



A Gamified MOOC: The Development of an Interactive Moodle-Based Learning Environment

Wanda Ramansyah, Universitas Negeri Malang, Indonesia

Henry Praherdhiono, Universitas Negeri Malang, Indonesia

I. Nyoman Sudana Degeng, Universitas Negeri Malang, Indonesia

Dedi Kuswandi, Universitas Negeri Malang, Indonesia

Received: 06/10/2023; **Accepted:** 09/18/2023; **Published:** 10/27/2023

Abstract: In the current digital era dominated by Generation Z, the virtual learning environment is unavoidable. Generation Z needs computers, smartphones, and the internet to meet their educational needs. Thus, Massive Open Online Courses (MOOCs) have emerged as a rapidly evolving virtual learning environment that caters to contemporary learning requirements. MOOC is currently developing as a provider of learning facilities for students to study anywhere, anytime, and in any way. However, many obstacles and challenges accompany the current prevalence of MOOCs, such as low completion rates, minimal interactivity, decreased learning engagement, and high dropout rates. Gamification is a trend that supports the learning process and is believed to provide fascinating and enjoyable learning to increase learning motivation and engagement. The aims of this study were to (1) develop the Gamified MOOC “WandaBelajar” for Informatics Education Study Program students in the Vocational Learning Media Course and (2) determine the feasibility level of the “WandaBelajar” product that has been developed. The product was developed using the ADDIE model, and from the evaluation results of material experts, learning media experts, and field tests on students it was found that the Gamified MOOC product “WandaBelajar” was appropriate for use in the learning process.

Keywords: Gamification, MOOC, Development, Moodle

Introduction

Generation Z is currently encountering a novel culture and paradigm of education that involves active participation in the learning process, which is occasionally regarded as radical by individuals belonging to Generations X and Y (Praherdhiono, Adi, and Prihatmoko 2018). The Generation Z cohort is a prominent demographic in the digital age, marked by a significant reliance on electronic devices such as computers, laptops, and other internet-connected gadgets to satisfy educational requirements. The contemporary era of digital learning encompasses a range of theoretical frameworks, including behaviorism, cognitivism, constructivism, and connectivism. Connectivism has gained prominence since the 2000s as a more suitable approach to addressing current learning demands (Huang, Spector, and Yang 2019). Connectivism is a theoretical framework that prioritizes establishing connections between a particular information set as the primary focus of learning. In this context, the creation of connections that facilitate further learning takes precedence over existing knowledge, or, in other words, “the pipe is more important than the content within the pipe” (Siemens 2005; Asmendri and Sari 2018).

The emergence of the Connectivism learning theory is attributed to the swift advancement of information technology, social networking, cloud computing, and Massive Open Online Courses (MOOCs), which have become prevalent in pedagogy. The acronym MOOC was initially employed in 2006 within the context of distance education and gained widespread recognition as a prevalent pedagogical approach by 2012. A MOOC is an internet-based course that is accessible to an unrestricted number of participants and is made available through open access on the World Wide Web (Kaplan and Haenlein 2016; Yousef et al. 2015). The MOOC is a platform that facilitates the dissemination of information and fosters relationships among diverse stakeholders in the learning process, including educators and students with varying educational backgrounds (Open). The dissemination of information is achieved through the internet network (Online), which enables the formation of a large community of learners (Massive) engaged in training courses (Courses) (José et al. 2021).

There are diverse categories of MOOCs, including the connectivist MOOC (cMOOC), which is founded on the principles of connectivism. The cMOOC platform offers a conducive environment for learners to engage in self-directed learning, wherein they can articulate their learning goals, express their perspectives, and engage in collaborative and creative knowledge sharing (Yousef et al. 2014; Haggard 2013). The cMOOC model allows students to collaborate to construct networks and study groups via various social media platforms, including blogs, Google groups, Twitter, Facebook, Instagram, and other applications, without any limitations imposed by instructors or teachers.

In addition to the benefits of MOOCs, many impediments and difficulties are associated with implementing this platform. Despite the rapid growth of MOOCs in delivering online learning experiences, preserving students' learning retention remains a significant challenge (Vaibhav and Gupta 2014). Empirical evidence suggests that MOOCs have been linked to slow completion rates, minimal interactivity, and decreased learning engagement among students, ultimately leading to boredom and high dropout rates (Khalil, Ebner, and Admiraal 2017; Ortega-Arranz et al. 2019; Uvalić-Trumbić and Daniel 2013; Jung and Lee 2018).

The challenges associated with integrating MOOCs in educational settings can be surmounted by integrating gamification components into the MOOC platform. According to the scholarly literature, gamification applies game mechanics, aesthetics, and cognitive processes to engage and incentivize learners, enhance the learning experience, and address educational challenges (Reigeluth, Beatty, and Myers 2017). Gamification involves engaging learners in activities that incorporate game-like elements, such as earning points, overcoming challenges, or receiving badges on completion of learning tasks, rather than requiring them to play games in their entirety. The utilization of gamification has the potential to enhance student engagement, which, in turn, can positively influence motivation, retention, and course completion rates, as supported by previous studies (Bakar et al. 2017; Khalil, Ebner, and Admiraal 2017; Rohan et al. 2021).

The opportunity space for the application of gamification elements in the context of an MOOC is expansive (Khalil, Davis, and Wong 2018). The mechanics of challenges, reward, and

chances, accompanied by components such as points, leaderboards, and badges, enhance the engagement, motivation, and metacognition of the participants in a MOOC (Rincón-Flores, Montoya, and Mena 2019). It has been presented and known that there are many important elements that will enable an effective gamification process that addresses major issues in MOOC implementation (Nugroho and Rini 2021). Establishing a MOOC learning environment that incorporates gamification can enhance students' engagement in the learning process, particularly when the material being studied is perceived as uninteresting (Vaibhav and Gupta 2014). The utilization of gamification in MOOCs has been found to enhance student attention and engagement (Khalil, Davis, and Wong 2018; Ortega-Arranz et al. 2019). These research findings suggest that the creation of Gamified MOOCs is crucial to offer efficient educational services that cater to the learning requirements of Generation Z in the contemporary digital age.

A gamified MOOC is a MOOC platform incorporating gamification components into its design. The development of gamified MOOCs can be facilitated through the utilization of a content management system (CMS), such as Moodle (Modular Object-Oriented Dynamic Learning Environment) (Suartama et al. 2020; Polhun et al. 2021; Rivers 2021; Egorov et al. 2021). Moodle is a potent instrument utilized to facilitate learning in diverse ways, whereby instructors and learners derive advantages from its utilization (Gamage, Ayres, and Behrend 2022; Simanullang and Rajagukguk 2020). Using Moodle as a learning management system (LMS) facilitates the formation of a collaborative learning community among students.

The foregoing context makes it imperative to devise a Gamified MOOC utilizing Moodle as a platform to establish an educational milieu that caters to the learning needs of Generation Z in the contemporary digital age.

Relevant Literature

MOOC

Massive, which stands for the letter M in MOOC, denotes no cap on the number of students who can register. The word Open, represented by the letter O in MOOC, denotes that participation is often free or inexpensive. Online, represented by the second letter O in MOOC, signifies that anyone from everywhere with internet access can participate and receive education, even if they cannot move (Gomez-Galan et al. 2019; Jarnac de Freitas and Mira da Silva 2020). With MOOCs, anyone can study for free from renowned professors or instructors and benefit from ongoing learning assistance with various activities and high-quality learning resources (Jung and Lee 2018; Khalil, Davis, and Wong 2018). MOOCs have garnered international attention due to their potential to provide free (Rabanal 2017; Nugroho and Rini 2021), high-quality, and accessible training and education to anyone, regardless of national origin, prior knowledge, and registration fees (Liyanagunawardena, Adams, and Williams 2013).

Clow distinguishes two types of MOOCs: cMOOCs and xMOOCs (Clow, Hall, and Keynes 2013). The cMOOC, also known as "The Connectivist MOOC," is a MOOC that is founded on the educational tenet of connectivism. The xMOOC, also known as the extended Massive Open

Online Course, represents a paradigm shift in education, as it leverages digital technologies to move beyond the traditional lecture-based format and adopts a behavioristic approach to learning. The nomenclatures cMOOC and xMOOC were initially coined by Stephen Downes, one of the pioneers of cMOOC, in 2008 (Liyanagunawardena 2015). The cMOOC platform offers a conducive environment for autonomous learning, enabling participants to establish learning goals, express their perspectives, and engage in collaborative and innovative knowledge sharing (Yousef et al. 2014). This conducive learning environment can be achieved by forming networks and study groups using diverse social media applications such as blogs, Google groups, Twitter, Facebook, and Instagram, outside the confines of the learning platform, without any form of regulation from instructors or teachers.

Conversely, xMOOCs entail predetermined learning objectives that are imparted by instructors through brief video lectures, frequently accompanied by e-assessments in the form of assignments (Stewart 2013). xMOOCs restrict the communication channels available to participants, resulting in limited interaction among the participants (Gaebel 2013). The xMOOC model is characterized by a more prominent role of the instructor in assigning tasks and evaluating learners. In contrast to cMOOCs, xMOOCs facilitate communication solely within the confines of their respective learning platforms, without external means of interaction among participants. Figure 1 delineates the primary concepts of cMOOC and xMOOC.

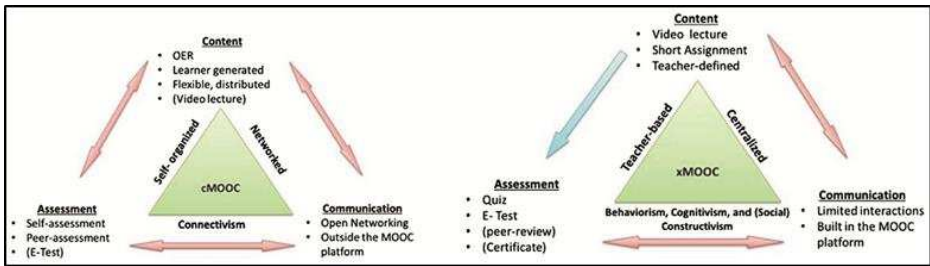


Figure 1: The Primary Concepts of cMOOC and xMOOC

Source: Yousef et al. 2014

Compared to xMOOCs, cMOOCs have a higher potential for promoting learning and self-regulated learning because of the increased level of interactivity between participants, learning objects, peers, and teachers in cMOOCs (Bartolomé and Steffens 2015). In contrast, xMOOCs are primarily concerned with imparting knowledge. Furthermore, cMOOCs are characterized by networked learning, non-linear or chaotic learning, individualized learning, distributed knowledge, scalable networks, and active learning, whereas xMOOCs are associated with traditional approaches to learning, linear or sequential learning, conceptual learning, standardized content, limited scalability, and passive learning (Vázquez, López, and Barroso 2015).

Gamification

Gamification is a learning approach that can facilitate learning and boost motivation by incorporating game elements, game mechanics, and game-based reasoning (Reigeluth, Beatty, and Myers 2017). Gamification refers to using aspects or elements typically found in games to promote learning, such as awarding points, accepting challenges, or receiving badges when students accomplish a stage of their learning activity instead of letting students play games from beginning to end. These activities create a learning environment that will inspire students and keep them engaged in their coursework until completion.

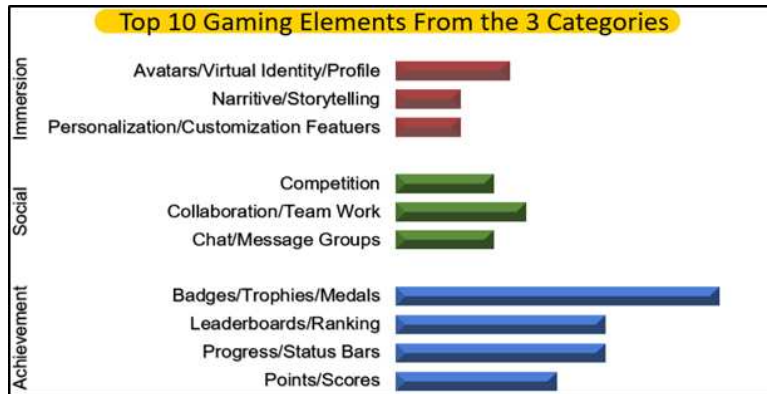


Figure 2: Top 10 Gaming Elements Most Frequently Used Related to the Three Gamification Categories

Source: Rohan et al. 2021

The basic motive behind using the gaming elements is to enhance social participation and improve the motivation level of the students by creating a more engaged and immersive learning environment (Rohan et al. 2021). Achievement, social, and immersion (ASI) are the three most common gamification elements. Popular gamification elements in the achievement category are badges, leaderboards, progress bars, and points. The most well-liked gamification components in the social category are rivalry, teamwork, and chat/messaging. Meanwhile, the popular gamification elements in the immersion category are profiles/avatars, narrative/storytelling, and personalization/customization features.

The primary focus of gamification pertains to applying game elements, design, and principles to non-game contexts, specifically in learning activities, environments, and subject matter. According to the scholarly literature, gamification refers to utilizing or applying game elements to address issues by organizing activities and processes (Subagja et al. 2021). Integrating game elements into the learning environment, commonly known as gamification, is a pedagogical approach that can enhance student engagement in the learning process (Dichev and Dicheva 2017; Codish 2014). Research shows that the integration of gamification elements into educational practices could enhance student engagement in the learning process, akin to the captivating effect of games on players (to bind players). Incorporating game elements into an educational curriculum can enhance skill acquisition and optimize learning experience (Smiderle et al. 2020).

Gamified MOOC

Vaibhav and Gupta (2014) applied game elements to the MOOC they created and discovered that gamification has a high potential to increase student retention. Incorporating game elements within a gamified MOOC can serve as a potent tool for educators to promote student engagement and persistence throughout the learning experience, ultimately leading to the attainment of specific competencies. Integrating game elements into MOOCs, such as badges, leaderboards, points, avatars, competition, and collaboration, can foster student engagement and motivation. These elements incentivize students to persist in their participation and ultimately facilitate their successful completion of the course material in an enjoyable manner.

Gamification in education has gained prominence in the last decade. The correlation between notoriety and favorable learning outcomes is evident in gamified MOOCs, as it heightens engagement and improves knowledge retention among all participants, as per previous research (Jarnac de Freitas and Mira da Silva 2020). The implementation of gamification in MOOCs has been proposed as a means to facilitate user engagement and serve as a connecting link between MOOCs and their users (Vaibhav and Gupta 2014). It has been recognized that a gamified learning environment will serve as a competitive advantage for higher education institutions in the future (Rohan et al. 2021). Gamification refers to the incorporation of game design components to enhance the utilization and efficacy of a given product, service, or information system, such as a MOOC (Blohm and Leimeister 2013).

A notable distinction between learning materials that have been gamified and those that have not is that participants cannot visually perceive the gamification elements in the latter. However, the system still executes the process of assigning points and conferring badges on participants, albeit without their awareness of it (Smiderle et al. 2020). Various instructional treatments yield varying effects on students. In this instance, individuals who engage in gamified learning demonstrate a heightened interest in sustained participation in MOOCs, wherein the incorporation of game elements, such as point systems, fosters a positive competitive environment among MOOC participants.

Development of Gamified MOOC Based on Moodle

Moodle is an LMS that prioritizes equipping educators with optimal resources for facilitating and advancing the learning process (Widodo, Musyarofah, and Slamet 2022). Moodle is a highly adaptable platform that affords educators the opportunity to customize and tailor their instructional approach to meet the unique needs of their students. This platform enables teachers to effectively organize, manage, and disseminate course content in a manner conducive to optimal learning outcomes. Moodle is an open-source software that facilitates the implementation of online learning. It operates on the principle that various learning support features can be seamlessly integrated into online learning portals (Suartama et al. 2020).

Moodle can be an effective learning platform that fosters cognitive engagement among students by facilitating their comprehension, interpretation, analysis, and manipulation of

information to generate solutions to diverse problems (Sumarwati et al. 2020). Empirical studies have demonstrated that utilizing Moodle can augment learning beyond the confines of the classroom and positively impact students' cognitive abilities and creativity (Chootongchai and Songkram 2018). Moodle, in its current state of development, possesses many features conducive to creating gamified MOOCs aimed at facilitating learning. Moodle's adaptability and intuitive interface facilitate the construction of a gamified educational setting (Hasan, Nat, and Vanduhe 2019). The Moodle platform facilitates the assimilation of gamification components, including but not limited to, badges, leaderboards, chatrooms, discussion forums, activity completion indicators, progression bars, scoreboards, plug-ins, and points (Yalagi, Gandhmal, and Dixit 2018). Research has demonstrated that incorporating gamification into the Moodle platform positively impacts student motivation and engagement (Ravelin et al. 2017).

The development of Moodle as an educational instrument entails a recommended approach for developers to undertake consecutive procedures. These procedures involve several steps, including acquiring a server or web hosting, configuring Moodle settings, modifying the identity and theme of the Moodle portal, establishing categories, creating and managing user status, adjusting course settings, inputting resources, and creating and managing activities (Surjono 2010).

Method

Research Design

The present study employed a research and development (R and D) design for education to develop and evaluate the viability of a product designed to meet the needs of learners. The study has yielded a product known as a "Gamified MOOC," which was constructed utilizing the Moodle platform and features content centered on "Innovative Learning Media Without Coding." The product was created through a collaborative effort involving educational technology experts, instructors, technology assistants, video specialists, and course producers (Seidametova 2018).

We developed the product using the ADDIE development model that comprises five stages: Analysis, Design, Development, Implementation, and Evaluation (Lee and Owens 2004). The ADDIE development model was employed in this study due to its simplicity, comprehensiveness, and established validity. Figure 3 depicts the ADDIE model for developing a Gamified MOOC.

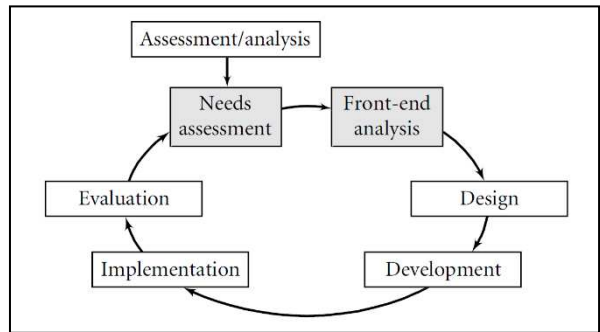


Figure 3: The ADDIE Development Model

Source: Lee and Owens 2004

Procedures

Table 1 presents the procedures for developing the Gamified MOOC using the ADDIE development model (Lee and Owens 2004).

Table 1: The Procedures for Developing a Gamified MOOC

No.	Stages	Activities
1.	Analysis	<i>Need Assessment:</i> identified learning problems that resulted in poor learning motivation and poor learning outcomes for online college students. <i>Front-End Analysis:</i> identified student characteristics, learning content that students required and were interested in, technology or learning support facilities, appropriate learning strategies, and gamification elements. These activities were conducted by interviewing, observing, surveying several professors and a few students, and examining pertinent literature.
2.	Design	Developed a schedule for the product development process. Identified the necessary hardware and software prerequisites for software development. Determined the learning content, learning strategies, and gamification elements utilized in the instructional design process. Developed instructional materials and educational tasks for students.
3.	Development	Developed a Gamified MOOC by: (a) <i>Creating a Gamified MOOC Learning Platform Portal.</i> This stage involved: (1) selecting Moodle 4.0, (2) installing the Moove theme, (3) setting the Moove theme by configuring General, Advanced, Frontpage, and Footer, (4) installing the H5P Plugin, Level Up, and Stash, (5) making user configurations, such as account registration, add an account, and forget account, (6) adding courses, (7) adding icon badges, (8) building to android using Android Studio and Kotlin Programming Language. (b) <i>Creating a Learning Scenario or Course in the Gamified MOOC.</i> This stage involved: (1) creating and customizing course settings, (2) entering content or learning resources (videos, ebooks, files, folders, IMS content, labels, pages, URLs), (3) creating learning activities (gamification, assignments, chat, choice, database, feedback, forum, glossary), (4) customizing the course display blocks and arranging blocks for each topic. Invited learning media and materials experts to validate the Gamified MOOC product. Revised the Gamified MOOC according to the experts' suggestions from the media experts and material experts.
4.	Implementation	Conducted a field trial of the Gamified MOOC on college students.
5.	Evaluation	Conducted the final revision and evaluation of the product.

Product Validation and Field Trial

The gamified MOOC product was validated by four lecturers, consisting of two experts in learning material and two experts in learning media. The four lecturers were selected based on their educational background and expertise in areas relevant to Gamified MOOC products. Following expert validation, we administered the product to fifty students in a field trial. The study's subjects were derived from two Informatics Education courses within the Faculty of Education at Trunojoyo University in Madura. The purpose of this field trial was to assess the practicality and quality of the product prior to its implementation in authentic educational settings.

The product was validated by administering questionnaires to individuals with expertise in learning material, learning media, and students as users. The questionnaire validating the material was adapted from Walker and Hess (1984). Meanwhile, we used the questionnaire Debattista (2018) developed to validate the product regarding media quality. The questionnaire utilized during the field trial phase was developed by extracting pertinent aspects or statements from evaluations conducted by the learning material and media experts on the role of students as the product's users (Suartama et al. 2020).

The questionnaires used during the validation expert phase and field trial comprise open-ended and closed-ended questions. The closed-ended questionnaire employed a Likert scale of five levels ranging from one to five. Additionally, the open-ended questionnaire was disseminated to gather feedback from experts and students regarding the product under development. Tables 2 and 3 contain the evaluation aspects and indicators that the experts employed to validate the product.

Table 2: Instrument for Evaluating the Learning Material

<i>Aspects to Assess</i>	<i>Indicators</i>
Materials Aspects	(1) Appropriate material with the competencies to be achieved, (2) truth of the concepts, (3) updated material, (4) order of material deliveries, and (5) appropriate examples given.
Learning Aspects	(1) Learning objectives, (2) motivation, (3) summary, (4) clarity of learning indicators, (5) providing training, and (6) appropriate images, videos provided to clarify the material.
Language Aspects	(1) Appropriate language in accordance with student's level of thinking, (2) simple language, (3) appropriate terms, (4) appropriate grammar and spelling, and (5) ability to encourage student curiosity.

Table 3: Instrument for Evaluating the Learning Media

<i>Main Standards</i>	<i>Specific Standards</i>
Course opening	Accessibility, role, description, behavior, integrity, technical competencies, and ownership
Instructional resources for teaching and learning	Provision, application, entitlement, variety, openness, and academic integrity
Interaction	Fostering, management, and peer learning
Learner support	Instructional support, academic support, technical support, and administrative support
Technology design	Support, centrality, openness, authentication, access, interface, investment, and management
Course closing	Assessment, resolution, and archiving.
Assessment of learning	Goals and objectives, strategies, grading, feedback, and management
Instructional design cycle	Academic review, technical review, and administrative review

The Gamified MOOC product’s validation results yielded two distinct data categories: qualitative and quantitative. The qualitative data comprised feedback, evaluations, and expert recommendations on the learning materials and learning media. The quantitative data consisted of scores assigned to each item on the instrument, as completed by the experts. Descriptive statistical analysis methods were employed to depict the quality of the Gamified MOOC. Subsequently, we summed the acquired scores, computed the mean scores, and categorized the scores into categories utilizing the conversion chart derived from (Sukardjo 2010). Table 4 shows the score conversion.

Table 4: Score Conversion to Value on a Five-Point Scale

Score	Category	Score	
		Pattern	Calculation
5	Very good	$X > \bar{X}_i + 1.80 SD_i$	$X > 4.21$
4	Good	$\bar{X}_i + 0.60 SD_i < X \leq \bar{X}_i + 1.80 SD_i$	$3.40 < X \leq 4.21$
3	Fairly good	$\bar{X}_i - 0.60 SD_i < X \leq \bar{X}_i + 0.60 SD_i$	$2.60 < X \leq 3.40$
2	Poor	$\bar{X}_i - 1.80 SD_i < X \leq \bar{X}_i - 0.60 SD_i$	$1.79 < X \leq 2.60$
1	Very poor	$X \leq \bar{X}_i - 1.80 SD_i$	$X \leq 1.79$

Remarks:

Ideal mean ($\bar{X}_i$)

Ideal standard deviation (SD_i)

Maximum score

Minimum score

$= 1/2 \times (\text{maximum score} + \text{minimum score})$

$= 1/6 \times (\text{maximum score} - \text{minimum score})$

$= 5$

$= 1$

Hence:

$\bar{X}_i$

SD_i

X

$= 1/2 \times (5 + 1) = 3$

$= 1/6 \times (5 - 1) = 0.67$

$= \text{Actual Score}$

To determine the mean of the scores obtained by the product developed, the following formula was used:

$$\bar{X} = \frac{\sum X}{n}$$

Description:

$\bar{X}$

$\sum X$

n

$= \text{Mean}$

$= \text{Total Score}$

$= \text{Total Number of validators/respondents}$

Results

Results of the Needs Assessment/Analysis Phase

A needs analysis/assessment was conducted on Informatics Education students from Trunojoyo University enrolled in the Vocational Learning Media course. The needs analysis involved conducting interviews, observations, and surveys with four lecturers and fifty students from the Department. A comprehensive review of the existing literature was also undertaken. This phase was conducted to acquire data or information about the underlying factors contributing to reduced motivation for learning and suboptimal academic performance among students. The data collected included student attributes, preferred learning content, technological or pedagogical support facilities, effective learning strategies, and gamification elements that can enhance the quality of learning. The information gathered during this phase served as the foundation or framework for developing a Gamified MOOC.

In this phase, we gathered data on the factors contributing to diminished academic drive and suboptimal academic performance among students. The analysis findings indicated that students experienced a sense of ennui when exclusively exposed to didactic materials such as textual content or PowerPoint presentations delivered by the lecturer. There was a growing demand among students for a campus-owned online learning platform that was currently unavailable. The lack of flexibility in synchronous virtual face-to-face communication tools, such as Zoom or Google Meet, posed a challenge for students in comprehending learning material, particularly in practicum. According to the students, their ability to engage in collaborative efforts with their peers was hindered due to the absence of a dedicated online learning platform provided by the lecturer. Ultimately, students anticipated the provision of adaptable study schedules.

Students enrolled in the Informatics Education Study Program in the Faculty of Education at Trunojoyo University, Madura, were Z-generation members whose current learning requirements relied on internet-connected desktops, laptops, and mobile devices. These students conveniently obtained the necessary information to help them achieve their learning goals using internet-enabled devices. Besides the students, the faculty also required access to the internet to efficiently and expeditiously locate current instructional resources. In short, contemporary educational pursuits, particularly in higher education settings, are inextricably linked to the utilization of laptops, smartphones, and the internet.

Educators must implement unique pedagogical approaches in the digital age to engage and instruct the Z-generation members effectively. Connectivism is a learning theory deemed suitable for implementation in the digital age. In light of this, collaborative and peer learning strategies are viable options for fulfilling the educational requirements of Generation Z. In the contemporary digital age, collaborative learning practices enable students to cultivate their capacity to establish connections with peers and individuals in diverse learning contexts, thereby fostering a cohesive learning community. Peer learning has the potential to optimize the learning experience. Students can construct and acquire knowledge and information by

interacting with peers who serve as learning collaborators. MOOCs have emerged as a prevalent educational approach in contemporary times, serving as a means to impart learning conditions of this nature to students.

The fundamental concepts, principles, and subject matter explored in the Vocational Learning Media course have remained relatively stable in recent times. However, the learning media landscape is experiencing a rapid and diverse evolution due to technology integration and innovative approaches. In order to enhance the level of engagement and importance attributed to this course, it is imperative to incorporate additional or supplementary learning resources. The supplementary educational materials under consideration may take the form of instructional materials aimed at assisting students in developing innovative and contemporary learning media, including, but not limited to, augmented reality, smartphone-based learning applications, interactive multimedia, and educational games.

Based on the findings of a literature review, observations, and interviews conducted with multiple lecturers in the Informatics Education Study Program, the incorporation of gamification elements in contemporary learning activities was deemed significant. Gamification in educational settings could enhance students' motivation and improve learning outcomes. The integration of gamification components, including, but not limited to, profiles/avatars, badges, progress bars, levels, points/scores, leaderboards, collaboration, and chat, within a MOOC platform is likely to yield a highly efficacious academic setting for university-level learners.

Design of the Gamified MOOC

The creation of e-learning materials utilizing Moodle necessitates the utilization of a compatible operating system (Linux or Windows), in conjunction with a web server (Apache or PHP 7.X), and a database (MySQL or MariaDB). On fulfilling the system prerequisites, a Moodle database was established, and authorization privileges were conferred on Moodle users through a database administration utility such as phpMyAdmin. Subsequently, the Moodle installation was executed by accessing the Moodle Uniform Resource Locator (URL) through a web browser and adhering to the installation guidelines. The language of choice was designated, and basic configurations, including database, administrative credentials, and data placement, were established. Installing Moodle was then followed by installing the H5P plug-in, which incorporates interactive content into Moodle courses. This plug-in can be obtained from the official website <https://moodle.org/plugins/h5p>. Finally, the zip file was extracted, and the H5P folder was transferred to the designated Moodle plug-in directory (/moodle/plugin/). The H5P plug-in was then enabled through the "Moodle Administration Settings" page.

Once the hardware and software were prepared, the material content, learning activities, and gamification elements within the Gamified MOOC learning platform were organized cohesively. The systematic organization of the learning space will create a conducive and efficient educational setting for learners. Table 5 displays the learning material, learning activities, and gamification elements incorporated into the Gamified MOOC.

Table 5: The Gamified MOOC Features, the Learning Material, Learning Activities, and Gamification Elements

Topic	Material	Gamified MOOC Features		Implementation of Gamification Elements
		Resources	Activities	
Introduction	An introduction to how to learn in a gamified MOOC and its contents	Page Video File URL	H5P (A plug-in tool used to produce and implement interactive content and interactive videos into an LMS or other type of e-learning browser) Interactive content (content that invites a response from users) Forum (Discussion room) Assignment (tasks that users complete) Feedback (in the form of peer assessment)	Profile/avatar Badges Progress bar Level Points/score Leaderboards Collaboration Chat
Assemblr Studio (A web-based Augmented Reality creator to create, view, and share AR creations in the browser without needing to download any app)	How to input and publish AR objects Ways to combine AR objects, import 3D objects or assets, input 2D images, input text, and video, use interactive tools, setting interactivity on AR objects Ways to create AR-based learning media			
Articulate Storyline (Software for creating presentations and presenting features such as videos, images, animations, photos, audio, and others)	Functions and use of various Articulate Storyline tools Analysis of appropriate tools for interactivity in Articulate Storyline Development of interactive learning media with Articulate Storyline			
Smart Apps Creator (Desktop application used to create applications and iOS without programming code)	How to make a flowchart or product design according to the product plan How to input assets and use tools to build products How to enter platforms from outside the SAC to complement the flowchart designs Development of APK-based learning media using all the tools			
Genially (web-based/online platform that creates all types of audiovisual and interactive content in a fast and easy way)	Functions of various tools and their use to create gamification objects Analysis of tools suitable for gamification interactivity Appropriate ways of setting interactivity on gamification objects How to create gamification-based learning media products			

Final Product

The Gamified MOOC final product can be classified as a cMOOC due to its emphasis on collaborative learning, knowledge sharing, and open expression of opinions among students. The instructor does not hold a central or primary role in regulating the learning process in this learning environment. The gamified MOOC product “WandaBelajar” is accessible through personal computers, laptops, and smartphones by visiting the website <https://wandabelajar.ac.id/>. The home page display of the Gamified MOOC “WandaBelajar” is depicted in Figure 4.

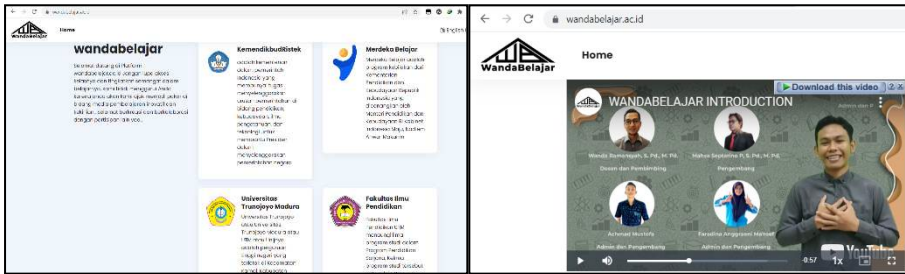


Figure 4: The Home Page of the Gamified MOOC “WandaBelajar”

On successful login, users are provided with additional educational resources to reinforce or supplement their knowledge of Vocational Learning Media. The educational resources in “WandaBelajar” facilitate the acquisition of novel competencies in developing cutting-edge learning media, including augmented reality, 3D objects, Android-based learning applications, and educational games. The educational resources are disseminated in various formats, such as instructional videos, manuals, hyperlinks to YouTube, and other materials that may arise from the outcomes of student discourse and exchange (as depicted in Figure 5). The presentation of each topic is divided into three levels corresponding to Bloom’s taxonomy. Level 1 of cognitive learning encompasses the ability to remember (C1), understand (C2), and apply (C3). Level 2 pertains to the ability to analyze (C4) and evaluate (C5) data, while level 3 pertains to the capacity to create (C6) (Krathwohl 2002).

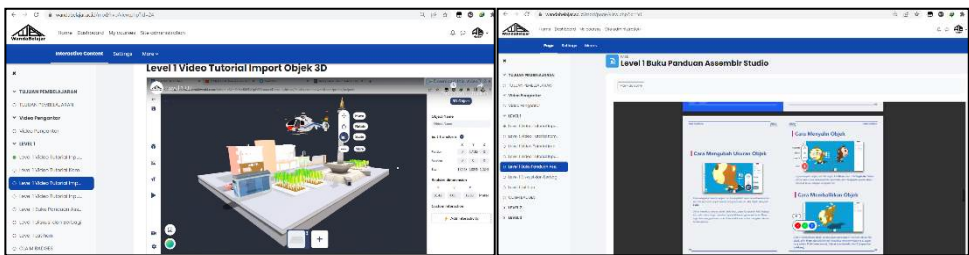


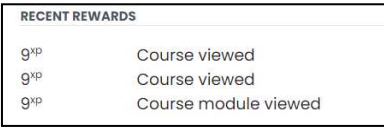
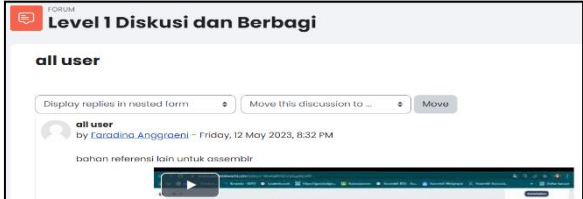
Figure 5: Learning Materials Presented in the Gamified MOOC “WandaBelajar”

The Gamified MOOC “WandaBelajar” incorporates connectivism-based learning activities manifested in various forms, such as discussion activities, peer feedback, and collaborative projects. The platform above offers a forum for university students to engage in discourse and exchange information or supplementary educational resource. Students receive feedback or responses from their peers after completing a task at every tier. At the third level of each subject, students will collaborate to establish groups to produce educational media products.

Gamification is a crucial aspect of the “WandaBelajar” platform. Implementing gamification elements in educational settings aims to enhance student engagement and motivation, thereby promoting sustained participation and progression through the learning process. The incorporation of gamification elements within the WandaBelajar MOOC has the potential to foster student engagement and participation in learning activities. By stimulating students’ curiosity, these elements can effectively sustain their interest and commitment to the

learning process. The learning platform under consideration employs gamification elements that pertain to three distinct categories, as outlined in Table 6. These categories involve immersion (profile/avatar), social (collaboration/teamwork and chat/message group), and achievement (badges, leaderboards, progress bars, levels, and points).

Table 6: Gamification Elements in the Gamified MOOC “WandaBelajar”

No.	Gamification Elements	Display of the Gamified MOOC
1.	Profile/Avatar, which displays student personal data as a Gamified MOOC user	
2.	Badges (bronze, silver, and gold), which are earned after passing certain stages in the Gamified MOOC	
3.	Progress Bar, which shows student learning progress	
4.	Level, which shows student learning achievement based on the difficulty level of the Gamified MOOC task	
5.	Points/Scores, which display the points that students get every time they complete a particular stage	
6.	Leaderboard, which displays the achievement order of students after completing a task in the Gamified MOOC	
7.	Collaboration, which shows the completion of a task through collaborative work	
8.	Chat, which shows discussion activities and information sharing between students as the users of Gamified MOOC	

Result of Product Validation and Field Trial

After the Gamified MOOC product was developed and confirmed to function correctly, the product was validated by experts in learning material and learning media. Before implementing the product in a field trial involving fifty students, the Gamified MOOC product underwent revision per expert recommendations. Table 7 depicts validation results by two experts in learning material.

Table 7: The Results of the Expert Validation on the Gamified MOOC Learning Material

<i>Evaluation Aspects</i>	<i>Average Score</i>	<i>Category</i>
Materials Aspect	4.40	Very good
Learning Aspect	4.25	Very good
Language Aspect	4.50	Very good
Total average score	4.38	Very good

According to Table 7, the learning material of the Gamified MOOC obtained a mean score of 4.38, denoting a very good score as per the conversion table (Table 4). This suggested that the educational content incorporated into the product was suitable for implementation within an academic setting. However, experts in learning materials advised that it was imperative to uphold audio fidelity in every instructional video to ensure optimal audibility. They also proposed that the product's developers maintained consistent audio volume across all speakers, emphasizing the narrator's volume in particular.

The results of the Gamified MOOC validation by experts in learning media are presented in Table 8.

Table 8: The Results of the Expert Validation on the Gamified MOOC Learning Media

<i>Evaluation Aspects</i>	<i>Average Score</i>	<i>Category</i>
Course opening	4.50	Very good
Instructional resources	4.50	Very good
Interaction	4.33	Very good
Learner support	4.50	Very good
Technology design	4.44	Very good
Course closing	4.33	Very good
Assessment of learning	4.50	Very good
Instructional design cycle	4.33	Very good
Total average score	4.43	Very good

Table 8 demonstrates that the Gamified MOOC's learning media received an average score of 4.43, an outstanding score per the conversion table (Table 4). The media expert validation results recommended the suitability of the Gamified MOOC product as a practical instructional resource in an educational setting. However, the learning media specialists advised developers to evaluate the interface design carefully, with particular attention to the colors and backgrounds.

Furthermore, the results of the product field trial on fifty students from the Informatics Education department are presented in Table 9.

Table 9: The Field Trial Results of the Gamified MOOC

<i>Evaluation Aspects</i>	<i>Average Score</i>	<i>Category</i>
Materials Aspects	4.00	Good
Learning Aspects	4.07	Good
Language Aspects	4.03	Good
Course opening	4.12	Good
Instructional resources for teaching and learning	4.10	Good
Interaction	4.02	Good
Learner support	4.01	Good
Technology design	4.07	Good
Course closing	4.01	Good
Assessment of learning	4.10	Good
Instructional design cycle	4.11	Good
Total average score	4.06	Good

The results of the Gamified MOOC field trial are presented in Table 9, indicating a mean score of 4.06. According to Table 4, this score falls within the range of the good category. The results suggested that the Gamified MOOC was feasible for the learning process. Furthermore, according to the survey results, students reported positive feedback on the gamified MOOC. Specifically, they found the MOOC appearance and learning features, including gamification, engaging and motivating, prompting further exploration. The material in the gamified MOOC was presented clearly and in a manner that facilitated proper content learning. They also found the material relevant to the course and their needs and agreed that the gamified MOOC could facilitate learning interactions between lecturers and students, as well as between students themselves. Finally, the accessibility of the gamified MOOC was noted as a positive factor, as it allowed for learning to occur at any time and from any location.

Discussion

The Gamified MOOC “WandaBelajar” allows college students to access it conveniently and from any location. Accessing <https://wandabelajar.ac.id/> solely requires using personal electronic devices such as laptops, computers, tablets, or smartphones by students. Learners are afforded unrestricted access to educational materials, allowing them to oversee their learning trajectory and advancement. Additionally, they can supervise and engage in group discussions, exchange knowledge with peers, cooperate on projects, compile practice assignments, and furnish constructive evaluations to fellow students. Conversely, the administrator of the course can readily gain access to the gamified MOOC “WandaBelajar” to fulfill their requirements for revising educational materials. The individual responsible for overseeing the course can also offer feedback on student discussions, oversee students’ learning progress and advancements, perform upkeep tasks, and promptly address any issues on the gamified MOOC.

The Gamified MOOC “WandaBelajar” is prospective for use in the learning process because it cannot be denied that the platform promotes the use of innovative technology and has the potential to enhance the learning process. MOOCs are accessible to learners at no cost and provide a highly engaging educational experience (Haggard 2013). The Gamified MOOC “WandaBelajar” presents learning material in an interactive, contemporary, concise, and structured manner through video, image, and text formats. At the outset of their educational journey, students are presented with an introductory video and a tutorial on how to use “WandaBelajar.” This approach aims to foster a sense of familiarity, comfort, and ease in the students, facilitating a conducive learning environment.

From the results of the field trial, there were comments regarding the Gamified MOOC platform “WandaBelajar” written by students in the validation questionnaire. Wahyu Mulia Maharani wrote a comment that “the platform is very good and useful for students, the appearance is quite attractive so that it creates motivation to explore further.” Bilal Rayhan commented that “the material provided is very clear and the content displayed is also good.” Siti Nur Hanisa commented that “the platform is very good because there is good interaction between lecturers and students or between students.” Even though this comment is an initial opinion from the experience of using the Gamified MOOC “WandaBelajar,” which still needs further research, it already appears that gamification can be a supplement to fix the weaknesses that appear in MOOC in general. Empirical evidence shows that the weaknesses of MOOCs are associated with slow completion rates, minimal interactivity, and reduced student engagement, which ultimately leads to boredom and high dropout rates (Khalil, Ebner, and Admiraal 2017; Ortega-Arranz et al. 2019; Uvalić-Trumbić and Daniel 2013; Jung and Lee 2018).

Gamification is used as a powerful reinforcement in “WandaBelajar,” where the gamification method results in higher learning outcomes than other methods (Kuswandi and Fadhli 2022). The primary objective of gamification in learning is to enhance social involvement and elevate student motivation levels by establishing a more immersive and engaging learning milieu (Rohan et al. 2021). Thus, the gamification component in “WandaBelajar” encompasses three distinct categories: immersion, social interaction, and achievement.

Immersion is a gamification element that involves the utilization of profiles or avatars to represent users within a virtual environment. The creation of profiles or avatars by students on the learning platform can result in a heightened sense of immersion within the virtual learning environment. Implementing a profile/avatar gamification feature allows students to exercise agency and fosters a heightened sense of self-directed and self-organized learning. Incorporating gamification elements into the learning process can enhance learner autonomy and foster greater engagement, ultimately bolstering student learning motivation (Rohan et al. 2021). In the “WandaBelajar” platform, students as users are given the freedom to create their own profiles and enter photos as user avatars in the MOOC. This aims to make students feel truly inside and integrated with the virtual learning environment, so that students have the freedom of autonomy in organizing learning activities according to their wishes and needs.

Students revealed that an attractive profile appearance made them more motivated to learn and explore further the “WandaBelajar” platform.

The gamified MOOC “WandaBelajar” has been found to enhance students’ social interaction during the learning process by incorporating collaborative and chat features. The results of this investigation align with the connectivism learning theory, which posits that students must establish connections with their peers to facilitate the learning process. At level 3, college students engage in collaborative efforts to complete assignments and participate in discussion activities on the “WandaBelajar” platform. They can also exchange and deliberate on ideas. Providing feedback to and from students during peer assessment is conducive to supporting learning activities. Incorporating student discussions and peer feedback into the learning process can enhance student engagement and motivation, thereby increasing the likelihood of sustained participation on the learning platform to achieve learning objectives (Hasan, Nat, and Vanduhe 2019). Students said that one of the reasons they enjoyed being on the “WandaBelajar” platform was the good interaction it provided with lecturers or between students, which was flexible. Studying in a virtual environment requires good communication so that students do not feel pressured, left behind, or strange in the learning environment. With good communication, the “WandaBelajar” platform will provide fun learning through good social interaction and mutual support.

Achievement is a gamification element that relates to pupil performance after completing specific learning activities or tasks. The gamified MOOC “WandaBelajar” employs a reward system whereby students’ learning accomplishments are incentivized by allocating points or badges. Providing rewards for student achievement can positively impact student learning motivation, as evidenced by previous research studies (Rohan et al. 2021; Pradana et al. 2023). Incorporating gamification elements into learning generates a positive motivational effect that enhances student engagement in the learning process (Vaibhav and Gupta 2014). Consequently, this phenomenon promotes the sustainability of student learning within the “WandaBelajar” platform. Students expressed that they were interested in the gamification elements (badges, progress bars, levels, points/scores, and leaderboards), which were designed to be interactive so that students felt that their learning process was always appreciated, which ultimately fostered feelings of joy. When students enjoy learning, their tendency to log back into the learning platform is high, and they will stay longer on it.

Conclusion

The current digital era has brought about significant advancements in information technology, which has dramatically impacted the learning process for Generation Z. In this context, MOOCs have emerged as a suitable option for creating an efficient virtual learning environment. The gamified MOOC “WandaBelajar” has been developed as an educational platform that aligns with the principles of connectivism. It aims to foster a collaborative learning environment that enables students to connect and engage in meaningful interactions. The gamified MOOC “WandaBelajar” does not impose learning on students, as is frequently encountered in

conventional learning scenarios. This platform facilitates an environment wherein college students require substantive material to acquire knowledge and experience satisfaction during the educational journey. The Gamified MOOC “WandaBelajar” presents subject matter capable of enhancing college students’ skills in developing learning media essential for contemporary digital learning. As a result, they experience a strong desire to learn. The Gamified MOOC “WandaBelajar” incorporates gamification elements that foster an engaging and enjoyable learning experience, thereby promoting prolonged student engagement.

The development of the gamified MOOC “WandaBelajar” followed the systematic instructional design process known as the ADDIE model. The course underwent rigorous evaluation by learning material experts and learning media specialists and was also subjected to a field trial. According to expert validation, “WandaBelajar” fell into the “Very Good” category, whereas the field trial outcomes indicated that it belonged to the “Good” category. The students who participated in the field trial expressed an inclination toward acquiring knowledge owing to the lucid and pertinent presentation of the subject matter in the “WandaBelajar” video. The incorporation of gamification elements such as profiles/avatars, badges, progress bars, levels, points/scores, leaderboards, collaboration, and chat in “WandaBelajar” was reported to have contributed to the students’ positive perception of the learning experience. Gamification components, such as badges and points, foster a sense of recognition among students for their accomplishments, thereby cultivating positive learning motivation. Strong learning motivation tends to enhance engagement and interactivity among students and those enrolled in Gamified MOOCs and learning retention. Ultimately, the presence of this platform has the capacity to mitigate the issue of low completion rates, which is a common challenge in implementing MOOCs for online learning. Based on the information presented, it can be inferred that the Gamified MOOC “WandaBelajar” is a suitable option for educational pursuits.

In view of the changing times and the need for technology for learning that is increasingly rapid, this gamified MOOC should be an alternative to or even compete with regular MOOC without using gamification elements. While many complaints arise from the application of MOOC in learning such as low levels of completion, lack of interactivity, and decreased learning engagement while using MOOC, which causes boredom and high dropout rates in learning, its gamification elements offer a better alternative to the regular MOOC. With the application of gamified MOOC in learning, it is hoped that it can positively increase student motivation and learning involvement to achieve high learning mastery. MOOC, which demands self-regulating learning, is very different from learning in face-to-face classes, which are always supervised by lecturers, in that it is very dependent on the students themselves as users of learning platforms. To learn with MOOC, students must have the desire to learn. When students’ learning needs are high, learning mastery will be well achieved. In this case, an element of gamification is needed in order to increase student motivation and learning involvement so that they feel the need to learn continuously.

The gamified MOOC “WandaBelajar” created as part of this research is still in its early development phase. The platform necessitates certain enhancements, such as a more streamlined student enrollment process, to facilitate easy access for students seeking to enroll in the course. The aesthetic appeal of the platform, including the utilization of icons, necessitates enhancement. The study’s field trial was conducted on a small scale, specifically on a cohort of fifty students at a single university. Subsequent investigations should aim to broaden the scope of this product by enlisting a larger cohort of students from multiple universities, albeit with comparable academic disciplines. Additional investigation is required to assess the effect of implementing the Gamified MOOC “WandaBelajar” on enhancing educational outcomes as observed through the distinct attributes of diverse tertiary-level learners, including self-regulated learning, locus of control, and personality. In the future, experimental tests are still needed regarding the effectiveness of gamified MOOCs by comparing them on similar platforms so that generalizations can be carried out in different contexts.

Acknowledgment

The current study was supported by Indonesian Education Scholarship from the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia.

Informed Consent

The authors have obtained informed consent from all participants.

Conflict of Interest

The authors declare that there is no conflict of interest.

REFERENCES

- Asmendri, Asmendri, and Milya Sari. 2018. “Analysis of Learning Theories in the Development of Blended Learning Models with Facebook (MBL-FB)” [Analisis Teori-Teori Belajar Pada Pengembangan Model Blended Learning Dengan Facebook (MBL-FB)]. *Natural Science Journal* 4 (2): 604–615.
- Bakar, Nur Fatihah Abu, Ahmad Fadhil Yusof, Noorminshah A. Iahad, and Norasnita Ahmad. 2017. “Framework for Embedding Gamification in Massive Open Online Course (MOOC).” Paper presented at the International Conference on Research and Innovation in Information Systems (ICRIIS), Langkawi, Malaysia, July 16–17, 2017. <https://doi.org/10.1109/ICRIIS.2017.8002496>.
- Bartolomé, Antonio, and Karl Steffens. 2015. “¿Son Los MOOC Una Alternativa de Aprendizaje?” [Are MOOCs a Learning Alternative?]. *Revista Científica de Educomunicación* 44:91–99. <http://www.revistacomunicar.com/index.php?contenido=detallesandnumero=44andarticulo=44-2015-10>.

- Blohm, Ivo, and Jan Marco Leimeister. 2013. "Gamification: Gestaltung IT-Basierter Zusatzdienstleistungen Zur Motivationsunterstützung Und Verhaltensänderung" [Gamification: Designing IT-Based Additional Services to Support Motivation and Change Behavior]. *Wirtschaftsinformatik* 55 (4): 275–278. <https://doi.org/10.1007/s11576-013-0368-0>.
- Chootongchai, Suparoek, and Noawanit Songkram. 2018. "Design and Development of SECI and Moodle Online Learning Systems to Enhance Thinking and Innovation Skills for Higher Education Learners." *International Journal of Emerging Technologies in Learning* 13 (3): 154–172. <https://doi.org/10.3991/ijet.v13i03.7991>.
- Clow, Doug, Walton Hall, and Milton Keynes. 2013. "MOOCs and the Funnel of Participation." Paper presented at the Third Conference on Learning Analytics and Knowledge (LAK 2013), Leuven, Belgium, April 8–12, 2013:185–189.
- Codish, David. 2014. "Personality Based Gamification-Educational Gamification for Extroverts and Introverts." In *Proceedings of the 9th Chais Conference for the Study of Innovation and Learning Technologies: Learning in the Technological Era*, March 2014:36–44. <https://www.researchgate.net/publication/260305044>.
- Debattista, Martin. 2018. "A Comprehensive Rubric for Instructional Design in e-Learning." *International Journal of Information and Learning Technology* 35 (2): 93–104. <https://doi.org/10.1108/IJILT-09-2017-0092>.
- Dichev, Christo, and Darina Dicheva. 2017. "Gamifying Education: What Is Known, What Is Believed and What Remains Uncertain: A Critical Review." *International Journal of Educational Technology in Higher Education* 14:9. <https://doi.org/10.1186/s41239-017-0042-5>.
- Egorov, Evgeny Evgenievich, Maria Petrovna Prokhorova, Tatiana Evgenievna Lebedeva, Olga Aleksandrovna Mineeva, and Svetlana Yevgenyevna Tsvetkova. 2021. "Moodle LMS: Positive and Negative Aspects of Using Distance Education in Higher Education Institutions." *Propósitos y Representaciones* 9 (SPE2): e1104. <https://doi.org/10.20511/pyr2021.v9nspe2.1104>.
- Gaebel, Michael. 2013. *MOOCs: Massive Open Online Courses—EUA Occasional Papers*. Brussels: European University Association.
- Gamage, Sithara H. P. W., Jennifer R. Ayres, and Monica B. Behrend. 2022. "A Systematic Review on Trends in Using Moodle for Teaching and Learning." *International Journal of STEM Education* 9 (1): 9. <https://doi.org/10.1186/s40594-021-00323-x>.
- Gomez-Galan, Jose, Antonio H. Martín Padilla, César Bernal Bravo, and Eloy López Meneses. 2019. *MOOC Courses and the Future of Higher Education: A New Pedagogical Framework*. Gistrup, Denmark: River Publishers.

- Haggard, Stephen. 2013. "The Maturing of the MOOC: Literature Review of Massive Open Online Courses and Other Forms of Online Distance Learning." *BIS Research Paper* 130. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/240193/13-1173-maturing-of-the-mooc.pdf.
- Hasan, Fahmi Hasan, Muesser Nat, and Vanye Zira Vanduhe. 2019. "Gamified Collaborative Environment in Moodle." *IEEE Access* 7:89833–89844. <https://doi.org/10.1109/ACCESS.2019.2926622>.
- Huang, Ronghuai, J. Michael Spector, and Jungfeng Yang. 2019. *Educational Technology*. Singapore: Springer.
- Jarnac de Freitas, Marta, and Miguel Mira da Silva. 2020. "Systematic Literature Review about Gamification in MOOCs." *Open Learning: The Journal of Open, Distance and e-Learning* 38:73–95. <https://doi.org/10.1080/02680513.2020.1798221>.
- José, Gomez Galan, Lázaro Pérez Cristina, Martínez López Jose Ángel, and López Meneses Eloy. 2021. "Chapter 9: VLE Environments and MOOC Courses." In *Innovation and ICT in Education: The Diversity of the 21st Century Classroom*, edited by Gomez Galan José, 77–91. Gistrup, Denmark: River Publishers.
- Jung, Yeonji, and Jeongmin Lee. 2018. "Learning Engagement and Persistence in Massive Open Online Courses (MOOCs)." *Computers & Education* 122:9–22. <https://doi.org/10.1016/j.compedu.2018.02.013>.
- Kaplan, Andreas M., and Michael Haenlein. 2016. "Higher Education and the Digital Revolution: About MOOCs, SPOCs, Social Media, and the Cookie Monster." *Business Horizons* 59 (4): 441–450. <https://doi.org/10.1016/j.bushor.2016.03.008>.
- Khalil, Mohammad, Dan Davis, and Jacqueline Wong. 2018. "Gamification in MOOCs—General Overview." Paper presented at the Open Education Global Conference 2018, Delft, the Netherlands, April 24–26, 2018:47. <https://doi.org/10.4233/uuid:559c4fa0-60e6-4e1a-8540-37f59afa7745>.
- Khalil, Mohammad, Jacqueline Wong, Bjorn de Koning, Martin Ebner, and Fred Paas. 2018. "Gamification in MOOCs: A Review of the State of the Art." Paper presented at the 2018 IEEE Global Engineering Education Conference (EDUCON), Santa Cruz de Tenerife, Spain, April 17–20, 2018:1629–1638. <https://doi.org/10.1109/EDUCON.2018.8363430>.
- Khalil, Mohammad, Martin Ebner, and Wilfried Admiraal. 2017. "How Can Gamification Improve MOOC Student Engagement?" Paper presented at the Proceedings of the 11th European Conference on Games Based Learning (ECGBL 2017), Graz, Austria, October 5–6, 2017:819–828.
- Krathwohl, David R. 2002. "A Revision of Bloom's Taxonomy: An Overview." *ReVision* 41 (4): 212–218. https://doi.org/10.1207/s15430421tip4104_2.
- Kuswandi, Dedi, and Muhibuddin Fadhli. 2022. "The Effects of Gamification Method and Cognitive Style on Children's Early Reading Ability." *Cogent Education* 9 (1): 1–14. <https://doi.org/10.1080/2331186X.2022.2145809>.

- Lee, W. W., and D. L. Owens. 2004. *Multimedia-Based Instructional Design: Computer-Based Training, Web-Based Training, Distance Broadcast Training, Performance-Based Solutions*. 2nd ed., vol. 4. San Francisco: Pfeiffer.
- Liyanagunawardena, Tharindu Rekha, Andrew Alexandar Adams, and Shirley Ann Williams. 2013. "MOOCs: A Systematic Study of the Published Literature 2008–2012." *International Review of Research in Open and Distance Learning* 14 (3): 202–227. <https://doi.org/10.19173/irrodl.v14i3.1455>.
- Liyanagunawardena, Tharindu Rekha. 2015. "Massive Open Online Courses." *Humanities* 4 (1): 35–41. <https://doi.org/10.3390/h4010035>.
- Nugroho, Wirawan Arief, and Dyah Puspito Rini. 2021. "Penggunaan Gamifikasi Pada Massive Open Online Course (MOOC)" [Using Gamification in Massive Open Online Courses (MOOC)]. *Jurnal Teknologi Informasi Dan Ilmu Komputer* 8 (1): 1–6. <https://doi.org/10.25126/jtiik.0811689>.
- Ortega-Arranz, Alejandro, Erkan Er, Alejandra Martínez-Monés, Miguel L. Bote-Lorenzo, Juan I. Asensio-Pérez, and Juan A. Muñoz-Cristóbal. 2019. "Understanding Student Behavior and Perceptions toward Earning Badges in a Gamified MOOC." *Universal Access in the Information Society* 18 (3): 533–549. <https://doi.org/10.1007/s10209-019-00677-8>.
- Polhun, K., T. Kramarenko, M. Maloivan, and A. Tomilina. 2021. "Shift from Blended Learning to Distance One during the Lockdown Period Using Moodle: Test Control of Students' Academic Achievement and Analysis of Its Results." *Journal of Physics: Conference Series* 1840:1–16. <https://doi.org/10.1088/1742-6596/1840/1/012053>.
- Pradana, Fajar, Punaji Setyosari, Saida Ulfa, and Tsukasa Hirashima. 2023. "Development of Gamification-Based e-Learning on Web Design Topic." *International Journal of Interactive Mobile Technologies* 17 (3): 21–38. <https://doi.org/10.3991/ijim.v17i03.36957>.
- Praherdhiono, Henry, Eka Pramono Adi, and Yulias Prihatmoko. 2018. "Konstruksi Demokrasi Belajar Berbasis Kehidupan Pada Implementasi LMS Dan MOOC" [Construction of Life-Based Learning Democracy in LMS and MOOC Implementation]. *Edcomtech* 3 (1): 21–28. <https://api.core.ac.uk/oai/oai:ajs.journal2.um.ac.id:article/2845>.
- Rabanal, Nuria G. 2017. "Cursos MOOC: Un Enfoque Desde La Economía" [MOOC Courses: An Approach from Economics] *RIED: Revista Iberoamericana de Educación a Distancia* 20 (1): 145–160. <https://doi.org/10.5944/ried.20.1.16664>.
- Ravelin, Teija, Heli Tolonen, Teija Lehto, Pauliina Tuomi, Andrew Sirkka, and Sari Merilampi. 2017. "Serious Games Education for Working Life Needs—A Pilot Study." *CEUR Workshop Proceedings* 1857:1–7. <http://urn.fi/urn:nbn:de:0074-1857-8>.
- Reigeluth, Charles M., Brian J. Beatty, and Rodney D. Myers, eds. 2017. *Instructional Design Theories and Models: The Learner-Centered Paradigm of Education*. Vol. IV. New York: Routledge.

- Rincón-Flores, Elvira G., María Soledad Ramírez Montoya, and Juanjo Mena. 2019. "Engaging MOOC through Gamification: Systematic Mapping Review." Paper presented at the Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 19)—ACM International Conference Proceeding Series, León, Spain, October 16–18, 2019:600–606. <https://doi.org/10.1145/3362789.3362831>.
- Rivers, Damian J. 2021. "The Role of Personality Traits and Online Academic Self-Efficacy in Acceptance, Actual Use and Achievement in Moodle." *Education and Information Technologies* 26 (4): 4353–4378. <https://doi.org/10.1007/s10639-021-10478-3>.
- Rohan, Rohani, Debajyoti Pal, Suree Funilkul, Wichian Chutimaskul, and Wichai Eamsinvattana. 2021. "How Gamification Leads to Continued Usage of MOOCs? A Theoretical Perspective." *IEEE Access* 9:108144–108161. <https://doi.org/10.1109/ACCESS.2021.3102293>.
- Seidametova, Zarema. 2018. "Design and Development of MOOCs." *CEUR Workshop Proceedings* 2104:462–471. https://ceur-ws.org/Vol-2104/paper_244.pdf.
- Siemens, George. 2005. "Connectivism: A Learning Theory for the Digital Age." *International Journal of Instructional Technology & Distance Learning* 2 (1): 3–10. http://www.itdl.org/Journal/Jan_05/article01.htm.
- Simanullang, N. H. S., and J. Rajagukguk. 2020. "Learning Management System (LMS) Based on Moodle to Improve Students Learning Activity." *Journal of Physics: Conference Series* 1462 (1): 1–7. <https://doi.org/10.1088/1742-6596/1462/1/012067>.
- Smiderle, Rodrigo, Sandro José Rigo, Leonardo B. Marques, Jorge Arthur Peçanha de Miranda Coelho, and Patricia A. Jaques. 2020. "The Impact of Gamification on Students' Learning, Engagement and Behavior Based on Their Personality Traits." *Smart Learning Environments* 7 (1): 3. <https://doi.org/10.1186/s40561-019-0098-x>.
- Stewart, Bonnie. 2013. "Massiveness + Openness = New Literacies of Participation?" *MERLOT Journal of Online Learning and Teaching* 9 (2): 228–238.
- Suartama, I. Kadek, Punaji Setyosari, Sulthoni Sulthoni, and Saida Ulfa. 2020. "Development of Ubiquitous Learning Environment Based on Moodle Learning Management System." *International Journal of Interactive Mobile Technologies* 14 (14): 182–204. <https://doi.org/10.3991/ijim.v14i14.11775>.
- Subagja, Ujang, Arnold Sigit Saputra, Yanditya Ekaputra Dwipada, Yoga Ardo Maulana, Gunawan Wang, and Emil Robert Kaburuan. 2021. "Gamification as an Effective Learning Tool to Increase Learner Motivation and Engagement." *International Journal of Advanced Trends in Computer Science and Engineering* 10 (5): 3004–3008. <https://doi.org/10.30534/ijatcse/2021/111052021>.
- Sukardjo. 2010. *Evaluasi Pembelajaran—Buku Pegangan Kuliah* [Learning Evaluation—College Handbook]. Yogyakarta, Indonesia: PPs Universitas Negeri Yogyakarta.

- Sumarwati, Sri, Harina Fitriyani, Fathin Muhammad Azhar Setiaji, Mohd Hasril Amiruddin, and Siti Afiat Jalil. 2020. "Developing Mathematics Learning Media Based on e-Learning Using Moodle on Geometry Subject to Improve Students' Higher Order Thinking Skills." *International Journal of Interactive Mobile Technologies* 14 (4): 182–191. <https://doi.org/10.3991/IJIM.V14I04.12731>.
- Surjono, Herman Dwi. 2010. *Membangun Course e-Learning Berbasis Moodle*. Yogyakarta, Indonesia: Universitas Negeri Yogyakarta. <https://blog.uny.ac.id/hermansurjono/files/2010/10/Membangun-Course-Elearning-berbasis-Moodle-Okt2010.pdf>.
- Uvalić-Trumbić, Stamenka, and Sir John Daniel. 2013. "Making Sense of MOOCs: The Evolution of Online Learning in Higher Education." In *Scaling up Learning for Sustained Impact. EC-TEL 2013*, edited by D. Hernández-Leo, T. Ley, R. Klamma, and A. Harrer, Lecture Notes in Computer Science (LNCS) [Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics]. Vol. 8095, 1–4, Berlin: Springer.
- Vaibhav, Anant, and Pooja Gupta. 2014. "Gamification of MOOCs for Increasing User Engagement." Paper presented at the Proceedings of the 2014 IEEE International Conference on MOOCs, Innovation and Technology in Education (MITE), Patiala, India, December 19–20, 2014:290–295. <https://doi.org/10.1109/MITE.2014.7020290>.
- Vázquez, E., E. López, and J. Barroso. 2015. "El Futuro de Los MOOC: Retos de La Formación Online, Masiva y Abierta" [The Future of MOOCs: Challenges of Online, Massive and Open Training]. *Pixel-Bit: Revista de Medios y Educación* 48:245–246. <http://dialnet.unirioja.es/servlet/articulo?codigo=5294367>.
- Walker, Decker F., and Robert D. Hess. 1984. *Instructional Software: Principles and Perspectives for Design and Use*. Belmont, CA: Wadsworth Publisher.
- Widodo, J. Priyanto, Lailatul Musyarofah, and Joko Slamet. 2022. "Developing a Moodle-Based Learning Management System (LMS) for Slow Learners." *Jurnal Inspirasi Pendidikan* 12 (1): 1–10. <https://doi.org/10.21067/jip.v12i1.6346>.
- Yalagi, Pratibha S., Dattatray P. Gandhmal, and Rashmi K. Dixit. 2018. "Business Intelligence Tools—Content Generation Using Moodle for Self Learning as an Elective Module." *Journal of Engineering Education Transformations* 31 (3): 243–249.
- Yousef, Ahmed Mohamed Fahmy, Mohamed Amine Chatti, Ulrik Schroeder, and Harald Jakobs. 2014. "MOOCs: A Review of the State-of-the-Art." Paper presented at the INSTICC (CSEDU 2014–6th International Conference on Computer Supported Education), vol. 3, ACM, Barcelona, April 1–3, 2014:9–20.
- Yousef, Ahmed Mohamed Fahmy, Mohamed Amine Chatti, Ulrik Schroeder, Marold Wosnitza, and Harald Jakobs. 2015. "The State of MOOCs from 2008 to 2014: A Critical Analysis and Future Visions." In *Computer Supported Education (CSEDU 2014): Communications in Computer and Information Science*, vol. 510, edited by S. Zvacek, M. Restivo, J. Uhomoibhi, and M. Helfert, 305–327. Cham, Switzerland: Springer.

ABOUT THE AUTHORS

Wanda Ramansyah: Doctoral Student in Instructional Technology, Department of Education and Technology, Universitas Negeri Malang, Malang, East Java, Indonesia
Email: wandaramansyah@trunojoyo.ac.id

Henry Praherdhiono: Department Head, Educational Technology Department, Universitas Negeri Malang, Malang, East Java, Indonesia
Corresponding Author's Email: henry.praherdhiono.fip@um.ac.id

I. Nyoman Sudana Degeng: Professor, Department of Educational Technology, Universitas Negeri Malang, Malang, East Java, Indonesia
Email: nyoman.sudana.d.fip@um.ac.id

Dedi Kuswandi: Professor, Department of Educational Technology, Universitas Negeri Malang, Malang, East Java, Indonesia
Email: dedi.kuswandi.fip@um.ac.id