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Developing Digital Module Using the TPACK Framework to Enhance Students' Life Skill

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Abstract: The purpose of this study is to develop a digital module using the Technological Pedagogical Content Knowledge (TPACK) framework in enhancing students' life skills and assessing the effectiveness of lecturers' learning management. The respondents of this study were the fourth-semester students of the Primary School Teacher Education (PGSD) program. This study employed an R&D (Research and Development) design that follows the 4-D (Define, Design, Develop, and Disseminate) model. The design adopted the theory proposed by Plomp, which outlines five steps: problem analysis, design, realization, implementation, and evaluation. The findings of this study indicated that students have a significant role in teaching and learning process. It revealed the lecturers' self-reflection on digital technology-based teaching abilities. Additionally, it implied the development of student creativity, critical thinking, collaboration, negotiation, and decision-making skills. These are integral components of 21st-century skills that play a pivotal role in students' future careers. This study concluded that the digital module using TPACK framework could enhance students' life skills and demonstrated high practicality regarding usage and lecturers' self-development.

Keywords: Digital Module; TPACK Framework; Students Life Skill Ability

Introduction

The 4.0 Industrial Revolution is characterized by pervasive technological disruptions and a widening digital talent gap across generations that presents a significant challenge (Drugova et al., 2021; Iivari et al., 2020; Pannen & Dwi Riyanti, 2022). Currently, education has transformed the landscape of learning, demanding the creation of teaching and learning processes that are engaging, creativity-inducing, and democratically inclined, all rooted in digital technology (Adams et al., 2020; Kaushal & Panda, 2019). Technology-based learning can enhance the learning experience and achieve higher levels of accomplishment (Lim et al., 2020). An educator must be adept at innovating through digitalization, ensuring that the learning process aligns with the characteristics of Generation Z (Nassr et al., 2021). Generation Z must possess a range of skills to adapt, including environmental sensitivity, social intelligence, critical and analytical thinking, cross-cultural proficiency, computational thinking, media literacy, multidisciplinary, open-mindedness, knowledge management, and virtual collaboration prowess (Asriandi & Putri, 2020; Erdisna et al., 2022; Penprase, 2018). For Generation Z students, the Internet of things necessitates lecturer guidance and direction to prevent unbounded Internet exploration, particularly concerning national identity and moral values. As the Internet of Things facilitates the massive flow of information, humans can access and disseminate knowledge easily (Sulasmi, 2022). This phenomenon necessitates teachers to utilize digital technology as a medium to access, use, and evaluate learning in the classroom through digital tools. Teachers or lecturers

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must implement classroom management with digital transformation, thus enabling them to produce proficient and skilled graduates. Consequently, higher education institutions must play a role in preparing capable graduates who can effectively enter the workforce (Astini, 2022; Erdisna et al., 2022). Prof. Paulina Pannen, an Academic Advisor to the Minister of Research, Technology, and Higher Education at Universitas Indonesia (UI) Salemba in Central Jakarta, conveyed a public lecture titled "Higher Education Policies in the Millennial Era." She stated that higher education is expected to be at the forefront of social engineering in this current era of digital technology disruption. The ministry of education endeavors to make higher education a spearhead of social engineering to accelerate the nation's progress. One of the innovations that university lecturers or educators can undertake is leveraging digitalization to create teaching materials that tap into students' higher order thinking abilities, such as life skills, creativity, critical thinking, problem-solving, collaboration, negotiation, and decision-making. Digital modules represent an innovative form of instruction that relies on digital technology. These digital modules are accessed by students through the Learning Management System (LMS) provided by the Faculty of Education at Universitas Almuslim.

Educators must play a role in creating efficiency in learning by utilizing Android, computers, laptops, and other types of internet technology to prepare graduates who are ready to enter the professional world in the digital disruption era (Astuti et al., 2022; Setiyani et al., 2020). The design of digital modules on innovative learning media topics is expected to utilize the life-skills abilities of students. Students at the forefront of the young generation and serving as agents of change in higher education must possess skills relevant to business and industry (DUDI) (Maisah et al., 2020). Higher education, a pivotal level of education and learning, prepares quality and resilient human resources (Podder et al., 2020; Sinambela, 2017). This situation coincides with Generation Z and its distinctive characteristics who currently enter higher education (Holzer et al., 2022). In the context of education, understanding the characteristics of each generation becomes crucial in determining effective educational strategies for learners. The goal is academic and pedagogical achievement and how the education process can cultivate students' character and passion during learning activities (Adams et al., 2020). Nowadays, a significant portion of Generation Z is pursuing higher education. It signifies that adjustments in the learning system within higher education institutions must consider the characteristics of Generation Z to align with their needs and demands in the business and industry world (DUDI) without disregarding their interests and habits. This generation is expected to adapt to every technological development and change (Indarta et al., 2021; Podder et al., 2020). Several previous studies have elucidated the topic of digital modules as a form of instructional material based on digital technology. Various prior studies, such as the findings by Nopriana et al. (2023) and Setiyani et al. (2020), revealed that digital modules effectively enhance mathematics learning. However, secondary school students need help in implementing these digital modules. From several empirical investigations, the author has discovered that digital modules' effectiveness in life skills development for students, such as decision-making, problem-solving, and teamwork, has yet to be thoroughly explored. The modules developed with technological advancements are theoretically expected to tap into students' life skills (including creativity, critical thinking, problem-solving, collaboration, negotiation, and decision-making). As suggested by Karademir et al. (2021) and Setiyani et al. (2020), modules play a vital role in achieving educational goals by allowing learners to adapt to the characteristics of their social environment. Through digital modules, students can enhance their communication skills by collaborating with a team to solve problems, negotiate, and make decisions related to the concepts, symbols, and example cases presented in the modules.

In Indonesian education policy, the government greatly supports digital technology, which aims to establish a high-quality digital learning environment within educational institutions, including higher education. The decision by the Ministry of Education and Culture (Kemendikbud) to launch grants for digital modules to both state and private universities from 2019 until now signifies the government's endorsement of digital technology advancement in higher education. Welcoming this governmental support, several faculty members within the faculty of teacher training and education at Universitas Almuslim Aceh have been responsible for developing these digital modules. A survey by Keminfo in collaboration with KIC (Katadata Insight Center) shows that Western Indonesian society attains a digital literacy index score 3.56 on a scale of 1-5. Furthermore, Eastern Indonesia achieves 3.55, and Central Indonesia receives 3.48. Western Indonesia, including Aceh, has a digital ethics and culture advantage. However, in the aspects of digital skill and digital safety, it still lags. The results of this survey indicate that Aceh is one of the regions that must devote considerable resources to digital transformation to attain proficient skill levels. This digital module has been collaboratively designed and aligned with the TPACK framework. TPACK helps teachers contextualize the knowledge required for technology integration (Almaiah et al., 2022; Drugova et al., 2021; Kusuma,

2021). In addition, Drugova et al. (2021) identify seven TPACK components: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK); Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPCK). TPACK is a highly pertinent theoretical reference for the effectiveness of technology integration in teaching and learning, facilitating transformation and change in technology-driven learning environments (Aleman-Saravia & Deroncele-Acosta, 2021). According to (Bray & Tangney, 2017; Papakostas et al., 2023), digital technology gives students more freedom to construct understanding and make the right decisions. Integrating the TPACK framework into a single module greatly assists lecturers in their instructional strategy. Developing digital modules with the TPACK framework is an innovative approach lecturers adopt. This digital module offers a variety of engaging features, allowing students to navigate the Learning Management System (LMS). The freedom to investigate the digital module provided numerous opportunities for lecturers and students. This strategy enables students to become adept at using digital technology while enhancing their critical thinking abilities. Researchers have customized the digital media product using the TPACK framework to integrate many elements into the Learning Management System (LMS). This adaptation ensures that all the course's learning objectives are effectively addressed. The learning goal is the development of students' proficiency in Life Skills, which are widely recognized as a crucial set of skills for success in the 21st century. The study conducted by (Chusni et al., 2022; Kansaart et al., 2018) found that 21st-century talents cover a diverse set of advanced learning skills, abilities, and attitudes. These skills have been recognized as essential to success in both contemporary society and the professional environment of the 21st century.

This recognition has been acknowledged by educators, corporate leaders, academics, and government organizations. It is necessary to provide students with expertise in life skills because future employment will require diversified talents. In order to succeed in the dynamic and evolving global landscape, it is imperative for individuals who have completed their studies at institutions of higher education to possess well-rounded abilities (Bekana, 2020; Kurilova et al., 2019). The phenomenon above indicates an expanding global trend emphasizing acquiring aptitudes essential for students to navigate and thrive in the dynamically increasing digital landscape (Gu et al., 2022). (Cronin et al., 2021; Mofrad et al., 2013; Shek et al., 2021) posit that life skills encompass various facets of self-emotional and social intelligence, which facilitate the acquisition of adaptive behavioral patterns, the ability to evaluate and analyze information for effective decision-making, and proficient interpersonal communication. According to (Chaiyama & Kaewpila, 2022; Shek et al., 2021), the indicators that assess students' abilities in life skills are creativity, critical thinking, problem-solving, cooperation, negotiation, and decision-making. Based on the description above, higher education can tap into students' life skills, which are highly valuable in their professional lives. It aligns with the recommendations of previous researchers like Cronin et al. (2021), who suggest that developing life skills could benefit researchers, policymakers, and educators interested in promoting life skills within higher education. Consequently, the alternative solution is to develop a digital module using the TPACK framework. This digital module product, integrated into the Learning Management System (LMS), aims to uncover students' life skills in the Educational Development course, particularly in their behavior during the teaching and learning process. Empirical evidence from several studies indicates a positive correlation between life skills and adolescent behavior (Shek et al., 2021). It serves as a reference for researchers to assess students' life skills. This development of digital media products is encapsulated within the research objectives: "(1) to enhance students' life skills through a digital module using the TPACK Framework, and (2) to examine the effectiveness of the digital module product on lecturers' learning management." Thus, this research will address several research questions: (1) Can the digital module using the TPACK framework enhance students' life skills? (2) Is the digital module with the TPACK framework user-friendly for both lecturers and students? (3) Can the digital module using the TPACK framework improve the quality of lecturers learning management? (4) What is the student response to developing the digital module using the TPACK framework?

Method

The data sources were taken from fourth-semester Primary School Teacher Education (PGSD) program students in the "Teaching and Learning Strategies" course. The data came from students' life skills test results and their responses to the digital module product using the TPACK framework. Furthermore, the nature of this study is quantitative research with a Research and Development (R&D) design, as proposed by Bennett et al. (1984). This development research approach is chosen because the researchers aim to develop a digital module product with the TPACK framework for the "Teaching and Learning Strategies" course. The R&D design encompasses four phases known as the 4-D model: Define, Design, Develop, and Disseminate. This research

model will provide a narrative description to illustrate the procedures and steps taken to depict the educational system's enhancement, development, and evaluation (Gustiani, 2019). The R&D design will develop and test a digital module product, starting with problem analysis, design, realization, implementation, and evaluation. The following are the stages of R&D undertaken by the researchers:

Problem Analysis

Researchers have identified an emerging issue: the deficiency in 21st-century skills, namely students' life skills. These skills are important in fulfilling their roles as prospective teachers who will partake in the student internship program at schools. School internships represent the graduate learning outcomes of the program to implement the Independent Learning Curriculum (MBKM) mandated by the Ministry of Education and Culture of the Republic of Indonesia. This initiative is underway in the Primary School Teacher Education (PGSD) Program at Universitas Almuslim.

1. *Design*

The researchers constructed a digital module using the TPACK framework. It begins by establishing the production flow through the learning plan for the Teaching and Learning Strategies course. The TPACK framework is integrated into the learning plan by combining the seven TPACK elements: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK); Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPCK). Subsequently, the researchers designed PowerPoint presentations, instructional videos, work instructions, practice exercises, communication forms, interactive quiz questions, and slots for uploading student assignment results. In this phase, the researchers also prepare instruments in the form of items to assess students' life skills and abilities and a questionnaire to gauge student responses.

2. *Realization*

The researchers have completed the initial prototype product, and subsequently, the prototype results have been validated to identify the product's weaknesses. It allows for necessary improvements to align with the criteria of a high-quality product relevant to the student's needs in the Teaching and Learning Strategies course. An expert team of digital module validators carries out the validation process, specifically experts invited by Universitas Almuslim from Universitas Negeri Jakarta.

3. *Implementation*

The implementation of the product in its initial phase serves as testing material carried out on students who enrolled in the Teaching and Learning Strategies course in a different academic program, specifically in the Physics Education program. The prototype becomes the final product after the testing is conducted and analyzed. The final product is a digital module employing the TPACK framework. This module is accessible to students through the Learning Management System (LMS).

4. *Evaluation*

The subsequent trial results are analyzed, and the final product of the digital module with the TPACK framework is determined. The completed digital module, declared the final product, is distributed to the students. Utilizing the Learning Management System (LMS) as one of the platforms where this digital module resides provides convenience for both students and lecturers to access.

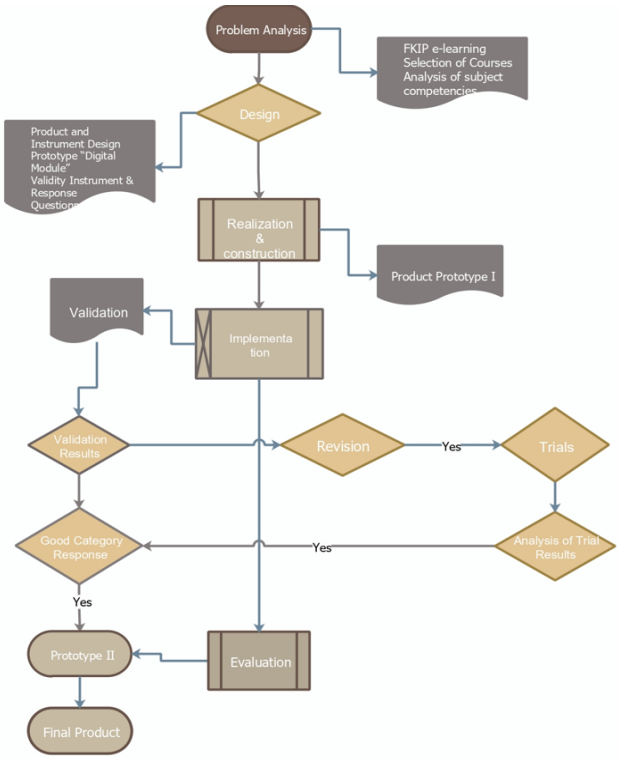

Figure.1. Plomp Development Flowchart

In Gustiani (2019), Plomp proposes a design comprising five steps: problem analysis, design, realization, implementation, and evaluation. Several experts consider this model more adaptable, as each step can be tailored to the research context and the researchers' characteristics. To ascertain the feasibility and practicality of the digital module, the researchers analyzed the lecturers' responses as module developers

and survey students' feedback as users. Analyzing these response data employs a Likert scale ranging from 1-4 for each alternative answer. The assessment percentage of student responses follows the criteria outlined below (Formula 1).

$$Percentage = \frac{score\ obtained}{maximum\ score}\ x\ 100\% \quad (1)$$

Table 1. Rating Scale Percentage

Category	Value	Percentage
Very Good	4	81.24% < % ≤ 100%
Good	3	62.49% < % ≤ 81.25%
Poor	2	53.74% < % ≤ 62.50%
Very Poor	1	25% < % ≤ 43.75%

Furthermore, students' life skills abilities are analyzed based on their average scores obtained from the life skills proficiency tests. The grading criteria are as follows:

Table. 2. Students' Average of Life Skills Criteria

Range	Categories
80-100	Very Good
70-79	Good
60-69	Fair
50-59	Low
≤ 49	Very Low

Result and Discussion

The development of education in Indonesia has been commendable in terms of quantity. However, in terms of quality, particularly in terms of competencies, there remains a need for significant attention from various stakeholders, especially higher education institutions. These institutions need to engage in substantial improvements to ensure competitiveness on a global level. Education is undergoing rapid transformations; hence, achieving this goal necessitates creativity and innovative approaches from educators, especially university lecturers, at the forefront of facilitating student learning (Risdianto, 2019). In 2018, Indonesia's higher education participation rate stood at only 31%, lagging behind Malaysia's 38% and Singapore's 78% (Ritonga et al., 2021). Among the disruptions faced by higher education in the era of Industrial Revolution 4.0, one prominent issue is the mismatch between jobs and educational backgrounds. The challenge of job markets demanding versatile and highly skilled professionals is the catalyst for this incongruity. In this context, higher education institutions should ideally support graduates in acquiring specific expertise or skills.

As a result, this motivates the higher education sector to improve its outcomes, starting with the government's efforts to strengthen governance through initiatives like Merdeka Belajar (Independent Learning) and continuing with the sector's efforts to strengthen its institutions' teaching competencies. Moreover, lecturers' competencies can be enhanced through the instructional materials design based on digital technology. Lecturers are highly expected to apply teaching strategies that align with the demands of the job market and are oriented toward the characteristics of Generation Z students who are familiar with technology (Sherly et al., 2020). The Faculty of Education and Teacher Training (FKIP) at Universitas Almuslim in Aceh, Indonesia, has taken on a role in preparing competent graduates. Creating digital media goods within the TPACK framework is one strategy to foster graduates with the necessary skills. The digital module product with the TPACK framework has been successfully designed and implemented for students and can be accessed through the Learning Management System (LMS) of Universitas Almuslim. This module's development is carried out following the stages of Research and Development (R&D) methodology. The following provides an overview of the findings and discussions after distributing the digital module product.

Phase 1. Problem Analysis

Researchers' analysis during the course indicates that the ability of students to solve problems, negotiate, and make decisions still needs to improve. It can be observed from the average student's assignments during school observations. In this context, students struggle to identify, analyze, and decide what constitutes problems in the learning process. Furthermore, the researchers reveal a tendency among students to use conventional methods, and there is a sense of weariness among them when the lecturer encourages them to examine various learning process-related cases through group discussions. Based on the findings of this analysis, the researchers are motivated to select the Teaching and Learning Strategies course as one of the subjects to be developed through a digital module using the TPACK framework.

Phase 2. Design

Product design is prepared through the teaching plan of the Teaching and Learning Strategies course. The TPACK framework is incorporated into the teaching plan by combining the seven elements of TPACK: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK); Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPCK). It brings all dimensions into the technology integration process when designing

digital modules using the TPACK framework (Drugova et al., 2021). Furthermore, the researchers create PowerPoint presentations, instructional videos, work instructions, practice exercises, communication forms, and interactive quizzes and prepare slots for uploading student assignment outcomes. The researchers also prepared instruments to assess students' life skills abilities and a questionnaire to gauge student responses to using the digital module within the TPACK framework. The researcher skillfully integrates TPACK components into the developed digital module in this phase. The TK component (Technological Knowledge) is present in analyzing learning concepts to construct individual understanding through various digital module features. Subsequently, the PK component (Pedagogical Knowledge) is manifested in the teaching approach employed by lecturers to integrate the digital module platform into the student teaching and learning process. The CK component (Content Knowledge) is evident in the presentation of instructional videos and other interactive learning tools such as Zoom features, discussion forms, and practice exercises.

Phase 3. Development and Evaluation

The digital module was validated by the validation team, which included experts in digital modules, namely Dr. Uwes Anis Chaeruman, M.Pd, from the Educational Technology study program at Jakarta State University. The validator provided several suggestions regarding the outcomes of the developed digital module prototype. The validation results by the validator are as follows (Table 3).

Table 3. IT Expert Validator Comments on Digital Module Prototypes

Content	Feedback Suggestions	Follow-up
Module cover	The validator suggests creating a more attractive module cover.	The module cover is changed to a more attractive appearance.
Interactive video time duration	In each sub-material, you must create an interactive video with a minimum duration of 10 minutes.	Re-recording and improving learning videos with a longer duration
Innovative learning model material	Insert more learning videos about the concept of innovative learning models.	The e-learning platform inserts several YouTube video links with the topic of innovative learning models, so students have lots of references.
Evaluation features	The evaluation feature should be presented in an interactive format with a multiple-choice format, allowing students to assess their evaluation results directly.	Constructing the evaluation component in a more engaging manner that can be evaluated by the students based on the results

In addition, the digital module product is distributed through the Learning Management System (LMS) application as an evaluation tool for researchers. Students are actively involved in groups or independently. Here is a digital module developed for the Teaching and Learning Strategies course.

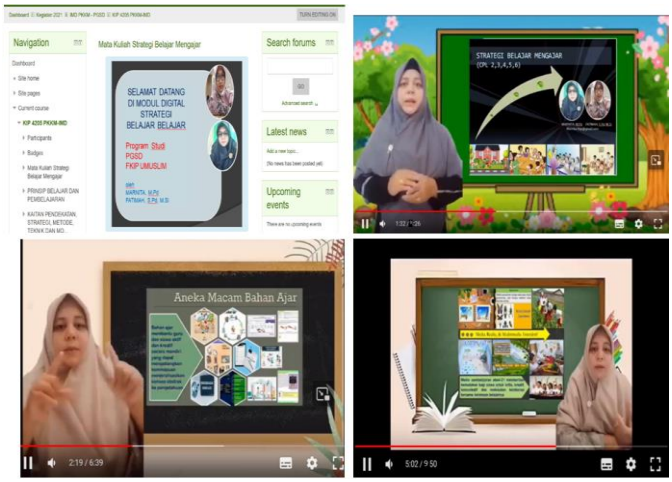

Figure 1. Material Design Module

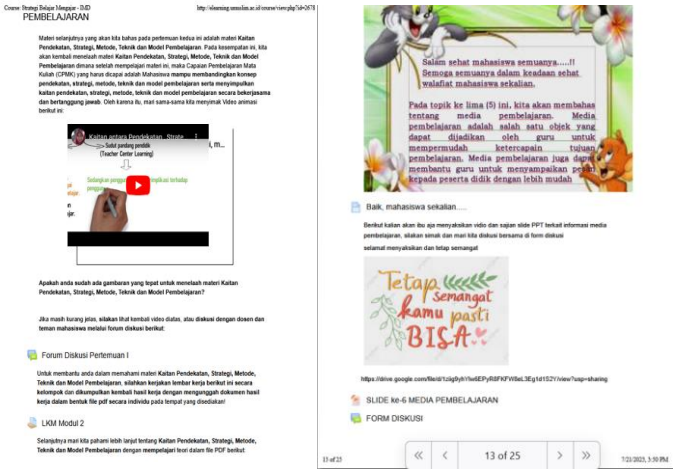

Figure 2. Material Design Module

Practicality and Ability of Student Life Skills

Lecturers and students benefit from the TPACK framework's digital modules because they can access them through the Learning Management System (LMS). It provides unlimited space and equipment to engage in the learning process actively. Students can freely explore their life skills, such as creativity, critical thinking,

problem-solving, collaboration, negotiation, and decision-making, using video features, presentations, quizzes, discussion forms, and project features. Here are the findings regarding specific student life skills indicators.

1) Creativity

The Learning Management System (LMS) is a web-based software application designed to facilitate educational resource management, documentation, monitoring, reporting, administration, and dissemination. The resources include educational content, training programs, technical manuals, instructional videos, digital library materials, and learning development. Digital technology can enhance and refine students' competencies, enabling them to utilize all accessible features effectively and providing opportunities for collaboration, communication, negotiation, creative thinking, and decision-making in problem-solving scenarios. fostering creative thinking skills in education is essential for preparing individuals to thrive in the complex and dynamic world of the 21st century. It's not just about academic success; it's about equipping students with the tools they need to make a positive impact on society (Noris et al., 2024). for example, students are assigned to carry out creative analysis of the results of projects in the field of education. For instance, within the subtopic of "Learning Media," students are required to assess inventive media formats for facilitating the learning process of primary students.

Presenting arguments in a compelling and comprehensible manner is difficult for individuals when engaging with students with specific learning differences. The findings from the data analysis revealed an average percentage of 53% for pretest scores and 98% for posttest scores, indicating a high level of proficiency in this category. The results align with a study by Hutabarat and Hasibuan (2020), which reported a 72.19% increase in student creativity while utilizing e-learning-based resources. This conclusion implies that students' creative abilities serve as a significant determinant of the life skills female students possess in the context of 21st-century capabilities. This result aligns with the research conducted by (Chaiyama & Kaewpila, 2022). In the 21st century, acquiring life skills is crucial for students before entering the workforce. According to Chaiyama & Kaewpila, (2022), the development of life skills is aligned with the intricacies of real-world scenarios. It can encourage students to engage in analytical, creative, and critical thinking, leading to optimal decision-making and problem-solving outcomes.

2) Critical thinking

Critical thinking is one of the students' life skills proficiency indicators. It involves extended statements and serves as the foundation for decision-making. In this study, students' critical thinking indicators are observed through the development of discussion forms. Several features in this digital module, such as the video learning feature, can present images and sound. It creates an enjoyable, interactive, and active learning environment that can stimulate students' critical thinking and enable them to study independently and collaboratively. The analysis result of the critical thinking indicator shows that the average scores obtained by students in the post-test reached the "very good" category, namely 96. This statement is supported by a previous study conducted by (Wardani et al., 2017), which stated that an interactive learning environment through audiovisual media can ensure student learning independence and active responses. According to (Miterianifa et al., 2020; O'Reilly et al., 2022), developing critical thinking skills has been a major global education focus in recent decades. (Barta et al., 2022; Miterianifa et al., 2020) elaborate that students should be prepared to compete and thrive in the era of Industrial Revolution 4.0. This study's data analysis demonstrates that the TPACK framework's digital module can enhance students' life skills. The results show that the average scores obtained by students for the critical thinking skills indicator in the pre-test were 59 (low category), and the average scores for the post-test were 96 (very good category). These findings align with the research findings of (Wardani et al., 2017), which found that the development of digital technology in the form of the Carbonil Board Game (CBG) can enhance students' critical thinking abilities in a "good" category. Furthermore, these findings are supported by the research results of **Kusmaharti and Yustitia (2022),** where one of their findings is that a self-regulated learning-based digital module can enhance students' critical thinking abilities.

3) Collaboration, Teamwork, and Negotiation

Various learning materials presented in several features of the digital module with the TPACK framework can provide challenges that students can identify, clarify, and resolve. Students' intellectual capacity as adult learners greatly supports problem-solving through collaborative teamwork and negotiation within their study groups, enabling them to avoid conflicts or misunderstandings among group members. The digital module with the TPACK framework guides students to think independently to solve problems in each session. Collaboration and negotiation occur in student study groups, as presented in the digital module features of the TPACK framework.

The collaboration, teamwork, and negotiation indicators results show that the average post-test scores of students reached a very good category, namely 90 and 93, while the pre-test scores were still in the low category, namely 50 and 56. It is consistent with the research conducted by Maryani et al. (2022), which stated that web-based learning media using Google Sites effectively enhanced students' problem-solving abilities when meeting the criteria of an effective average n-gain score. Furthermore, Pramuditya et al. (2022) found that students demonstrated good mathematical problem-solving skills through virtual reality game media. Thus, the digital module with the TPACK framework can cultivate 21st-century skills through problem-solving, collaboration, and negotiation indicators.

4) Decision Making

Decision-making is one of the indicators of students' life skills that can be assessed through appropriate teaching and learning processes. In 21st-century skills, decision-making is essential for students as it equips them with the necessary tools to navigate the globalized job market. In this study, the results demonstrate that a digital module using the TPACK framework can enhance students' ability to make the right decisions. Based on the analysis results, the average post-test scores reached a very good category with a score of 92, while the average pre-test score was 54, categorized as low. Students' ability to undertake decision-making is evident through the presented case examples, where they can determine appropriate solutions. These findings align with a study conducted on health students by McBeath et al. (2022), highlighting that using digital technology in education supports collaboration and decision-making. Moreover, a previous study by Makarova and Makarova (2018) found that effective integration of digital technology in learning contributes to decision-making skills and digital competence. In addition, digital interaction is needed in the digital job market and economic landscape.

Figure 3 is a graph illustrating the average scores attained by students in each life skills indicator through the implementation of a digital module with the TPACK framework in the "Teaching and Learning Strategies" course in the Primary School Teacher Education Study Program at Universitas Almuslim.

The results of this analysis demonstrate that the digital module with the TPACK framework is highly applicable for use by both lecturers and students through the e-learning platform at the Faculty of Teacher Training and Education, Universitas Almuslim. The practicality of the digital module is measured not only in terms of time usage and enhanced user-friendliness but also by lecturers' acknowledgment that it considerably improves students' life skills. Furthermore, it plays a pivotal role in lecturers' professional development, enabling them to design and develop digital modules effectively. As a result, lecturers perceive that this strategy enhances their pedagogical competence, consequently bolstering students' life skills capabilities. It is essential, as both teachers and lecturers are at the forefront of the educational process and hold significant responsibility for the quality of education received by students, including those in higher education. Engaging teaching methods tailored to student's needs is a powerful motivation for students to innovate and excel in their learning journey. Students must master essential proficiencies such as creative thinking, critical analysis, group negotiation, and decision-making because they constitute higher education outcomes in the professional realm. The ability of lecturers to design digital module products using the TPACK framework has garnered highly positive responses from student users.

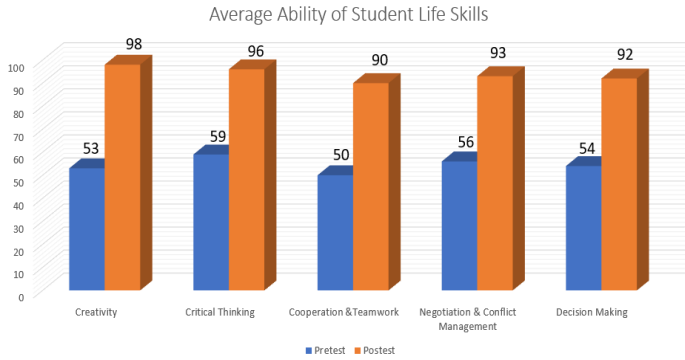

Figure 3. Average Pretest-Posttest Value of Students' Life Skills

Students discover numerous advantages to active and unconstrained learning beyond the classroom when they are in the learning process. These learning advantages strengthen students' critical thinking, making it easier to achieve comprehension through self-reliance and autonomy (Ng et al., 2022). It improves students' life skills through a digital module using the TPACK framework. Similarly, Ritonga et al. (2021) and Wusqo et al. (2021) state that lecturers must consistently upgrade their competence following the demands of the global market. In the 4.0 era, lecturers must be able to understand students' thought patterns, digital literacy, and classroom activities in physical settings with various online learning platforms (Manulang et al., 2020). Education 4.0 will contribute to shaping Generation Z, or the ingeneration (Asriandi & Putri, 2020; Rachmawati & Purwaningrum, 2019). Thus, the lecturers' competency in managing learning through a digital module with the TPACK framework contributes to

enhancing students' life skills. These findings fulfill the objectives of this research: a digital module utilizing the TPACK framework can enhance students' life skills. Lecturers and students practically employ this framework, and it improves the quality of lecturers' learning management.

This finding is supported by previous research, namely the study conducted by Meirbekov et al. (2022), which asserts that the results validate the initial hypothesis regarding the positive impact of digital tools on developing critical thinking among students. Critical thinking serves as an indicator of students' life skills. It demonstrates the practical development of a digital module utilizing the TPACK framework that assists students in acquiring life skills. Another investigation conducted by Kusmaharti and Yustitia (2022) produced the following results: (1) self-regulated learning using digital module was valid; (2) self-regulated learning using digital module was practical, as evidenced by positive responses and successful implementation; and (3) students' critical thinking abilities in the experimental group surpassed those in the control group. Hence, the digital module based on self-regulated learning has been validated, proven practicable, and demonstrated effectively.

Student Response

When high-quality higher education institutions with competent and excellent human resources properly prepare students, they can compete globally. This result is consistent with research by Syed Chear and Md Yunus (2019), who claim that higher education is essential in forming graduates' knowledge, skills, and 21st-century attitudes. Based on the student's responses, developing digital modules can enhance the lecturers' competence and the students' life skills at Universitas Almuslim. Students are engaged and enjoy digital-based learning because it links to their characteristics in the digital era.

Furthermore, several findings were obtained through the distribution of this digital module. First, developing digital modules can enhance the 21st-century competencies of the lecturers. It can be observed from the outcomes of the digital module products created by the lecturers, which the students at Universitas Almuslim have utilized. Second, the development of digital modules has positively impacted the technology-integrated instructional materials at Universitas Almuslim. Digital modules exhibit greater practical value and receive better responses from lecturers and students than traditional textbooks or student worksheets. Third, students' positive responses to the digital module-based learning process using the TPACK framework show that the digital module products help to improve their life skills. This is in accordance with (Cynthia et al., 2023) statement that e-modules can be a solution in learning. This is attributed to the fact that they belong to Generation Z, which inherently favors digitalization and finds enjoyment in learning through exploration within digital modules while navigating the digital landscape.

Nevertheless, the student's responses indicate that the digital module with the TPACK framework is highly practical, demonstrating a practicality percentage of 95.1%, classified as a very good category. Students' feedback towards the digital module integrated with the TPACK framework falls under the very good category, at 99%. Students express significant enthusiasm and contentment in utilizing the digital module with the TPACK framework. Various aspects of the module have provided fresh insights into utilizing digital technology and the internet more prudently. Therefore, the digital module can enhance students' self-reliance in learning and improve students' critical thinking skill, as its utilization extends beyond the classroom. The discovery aligns with previous research findings by Rahmatsyah and Dwiningsih (2021), where 81% of students' responses indicated that the digital module exhibits excellent practicality. Additionally, the interactive digital module was highly effective using a t-test with a significance level of 5%.

Conclusion

Based on the research questions, four points can be concluded related to developing the digital module with the TPACK framework. (1) The digital module using the TPACK framework can enhance students' life skills. It can be observed from the average post-test scores of the items related to students' life skills, which all fall within the "good" category. (2) The TPACK framework's digital module is highly practical for lecturers and students. It can be seen from the practicality score of the digital module product, which reached 95.1%. (3) The digital module using the TPACK framework can improve the quality of lecturers' teaching management. It can be seen from the percentage of student responses indicating their enjoyment and enthusiasm for participating in the learning process using the digital module with the TPACK framework. (4) The questionnaire results show that 99% of student responses express strong enthusiasm and contentment about using the digital module with the TPACK framework. Various aspects of the module have provided them with new insights, particularly in the skillful and judicious utilization of digital technology and the internet.

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Author Contributions

The role of each researcher is, Marnita: Software; Marnita: Writing—original draft preparation, Marnita; writing—review and editing, Marnita; visualization, Marnita; Editing and Supervision. Diding Nurdin and Eka Prihatin: methodology, Diding Nurdin and Eka Prihatin; Reviewing, Marwan; validation. All authors have read and approved the published version of the manuscript.

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The findings in this research are (1) The digital module using the TPACK framework can enhance students' life skills. (2) The TPACK framework's digital module is highly practical for lecturers and students. (3) The digital module using the TPACK framework can improve the quality of lecturers' teaching management.

Conflicts of Interest

The authors declare no conflict of interest.

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