Inovasi Kurikulum *- p-ISSN 1829-6750 & e-ISSN 2798-1363*
Volume 21 No 3 (2024) 1481-1496

Inovasi Kurikulum
https://ejournal.upi.edu/index.php/JIK

Development of hypercontent-based teaching materials for screen printing course at FIP UNM

Asrul Burhan[1], Pattaufi[2], Nurhikmah H.[3], Farida Febriati[4], Abdul Hakim[5], Citra Rosalyn Anwar[6], Wahira[7]
[1,2,3,4,5,6,7]Universitas Negeri Makassar, Makassar, Indonesia
asrul.burhan@unm.ac.id[1], pattaufi@unm.ac.id[2], nurhikmah.h@unm.ac.id[3], farida.febriati@unm.ac.id[4], abdul.hakim7308@unm.ac.id[5], citra.rosalyn.anwar@unm.ac.id[6], wahira@unm.ac.id[7]

ABSTRACT

This research was conducted to meet the need for hypercontent-based digital teaching materials in the Screen Printing Techniques course in the Educational Technology Study Program, FIP UNM. The existing materials are less interactive and lack media such as text, images, and videos, essential for enhancing student understanding. The main goals are identifying these needs, designing hypercontent-based digital teaching materials, and measuring their validity, practicality, and effectiveness. The Research and Development (R&D) method follows the M. Alessi and Stanley R. Trollip model, including the stages of planning, design, and development. The research subjects included 20 students, one lecturer, and two validators (1 content/material expert and one design/media expert). Data collection techniques involved needs identification questionnaires, expert validation questionnaires, lecturer response questionnaires, and small and large group trial questionnaires. Descriptive quantitative analysis was used to evaluate the data. The findings indicate that the need for digital modules among students is very high, expert validation shows good qualifications, trials demonstrate the modules' good practicality, and pre-test and post-test results reveal improved student learning outcomes with effective to very effective qualifications. Consequently, the screen printing technique digital module is deemed valid, practical, and effective.

ARTICLE INFO

Article History:
Received: 19 Apr 2024
Revised: 19 Jul 2024
Accepted: 24 Jul 2024
Available online: 31 Jul 2024
Publish: 30 Aug 2024

Keyword:
Digital modules; educational technology; learning resource development; screen printing techniques

Open access
Inovasi Kurikulum is a peer-reviewed open-access journal.

ABSTRAK

Penelitian ini dilakukan untuk memenuhi kebutuhan akan bahan ajar digital berbasis hypercontent pada mata kuliah Teknik Sablon di Prodi Teknologi Pendidikan FIP UNM, karena bahan ajar yang ada saat ini kurang interaktif dan tidak menyediakan berbagai media seperti teks, gambar, dan video yang dapat meningkatkan pemahaman mahasiswa. Tujuan utamanya adalah mengidentifikasi kebutuhan tersebut, merancang bahan ajar digital berbasis hypercontent, serta mengukur tingkat validitas, kepraktisan, dan efektivitasnya. Metode yang digunakan adalah Research and Development (R&D) dengan model M. Alessi dan Stanley R. Trollip, mencakup tahap perencanaan, desain, dan pengembangan. Subjek penelitian terdiri dari 20 mahasiswa, 1 dosen pengampu, dan 2 validator (1 ahli isi/materi dan 1 ahli desain/media). Teknik pengumpulan data meliputi angket identifikasi kebutuhan, angket validasi ahli, angket tanggapan dosen, serta angket uji coba kelompok kecil dan besar. Analisis data dilakukan secara deskriptif kuantitatif. Temuan menunjukkan bahwa kebutuhan mahasiswa terhadap modul digital sangat tinggi, validasi ahli menunjukkan kualifikasi baik hingga sangat baik, uji coba menunjukkan kepraktisan modul yang baik, dan hasil pre-test dan post-test menunjukkan peningkatan hasil belajar mahasiswa dengan kualifikasi efektif hingga sangat efektif. Modul digital Teknik Sablon dinyatakan valid, praktis, dan efektif.

Kata Kunci: *Modul digital; teknologi pendidikan; pengembangan bahan belajar; teknik sablon*

How to cite (APA 7)
Burhan, A., Pattaufi, P., H. Nurhikmah., Febriati, F., Hakim, A., Anwar, C. R., & Wahira, W. (2024). Development of hypercontent-based teaching materials for screen printing course at FIP UNM. *Inovasi Kurikulum, 21*(3), 1481-1496.

Peer review
This article has been peer-reviewed through the journal's standard double-blind peer review, where both the reviewers and authors are anonymised during review.

https://doi.org/10.17509/jik.v21i3.71289

INTRODUCTION

21st-century education demands a significant transformation in learning approaches to prepare the younger generation for the challenges and opportunities in an ever-changing world. One crucial aspect of educational reform is integrating technology to enhance learning effectiveness (Lavi et al., 2021). The development of information and communication technology (ICT) has shifted the paradigm of traditional learning towards a more interactive and contemporary approach. The application of technology in education has become an urgent necessity as future individuals are required to possess the skills to operate such technology (Basyaev, 2021). Therefore, the learning processes occurring in educational institutions must meet these standards. The advancement of technology, especially in the education sector, plays a crucial role in improving the quality of education and shaping intelligent and qualified human resources (Dzaky, 2020). Educational technology has undergone a significant evolution from merely using hardware and software in learning to focusing more on the integration of technology to support effective learning interactions.

The current definition of educational technology encompasses the use of information and communication technology (ICT) to facilitate a more interactive, adaptive, and connected learning process that meets the needs of modern education. In this digital era, the transformation of technology into digital learning has become necessary in the educational world as it provides services and learning resources that are easily and quickly accessible. Digital learning is developed to create an integrated education system, connecting various educational components to make education more dynamic and flexible in communication and seizing development opportunities (Rosyidin et al., 2023). All components of human resources must be prepared with a mindset, orientation, behavior, attitude, and value system that supports the utilization of digital learning for the greater good in the digital era (Astini, 2020).

Digital learning can be defined as a digital processing system that encourages active learning, knowledge construction, inquiry, and exploration among learners, enabling remote communication and data sharing between teachers and/or learners in different physical classroom locations (Hidayat, 2019). Additionally, digital learning media can be interpreted as any form of physical communication tools in the form of software and devices that must be created or developed, used, and managed for learning needs to achieve effectiveness and efficiency in the learning process (Hadiapurwa et al., 2023; Okra, 2019). This definition emphasizes that digital learning utilizes digital media to provide stimuli that can enhance interaction and effectiveness in the teaching and learning process. However, digital learning has not been fully optimized in several courses in the Educational Technology Study Program at FIP UNM, including the Screen Printing course. The available teaching materials are less interactive and do not provide diverse media such as text, images, and videos that can enhance students' understanding. This results in the material being difficult to comprehend optimally, often making students feel bored and less motivated to participate in lectures (Armansyah et al., 2019; Ashary & Komara, 2022).

One of the weaknesses of e-modules is that they require considerable time to adjust the content and its illustrations. The costs incurred for creating e-modules are significant and quite large, and the development process takes considerable time (Feriyanti et al., 2019). This process also demands much perseverance from teachers or lecturers as facilitators to continuously monitor students' learning processes. Conversely, traditional textbooks have several drawbacks, such as being unable to visualize phenomena dynamically, lacking interactivity, and not supporting learning from various sources. Furthermore, even though students have printed books, they often forget to bring them. Therefore, lecturers need to develop supplementary teaching materials to address the limitations of printed books by creating hypercontent-based digital learning materials.

https://doi.org/10.17509/jik.v21i3.71289

The use of digital media with multimedia elements such as videos and animations can significantly enhance student learning outcomes (Putra & Salsabila, 2021; Ramadhan et al., 2021; Sari, 2019). Related research also indicates that interactive multimedia in chemistry education significantly increases student interest in learning, helping them to understand complex concepts more easily (Waruwu & Sitinjak, 2022). This research directly supports the development of hypercontent-based digital teaching materials that will be developed in this study. These findings provide a strong foundation for the development of hypercontent-based digital teaching materials in the Screen Printing course, which will integrate text, images, and videos to maximize the learning experience for students. By utilizing multimedia elements such as videos and animations, it is hoped that these digital teaching materials will significantly enhance student interest and learning outcomes.

This research was conducted to develop hypercontent-based digital teaching materials for the Screen Printing course in the Educational Technology Study Program, FIP UNM. These teaching materials are necessary to enhance interactivity and provide various media that can improve student understanding. It is hoped that hypercontent-based digital teaching materials will make learning more engaging and effective and address the limitations of existing teaching materials (Magdalena, 2020). This research emerged in response to the needs identified among students in the Screen Printing course. An initial study conducted in October 2023 involving 20 odd-semester students found that the lack of images and videos in the learning materials reduced the practicality of hands-on learning. The Semester Learning Plan (Rencana Pembelajaran Semester, RPS) indicates that by the end of the semester, students are required to produce their own screen printing products; however, the lack of multimedia support makes the learning process suboptimal. Instructors often have to search for additional materials online due to the scarcity of resources in traditional teaching materials. Therefore, the development of hypercontent-based digital modules is expected to address these issues by providing interactive and comprehensive content, meeting the need for more effective teaching materials, and motivating students in learning Screen Printing.

The use of mobile-based learning applications can support students' independent learning, proving to be innovative and effective (Jayasiriwardene & Meedeniya, 2023). It facilitates teachers in organizing learning materials through adaptive features, interactive elements, and customizable lesson creation tools to enhance students' learning experiences. Further research by Vagg et al. (2020) titled "*Multimedia in Education: What do the Students Think?*" shows that multimedia is recognized as a valuable tool that can enrich the learning experience. The students involved in this study expressed particular interest in interactive tools, such as simulators, which can complement and enhance their learning.

Based on the recap of the needs identification results related to the development of digital modules for educational technology students, 53.8% require references for teaching materials, and 50% prefer hypercontent-based digital teaching materials in the form of digital modules. Furthermore, 65.4% of students stated that e-modules in the Screen Printing course containing text, images, and videos would aid in understanding the material. However, previous research has not specifically developed hypercontent-based digital modules for the Screen Printing course in this context.

This research will fill this gap by designing and developing an interactive digital module that integrates text, images, and videos to enhance students' understanding and motivation to learn. Based on this information, the researcher is interested in creating a digital module for the Screen Printing course to facilitate students' comprehension of the material. This module must be easily accessible, practical to use, and contain comprehensive information to support learning. A hypercontent-based digital module is an appropriate teaching material to address this issue. The main objectives of this research are to identify students' needs for hypercontent-based digital teaching materials, design and develop a hypercontent-based digital module, and measure the digital module's validity, practicality, and effectiveness. It is hoped that this research can make a significant contribution to the development of interactive and comprehensive digital teaching materials, thereby improving the quality of learning in higher education. Several previous

https://doi.org/10.17509/jik.v21i3.71289

researchers have conducted relevant research on the development of digital modules. The results of this research produce a valid and practical e-module published in an executable format (.exe). This research was conducted in the Educational Technology Study Program, Faculty of Education, Universitas Negeri Makassar. The developed teaching materials were designed for student use and include images and videos related to the Screen Printing Techniques course.

LITERATURE REVIEW

The Industrial Revolution 4.0 currently emphasizes rapid technological advancement. This statement implies that with the swift development of technology, there is a need to innovate in technology development so that the current learning processes can be presented more effectively. One form of such innovation is the development of learning media, which is an essential part of the learning process (Daryanes, 2023). The innovation of multimedia learning development in the field of education, which is now entering the 4.0 era, encompasses various technological advancements and new approaches designed to address the challenges and opportunities arising in this digital age. Media can be defined as an intermediary or connector between two parties, namely the source of the message and the recipient of the message; thus, learning media can be understood as something that delivers the learning message between the sender and the receiver (Purba, 2023). Learning media include any person, material, tool, or event that enables learners to acquire knowledge, skills, and attitudes; in other words, teachers/lecturers, textbooks, and the environment are all forms of learning media. Each medium serves as a means to achieve objectives, containing information that can be communicated to others.

Media is a tool for conveying messages from the source to the audience, where these messages can be delivered through various types of media, whether in audio, visual, or audiovisual forms (Anwar, 2022). Some examples of audiovisual media include television broadcasts, videos, films, and so on (Suprianto, 2020). Interactive learning aligns with the context of cognitive learning theory, which emphasizes the active role of students in learning. Interactive learning provides opportunities for students to actively participate in the learning process through simulations, experiments, and interactive activities (Herianto & Lestari, 2021). The use of digital teaching materials in interactive learning has become a highly relevant topic in modern education. Previous research has revealed the impact of interactive digital teaching materials on students' motivation and understanding, indicating that their use can significantly enhance students' motivation and comprehension (Yusri, 2020). These findings underscore the importance of interactivity in digital teaching materials to improve the quality of learning.

Teaching materials can be categorized into two main types: print materials and non-print materials. Print materials include handouts, books, modules, brochures, and student worksheets, which have long been tools in the learning process (Sari, 2019). On the other hand, non-print materials include audio materials such as cassettes and CDs, audiovisual materials like Computer Assisted Instruction (CAI), and web-based learning materials that offer greater interactivity and accessibility in a modern context. The constructivist approach, as a branch of cognitive learning theory, focuses on the deep understanding of learners regarding the subject matter. Integrating discovery learning methods and meaningful learning concepts aims to actively and relevantly build learners' knowledge and enhance their understanding of the substance being studied (Masgumelar, 2021). Implementing the constructivist approach in the use of print and non-print teaching materials can improve learning effectiveness and facilitate a more meaningful and student-centered learning experience. Both of these learning methods are situated within the context of cognitive learning theory (Mahbubi et al., 2023).

The constructivist learning theory by Piaget is the primary foundation for developing digital learning materials. According to this theory, learning is an active process in which learners construct their understanding from experiences and prior knowledge. In this context, technology-based learning allows

https://doi.org/10.17509/jik.v21i3.71289

for active interaction with learning content, which can support the formation of deeper understanding (Masgumelar, 2021). The cognitive theory of multimedia also supports this approach by emphasizing that learning is more effective when information is presented in a multimedia format that combines text, images, and sound. These principles form the basis for developing hypercontent-based digital learning materials, which utilize multimedia elements to enhance student understanding (Bustanil, 2019).

In addition, the Self-Determination Theory (SDT) of learning motivation is also relevant in developing digital learning materials. SDT emphasizes the importance of autonomy, competence, and relatedness in enhancing students' intrinsic motivation (Adan, 2023). Well-designed digital learning materials can provide opportunities for students to have greater control over their learning and offer challenges that align with their skill levels, thereby increasing intrinsic motivation. The development of hypercontent-based digital learning materials is a concept used to describe the existence of content simultaneously connected to other content. This includes nine essential instructional events: gaining attention, informing goals, stimulating recall, presenting stimuli, providing learning guidance, eliciting performance, giving feedback, assessing performance, and enhancing retention and knowledge transfer. In this study, the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) is used as a framework for developing digital learning materials, ensuring a systematic development process responsive to learning needs.

The use of multimedia elements in digital learning materials must be designed in such a way as to optimize learning and avoid cognitive overload. This theory emphasizes the importance of managing intrinsic, extraneous, and germane load in learning. To support implementing these principles, using tools such as Adobe Captivate and Articulate Storyline is crucial in developing digital learning materials (Alqadri et al., 2021). These tools facilitate the development of interactive and multimedia content that enhances the quality of learning and ensures alignment with the established instructional design principles.

METHODS

This study employs the Research and Development (R&D) method using the development model created by M. David Merrill, Roger T. Kaufman, and James W. Gagne. This model is structured into three main stages: planning, design, and development. The planning stage involves identifying the product development goals, conducting a needs analysis, and formulating implementation strategies. The design stage focuses on developing the product concept, detailed design, and instructional design that aligns with practical learning principles. Meanwhile, the development stage emphasizes implementation, initial evaluation, revision, and finalization of the product before it is widely implemented (Okpatrioka, 2023).

This model is suitable for research in the development (R&D) field aimed at creating specific educational products such as digital modules. The systematic approach from planning to implementation ensures that the resulting product is innovative and effective in enhancing the quality of learning. Applying the R&D method in this research can test and evaluate the effectiveness level of the developed digital module in a systematic and structured manner. The following stages are described in detail as follows:

1. Planning Stage: (1) Defining the scope: Establishing the goals and scope of the digital module to be developed. (2) Identifying student characteristics: Using questionnaires to assess students' needs. (3) Planning document: Based on the Semester Learning Plan (Rencana Pelaksanaan Semester, RPS) provided by the Screen Printing Techniques course lecturer. (4) Determining resources: Collecting literature and other relevant sources related to the course. (5) Brainstorming: Conducting discussions with the lecturer to enrich ideas.
2. Design Stage: (1) Idea development: Determining the initial content, including text, sound, video, and audio elements. (2) Task and concept analysis: Organizing the required materials and creating a flowchart. (3) Creating a storyboard: Developing a storyboard as the blueprint for the digital module.

https://doi.org/10.17509/jik.v21i3.71289

3. Development Stage: (1) Creating the digital module: Developing the module based on the storyboard. (2) Alpha testing: Product validation by media experts and content experts. (3) First revision: Refining the product based on the alpha test results. (4) Beta testing: Testing the module with a small group (5 students) and a larger group (15 students), and gathering feedback from the lecturer. (5) Final revision: Improving the product based on the beta test results. (6) Summative evaluation: Assessing the effectiveness of the digital module by measuring students' improvement in content mastery through learning outcome tests.

The research was conducted in the Educational Technology Study Program at the Faculty of Education, Universitas Negeri Makassar. The subjects of this study included 20 students, one lecturer responsible for the screen printing course, and two validators (1 content/material expert and one design/media expert). Data collection techniques involved a needs identification questionnaire, expert validation questionnaires for media and content, a lecturer response questionnaire, and trial questionnaires for small and large groups. The data analysis method applied was a quantitative descriptive method to explain the results of validation, practicality, and effectiveness of the digital module. This research produced a valid, user-friendly, and effective digital module for enhancing screen printing learning in the Educational Technology Study Program at Universitas Negeri Makassar Faculty of Education.

RESULTS AND DISCUSSION

The aim of this study was to develop hyper-content digital teaching materials for the Screen Printing course at Universitas Negeri Makassar, using the development model by M. Alessi and Stanley R. Trollip, which consists of three stages: planning, design, and development.

Pada tahap perencanaan

In the planning stage, the objectives and scope of the program were defined based on the Semester Learning Plan (Rencana Pembelajaran Semester, RPS), and student characteristics were identified through interviews and an online survey involving 20 students. The survey results showed that 82.14% of students expressed a need for additional instructional materials that are interactive and suitable for self-directed learning.

Table 1. Description of student needs identification

No	Questions	Responses	
		Yes	No
1	Does the lecturer use instructional materials during lectures?	90 %	10 %
2	Are the instructional materials used by the lecturer aligned with the learning objectives?	85 %	15 %
3	Do the instructional materials cover all the topics you have studied in the Screen Printing Techniques course?	80 %	20 %
4	Do you have difficulty understanding the content of the Screen Printing Techniques course?	55 %	45 %
5	Do you need additional instructional materials besides those usually provided by the lecturer?	90 %	10 %

https://doi.org/10.17509/jik.v21i3.71289

No	Questions	Responses	
		Yes	No
6	Do you need instructional materials that can be used for self-directed learning?	85 %	15 %
7	Are instructional materials that include text, images, audio, and video more engaging and enjoyable?	90 %	10 %

Source: Research 2024

Based on the questionnaire assessment results in **Table 1**, the percentage of needs analysis for the Screen Printing Techniques Digital Module is as follows:

$$\text{Percentage} = \frac{90\ \%+ |85\ \%|+ 80\ \%+ |55\ \%+ |90\ \%|+ 85\ \%|+ 90\ \%|}{7} = 82{,}14\%.$$

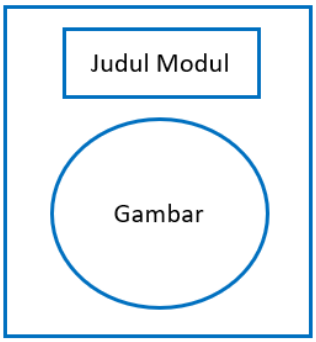
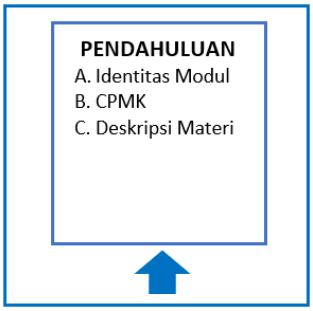
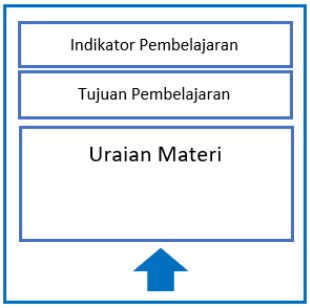
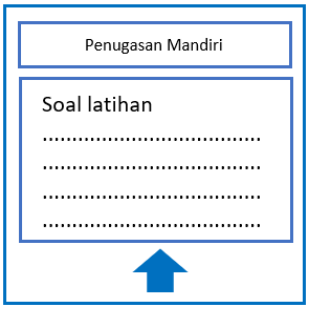
The average percentage for the screen printing techniques digital module was 82.14%, which falls into the category of highly needed. After obtaining this initial data as the basis for the needs analysis in developing the digital module, it can be concluded that students desire new instructional materials that can be used independently in the learning process.

Tahap Desain (Designing Stage)

The digital module design stage involves two main steps in the design phase. First, ideas and concepts are developed by gathering information to determine the content to be included in the digital module, such as text, images, and videos. This content is organized sequentially and interrelated according to the established objectives. Second, task and concept analysis is performed by examining screen printing material from various sources by the Semester Learning Plan (RPS). Concept maps and practice questions are created to measure the achievement of learning objectives and students' understanding of concepts. Additionally, a flowchart is developed to visually illustrate the program flow before being implemented into a storyboard. This flowchart and storyboard assist in the process of developing a hypercontent-based digital module using screen printing techniques. A sample storyboard display can be found in Appendix 8, with a specific example in **Table 2**.

Table 2. Storyboard of Digital Screen Printing Technique Module

https://doi.org/10.17509/jik.v21i3.71289

No.	Visualisation	Description
1		The module cover page is the initial display of the hypercontent-based digital module for Screen Printing Techniques. To proceed to the next page, users tap the right side of the screen, and to return to the previous page, they tap the left side.
2		The introductory display contains the module identity, course learning outcomes (CLO), a brief description of the material, instructions for using the module, and the learning content.
3		The learning activity display consists of three learning activities. Activity 1 covers tools and materials, Activity 2 discusses the pre-press process, and Activity 3 focuses on printing.
4		The assessment page display includes self-assignment tasks, practice questions, self-assessment, and answers to the practice questions.

Source: Author's Documentation 2024

After the storyboard was completed, the next step was designing the cover (see **Figure 1**) and the module layout using Canva for the cover and Microsoft Word for the layout. The final design was then converted into a PDF format with Flip PDF Professional.

https://doi.org/10.17509/jik.v21i3.71289

Figure 1. *Cover of the reaching material hypercontent-based module*
Source: Author's Documentation 2024

The module layout (see **Figure 2**) includes page color settings, square page lines, and a footer with page numbers. Text, infographic images of screen printing tools and processes, and videos explaining the screen printing process are all neatly arranged within this layout.

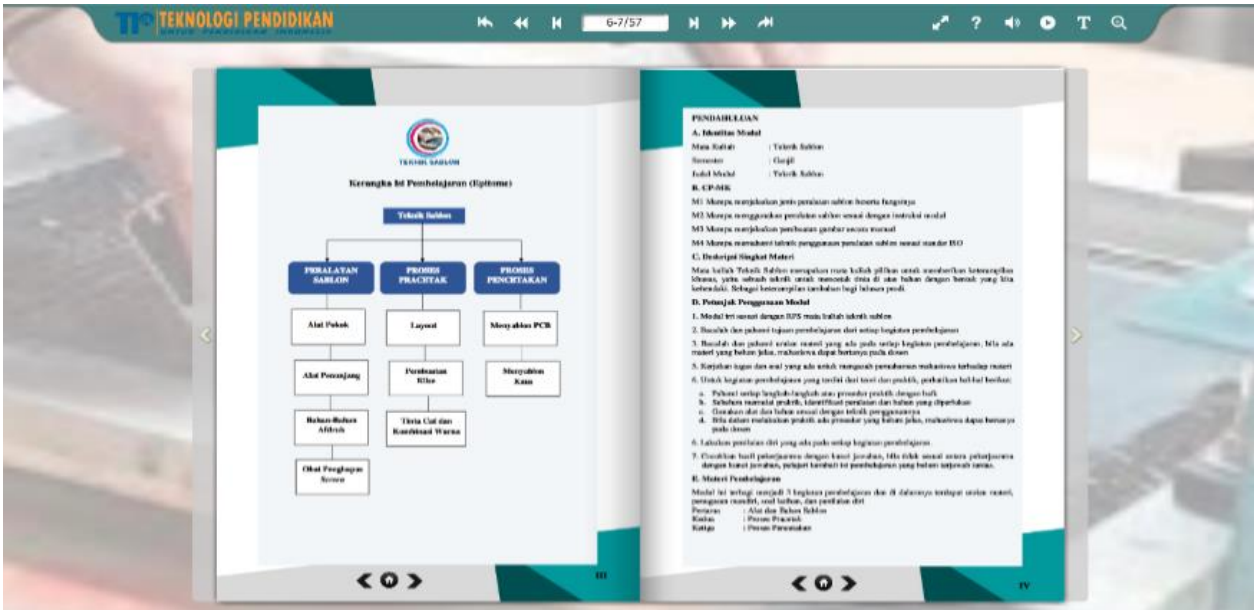


Figure 2 *Module Layout*
Source: Author's Documentation 2024

Tahap Pengembangan (Development Stagenya)

https://doi.org/10.17509/jik.v21i3.71289

Next, the development stage of the Digital Screen Printing Module begins by designing a storyboard as the main guide. The module cover is created using Canva and converted into PDF format to be used as the module cover. The module layout is then designed using Microsoft Word, integrating text, images, and videos about screen printing techniques. This content is then compiled and processed using Flip PDF Professional, exported in HTML format, and converted into an application using Website 2 APK Builder for smartphone accessibility. Once completed, this product is validated by two experts: Dr. Irfan Arifin, M.Pd, as the content expert, and a learning media expert, to ensure quality and effectiveness as teaching material that meets the established learning standards. Based on the expert validation results from the media and content experts, this module is deemed suitable for use with an achievement percentage of 83.07%.

Hasil Penilaian Ahli Isi Atau Materi (Results of Content or Material Expert Assessment)

Table 3. Content/Matter Expert Validation of Digital Modules

No	Assessed Aspects	Scale
1	Alignment with the Semester Learning Plan (Rencana Pembelajaran Semester, RPS) and content	4
2	Alignment of the epitome (content framework) with the material	4
3	Clarity of learning instructions (user guide)	3
4	Clarity of the program title	4
5	Clarity of the program's target audience	5
6	Accuracy in explaining theoretical material	5
7	Accuracy in explaining practical material	5
8	Appeal of the content/material	4
9	Coverage (breadth and depth) of the content/material	4
10	Coherence of the content/material explanation	4
11	Use of the standard Indonesian language	4
12	Alignment of practice questions with learning objectives	4
13	Alignment of answer keys with practice questions	4
	Tota;	54

Source: Research 2024

Based on the results of the content or material expert assessment as listed in **Table 3**, the percentage level of achievement can be calculated as follows:

$$\text{Percentage} = \frac{\Sigma\ Jawaban\ x\ bobot\ tiap\ pilihan}{N\ x\ bobot\ tertinggi}\ x\ 100\%$$

Since the weight of each choice is 1, the percentage:

$$\text{Percentage} = \frac{54}{13\ X\ 5}\ x\ 100\% = 83{,}07\ \%$$

After being converted with the conversion table, the percentage achievement level of 83.07% is in the **Good** qualification.

Hasil Penilaian Ahli Media (Results of Media Expert Assessment)

https://doi.org/10.17509/jik.v21i3.71289

Based on the content expert's evaluation, the material is considered suitable for field testing but requires revisions in accordance with the instructional content expert's suggestions to improve the quality of the developed digital module. Dr. Farida Febriati, S.S., M.Si, a media expert from the Educational Technology Study Program, Faculty of Education, Universitas Negeri Makassar, conducted the media validation.

Table 4. Media expert validation of hypercontent-based digital module teaching materials

No	Assessed Aspects	Scale
1	Quality of the cover design	4
2	Appropriateness of font selection	5
3	Appropriateness of font color selection	5
4	Suitability of color usage and contrast	5
5	Relevance of videos to the material	5
6	Relevance of images to the material	5
7	Attractiveness of the media display	4
8	Ease of use	4
9	Clarity of learning instructions (user guide)	4
10	Clarity of the material	5
11	Clarity of learning objectives	5
12	Alignment of practice questions with learning objectives	5
13	Accuracy of answer keys	5
	Total	61

Source: Research 2024

The instructional media expert's input, suggestions, and comments regarding the hypercontent-based digital module for screen printing techniques were as follows: "*Suitable for field testing with revisions, including: Enrich the material with additional references and separate the learning objectives page from the content*." Based on the evaluation results from the instructional media expert, as shown in **Table 4**, the percentage of achievement level can be calculated as follows:

$$\text{Percentage} = \frac{\Sigma\ Jawaban\ x\ bobot\ tiap\ pilihan}{N\ x\ bobot\ tertinggi}\ x\ 100\%$$

Since the weight of each choice is 1, the percentage:

$$\text{Percentage} = \frac{61}{13\ X\ 5}\ x\ 100\% = 93{,}84\%$$

After being converted with the conversion table, the percentage achievement level of 93.84% is in the **Very Good** qualification.

Tahap Uji Beta (Beta Test Stage)

In the Beta Testing phase of developing the hypercontent-based Digital Module using screen printing techniques, a small group trial was conducted first, involving five students. The product, which has been revised based on feedback from experts in instructional media design and content specialists, was evaluated based on aspects of clarity of learning instructions, learning objectives, relevance of images and videos, ease of understanding the content, attractiveness of the material, ease of use, as well as clarity and appropriateness of the language used. The trial results showed an average percentage of 87%, indicating a qualification of "**Good**."

Table 5. Results of the small group trial assessment questionnaire

https://doi.org/10.17509/jik.v21i3.71289

No	Assessed Aspects	Average				
		R1	R2	R3	R 4	R5
1	Clarity of learning instructions (user guide)	5	4	4	4	4
2	Clarity of learning objectives	5	5	4	4	4
3	Relevance of images to the material	4	4	5	5	4
4	Relevance of videos to the material	5	4	3	5	4
5	Ease of understanding the content/material	4	4	4	4	4
6	Appeal of the content/material	5	4	3	5	4
7	Ease of use during the learning process	4	4	5	4	5
8	Clarity and appropriateness of the language used	5	5	5	5	5
Total		**37**	**34**	**33**	**36**	**34**
Average Percentage (%)		**87%**				

Source: Research, 2024

Based on the results of the questionnaire assessment in **Table 5**, it can be seen that the percentage of small group trials on teaching materials for hypercontent-based digital modules for Screen Printing Techniques is as follows:

$$\text{Percentage} = \frac{37+34+33+34}{8\ x\ 5\ x\ 5} = 87\%$$

The average percentage of teaching materials for digital modules based on hyper content screen printing techniques, 87%, is in the **Good** qualification.

Uji Coba Kelompok Besar (Large Group Test)

Next, a large group trial was conducted involving 15 students after the product was revised based on the same feedback. The evaluation focused on the same aspects as the previous trial. The results showed an average percentage of 91%, indicating a qualification of "Very Good." The results of this trial provide a positive outlook on using the hypercontent-based Digital Module for Screen Printing as an effective teaching material that meets learning needs.

Table 6. Results of the assessment questionnaire for the Large Group test.

No	Assessed Aspects	Average														
		R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12	R 13	R 14	R 15
1	Clarity of Learning Instructions (Usage Instructions)	4	5	4	4	5	5	4	4	4	4	4	4	4	4	5
2	Clarity of Learning Objectives	5	4	5	5	4	5	4	4	5	5	5	5	4	5	5
3	Relevance of images to the material	4	5	4	4	5	5	5	5	5	5	5	5	4	5	5
4	Relevance of videos to the material	5	5	5	5	5	5	4	5	5	4	4	4	5	5	5
5	Ease of understanding the content/material	5	5	5	4	4	5	4	5	5	5	4	4	4	5	5
6	Engagement of the content/material	4	4	5	5	5	5	5	4	4	4	4	4	4	5	5
7	Ease of use in the learning process	4	4	5	4	5	5	4	5	4	5	4	4	5	4	5

https://doi.org/10.17509/jik.v21i3.71289

No	Assessed Aspects	Average														
		R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12	R 13	R 14	R 15
8	Clarity and appropriateness of the language used	5	5	4	5	5	5	4	5	5	5	4	4	4	4	5
Total		**36**	**37**	**37**	**36**	**38**	**40**	**34**	**37**	**37**	**37**	**34**	**34**	**34**	**37**	**40**
Average Percentage (%)		**91%**														

Source: Research 2024

Based on the questionnaire results in **Table 6**, the percentage from the large group trial of the hypercontent-based digital module is as follows:

$$\text{Percentage} = \frac{36+37+37+36+38+40+34+37+37+37+34+34+34+37+40}{8\ x\ 5\ x\ 15} = 91\%$$

The average percentage for the hypercontent-based digital module on screen printing techniques was 91%, which falls into the "**outstanding**" category.

Discussion

The hypercontent-based digital module developed in this research demonstrates satisfactory results in enhancing students' understanding and learning outcomes in the Screen Printing Engineering course. Based on the collected data, using this module significantly improves students' learning outcomes as evidenced by the pre-test and post-test results. This improvement proves that the developed digital module can meet learning needs and enhance the effectiveness of education. This aligns with previous research stating that teaching materials encompass all resources, whether information, tools, or texts, systematically organized to present a complete picture of the competencies to be mastered by learners and used in the learning process for planning and evaluating the implementation of education (Anharuddin, 2023). This digital module is designed to provide various media such as text, images, and videos. These different media have been shown to enhance students' understanding of the material being taught. This is also supported by prior research indicating that interactive multimedia-based learning media can increase students' interest in learning, as learners are directly engaged in learning activities, stimulating their attention and concentration on studying (Wulandari, 2020). Using interactive learning media with visuals can stimulate the concentration and participation of learners in studying (Putra, 2021).

The results of expert validation indicate that this digital module has qualifications ranging from good to very good. This validation involved content/material experts and design/media experts who assessed the content and design of the digital module. The results of this validation show that the developed digital module has good quality and meets the expected standards. Thus, the hypercontent-based digital module developed in this research meets the criteria for high validity, practicality, and effectiveness. This hypercontent-based digital module allows students to access learning materials interactively and flexibly. This module provides text, images, and videos that students can access anytime and anywhere. This supports previous research findings that interactive digital modules enhance interest in learning activities and provide a clear learning structure (Kusnendar et al., 2024; Talaksoru et al., 2024; Yayi & Yuliana, 2019).

The interactivity in this module allows students to learn independently and explore the material more deeply. Additionally, using hyperlinks in this module enables interactive links that can direct students to relevant additional resources. The use of hypercontent in online learning has been shown to create a more immersive learning experience tailored to user needs (Pattaufi, 2020). In the context of this digital module,

https://doi.org/10.17509/jik.v21i3.71289

hypercontent allows students to access tutorial videos, graphics, and other external resources that can enrich their learning experience. This digital module is also designed with the characteristics of the Screen Printing course in mind, which emphasizes practical aspects. This course requires students to engage in the process of creating screen printing media with full creativity. Therefore, this module contains theoretical explanations and provides step-by-step tutorial videos that guide students in conducting independent practice. This facilitates students' understanding and application of the screen printing techniques taught in this course.

This research also found that students highly demand hypercontent-based digital modules. Based on the needs identification results recap, 53.8% of students require teaching material references, and 50% prefer digital teaching materials based on hypercontent in digital modules. A total of 65.4% of students stated that e-modules for the Screen Printing course, which include text, images, and video content, would greatly aid in their understanding of the material. These results indicate that students strongly prefer interactive and media-rich digital teaching materials. Overall, this study proves that hypercontent-based digital modules can effectively enhance the quality of learning in the Screen Printing course. This module is valid, practical, and highly effective in improving student learning outcomes, per previous theories and research that have been reviewed. The development of this module also demonstrates that the use of technology in education can provide significant benefits for students and support broader educational goals.

CONCLUSION

Based on the research and discussion results, it can be concluded that students highly need hypercontent-based digital teaching materials for screen printing in the TP FIP UNM program. This is evidenced by the results of an online questionnaire filled out by students through Google Forms, which revealed that they require teaching materials that can be used independently and are supplemented with content such as text, images, and videos. These teaching materials were designed using the Canva application for the cover and Microsoft Word for the layout, covering topics on screen printing tools and materials, pre-printing processes, and printing processes, as well as infographics and five explanatory videos on the screen printing process. The validity of this module has been tested by content and media learning experts, with validation results obtaining qualifications of Good and Very Good, thus declared valid. The practicality of this module was measured through trials in small and large groups, which showed qualifications of Good and Very Good. The feedback from the lecturers teaching the screen printing course was also very positive, indicating that this module is practical for learning. The effectiveness of this module was tested through pre-test and post-test learning outcomes, which showed an improvement in student learning outcomes after using this module, thus declaring it very effective. It is recommended that the development of this digital module be expanded by adding other interactive features, such as online quizzes and discussion forums, to enhance interactivity and student engagement. Additionally, future research could explore using augmented reality (AR) or virtual reality (VR) technology in the module to provide a more immersive learning experience. Long-term measurements of the learning outcomes of students using this module should also be conducted to assess the sustained impact of using this hypercontent-based teaching material.

AUTHOR'S NOTE

The author hereby declares that there are no conflicts of interest related to the publication of this article. The author also affirms that the data and content of this article are free from plagiarism.

REFERENCES

https://doi.org/10.17509/jik.v21i3.71289

Adan, S. I. A. (2023). Pentingnya motivasi belajar dalam meningkatkan hasil belajar siswa. *Pijar: Jurnal Pendidikan dan Pengajaran, 1*(2), 76-86.

Alqadri, S. N. Z., Iriani, R., & Hamid, A. (2021). Pengembangan multimedia pembelajaran interaktif menggunakan articulate storyline dengan model pembelajaran Auditory, Intellectually dan Repetition (AIR) pada materi larutan penyangga. *Journal of Chemistry and Education, 4*(3), 108-115.

Anharuddin, M. `Izza M., & Prastowo, A. (2023). Pengembangan bahan ajar tematik dengan media pembelajaran Lectora Inspire. *Al-Madrasah: Jurnal Pendidikan Madrasah Ibtidaiyah, 7*(1), 94.

Anwar, A., Galib, M., & Amran, F. D. (2022). Analysis of Cocoa (Theobroma cacao l) sustainability status in Bantaeng District. *Jurnal Tanah dan Sumberdaya Lahan, 9*(1), 121-130.

Armansyah, F., Sulton, S., & Sulthoni, S. (2019). Multimedia interaktif sebagai media visualisasi dasar-dasar animasi. *Jurnal Kajian Teknologi Pendidikan, 2*(3), 224-229.

Ashary, M. I. A., & Komara, D. A. (2022). Library human resources training through online-based service provider platform. *Edulib, 12*(1), 69-77.

Astini, N. (2020) Pemanfaatan teknologi informasi dalam pembelajaran tingkat sekolah dasar pada masa pandemi COVID-19. *Lampuhyang 11*(2), 13-25.

Basyaev, M. H., Diens, N. A. A., & Suwandi, M. F. K. (2021). Implementasi pembelajaran dengan teknologi video based learning. *Inovasi Kurikulum*, *18*(1), 82-94.

Bustanil S, M., Asrowi, & Adianto, D. T. (2019). Pengembangan media pembelajaran interaktif berbasis video tutorial di sekolah menengah kejuruan. *JTP (Jurnal Teknologi Pendidikan), 21*(2), 119-134.

Daryanes, F., Darmadi, D., Fikri, K., Sayuti, I., Rusandi, M. A., & Situmorang, D. D. B. (2023). The development of articulate storyline interactive learning media based on case methods to train student's problem-solving ability. *Heliyon, 9*(4), 1-14

Dzaky, S. Z. A., Badarudin, B., & Muslim, A. H. (2020). Analisis kompetensi guru dalam penguasaan teknologi informasi dan komunikasi pada pembelajaran di Sekolah Dasar Negeri 2 Purbalingga Lor. *School Education Journal PGSD FIP Unimed*, *10*(1), 27-36.

Feriyanti, N., Hidayat, S., & Asmawati, L. (2019). Pengembangan emodul Matematika untuk siswa SD. *Teknologi Pendidikan dan Pembelajaran, 6*(1), 1-12.

Hadiapurwa, A., Joelene, E. N., Nugraha, H., & Komara, D. A. (2023). Social media usage for language literacy development in Indonesia. *Jurnal Kajian Informasi & Perpustakaan, 11*(1), 109-126.

Herianto, H., & Lestari, D. P. (2021). Implementasi teori konstruktivisme dalam pembelajaran IPA melalui pemanfaatan bahan ajar elektronik. *Jurnal Pembangunan Pendidikan: Fondasi dan Aplikasi, 9*(1), 49-57.

Hidayat, N., & Khotimah, H. (2019). Pemanfaatan teknologi digital dalam kegiatan pembelajaran. *Jurnal Pendidikan & Pengajaran Guru Sekolah Dasar, 2*(1), 10-15

Jayasiriwardene, S., & Meedeniya, D. (2023). An adaptive and interactive learning toolkit (iLearn). *Software Impacts*, *15*(1), 100471.

Kusnendar, J., Darmawan, D., & Rusman, R. (2024). Instructional design research trends towards digital transformation of education systems in ASEAN. *Inovasi Kurikulum, 21*(2), 819-834.

Lavi, R., Tal, M., & Dori, Y. J. (2021). Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning. *Studies in Educational Evaluation, 70*(1), 1-11.

Magdalena, I., Prabandani, R. O., Rini, E. S., Fitriani, M. A., & Putri, A. A. (2020). Analisis pengembangan bahan ajar. *Jurnal Pendidikan dan Ilmu Sosial, 2*(2), 170-187

Mahbubi, A., Latifah, S. N., & Bakar, M. Y. A. (2023). Analisis cara belajar menurut madzhab teori belajar modern. *Hudan Lin Naas: Jurnal Ilmu Sosial dan Humaniora, 4*(1), 87-112.

Masgumelar, N. K., & Mustafa, P. S. (2021). Teori belajar konstruktivisme dan implikasinya dalam pendidikan dan pembelajaran. *Iskamic Education Jurnal, 2*(1), 49-57.

https://doi.org/10.17509/jik.v21i3.71289

Okpatrioka, O. (2023). Research and Development (R & D) penelitian yang inovatif dalam pendidikan. *Dharma Acariya Nusantara: Jurnal Pendidikan, Bahasa dan Budaya, 1*(1), 86-100.

Okra, R., & Novera, Y. (2019). Pengembangan media pembelajaran digital IPA di SMP N 3 Kecamatan Pangkalan. *Journal Educative: Journal of Educational Studies*, *4*(2), 121.

Pattaufi, P. (2020). Pengaruh pemanfaatan bahan ajar berbasis audio-visual (video) pada mata pelajaran Sejarah kelas X di SMA Negeri 11 Pangkep. *Jikap PGSD: Jurnal Ilmiah Ilmu Kependidikan, 4*(2), 482-484.

Purba, D. F., Nurdin, D., Diturun, A., Irawan, B., & Darmawan, D. (2023). Mengembangkan kepemimpinan pendidikan unggul di era Revolusi Industri 4.0 dan Era Society 5.0. *Educare: Jurnal Penelitian Pendidikan dan Pembelajaran, 3*(1), 1-8.

Putra, A. D., & Salsabila, H. (2021). Pengaruh media interaktif dalam perkembangan kegiatan pembelajaran pada instansi pendidikan. *Inovasi Kurikulum*, *18*(2), 231-241.

Ramadhan, M. R., Ferdian, N. D., & Pratama, M. R. (2021). Pembuatan media pembelajaran dengan video based learning pada peserta didik. *Inovasi Kurikulum, 18*(1), 104-114.

Rosyiddin, A. A. Z., Fiqih, A., Hadiapurwa, A., Nugraha, H., & Komara, D. A. (2023). The effect of interactive PowerPoint media design on student learning interests. *Edcomtech: Jurnal Kajian Teknologi Pendidikan, 8*(1), 12-24.

Sari, I. P. (2019). Perancangan video edukasi animasi 2 dimensi berbasis *motion graphic* mengenai bahaya zat adiktif untuk remaja. *Jurnal Pendidikan Multimedia, 1*(1), 43-52

Suprianto, E. (2020). Implementasi media audio visual untuk meningkatkan kemampuan menulis teks eksplanasi. *Trapsila: Jurnal Pendidikan Dasar, 1*(2), 22-32.

Talaksoru, D. O., Kuswandi, D., & Ulfa, S. (2024). Development of Digital Research-Based Learning (D-RBL) strategy in instructional media course. *Inovasi Kurikulum, 21*(2), 955-968.

Vagg, T., Balta, J. Y., Bolger, A., & Lone, M. (2020). Multimedia in education: What do the students think? *Health Professions Education, 6*(3), 325-333

Waruwu, A. B. C., & Sitinjak, D. (2022). Penggunaan multimedia interaktif dalam meningkatkan minat belajar siswa pada pembelajaran Kimia. *Jurnal Pendidikan MIPA*, *12*(2), 298-305.

Wulandari, S. (2020). Media pembelajaran interaktif untuk meningkatkan minat siswa belajar matematika di SMP 1 Bukit Sundi. *Indonesian Journal of Technology, Informatics, and Science (IJTIS),1*(2), 43-48.

Yayi FP, & Yuliana A. (2019). Pengembangan multimedia pembelajaran dalam bentuk buku digital interaktif berbasis *flipbook* bagi mahasiswa teknik mesin. *Jupiter: Jurnal Pendidikan Teknik Elektro, 4*(2), 1-10.

Yusri, D., & Zaki, A. (2020). Penggunaan media pembelajaran. *Al-Ikhtibar: Jurnal Ilmu Pendidikan, 7*(2), 809-820.

https://doi.org/10.17509/jik.v21i3.71289