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Development of an Interactive Web-Based Video Information System Learning Module

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ABSTRACT

This study aims to develop an interactive web-based video learning module for the Information Systems course in the Information and Communication Technology Education (PTIK) Study Program at Manado State University. The research seeks to address the need for innovative, flexible, and engaging learning resources that support independent learning and improve students' understanding of Information Systems concepts. Specifically, the study focuses on producing a valid, practical, and effective multimedia-based learning module that integrates web technology and interactive video features.The research adopts a Research and Development (R&D) methodology using the ADDIE model, which consists of the stages of Analysis, Design, Development, Implementation, and Evaluation. At the analysis stage, learning needs, curriculum demands, and student characteristics were assessed. The design stage involved planning the module structure, interactive video storyboard, and interface. The development stage produced the web-based module and interactive videos, which were then validated by media and material experts. Implementation was carried out through limited trials with students, while evaluation assessed feasibility, usability, and effectiveness. The results indicate that both media experts and material experts rated the module as "Very Good," with overall validity scores exceeding 90%. Students reported increased motivation, engagement, and improved conceptual understanding when using the module. The interactive elements, such as quizzes, visualizations, and navigation features, were particularly effective in enhancing comprehension. In conclusion, the interactive web-based video module is feasible, effective, and aligned with digital-native learning needs. It provides a valuable alternative learning resource that supports student-centered learning and improves the quality of Information Systems education.

Keywords: ADDIE Model, Information Systems learning, Interactive video, multimedia learning, web-based learning module

INTRODUCTION

The development of information and communication technology (ICT) has had a significant impact on education, particularly in providing learning resources that are more varied, flexible, and adaptive to students' needs. Digital transformation enables learning processes to become more interactive, collaborative, and student-centered, where students are given broad opportunities to explore knowledge independently using various technology-based learning resources (Munir, 2017). Furthermore, UNESCO emphasizes that the integration of technology in learning is one of the main indicators of quality in modern higher education institutions (UNESCO, 2020).

In the context of higher education in Indonesia, the use of digital learning media has become increasingly essential, especially in programs aligned with technological fields such as the Information and Communication Technology Education Study Program (PTIK) at Manado State University (UNIMA). PTIK students are required not only to master theoretical concepts but also to possess practical skills in designing, developing, and utilizing educational technology. Therefore, the learning materials used must be innovative, accessible, relevant to industry developments, and able to support independent learning.

One of the core courses in PTIK UNIMA is Information Systems, which emphasizes understanding basic concepts, components, analysis, design, and implementation of information systems in organizational contexts (Laudon & Laudon, 2020). This course often requires in-depth conceptual explanation along with practical illustrations of information system applications in real-world contexts. However, learning activities still frequently rely on lectures and conventional materials such as slides or text modules. This method does not sufficiently support the learning preferences of digital-native students who need visual and interactive media to improve comprehension and engagement.

Developing a web-based interactive video learning module serves as a strategic solution. Web-based media provides flexible access without space or time constraints and supports open learning and self-regulated learning. Meanwhile, interactive videos present material in a more engaging manner through combinations of text, images, animation, audio, and interactive elements (Mayer, 2009). Interactive videos allow students to participate directly through quizzes, reflective questions, adaptive navigation, and simulations, enabling more active and personalized learning experiences (Ibrahim & Ishak, 2021).

From a learning theory perspective, multimedia-based and interactive media development aligns with Mayer's Cognitive Theory of Multimedia Learning (2009). The theory states that learning is more effective when information is presented through both visual and verbal channels, helping reduce cognitive load and enhance knowledge construction. Web-based interactive video modules also support constructivist learning principles, allowing students to build knowledge through exploration and interactive activities.

For PTIK UNIMA students, developing an interactive web-based video module for the Information Systems course not only functions as a learning resource but also as a practical example of educational technology utilization. This product is expected to increase learning motivation, active engagement, and conceptual understanding. Moreover, the module aligns with 21st-century learning competencies, including digital literacy, creativity, problem-solving, and collaboration (Trilling & Fadel, 2009).

However, few learning materials at PTIK UNIMA integrate web-based modules with interactive video specifically for the Information Systems course. Innovative learning materials are urgently needed given the characteristics of digital-native students and the increasing demand for multimedia-based learning. Appropriate modules can also improve consistency in teaching and assist lecturers in managing learning.

Based on these needs, this study aims to develop a web-based interactive video learning module for the Information Systems course that is valid, practical, and effective for use in learning processes. This module is expected to improve learning quality and contribute to innovative teaching materials in PTIK UNIMA.

LITERATURE REVIEW

Learning Modules

Learning modules are systematically designed teaching materials created to facilitate students in learning independently. According to Majid (2013), modules are sets of instructional materials organized into small units that students can learn without full dependence on lecturers, emphasizing independence, clarity, and content completeness. Trianto (2012) states that modules should be self-instructional, self-contained, adaptive, and user-friendly to ensure structured learning experiences aligned with competencies. In Information Systems courses, effective modules present theory alongside practical examples, diagrams, analytical models, and exercises to bridge gaps between theory and practice.

Web-Based Learning

Web-based learning provides flexibility in accessing materials, interactivity, and unlimited storage for learning resources. Horton (2012) explains that web-based learning enables students to learn anytime and anywhere through multimedia resources. Clark & Mayer (2016) add that web-based environments support self-paced and collaborative learning through forums, online quizzes, tutorial videos, and LMS platforms. For PTIK students, web-based learning strengthens digital literacy, information navigation, and digital media use (Ng, 2012). Its combination of text, animation, graphics, video, and simulations makes it effective for complex content such as Information Systems.

Interactive Video Media

Interactive video builds upon conventional video by adding features such as navigation choices, questions, quizzes, branching, and automatic feedback. Ibrahim & Ishak (2021) argue that interactive video fosters participatory learning because students can choose paths, select topics, and

assess understanding directly. Mayer (2009) states that interactive video optimizes dual-channel processing through visual and verbal information, enhancing retention and comprehension. In Information Systems learning, interactive videos help explain flowcharts, business process models, application simulations, and system analysis procedures.

Multimedia Learning Theory

Mayer's Cognitive Theory of Multimedia Learning (CTML) states that multimedia learning is effective when information is presented visually and verbally. The theory's assumptions, dual channel, limited capacity, and active processing, highlight the need for well-structured media. Dual-coding theory (Paivio, 1991) supports combining text and visuals to improve long-term memory. Constructivist theories (Piaget, 1977; Vygotsky, 1978) emphasize learning through interaction with environment—fulfilled by interactive web-based modules.

METHOD

The development procedure for this interactive video-based Informatics learning module refers to the ADDIE model, which consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation. Each stage is carried out systematically to produce effective learning media that meets student needs. This research was conducted in the Information and Communication Technology Education Study Program, Manado State University.

Analysis

In this stage, researchers conduct an in-depth analysis to understand learning needs, student characteristics, and available resources. This analysis involves several sub-stages, namely:

a) Needs Analysis, to determine the competencies students need to master and the material to be presented in the learning video.
b) Task Analysis, to understand whether existing problems can be solved by creating an interactive learning video. The purpose of this analysis stage is to determine the type of learning video to be developed, the material to be taught, and clear learning objectives.

Design

In the design stage, researchers plan the elements to be included in the interactive learning video. Some of the steps taken include:

a) Designing the learning video flow based on the structure created in the analysis stage.
b) Designing the video's storyline from beginning to end, ensuring continuity of material and interactivity.
c) Creating evaluation questions appropriate to the designed material to measure student understanding.
d) Creating a product assessment instrument used to assess the quality and appropriateness of the learning video.

Development

In the development stage, researchers begin creating interactive video learning media based on the design. This process includes collecting relevant learning materials, such as books, modules, images, audio, and video illustrations. Researchers also use software to edit and compile the video, adding interactive elements such as questions or quizzes.

At this stage, validation is carried out by two experts: a) Media Expert Validation: Media experts assess the quality of the video based on its appearance, appeal, and the appropriateness of the media concept to the learning objectives. b) Material Expert Validation: Material experts assess the appropriateness of the video material to the desired competencies, as well as the validity and accuracy of the material presented.

Implementation

The implementation stage involves implementing the learning video in the classroom. Once validation is complete and the product is ready, the video is piloted with students to determine how well it enhances their understanding of the Informatics material.

Evaluation

The evaluation stage aims to assess whether the developed learning video meets the established learning objectives. The evaluation is based on responses from media experts, content experts, and students who tested the video. Based on the results of this evaluation, revisions are made to improve the learning video, if necessary, to meet their needs.

RESULTS AND DISCUSSION

This study uses a Research and Development (R&D) approach that aims to produce a product in the form of an Interactive Web Video-based Information System Learning Module that is valid, practical, and effective for use in the learning process in the Information and Communication Technology Education Study Program at Manado State University. The development model used refers to the ADDIE model which consists of the stages of Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was chosen because it has a systematic structure in developing learning tools and provides flexibility for researchers to make continuous revisions at each stage. According to Branch (2009), the ADDIE model provides a comprehensive framework for designing technology-based learning by considering user needs, multimedia design, and product quality validation.

Analysis

The analysis stage was conducted to identify learning needs, student characteristics, required competencies, and the actual learning conditions of the Information Systems course at PTIK UNIMA. The needs analysis was conducted through interviews with lecturers, distribution of needs questionnaires to students, and a curriculum study to ensure the material aligns with the program's learning outcomes (CPL). The analysis results indicated that learning was still dominated by lecture

methods and the use of conventional teaching materials that were less engaging and less interactive. Students needed learning media that could be accessed flexibly, were multimedia-based, and enabled self-paced learning. Furthermore, students' limited understanding of several basic information systems concepts was identified, necessitating the need for web-based modules with interactive videos that could enhance material visualization and learning engagement. These findings align with Mayer's (2021) opinion that interactive multimedia can increase cognitive engagement and deeper conceptual understanding.

Design

In the design stage, researchers developed a draft of the module structure, web navigation flow, interactive video storyboard, and the multimedia components to be used. The module design includes the preparation of learning objectives, material mapping, learning activity design, evaluation instrument development, and web interface design using simple and user-friendly User Interface (UI) and User Experience (UX) principles. Interactive videos are designed using the segmenting, signaling, and interactivity principles approach as recommended by Mayer (2020), by adding a mid-video quiz feature, navigation buttons, and system diagram visualizations. The module design is carried out by paying attention to instructional design principles so that the content is easy to understand and facilitates independent learning. The interactive video storyboard is prepared in detail including the narrative script, visual illustrations, transitions, animations, and interaction points that will be inserted.

Development

The development phase involves producing web-based modules and interactive videos according to the pre-designed design. The modules are designed in web format using HTML5, CSS, and JavaScript, and integrate interactive videos developed using applications such as H5P or Adobe Animate. See Figure 1 and 2.

Figure 1. Making Process

Figure 2. Results of creating learning modules

The initial product then underwent an expert validation process involving two validators: a material expert and a media expert. Validation was conducted to assess aspects of content suitability, language, presentation, graphics, interactivity, and pedagogical suitability. Input from the experts was used to revise improve the product's quality. See table 1.

Table 1. Media Expert Assessment Results

No	Indicator	Score	Perecentage	Avarage	Criteria
1	Language Element	10	100%	5	Verry Good
2	Display Element	36	90%	4.5	Verry Good
3	Audio Element	19	95%	4.75	Verry Good
4	Implementation Element	50	90.9%	4.55	Verry Good
Total		115	93,98%	4,7	Verry Good

The assessment results indicate that the overall quality of the product is categorized as very good, with a total score of 115, equivalent to 93.98% and an average score of 4.7. The language element achieved a perfect score of 100% with an average of 5, showing that the language used is clear, accurate, and highly appropriate for the target audience. The display element obtained 90% with an average of 4.5, indicating that the visual design is attractive, well-structured, and effectively supports user interaction. Meanwhile, the audio element received 95% with an average of 4.75, reflecting excellent audio clarity, quality, and synchronization that enhance the overall learning experience. Additionally, the implementation element scored 90.9% with an average of 4.55, demonstrating that the product functions very well, is easy to operate, and meets performance expectations. See Table 2.

Table 2. Matero Expert Assessment Results

No	Indicator	Score	Perecentage	Avarage	Criteria
1	Elements of Truth, Breadth, and Depth of Material	28	93%	4.67	Verry Good
2	Elements of Language	10	100%	5	Verry Good
3	Elements of Implementation	37	92.5%	4.63	Verry Good
4	Elements of Video Display	10	100%	5	Verry Good
5	Elements of Audio	15	100%	5	Verry Good
	Total	100	97.1%	4.86	Verry Good

The evaluation results show that the developed product achieves a very good level of quality across all assessed indicators. The Elements of Truth, Breadth, and Depth of Material obtained a score of 28 with a percentage of 93% and an average of 4.67, indicating that the content is accurate, comprehensive, and sufficiently in-depth. The Elements of Language achieved a perfect score of 10 (100%) with an average of 5, reflecting excellent clarity, readability, and appropriateness of language usage. Similarly, the Elements of Implementation received a score of 37, equivalent to 92.5% with an average of 4.63, showing that the product is highly feasible and well-structured for practical use. Both the Elements of Video Display and Elements of Audio also achieved perfect scores (100%) with an average of 5, demonstrating that the visual quality and audio components meet excellent standards. Overall, the total score of 100 with an average percentage of 97.1% and an overall average score of 4.86 confirms that the product is categorized as Very Good, indicating strong feasibility and readiness for implementation.

Implementation Stage

After the learning video creation stage is complete and the video is screened to check for errors, the next stage is testing. The first stage of this testing is called Alpha Testing, which is conducted by media experts and content experts to assess the suitability of the learning video. In this validation stage, researchers use a Likert scale ranging from one to five, where one indicates "Very Poor" and five indicates "Excellent."

Evaluation Stage

At this stage, the developed product was validated by media experts, module experts, and material experts. Media expert validation was conducted by Peggy Veronica Togas, S.T, DEA., a lecturer at a State University, who assessed the interactive learning videos for Informatics based on language, display, audio, and implementation elements. Various indicators and assessment criteria were used to assess the quality of the multimedia. The material expert, Dr. Mario Tulenan Parinsi, S.Kom, MTI., assessed the material and learning elements in the videos. Data collected from the material experts was used to assess the appropriateness of the learning video content, which was also assessed using various indicators and criteria.

After gathering all the necessary information, the researchers used the validation results as a basis for updating the final product. The interactive learning videos were packaged in MP4 format and validated and revised to ensure they were suitable for use in educational institutions.

CONCLUSION

This study concludes that the development of an interactive video-based web-based Information Systems learning module has proven to be a significant innovation in the learning process in the UNIMA PTIK Study Program. The development was conducted through a Research and Development (R&D) model with the ADDIE approach, encompassing the stages of analysis, design, development, implementation, and evaluation. Based on these stages, it can be concluded that the needs of students and lecturers for more interactive, accessible, and digitally native learning materials can be effectively met through an interactive video-based web-based learning module.

Validation results from subject matter experts, media experts, and learning experts indicate that the developed module has a high level of feasibility, based on the quality of content, presentation, language, interactivity, and ease of navigation. Student responses during the pilot phase also indicate that this module provides a more engaging learning experience, increases motivation, and facilitates the understanding of Information Systems concepts previously considered abstract and difficult. Interactive video has been shown to strengthen the material elaboration process through visualizations, demonstrations, and interactive features such as integrative quizzes, navigation buttons, and concept simulations.

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