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Developing Microlearning in Buddhist Education: A Descriptive Study on Integrating Moodle for Enhanced Learning

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ABSTRACT

In the 4.0 era, traditional teaching has been replaced by various ways of using microlearning in learning development. Many educators face barriers in developing micro learning, particularly in Buddhist education. Therefore, this article aims to enlighten the steps of developing micro learning in the context of Buddhist education. This type of research is descriptive in nature with a focus on developing the steps of creating microlearning integrated with Moodle using critical analysis methods. The stages include pre-production, production and post-production stages.

In the pre-production stage, educators must plan carefully to accelerate the production process. This includes analyzing learning objectives, designing material structures, and selecting interesting learning media. The second stage includes preparing the material that will be present, including the development of flowcharts and storyboards. The third stage focuses on presenting the results of microlearning development by considering aspects of editing, validation, testing, revision, and dissemination. Educators can follow these steps in developing micro learning integrated with Moodle, which is one of the alternatives chosen to create interesting learning

Keywords: Microlearning Development, Buddhist Education, Moodle Integration, Instructional Design

INTRODUCTION

Learning and technology in the 4.0 era have an important role in the world of education especially in microlearning-based Buddhist education is becoming increasingly important. Learning and technology have become two interrelated elements with a focus on Buddhist education that increasingly leads to the use of microlearning as a supporting tool. The rapid advancement of technology demands the transformation of learning media to be more engaging and effective [1]. Microlearning as an innovative medium combines various learning materials into small digestible pieces of information, making it relevant to modern lifestyles and learning patterns [2].

The application of microlearning in Buddhist education involves not only intellectual understanding but also a comprehensive sensory experience, making it easier for students or educators to follow the educational process [3]. There are still many educators who do not understand theoretically the steps to create microlearning integrated on LMS platform in this case Moodle. By integrating microlearning technology in e-learning platforms such as Moodle, Buddhist education can transform into a more adaptive and responsive learning system [4]. Challenges in this transformation, especially for educators in Buddhist educational institutions, include: designing relevant and effective learning materials using platforms such as Moodle [5]. Microlearning offers a solution to this challenge by enabling more in-depth interactions and richer learning experiences [6].

Learning media has the main purpose of improving the quality of communication and education, and plays an active role in influencing learning conditions and environments [7]. This is particularly relevant to the

implementation of microlearning on the Moodle platform, as highlighted by Bower [8]. The aim is to make the learning process more effective through the presentation of segmented teaching materials based on concepts and subjects in a realistic manner. Furthermore, Garrison adds another important dimension by emphasizing that in the context of online and blended learning, the process of critical inquiry is key [9]. This means that learners are not only passively receiving information, but also actively involved in constructing knowledge through collaboration and reflection. Applying principle in Moodle can enrich the learning experience by creating a more interactive and immersive environment in line with the goals of learning media [7].

Training facilities for microlearning should be made for educators who need them, supporting the improvement of the quality of Buddhist education, which is expected to increase the effectiveness and engagement of students in learning [10]. In learning Buddhism related microlearning integrated with Moodle is a necessity for more adaptive and relevant learning approaches. By combining technology, pedagogy, and a deep understanding of student needs, this research offers valuable insights and practical solutions that can shape the future of Buddhist education in the modern era.

It is important for educators and educational institutions to have a theoretical understanding of the microlearning development process integrated in the LMS platform in this case in Moodle. In line with what Singh & Hardaker stated, "It is very important for educators to understand and master digital learning technology to create effective and engaging learning experiences. Interesting context microlearning, this means designing learning materials that are not only informative but also interesting and easy to access to provide the needs of a growing generation of students" [11]. With this knowledge, Buddhist education taught in schools can achieve standards competency that are set and created more interesting and simpler so that student can easily understand it.

This article aims to provide solutions to the challenges faced and answer the research question: How can microlearning integrated into the Moodle platform be developed to enhance the learning process of Buddhism? This research is important as it can help understand how to effectively integrate technology in Buddhist education and support the development of more interactive and engaging learning. By combining integrating various perspectives and references, this paper offers a comprehensive view of the potentials and challenges of microlearning integrated into the LMS platform, especially Moodle of Buddhist education in the modern era.

I. Method

This research uses a descriptive critical analysis method enriched by various relevant theories. Critical Response Theory, further developed by Tyson, provide an important foundation by highlighting the need to combine multiple perspectives in analysis to create deeper understanding and more comprehensive solutions [12]. In line with this, the Complex Adaptive Systems Theory proposed by Holland brings an additional dimension by emphasizing the importance of understanding how complex systems adapt and evolve, revealing the value of dynamic interactions and emergent patterns in seeking solutions [13]. This approach which blends with Harold Laswell's communication understanding of message, media, receiver and effects, guides the critical analysis process in the context of learning Buddhism through microlearning integrated into Moodle, as explained in Table 1. This is to answer the steps to make microlearning integrated into the LMS platform, in this case Moodle in the context of learning Buddhism based on critical analysis.

Rawls's distributive theory for the modern context adds an ethical dimension to critical analysis, emphasizing that the solutions identified should support problem-solving principles [14]. The integration of these three theories not only provides a multi-dimensional framework for critical analysis but also fosters more inclusive, adaptive, and ethical approach to identifying and addressing problems. Thus, this study, which is descriptive of critical analysis and focuses on collecting data related to the research problem, outlines the interrelated steps, ensuring that each step towards a solution is carefully and comprehensively considered. As summarized in Table 1.

Table 1. Stages of creating microlearning

Stages	Expert's Opinion	Results (Steps in Related Stages)
Pre-Production	Nguyen [15]	Determining clear and measurable learning goals.
Pre-Production	Lee [16]	Division of learning material into small units for in-depth understanding.
Pre-Production	Kim [17] and Smith [18]	Implementation of LTI and LIS standards for integration of external resources.
Production	Zhang and Patel [19]	Technical development that reflects learning objectives and transformative experiences.
Production	Thompson, H., & Lee [20] and Walker et al. [21]	Content integration process into Moodle platform and thorough testing.
Production	Johnson [22] and Singh [23]	Student feedback for interactive instructional design.
Post-Production	Baker & Inventado [24] dan Somaratne [25]	Utilization of learning analytics for student progress monitoring and curriculum development.
Post-Production	Conrad [26]	Periodic updating materials and technical system maintenance.

II. Literature Review

Micro-learning refers to a series of focused and relatively small learning units and activities, which are usually completed in a short duration of 10 minutes, and can be accessed via various devices [10]. Micro-learning is an effective strategy due to its learner orientation, ease of access, interactivity, and well-designed features [17]. The success of micro-learning depends on the interaction between diverse dimensions such as learning content, duration, curriculum level, form, process, mediality, and type of learning. It is important to note that in micro-learning the students control their learning progress and learning content can be accessed as often as possible without time and place restrictions [27].

A prominent feature of micro-learning is the ease with which students can find the resources they need. Often new generation learners identify micro-learning as a modern and innovative learning approach [28]. Micro-

learning delivers information in small chunks that mimic the way a learner's brain receives information, and the short duration of micro-learning content reduces the cognitive fatigue resulting from longer lessons. A study revealed that presenting learning content in small chunks increases information retention by 20%. Therefore, micro-learning appears to be a promising learning delivery method that enhance learning experiences and outcomes [29]. Micro-learning based on mobile devices or integrated to Moodle with conventional teaching; shows that micro-learning can effectively increase students' intrinsic motivation and improve learning performance to the extent that there have been no studies on micro-learning using chatbots and Moodle. A chatbot and Moodle are autonomous and can provide context-sensitive information and guidance to learners. Chatbots can integrate more interactive conversations into a single learning system that allows students to practice skills by transforming learning content into a series of messages in order it appear like standard chat conversations; therefore, it seems appropriate for chatbots to incorporate micro-learning strategies [30]. Currently, research on chatbot and Moodle-based micro-learning is still rare, especially regarding students' learning motivation and learning performance in general.

The pedagogical design of chatbot and Moodle-based micro-learning systems can adopt micro-learning theory. This theory suggests that in addition to organizing small content modules with minimal time spans, the suggested design involves content that moves through three phases of learning: the absorbing phase, the acquiring phase, and the building phase. In the absorbing phase, basic knowledge is presented to students to enable them to absorb the required knowledge which involves students completing several basic activities. In the acquiring phase, the design assumes that learning is an active process. Students interact with chatbots and Moodle to acquire and build knowledge through instant feedback, revision, and reflection thus shaping the learning experience. In the building phase, learners and the chatbots interact to create a solution to resolve a checkpoint. The problem chosen should have one clear and simple solution so that it can be solved within the limited time constrained by the learning objectives [31].

Microlearning integrated into Moodle provides an effective and efficient approach to learning by breaking down content into small, manageable chunks, easing the absorption and retention of knowledge. This integration leverages Moodle's strength in customizing the learning experience to support the individual needs of students [32]. With Moodle's adaptive features, learners can navigate through well-structured and interactive learning modules that enhance their learning experience [33]. The implementation of microlearning in Moodle supports independent and continuous learning, crucial in adult education and lifelong learning, encouraging the development of skills such as self-regulation and problem solving [34].

Moodle's analytical functions provide valuable feedback on student progress and understanding, allowing teachers to adjust learning materials and teaching strategies in real-time [35]. In addition, the use of multimedia in microlearning such as videos and simulations can increase engagement and enrich the learning experience [36]. Meanwhile social and collaborative integration strengthens the learning community and improves communication between students [30].

Moodle is an open-source e-learning platform based on the philosophy of social constructivism which emphasizes that learning occurs best when individuals actively construct the learning process through interaction with their environment including other people [4]. This pedagogical approach supports collaboration, discussion, and reflection, making Moodle an ideal choice for implementing integrated microlearning. Microlearning which involves teaching through small units of information can be personalized and customized through Moodle to meet the specific needs of teachers and students while taking advantage of progress tracking features and customized learning based on student answers [5].

Moodle's scalability and flexibility allow to be used in a variety of educational environments from small classrooms to large institutions [31]. With features such as quiz creation, discussion forums, and assessment books, educators can efficiently manage and deliver educational content in a microlearning format, allowing for more focused and shorter learning sessions. Moreover, Moodle is supported by a strong global community of users and developers who contribute to the development of modules, plugins and regular updates, ensuring that the platform continues to evolve and provide the latest tools to support innovative learning approaches including microlearning [32].

One of Moodle's greatest strengths in supporting micro learning is its ability to provide learning analytics that help educators understand and improve student learning. With features such as activity reports and access logs, educators can track student progress and engagement, enabling timely and informed interventions to increase the

effectiveness of microlearning sessions [37]. Overall, the integration of microlearning into Moodle represents a synthesis of advanced educational technology and student-centered teaching methods, leading to a more dynamic, interactive, and personalized learning experience.

III. Results

The steps for creating microlearning integrated into the Moodle platform for learning in Buddhism include a series of strategies designed to combine modern learning methods with spiritual traditions. The process of creating microlearning integrated into the Moodle platform for Buddhist learning begins with determining clear and measurable learning objectives in line with Buddhist principles [15]. These goals, which must be specific and measurable, become an important reference in the content development process. According to Lee, learning material is divided into small unit's design to facilitate in-depth understanding of core concepts in Buddhist teachings, helping students to focus on one aspect of learning at a time and supporting more effective absorption of information [16].

The implementation of Learning Tools Interoperability (LTI) and Learning Information Services (LIS) standards is essential [17], [18]. To integrate external resources that support the study of Buddhist texts into Moodle, allowing the platform to efficiently combine learning tools and content from various sources. Technical development within Moodle involves the creation that reflect Buddhist teachings and the facilitation of meditation and interactive discussions [20]. Designed to present information and facilitate transformative learning experiences.

The process of integrating content into the Moodle platform is followed by thorough testing to ensure all technical aspects function properly and the material is accessible to all learners [21]. This testing includes an assessment of content clarity, course navigation, and compatibility with various devices. Feedback from students is a critical component in interactive instructional design, allowing educators to assess the effectiveness of the material delivered and make necessary adjustments [22], [23].

Learning analytics allows educators to monitor students' progress and understand their interactions with the material, providing valuable information for further curriculum development [24]. Regular material updates and technical maintenance of the system ensure that the content remains relevant to new discoveries in Buddhist studies and the Moodle platform operates smoothly, providing a stable and high-quality learning experience, reflecting a commitment to continuous learning and adaptation to the latest developments in education as recommended [27].

The pre-production stage is an important foundation that involves comprehensive analysis of learning objectives, understanding the needs and characteristics of the audience, as well as determining the expected learning outcomes and selecting interesting and relevant learning media [38]. In this context, understanding and responding to audience needs is key to successful e-Learning design and formulating clear and measurable instructional objectives is essential to set the direction of the entire design and development process [39].

During the production stage, the presence of visual tools such as flow diagrams and storyboards is very crucial [40]. Meanwhile effective writing and content organization increases information as well as student interest and understanding. Learning design based on the principles of cognitive psychology creates a more effective and interesting learning experience [41].

In the post-production stage, the finished microlearning material is created through careful editing, content validation by material experts, technical function testing, and revision based on feedback. Ongoing monitoring and formative assessment are important to ensure that learning materials continue to meet high quality standards and student learning needs. As well as learning analytics to make necessary adjustments. The dissemination process involves effective communication strategies to ensure that students know about and can access new resources.

Integration micro learning with Moodle through the stages of pre-production, production, and post-production enabling more focus and effective teaching. With careful planning, creative production, and careful evaluation, these learning materials can significantly improve the quality of students' learning experiences [42]. It is important for educators to continue to explore and adapt best practices in microlearning development to ensure success and relevance in an ever-changing educational environment [43]. The appropriate use of technology and educational strategies can provide better learning outcomes and a more satisfying learning experience for students [36].

The right educational strategy has been proven to provide better learning outcomes and a more satisfying learning experience for students. Well-designed multimedia instruction enhances student learning by enabling the integration of new information with existing knowledge [44]. Students who took some or all of their classes online performed better than those who received traditional face-to-face instruction, demonstrating the potential of technology-enhanced learning strategies. Use of Cognitive Tutors has consistently shown improvements in classroom exams and standardized tests, highlighting the effectiveness of certain educational technologies [45]. The use of structured teaching methods, including technology, has a significant positive effect on student learning [46]. Overall, this evidence supports the idea that the right approach to educational technology and strategies can significantly improve learning processes and outcomes [36].

This research is important because it responds to the need for more adaptive and relevant learning methods in Buddhist education. The integration of technology, pedagogy, and understanding student needs provides insights and solutions that can shape the future of Buddhist education in the modern era. In creating microlearning that is integrated into Moodle, storyboards play an important role in planning and arranging content, activities and interactions.

The following is a narrative for building a microlearning storyboard integrated into Moodle:

In the pre-production phase of creating microlearning integrated into Moodle, a team of teachers and e-learning developers come together to define specific, measurable, and relevant learning objectives for students with discussions focused on defining clear, measurable objectives for the course [15].

Next, the learning material is divided into small, easily digestible units to address one key concept for in-depth understanding, ensuring each segment of the material is designed to educate effectively [16]. Additionally, the team integrated external resources using LTI and LIS standards, enriching the material with videos, articles, and quizzes from relevant external platforms to provide additional variety and context [47].

Entering the production phase, the IT team and instructional designers collaborate to develop modules and interactive activities that reflect the learning objectives, ensuring that each technical element supports the achievement of those objectives [19], [42]. Content is then uploaded and organized in Moodle with thorough functionality and user experience tests to ensure proper integration [20]. Based on feedback from pilot sessions with students, the design is iterated for further optimization, utilizing the feedback as a basis for refinement and improvement [23].

In the post-production phase, the team reviews data from learning analytics to identify patterns and make adjustments to the curriculum, using this information to understand how students interact with the material and how improvements can be made [25]. Finally, scheduled content updates and technical maintenance are performed to ensure that the system and content remain current and functioning properly, ensuring the sustainability and effectiveness of the learning platform [26].

This storyboard provides a visual and methodical depiction of how the step-by-step process of creating integrated microlearning into Moodle takes place, from pre-production to post-production, providing a step-by-step guide to ensure effective achievement of learning objectives.

IV. discussion

The process of creating microlearning integrated into Moodle for Buddhist learning reveals a deep insight into how technology and instructional design can enrich the learning experience. This finding, which emphasizes the importance of effective use of microlearning to improve understanding and retention, shows how critical good instructional design and the use of technology are in creating learning materials that are educational, interesting, and easily accessible [33], [48]. The integration of technology in education should be done with strategic thinking to ensure that students get the maximum benefit from the learning material. Well-planned microlearning can significantly improve students' cognitive performance by presenting information in small chunks that are easier to manage [49].

Compared with previous literature, this study expands understanding by providing a specific framework for Buddhist learning, highlighting the adaptability of technology and instructional design principles to meet specific learning needs [50], [51]. In addition, Hung emphasized the importance of understanding the learner's culture and context to design effective learning materials [52]. Designing student-centered learning can produce better learning outcomes. The practical implications of this research are important for educators and course developers, demonstrating how learning analytics and adaptive design can facilitate continuous and responsive customization

of learning materials [35], [53]. Adaptive design allows educators to adapt content to students' needs and preferences in real-time. The importance of learning analytics in identifying patterns and trends in the learning process [54].

The contribution of this study to the fields of technology-based education and instructional design is significant, offering a new perspective on the application of these principles in the context of Buddhist learning [55], [56]. Innovative learning technology can enrich the overall learning experience. The potential of technology to tailor learning experiences to individual needs [57]. Reliance on learning analytics data may not cover the entire spectrum of students' learning experiences and adapting content to individual needs may be logistically challenging [58]. Limited resources and inadequate training can be barriers to the effective implementation of educational technology [47].

Future researchers are expected to build on this research by exploring the applicability of this approach in other contexts or by using new technologies and tools. Must continue repair and adapting instructional design approaches to meet technological developments and changing learner needs, ensuring that learning approaches remain relevant and effective [59]. The importance of ongoing research in education to continually improve and update teaching practices [60]. Collaborative research between practitioners and researchers to produce innovative and effective solutions.

In the process of integrating microlearning into Moodle, the first step involves the use of detailed storyboards [61. This is a critical step in planning and organizing learning content and activities. Specific, measurable learning objectives need to be defined upfront, with content designed to be delivered in small, easily digestible segments. This approach supports a more personalized and effective learning experience [62]. By breaking material down into small units, students can engage more deeply with complex and abstract material, allowing for better understanding and long-term retention.

The importance of technology integration in the current digital era is becoming increasingly critical in education [63]. In the context of Moodle, this means optimizing the platform's features to support a microlearning approach. The use of short learning modules, interactive quizzes, and discussion forums is designed to enrich the student experience in an interactive and engaging way. Each technical element must be designed to support the achievement of the learning objectives that have been set. With effective technology integration, microlearning can become not only informative but also engaging and accessible, meeting the needs of a growing generation of learners.

Finally, the evaluation and iteration phase become important once the material is uploaded to Moodle. Use of learning analytics to gain insight into how students interact with material [64]. These data-driven adjustments can help in significantly improving course effectiveness. This continuous evaluation and adjustment are an integral part of the instructional design cycle, where feedback and data are used to continuously improve the learning experience. Additionally, scheduled content updates and technical maintenance are required to ensure that systems and content remain current and functioning properly. Through this holistic and structured approach, integrating microlearning into Moodle creates a supportive, engaging, and effective learning experience, while meeting the adaptive and relevant needs of students in Buddhist education.

This continuous evaluation and adjustment are an integral part of the instructional design cycle, where feedback and data are used to continuously improve the learning experience [65]. The iterative process of review and adjustment based on feedback is at the heart of adaptive learning and personalization of the learning experience. Additionally, scheduled content updates and technical maintenance are required to ensure that systems and content remain current and functioning properly. Scheduled maintenance and content updates not only maintain system reliability but also ensure the relevance and freshness of learning materials.

Through this holistic and structured approach, integrating microlearning into Moodle creates a learning experience that is supportive, engaging, and effective, while meeting adaptive and relevant needs [20]. Integrating microlearning in platforms like Moodle offers a personalized and relevant approach, perfectly suited to modern educational needs.

1. Conclusion

The process of creating microlearning integrated into Moodle involves steps such as setting clear learning objectives, implementing technical standards, thoroughly testing, monitoring student progress, and conducting regular updates. The Integration of micro learning with Moodle allows educators to provide more focus and effective learning which suits students' cognitive and experiential needs. The implication is that Buddhist

educators can adopt this approach to improve the quality of Buddhist learning and open opportunities for the development of more adaptive educational technology.

However, the limitation of this research is focuses on the Buddhist context so the results may not be directly applicable to other learning contexts. In addition, using the Moodle platform also requires a fairly deep technical understanding, so additional training for educators may become a necessity. A suggestion for future research is to carry out further research on usage micro learning in Buddhist learning including measuring its impact on student motivation and learning outcomes. Additionally, further research could explore the use of chatbots in Buddhist microlearning and the development of educational technology that is more adaptive to students' spiritual needs.

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