
Design of Information and Communication Technology Teaching Materials Based on Contextual Teaching and Learning

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Abstract

SMP Patra Mandiri 2 Palembang is an educational institution affected by the COVID-19 pandemic, which disrupted face-to-face learning activities. Consequently, the entire learning process was conducted online. The situation underscored the critical role of teaching materials in facilitating effective learning. Teaching materials are instructional resources designed in accordance with the curriculum to achieve established competency standards and learning objectives. In the Information and Communication Technology (ICT) subject, teaching and learning are generally carried out in computer laboratories, where teachers rely on printed manuals to guide students during practical sessions. This conventional approach limits the delivery of updated knowledge. Therefore, a web-based system for developing ICT teaching materials was designed using the Contextual Teaching and Learning (CTL) model. CTL emphasizes connecting academic content with real-world situations to enhance students' understanding and engagement. The research resulted in a web-based ICT teaching material platform grounded in CTL principles. The system serves as an effective medium for online learning, providing teachers with an efficient tool to deliver instructional materials and students with flexible access to learning resources.

Keywords

Teaching Materials, Information and Communication Technology, Contextual Teaching and Learning, Website, SMP Patra Mandiri 2 Palembang

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Introduction

The rapid advancement of Information and Communication Technology (ICT) has profoundly reshaped the educational landscape, revolutionizing how knowledge is created, delivered, and accessed. Digital technologies have become essential in promoting equitable access to education and fostering innovative learning environments. According to the Law of the Republic of Indonesia No. 20 of 2003 concerning the National Education System, education is defined as a conscious and planned effort to create a learning environment and process that enables learners to actively develop their potential, intelligence, character, and spiritual strength. In this context, ICT is not merely a supporting tool but a strategic enabler that transforms traditional learning paradigms into more flexible, interactive, and student-centered models.

The emergence of global challenges such as the COVID-19 pandemic has accelerated this transformation, compelling schools across Indonesia to transition abruptly from face-to-face instruction to fully online learning modalities. This paradigm shift affected all educational stakeholders—teachers, students, administrators, and parents—requiring them to adapt to new methods of communication and knowledge delivery. While digital platforms such as Zoom, Google Classroom, and Moodle became essential tools, the transition also exposed systemic weaknesses, including limited digital literacy, uneven access to technology, and the inadequacy of conventional teaching materials for online formats. The need for innovative, interactive, and easily accessible digital teaching materials thus became increasingly urgent.

Teaching materials occupy a central role in the educational process as they serve as the primary medium through which teachers deliver content and students construct knowledge. As emphasized by Sukmawati (2015) and Susiloningsih (2016), effective teaching materials support learners' self-directed study, enhance comprehension, and contribute to the achievement of curriculum-based competencies. However, during the pandemic, the use of printed or physical materials became impractical due to restrictions on physical gatherings and the closure of schools. The situation demanded a shift toward web-based learning media, where instructional content could be accessed remotely and dynamically updated according to curricular needs and student feedback.

At SMP Patra Mandiri 2 Palembang, ICT lessons are typically conducted in computer laboratories using printed instructional modules to guide students in completing computer-based assignments. While effective in face-to-face contexts, these materials proved ineffective during online learning, as students lacked structured digital resources to follow lessons independently. Consequently, there arose an institutional need for a web-based ICT instructional platform that not only digitizes the existing modules but also enables interactive learning experiences aligned with the school's ICT curriculum. The platform must integrate features for material uploads, multimedia-based explanations, and feedback mechanisms to facilitate continuous engagement between teachers and students.

Pedagogically, the integration of the Contextual Teaching and Learning (CTL) model into digital instructional media provides a strong theoretical foundation. CTL emphasizes connecting classroom content to real-world applications, encouraging students to construct meaning based on authentic experiences. The model promotes critical thinking, problem-solving, and reflective learning, bridging the gap between theory and practice. Through CTL, ICT learning becomes more relevant, as students can relate the technological concepts they learn to everyday contexts such as online communication, digital ethics, and productivity tools.

This approach ensures that technology is not only learned as a technical skill but also understood as part of a broader socio-digital competency essential for 21st-century learning.

To meet these pedagogical and technological needs, this study proposes the development of a web-based ICT teaching material system using the Extreme Programming (XP) method. XP, as described by Borman et al. (2020), is an agile software development model that emphasizes adaptability, iterative design, and continuous user collaboration. It is particularly suitable for educational systems that require frequent revisions and active feedback from teachers and students. By applying XP, the research aims to produce a platform that is not only functional and reliable but also evolves according to user input. The ultimate goal is to create an accessible, interactive, and scalable learning environment that enhances the quality of ICT education at SMP Patra Mandiri 2 Palembang while supporting Indonesia's broader vision for digital transformation in education.

Methodology

Research Site and Duration

The study was conducted at SMP Patra Mandiri 2 Palembang, located on Jalan Flamboyan, Pertamina Housing Complex, Sungai Gerong, Plaju District, Palembang City, South Sumatra (postal code 30763). The research took place over eight months, from February to September 2021.

Data collection and analysis

The following data collection techniques were employed:

1. Observation – Direct field visits were conducted to observe learning activities and the use of ICT in classrooms.
2. Interviews – Semi-structured interviews were held with ICT teachers to identify existing challenges in teaching material management.
3. Literature Review – Books, scientific journals, and other credible sources related to contextual learning and educational technology were reviewed.
4. Documentation – Data related to school profiles, learning schedules, and existing teaching materials were collected for system design reference.

System Modeling

The system was modeled using Unified Modeling Language (UML) diagrams to visualize its architecture and user interactions

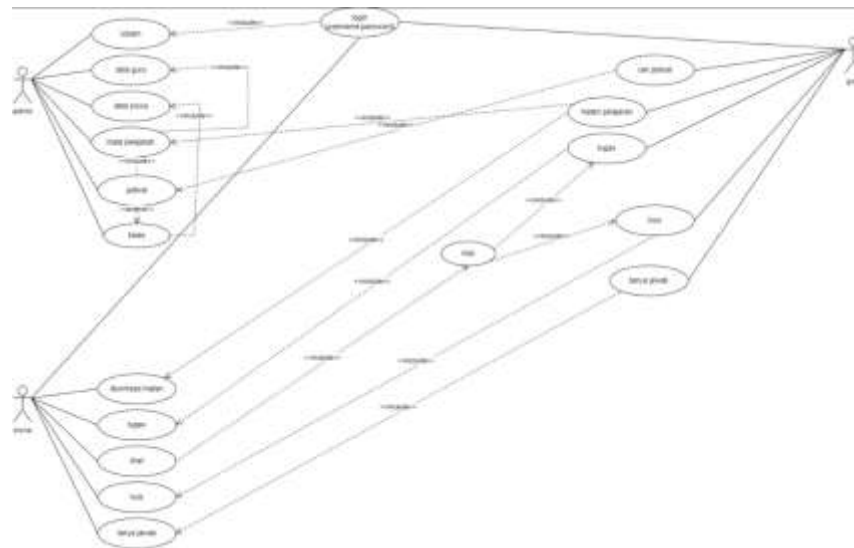


Figure 1. Use Case Diagram

Use Case Specifications

Table 1. Admin Use Case Specification

Use Case	Teacher
Description	Admin logs into the system and manages user data.
Actor	Admin
Functions	Add teacher data, add student data, create classes, manage subjects, set schedules.

Table 2. Teacher Use Case Specification

Use Case	Teacher
Description	Teacher logs into the system to manage instructional activities.
Actor	Teacher
Functions	View schedules, upload materials, upload assignments, conduct discussions, grade student work, upload quizzes, view results.

Table 3. Student Use Case Specification

Use Case	Student
Description	Student logs into the system and participates in online learning.
Actor	Student
Functions	View schedules, download materials, submit assignments, take quizzes, join discussions, view grades.

Results

Following all stages of the Extreme Programming (XP) process, a web-based ICT teaching material system was successfully developed for SMP Patra Mandiri 2 Palembang. The system enables administrators, teachers, and students to interact through a unified platform. Teachers can upload materials and monitor student performance, while students can access and complete learning tasks online.

The website is accessible via a web browser at <http://localhost/smppm2bahanajar/>. Administrators and teachers log in through <http://localhost/smppm2bahanajar/sistem/>.

System Evaluation, The system was evaluated using Blackbox Testing, which confirmed that all functional components login, data management, material upload, assignment submission, and discussion forums performed accurately and reliably. Users reported that the platform enhanced learning flexibility and improved access to materials.

Conclusion and Recommendations

The following conclusions were drawn from the study: The web-based ICT teaching material system was successfully developed using the Contextual Teaching and Learning (CTL) model. The system integrates teachers and students in a unified digital platform for learning and evaluation. Features such as material uploads, assignments, quizzes, discussions, and grading enhance learning efficiency. The Extreme Programming (XP) method proved effective in designing a flexible system that adapts to user needs. The implementation supports digital learning continuity, particularly during pandemic conditions.

Disclosure Statement

The authors declare no conflict of interest. The study was conducted solely for academic purposes within the Faculty of Computer Science, Universitas Bina Darma.

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