness Results

Test	Score	Max Score	%	Category
Effectiveness (Small Scale)	494	600	82.5%	Effective
Effectiveness (Large Scale)	2766	3080	90%	Very Effective

Conclusion

The development of the E-Module for PE in table tennis utilized the Research and Development (R&D) model, specifically the modified Borg and Gall model. The E-Module was designed to enhance learning by integrating multimedia elements. Validity, practicality, and effectiveness tests showed excellent results: 92% validity for content, 91% for language, and 95% for media. With 90% practicality and 92% effectiveness, the E-Module significantly improves student understanding, engagement, and teacher delivery, making it a valuable educational tool.

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Author Contributions

Pondi Ahmad Ariski was responsible for the conceptualization, methodology, and overall project administration. He also contributed to data analysis and manuscript writing. Asep Sujana Wahyuri designed the study, supervised the research process, and played a key role in data collection and analysis. Khairuddin assisted in data collection, provided critical revisions, and contributed to the analysis and interpretation of the results. Ahmad Chaeroni contributed to the design and development of the E-Module, participated in the validation process, and helped in manuscript preparation.

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Conflict of Interest

The content of this article does not create a conflict of interest.

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