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Designing a Project-Based Learning Digital Module for Entrepreneurship Education

Farida Febriati*[1]
[1]Universitas Negeri Makassar, Indonesia
Miftahu Nur[2]
[2]Universitas Negeri Makassar, Indonesia
Dedy Aswan[3]
[3]Universitas Negeri Makassar, Indonesia
Maenuddin Bustanil Syah[4]
[4]Universitas Negeri Makassar, Indonesia

Corresponding Author: farida.febriati@unm.ac.id

Abstract

This research addresses the need for innovative and practical teaching materials in higher education entrepreneurship courses. The study aimed to develop and evaluate an interactive digital module based on Project-Based Learning (PjBL) to enhance student engagement and bridge the gap between theory and practice. Using a Research and Development (R&D) approach with the 3D model (Define, Design, Develop), a digital flipbook module was created, featuring multimedia content and QR codes that link theoretical concepts to practical project guidelines. The product was evaluated through expert validation and user practicality trials. The results demonstrated the module's high feasibility, achieving a content validity score of 86% and a media validity score of 94%. Furthermore, the module proved highly practical, with consistent scores from students (85-86%) and the course lecturer (90%). The study concludes that the systematic integration of a PjBL workflow into an interactive digital module is an effective solution for creating an active and autonomous learning environment. This research provides a valid, practical, and replicable model for developing modern educational resources. Future studies are recommended to quantitatively measure the module's impact on student learning outcomes and entrepreneurial competencies.

Keywords: Digital Module, Project-Based Learning, Entrepreneurship Education, Interactive Learning, Teaching Materials

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INTRODUCTION

The digital era has triggered a fundamental transformation in the global education system, demanding the adaptation of learning methods that are more relevant to the characteristics of the current generation of learners. The integration of technology into the learning process is no longer just an option but has become a primary necessity to improve the quality, accessibility, and effectiveness of education(Alakrash & Razak, 2021; Alhashem & Alfailakawi, 2023) . In line with the mandate of the Republic of Indonesia Law Number 11 of 2019 concerning the National System of Science and Technology, the utilization of technology in education is aimed at enhancing human resource capacity and national competitiveness. In the context of higher education, educational technology (edutech) plays a crucial role as a bridge connecting technological innovation with classroom learning practices, especially in equipping students with the practical competencies required in the professional world(Barokati & Annas, 2013; Siddik et al., 2017).

One tangible manifestation of this technological implementation is the evolution of teaching materials from conventional print formats to more dynamic digital formats. The development of digital teaching materials is key to creating engaging, meaningful, and independence-promoting learning experiences. Among the various existing formats, the digital module (e-module) emerges as an innovative solution capable of overcoming the limitations of static printed modules (Limongelli et al., 2010; Mamun et al., 2020). With its ability to integrate multimedia elements such as text, images, audio, video, and interactive simulations, the digital module has proven effective in increasing student motivation, independence, and learning outcomes, as demonstrated by various relevant studies in this field.

Despite the immense potential of digital teaching materials, their implementation in the field still faces various challenges. A needs analysis conducted for the Entrepreneurship course in the Educational Technology Study Program, Faculty of Education, Makassar State University, identified several fundamental problems. First, there is an observable tendency for students to remain heavily dependent on materials delivered directly by the lecturer, resulting in low initiative for independent learning through the exploration of other learning resources. This lecturer-centered learning model is misaligned with the demands of 21st-century learning, which emphasizes autonomy and critical thinking skills(Halimatul Mu'minah et al., 2019).

Second, the Entrepreneurship course is relatively new in the curriculum, leading to a significant scarcity of teaching materials that are comprehensive, structured, and specifically designed according to the learning outcomes. The currently used printed module is considered suboptimal due to its static nature and inability to accommodate the need for visualizing real-

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world business examples. This limitation hinders students from gaining a holistic and contextual understanding of entrepreneurship concepts, which are inherently applicative in nature.

This research is based on three main concepts: digital modules, Project-Based Learning (PjBL), and entrepreneurship education. A digital module is defined as a self-contained teaching material presented in an electronic format, systematically designed to achieve specific learning objectives(Ahmad et al., 2023; Elfeky et al., 2022). Unlike printed modules, digital modules possess superior characteristics such as being self-instructional and self-contained, enriched with interactive elements. The inclusion of video tutorials, animations, and navigational links allows students to learn at their own pace and according to their individual learning styles, transforming passive material into a dynamic and engaging learning experience.

The second variable is the Project-Based Learning (PjBL) approach, an innovative student-centered learning model. PjBL actively involves students in exploring and solving real-world problems through the execution of a comprehensive project over a specific period. This model has been proven effective in honing higher-order skills such as critical thinking, creativity, collaboration, and problem-solving. In the context of entrepreneurship, PjBL enables students not only to learn theory but also to apply it directly in designing and developing a business idea.The core concept that provides the context for this research is entrepreneurship education. This course aims to instill the mindset and skills necessary to become an entrepreneur, such as innovation, risk-taking, and the ability to identify opportunities. Effective entrepreneurship education demands a learning method that is not only theoretical but also applicative and contextual. Therefore, integrating PjBL into a digital module becomes a strategic approach to provide a relevant learning experience and prepare students for the real challenges of the industry(Megayanti et al., 2020; Sorea & Repanovici, 2020).

Previous research has extensively discussed the development of digital modules for various courses, including entrepreneurship. However, the novelty of this study lies in the systematic integration of an interactive digital module with a Project-Based Learning (PjBL) framework specifically designed for the Entrepreneurship course at the Educational Technology Study Program, FIP UNM. This innovation is realized through the embedding of features such as QR codes at the end of each module chapter, which directly guide students to project work guidelines relevant to the material they have just studied.This approach fundamentally transforms the function of the module from a mere source of information into an active learning facilitator. Students are not only reading the material but are also encouraged to immediately apply the acquired knowledge to a real project. The combination of rich multimedia content within the

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module and structured project-based tasks creates a holistic independent learning ecosystem, which has not been widely explored in similar research within the local context (Bonk & Graham, 2006; Rosmayanti et al., n.d.).

The main objective of this research is to develop and produce a Project-Based Learning digital module that is valid and practical for use in the learning process of the Entrepreneurship course. The urgency of this research is based on the pressing need to provide innovative and interactive teaching materials that can facilitate independent learning to support the effectiveness of the Entrepreneurship course, which is still in its developmental stage. Practically, this research contributes by providing a ready-to-use teaching material product for lecturers and students. Theoretically, this study offers a model for developing teaching materials that integrates technology and modern pedagogical approaches, which can be replicated for other courses.

LITERATURE REVIEW

The Transformation of Teaching Materials in the Digital Era: From Printed to Interactive Digital Modules

The rapid development of information and communication technology has driven a paradigm shift in the world of education, particularly in the development and utilization of learning resources. Teaching materials, as one of the fundamental components of the learning process, have evolved from static print formats to dynamic and interactive digital formats (Darmawati, n.d.; Lasut & Nurlaily, 2022). This transformation is in line with efforts to create a more flexible, personal, and accommodating learning environment for modern learners who are familiar with technology. Among the various forms of digital teaching materials, the digital module, or e-module, stands out as one of the most significant innovations. A digital module is defined as a form of self-directed learning material that is systematically organized into specific learning units, presented in an electronic format, and enriched with interactive elements. Unlike printed modules, e-modules have the capability to integrate various media formats such as text, images, audio, animations, and video tutorials. This advantage allows for a richer and more dynamic presentation of material and can reduce verbalism with strong visual support(Aswan, 2023, 2024; Rodwell et al., 2020).

The key characteristics that make digital modules effective are their self-instructional (can be studied independently), self-contained (all materials, exercises, and evaluations are integrated into one complete package), adaptive, and user-friendly nature. These characteristics empower university students as adult learners to learn at their own pace and rhythm, anytime and

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anywhere. Research has shown that the effective use of digital modules can enhance students' learning independence (Aswan, 2022; Siregar & Aswan, 2019, 2022). Furthermore, well-designed digital modules have been proven to significantly increase motivation and learning outcomes, as the more engaging and interactive presentation of material can capture students' attention and interest.

Project-Based Learning (PjBL) as an Approach to Hone Higher-Order Skills

To maximize the potential of digital modules, integration with a relevant learning model is necessary. Project-Based Learning (PjBL) is an innovative, student-centered learning model that emphasizes contextual learning through the completion of complex projects relevant to the real world. In PjBL, students are not just passive recipients of information but are actively involved in the process of inquiry, problem-solving, decision-making, and ultimately producing a product or presentation as the culmination of their learning process. Academic literature consistently shows the positive impact of PjBL on the development of higher-order thinking skills (Arnidah et al., 2022, 2023; Siregar et al., 2024). Various studies have demonstrated that PjBL significantly enhances creative thinking abilities, including aspects of fluency, flexibility, originality, and elaboration. Moreover, this model has also proven effective in honing critical thinking, collaboration, and communication skills, which are essential competencies in the 21st century. By working on a project, students learn to apply theoretical concepts to practical situations, thereby building a deeper and more meaningful understanding compared to conventional teaching methods. The PjBL approach encourages students to take ownership of their learning process, which in turn fosters curiosity, initiative, and innovation.

Entrepreneurship Education and the Need for Applicative Teaching Materials

Entrepreneurship education in higher education aims to instill the mindset, knowledge, and skills needed to identify opportunities, manage risks, and create value through business ventures. This course not only aims to produce graduates who are ready to start businesses but also to form entrepreneurial characteristics such as creativity, independence, and innovation, which are relevant in various professional fields. The highly applicative nature of the entrepreneurship course demands the use of methods and teaching materials that can bridge the gap between theory and practice(Noguera et al., 2022; Smith & Sheridan, 2019; Thoonen et al., 2011). Previous research has highlighted the importance of innovating teaching materials in entrepreneurship education. Studies have found that the implementation of digital modules

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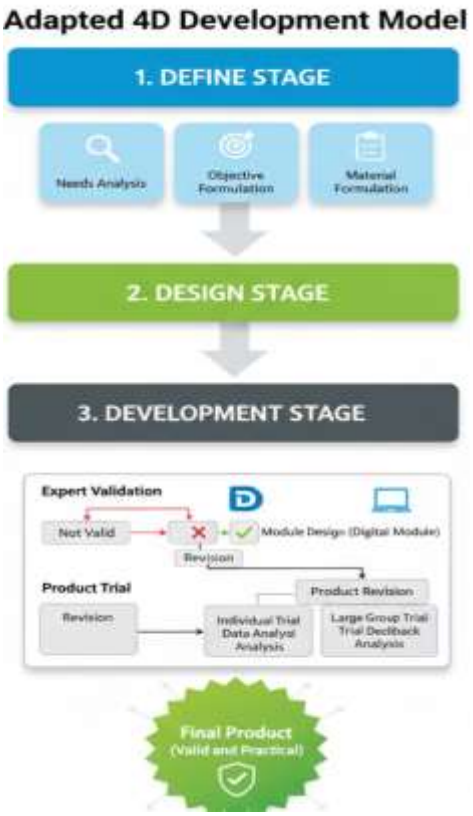
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supported by instructional videos featuring real business case studies can significantly enhance students' entrepreneurial competencies. Similarly, research has shown that digital teaching materials equipped with interactive features like audio, video, and external links successfully increase students' interest and ease in understanding entrepreneurship material. These findings underscore that effective entrepreneurship teaching materials must be contextual, interactive, and able to provide a realistic picture of the business world.

METHOD

Research Design

This study employed a Research and Development (R&D) approach to develop a digital module for the Entrepreneurship course. The development process was structured using a modified version of the Thiagarajan 4D model. While the original model consists of four stages (Define, Design, Develop, and Disseminate), this research adapted the first three stages—Define, Design, and Develop—to systematically create and validate the educational product. This model



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was chosen for its comprehensive and systematic framework, which involves expert validation and iterative revisions to ensure the final product is effective and suitable for the intended learning context.

Participants

The participants in this study were selected from the Educational Technology Study Program at the Faculty of Education, Makassar State University. They included: (1) one content expert and one media design expert for product validation; (2) one lecturer of the Entrepreneurship course who provided insights during the needs analysis and final evaluation; and (3) students enrolled in the Entrepreneurship course. A total of 25 students participated in the large group trial.

Data Collection and Instruments

Data were collected using two primary instruments: questionnaires and interview guidelines. Questionnaires, utilizing both Likert and Guttman scales, were the main tool for gathering quantitative and qualitative data regarding needs, product validity from experts, and practicality from student and lecturer responses. Structured interviews were conducted with the lecturer during the define stage to gain an in-depth understanding of the existing teaching and learning process.

Data Analysis

A mixed-method approach was used for data analysis. Qualitative data, consisting of comments, suggestions, and critiques from experts and open-ended responses, were analyzed using descriptive qualitative techniques. These insights were systematically categorized and used as the basis for product revision. Quantitative data from the questionnaires were analyzed using descriptive statistics. Scores from the Likert scale were converted into percentages to determine the level of validity and practicality. A product was considered valid and practical if it achieved a score of 70% or higher, indicating a "Good" to "Very Good" qualification, thus not requiring further major revisions.

RESULT

This study was conducted using a Research and Development (R&D) approach aimed at producing an innovative teaching material in the form of a Project-Based Learning (PjBL) digital

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module for the Entrepreneurship course. The product development process adopted a modified version of Thiagarajan's 4D model, streamlined into three main stages: Define, Design, and Develop. Each stage yielded a series of data and findings that systematically led to a final product that is both valid and practical.

Define Stage: Identifying Fundamental Needs

The first stage, Define, served as the foundation for the entire development process. The primary focus of this stage was to conduct an in-depth needs analysis to ensure that the product to be developed would genuinely address real-world problems in the learning environment. This analysis involved two main subjects: students as the end-users and the lecturer as the learning facilitator. Data were collected through the distribution of questionnaires to 25 students from the 2023 cohort of the Educational Technology Study Program enrolled in the Entrepreneurship course, as well as structured interviews with the course lecturer.

The results of the needs analysis from the students revealed a high urgency to transition to more modern and interactive digital teaching materials. It was found that a majority of students (21 out of 25 respondents) had prior experience using digital modules and recognized their benefits. Furthermore, 17 students explicitly stated the need for digital learning media to help them better understand the course material. Motivation was also a significant finding; 19 out of 25 students believed that an engaging digital module could significantly boost their learning enthusiasm in the Entrepreneurship course. This finding indicates that students are not only technically prepared to adopt new technologies but also have an expectation that teaching materials should offer a learning experience beyond static text.

The lecturer's perspective reinforced the findings from the students. Through interviews, it was revealed that the applicative nature of the Entrepreneurship course necessitates teaching materials capable of presenting contextual and relevant examples from the current industry landscape. The lecturer emphasized the importance of implementing a project-based learning (PjBL) model to hone students' practical skills but acknowledged that the existing printed materials were insufficient to optimally facilitate this approach. The lecturer also confirmed that students possessed adequate digital literacy and devices, meaning there were no significant technical barriers to implementing a digital module. Thus, the conclusion from the Define stage was that a gap existed between the available teaching materials and modern pedagogical needs, which validated the necessity of developing an interactive Entrepreneurship digital module integrated with a PjBL framework.

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Design Stage: Transforming Concept into Product

Armed with data from the definition stage, the research proceeded to the second stage, Design, where concepts and needs were translated into a detailed product blueprint. This design process was holistic, covering content, visual design, functionality, and user experience. The design began with the selection and structuring of material strictly aligned with the Course Learning Outcomes (CPMK) outlined in the official syllabus (RPS). The module was designed to cover five main chapters, ranging from the fundamental concepts of entrepreneurship, business and production planning, branding and marketing strategies, financial and human resource management, to the utilization of technology in entrepreneurship.

The visual design and user interface were developed using professional software such as Adobe Photoshop to create an aesthetically pleasing and consistent cover, page layouts, and graphic elements. The compiled material was then integrated into the Heyzine Flipbook platform. The choice of this platform was intended to provide an intuitive and interactive reading experience that mimics the turning of physical pages (a "flipbook effect"), which is more engaging than the conventional PDF format.

The primary innovation in the design stage was the integration of interactive features designed to support learning objectives. Hyperlinks were embedded in the table of contents, allowing students to navigate quickly to specific chapters or sub-chapters. Additionally, the module was enriched with multimedia content in the form of relevant learning videos sourced from platforms like YouTube. These videos could be played directly within the module, providing visualizations and real-world case studies that enhance student understanding. The pinnacle of functional innovation was the embedding of a QR Code at the end of each chapter. This feature serves as a digital bridge connecting the theoretical and applicative domains. After completing a chapter, students can scan the QR Code to directly access a guide for the relevant PjBL project, presented visually on the Canva platform. Thus, the module functions not only as a source of information but also as an active facilitator in the project-based learning process.

Develop Stage: Product Validation and Practicality Testing

The final stage, Develop, was the testing and refinement phase of the product. The objective was to ensure that the designed module was not only conceptually appealing but also valid in terms of content and media, and practical for use by the target audience. This process involved two main evaluation steps: expert validation and field trials.

Expert validation was conducted by two specialists in their respective fields: a content

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expert and a media/design expert. The content expert evaluated the material's alignment with the syllabus, its depth, and the clarity of the language. The results showed a very high feasibility level of **86%**, qualifying as "Very Good." Several suggestions for improvement were provided, such as adding specific learning outcomes to each chapter's cover and including a back cover, which were subsequently accommodated in the revision process. Meanwhile, the media and design expert assessed the visual aspects, readability, navigation, and the quality of multimedia elements. The media validation result was even higher, at **94%**, also qualifying as "Very Good." Feedback from the media expert focused on improving the color harmony and background transparency to enhance reading comfort, which was also promptly implemented.

After being revised based on expert feedback, the validated product was then tested with users. The first trial was an individual test involving five students. The purpose was to gather initial feedback on usability and identify potential technical issues. The results indicated a practicality level of **85.88%** ("Very Good"). Following the success of the initial trial, a large group trial involving 25 students was conducted. This trial aimed to measure the product's practicality and acceptance on a more representative scale. The results remained consistent, with a practicality level of **85%** ("Very Good"). Finally, the module was evaluated by the course lecturer, who gave a final assessment with a practicality score of **90%**. The lecturer deemed the module highly feasible in terms of content, attractive in design, and very practical for implementation in the course. This consistent series of quantitative results provides strong evidence that the developed PjBL-based digital Entrepreneurship module has met the expected quality standards and is ready for effective use in the learning process.

DISCUSSION

The success of this research in developing a Project-Based Learning (PjBL) digital module that has been declared valid and practical for the Entrepreneurship course marks a significant achievement. This success is not merely reflected in the high quantitative scores for validation and practicality, but more crucially, in its ability to directly address the fundamental needs identified in the initial phase of the research. This discussion aims to delve into the deeper meaning behind these findings, contextualize them within the relevant theoretical framework, and critically analyze the implications, limitations, and future directions for research in the field of educational technology.

The product's exceptional validity, with scores of **86%** from the content expert and **94%** from the media expert, serves as clear evidence of the effectiveness of the systematically applied

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3D development model (*Define, Design, Develop*). This result is more than just a number; it confirms that the developed module successfully achieved a synergy between the accuracy of pedagogical content and the excellence of instructional design and user interface (Awang et al., 2016; Prunuske et al., 2015). The high content validation ensures that the module's material is aligned with the learning outcomes established in the curriculum, while the outstanding media validation affirms that modern principles of electronic module design have been successfully implemented. This finding aligns with the framework proposed by Najuah, which underscores the importance of blending engaging visual aspects with communicative verbal elements (Ichiuji et al., 2022; Nugroho, 2023). The success in color harmonization, ergonomic layout, and responsive media functionality were key factors praised by the media expert. This reinforces the argument that in the contemporary digital learning context, aesthetics and user experience are not secondary or decorative elements, but rather fundamental pedagogical components that serve to reduce cognitive load, capture interest, and actively facilitate the student learning process.

On the other hand, the consistently high practicality scores across a diverse spectrum of users—from students in individual trials (**86%**) and large groups (**85%**), to the course lecturer (**90%**)—indicate that this product is not only theoretically sound but also successfully meets the real-world expectations and needs of the learning environment. This superior level of practicality can be attributed to two primary interconnected factors. First, this success is firmly rooted in the comprehensive needs analysis conducted during the *Define* stage. By thoroughly understanding the challenges faced by students—such as passive learning tendencies and a lack of contextual teaching materials—the module could be designed with features and content that are genuinely relevant and solution-oriented (Alias et al., 2013; Rini & Cholifah, 2020).

The second factor, which represents the core innovation of this research, is the strategic and deep integration of the PjBL approach(Liew et al., 2023; Rini & Cholifah, 2020). This module transcends the function of conventional digital modules, which often act merely as material repositories. Instead, this product actively guides students toward independent and applicative learning. As stated by Ramadhani & Yanti (2021), an effective digital module has significant potential to foster self-directed learning. The innovation of embedding a QR Code at the end of each chapter, linking theoretical material to practical project guidelines, is a tangible manifestation of the bridge between theory (*knowing*) and practice (*doing*). This feature fundamentally transforms the module's role from a passive source of information into an active learning facilitator (Cristina et al., 2020; Veine et al., 2023). Students are encouraged to immediately apply the knowledge they have just acquired, which is the essence of an authentic

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and effective entrepreneurship education that emphasizes action and execution.

Furthermore, this finding strengthens the argument that the integration of technology in education must go beyond the mere digitization of printed materials. The success of this module lies in its ability to create a holistic and multi-modal "learning ecosystem." The use of multimedia elements like video tutorials not only makes the material more dynamic but also effectively overcomes verbalism by presenting real-world examples and case studies from the business world, a finding that supports previous research by Games, Albar, & A (2021). The combination of rich content, a user-friendly interface, and a structured project-based learning flow creates a learning experience that is highly suited to the characteristics of students as adult learners (*andragogy*). They require autonomy, relevance to the real world, and a problem-solving orientation, all of which are facilitated by this module.

CONCLUSION

This research successfully developed and evaluated a digital module based on Project-Based Learning (PjBL) for an Entrepreneurship course, which was proven to meet academic feasibility standards and practical needs within the learning environment. Based on a comprehensive data analysis, it can be concluded that the developed product is highly valid, both in terms of content (86%) and media (94%), as well as highly practical for use by students and lecturers, with practicality scores consistently ranging from 85% to 90%. The module's success lies in its core innovation: the systematic integration of rich theoretical content with an applicative PjBL workflow, facilitated by interactive features such as embedded learning videos and QR Codes that link directly to project guidelines. This approach effectively bridges the gap between theory and practice, successfully transforming the module from a passive source of information into an active learning facilitator that promotes student autonomy and engagement.

Although this study has limitations regarding its scope and its evaluation focus on user perception, the findings provide significant contributions. Practically, the module serves as an innovative, ready-to-use teaching material solution. Theoretically, this research presents a proven and replicable development model for creating digital teaching materials relevant to the demands of 21st-century learning. Therefore, future research is recommended to build upon this foundation by quantitatively measuring the causal impact of the module on students' learning outcomes and entrepreneurial competencies.

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