Gamification of Ubiquitous-Based Learning Media as an Initiative of Open-World Metaverse Conversion for Problem Based Learning (PBL) in Business and Management Courses

Suryo Hadi Wira Prabowo[1], Achmad Murdiono[1(✉)], Jefry Aulia Martha[1], Ika Zutiasari[1], and Safwan Marwin Abdul Murad[2]

[1] Department of Management, Universitas Negeri Malang, Malang, Indonesia
achmad.murdiono.fe@um.ac.id

[2] School of Business Management, Universiti Utara Malaysia, Changlun, Malaysia

Abstract. Digitalization of education is capable of providing a variety of creative and innovative learning media to facilitate the delivery of content by teachers. In reality, however, the comprehension of the provided material by students is heavily influenced by the learning activities conducted by the teacher. If learning activities are conducted with peers or using a practice-doing model, students' ability to retain information can reach 90 percent. Learning media can support learning success because it has advantages. The advantages of learning media include providing a deeper understanding of the learning material being discussed. This study aims to gamify learning media based on ubiquitous learning as an initiative the open-world metaverse conversion of project-based learning (PBL) in business and management courses to support the teaching and learning process. The research phase begins with information gathering and preliminary studies. Then proceed with planning the program framework for the application of learning materials. After that, the preparation of learning materials was carried out. And finally, validation trials were carried out by experts to validate the materials and media. It is hoped that the ubiquitous learning-based learning media gamification software as an initiative to convert open-world metaverse project-based learning (PBL) in business and management courses to support the teaching and learning process. In addition, it is hoped that through this research, the current state of media use in learning and the efficacy of using business application media in business and management courses will be understood.

Keywords: Gamification · Learning Media · Ubiquitous Learning · Project Based Learning · Business and Management Course

1 Introduction

According to Human Development Reports' Education Index, Indonesia ranked seventh in ASEAN in 2017 with a score of 0.622. The highest score for Singapore was 0.832. Malaysia comes in second (0.719) followed by Brunei Darussalam (0.704). Thailand

and the Philippines are tied for fourth place with a score of 0.661. This condition affects Indonesia's competitiveness in the ASEAN Region. Based on these conditions, a strategy is needed to accelerate the quality of education in Indonesia. One solution to catch up with our education is the innovation of technology-based learning media [1].

Now, efforts to overcome these problems in Indonesia offer many innovations in information technology-based learning media [1]. However, there are still not many technology-based learning media that have not been able to create a conducive learning climate and can increase students' understanding of the learning delivery process [2]. So that the existing learning media have not been able to meet the learning needs of students which can affect their mindset in learning and the speed of learning of students [3].

Teaching staff will increase the efficacy of learning by implementing a learning strategy that engages students directly in learning activities, such as demonstrations and practice doing. The notion of games in learning may be implemented by creating learning media based on gamification [1]. The benefit of the game style is that players will be more immersed, therefore they will feel more connected to the game's content. This is because if the learning process can be conducted in an immersive manner, it will be more successful [2].

The learning method using the Project-Based Learning (PBL) method is proven to increase the effectiveness of the learning process [3]. PBL is a learning method by applying certain projects so as to produce the desired outcomes to explore a learning process [4]. Moreover, business education, the ability to manage a business requires learning media that can represent the reality of business conditions [5].

In the application of the project-based learning (PBL) method, a case that has been arranged in such a way as to replicate the conditions in question. Simulation of conditions is needed as a solution to the PBL learning method. So, with the gamification of project-based learning methods (PBL) in the form of games, it can make it easier for students to understand real conditions in business and hone students' entrepreneurial skills [2].

Based on the above conditions, it is necessary to develop learning media innovations that are integrated with ubiquitos learning to build learning speed and meet student learning needs. Yogiyanto describes ubiquitous learning as a new learning paradigm that provides resources or learning networks with communication and connectivity anytime and anywhere. The development of ubiquitous learning technology infrastructure needs to be done as a response to the development of digital learning tools [5].

Through this study, it is hoped that the ubiquitos learning-based learning media gamification software can be used as an effort to convert the open-world metaverse of project-based learning (PBL) in business and management courses. In addition, through this study, it is hoped that the current condition of the use of media in life-based learning, and the effectiveness of the use of business game media in courses that have a business and management basis will be known.

2   Literature Review

2.1   Learning Media

Media is a tool with the purpose of communicating messages [6]. The purpose of learning media is to convey learning messages. Learning is a process of interaction between students, instructors, and instructional materials. Without the means of conveying messages or media, communication would not be possible [7].

In essence, teaching and learning activities are a communication process. Communication must be realized through the delivery and exchange of messages or information by each teacher and student [8]. In the communication process there can be differences in perceptions so that a means is needed to assist the communication process called media [9].

Media for learning should promote learner motivation [10]. In addition to delivering fresh learning stimuli, media must also encourage learners to recall previously acquired information [11]. Good media will also engage pupils in offering feedback and motivate them to practice appropriately [12].

2.2   Gamification of Learning Media

Effective learning media are media that are attractive to users and provide benefits in the learning process. This is supported by Wang [13], learning media must be able to provide more benefits than without using learning media. By utilizing learning media, the learning process will become more comprehensive and in-depth [14]. Deep and comprehensive learning will make it easier to provide information and messages to students.

Intriguing learning is achieved by the use of interesting learning media [15]. Game-based media [1] is one of the most engaging and useful learning media for the learning process. Game-based learning media may bundle information and practice in an enticing manner, hence increasing students' learning motivation [17].

The teaching and learning process will be more successful if it is a pleasurable experience. In addition to being a pleasant learning tool, game-based learning media provides students with an immersive experience. Immersive activities will facilitate student comprehension [17]. This is due to the fact that through immersive experiences, students will experience the subject first-hand during the learning process [18]. Game-based learning media in the form of business simulations is one example of immersive learning media [11].

2.3   Ubiquitous Learning

According to Jung in Yogiyanto, ubiquitous learning is a new learning paradigm that gives learning materials or networks with communication and connectivity anytime, anyplace, dependent on the learner's circumstance, employing intelligent technologies like as cellphones, digital slates, etc. A clever computer. In response to the emergence of digital learning aids, the development of ubiquitous learning technology infrastructure is required [12]. The ubiquitous learning environment is a collection of settings that

facilitate learning via the use of technology that promotes genuine, engaging, effective, and student-centered learning experiences without regard to time or place [9]. Students may utilize this system to learn at the appropriate time, in the right location, with the correct tools and information [5].

One of the studies on the development of Ubiquitous Learning is the research conducted by Yogiyatno W. in 2019 [12], discussing ubiquitous computing, the ubiquitous learning environment, its characteristics and components, and the possibility of its application in Indonesia. The related research was conducted by Suartama I. K., et al. in 2020 [15], which discusses the development of a ubiquitous learning environment using the Moodle LMS and the feasibility of the ubiquitous learning environment that has been developed.

2.4 Application of Open-World Metaverse in Education

With today's technological advances, the software created is not only limited as a computational tool that helps human work [19]. This can be used to improve the quality of human life, one of which is the quality of education [20]. The quality of education can be improved by utilizing the application of software technology in accordance with the needs of teaching and learning activities.

The Open-World Metaverse concept is a new software concept that offers a very broad user-interaction experience just like real life [21]. The concept of the Open-World Metaverse can be applied to various needs. One of them can be applied in the field of education. This will provide a different and interesting experience for users to explore, in this case students.

The application of the Open-World Metaverse concept in the field of education can be applied to several needs. Such as the need for providing information, the need for communication between students and teachers [20]. It is hoped that the implementation of the Open-World Metaverse concept in the field of education can be wider and more immersive, so that it will provide significant results.

3 Methodology

3.1 Study Approach

In accordance with the research's aims, a research-and-development methodology is employed. [22] Borg and Gall provides a systematic roadmap to the actions researchers must follow to ensure the viability of the goods they propose. In this study, the product in issue is a ubiquitous learning-based gamification of learning media. These are the research phases that will be applied to this project.

The stages of the application design research in this study were carried out in several stages, those are:

3.1.1 Preliminary Study and Data Collection Stage

At this stage, information and preliminary studies from prior research or related areas are gathered. Then, analyze what should be included in the application that will be submitted.

3.1.2 The Planning and Preparation Stage of the Application

At this stage, the framework is initially planned, and then the application is compiled as the basic form of the product.

3.1.3 Expert Test Stage

In this stage, materials, media, and applications are validated beginning with the first trial conducted by specialists. Then, enhancements are made based on the advice of the specialists.

3.2 Data and Analytics

In this process, descriptive qualitative data is utilized. The comments of media experts, material specialists, and end-users (lecturers and students) to the final output provide qualitative data. Large-scale trials involving a subset of students and professors will be able to represent and generate results applicable to this research. This study utilized a total sample size of one hundred institutions in East Java.

　　This research utilizes descriptive data analysis for its data analysis. The validation findings of material experts, media experts, and surveys from users, mainly lecturers and students, were analyzed using descriptive data analysis. Validity tests, reliability tests, and descriptive data analysis are among the data analysis techniques employed in this study.

4 Result

This research was carried out based on the research design that was made at the time of the proposal. This research is designed to have several stages according to the needs of the preparation of the application and the existing problems. In this progress report, several stages have been carried out by researchers in an effort to realize useful research results. Based on the research methods and objectives, the activities will start from ideating and end with the product establishing stage. The following is a description of each stage in this research.

4.1 Preliminary Study and Data Collection Stage

At this point, determining the success of the subsequent step is crucial. The ideation stage begins with the identification of the problem and the collection of relevant data and information, and ends with the generation of the necessary solutions/ideas. At this stage, information and preliminary studies from prior research or related areas are gathered. Then, analyze what should be included in the application that will be submitted.

　　The preparatory phase begins with a literature review and is followed by a field investigation. To perform the literature review, references on introductory business theory, operational management, finance management, marketing management, and managerial economics were sought. Literature study is important to formulate material and business cases that will become learning media in this learning media application. The

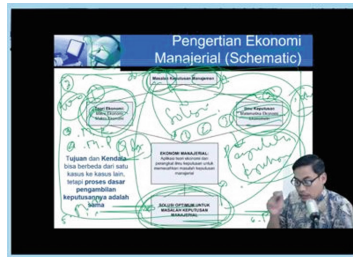**Fig. 1.** Material in the form of presentation slides

Fig. 2. Material in the form of Videos

results of the preliminary study will be used as the basis for researchers to formulate business case studies that will be included in the application of learning media. The following are some of the things obtained from the preliminary study activities and data collection which are the needs of users in developing this game application.

4.1.1 Relevant Material

From the preliminary study activities and data collection, it is known that users need relevant and important material to learn, especially that the material is used in solving the given case. These materials can be in the form of explanatory videos or slides containing certain chapter material. It is hoped that the provision of relevant material will make it easier for users to understand and work on the given case. The following is some examples of material that can be given in this game application (Figs. 1 and 2).

4.1.2 Choice of Case Science Concentration

From preliminary study activities and data collection, it is known that users need a choice of case science concentration that they will work on. This is useful so that application users, namely students, will be able to focus on one scientific concentration according to their choice. In this application, which is developed first is the choice of financial and marketing concentration. These two scientific concentrations were chosen because of the large user interest in the scientific concentration. So that by providing an opportunity
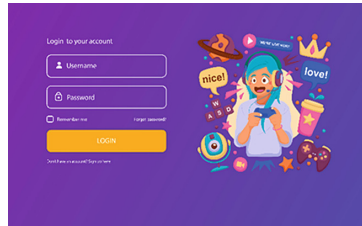
Fig. 3. Login Page Interface

for users to choose a scientific concentration according to their abilities and needs, it is expected that the user's problem-solving ability will be better in certain areas of focus.

4.1.3 Communication Between Application Users (Teaching Participants)

From preliminary study activities and data collection, it is known that users need facilities that allow application users to interact with each other. This is needed as a bridge so that application users, in this case students, can communicate and discuss the cases they face. By facilitating communication between users, it will increase the immersive level of the game so that this business simulation game application will provide benefits to its users.

4.2 The Planning and Preparation Stage of the Application

Based on the results of FGDs with various parties, a design for developing ubiquitos learning-based learning media was found as an effort to convert the open-world metaverse of Project Based-Learning (PBL) learning. The following are basic specifications as a guide in product development.

4.2.1 Ubiquitous Learning Concept

Using the principle of Ubiquitous Learning, Gamification Learning Media includes text, video, and animation learning media. Then, offer students with the option to select learning media that facilitates their comprehension of course information.

4.2.2 Concept of Intensive Course Everyday

The concept of Intensive Course Everyday is a concept in learning in Learning Media Gamification that helps students schedule learning materials every day so that students are disciplined in learning and can study intensively every day.

After the application design has been compiled, the research team is now at the stage of preparing the application according to the application design that has been prepared previously. This is done so that the compiled application can be useful. The following are some of the features designed and arranged in the application created (Fig. 3).

The login page may be seen in the graphic above, which depicts the first interface. The login screen offers a field for entering the needed identification to play the game. If

Fig. 4. Main Page Interface

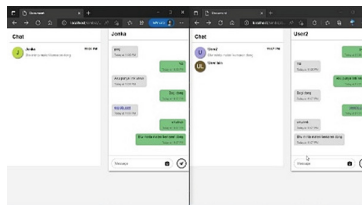**Fig. 5.** Main Player Page Interface

Fig. 6. Chat Page Interface

the user does not already have an account, they will be prompted to establish one. This page is useful for recognizing users, so that if a user has previously played this game, the data will be accessed and the game may continue (Fig. 4).

The graphic above depicts the game's first interface, which is the primary page display. Before accessing the main game, the home screen is displayed on the main page. In this interface, users may utilize the various options to configure the game parameters. This display is essential for the user to access additional gaming program functions (Fig. 5).

As seen in the graphic above, the game's primary interface is the presentation of the main player page. When the game is played, the main player page is the primary page. This view is the central view of the produced game since it provides the necessary information and data. Users utilize this website to play in this game (Fig. 6).

We can see in figure above, which is an interface feature in the game, namely the chat page display. The chat page is a page that contains features in the form of chat, thus facilitating communication between players. This view is an important feature display so

Fig. 7. Notification Page Interface

Table 1. Expert Validity Test Result

Category	Result	Conclusion
Programming	80.1%	Valid
Material	85.4%	Valid
Interface	79.3%	Valid

that learning will be more thorough with communication between users which increases activity in this game (Fig. 7).

We can see in figure above, which is an interface feature in the game, namely the chat page display. The chat page is a page that contains features in the form of chat, thus facilitating communication between players. This view is an important feature display so that learning will be more thorough with communication between users which increases activity in this game.

4.3 Expert Trial Stage

At this stage, the validation of the assembled materials, media, and applications of learning media commences with the initial testing by experts and users with restricted access. Then, enhancements are made based on the advice of the specialists. Here are some expert test results.

The validity of the evaluation in this study is based on the concept of a valid instrument [9], which indicates that a valid instrument is the instrument used to collect data (measurement). Validity is the capacity of an instrument to measure what it promises to measure. Experts or practitioners evaluate business simulator learning media employing tools based on current theories, which are subsequently employed as indicators in expert evaluation (Table 1).

Based on the arrangement of the three assessment components programming features, content, and gamified presentation of learning media, it can be claimed that it is an effective learning media that can be utilized in business and management classes. The findings of this study indicate that the experts accepted the assembled gamification of learning media.

5 Conclusion

The objectives of this study were to develop a learning media gamification-based ubiquitous learning application and evaluate its validity and efficacy. These objectives can be summed up as follows:

1. The application of learning media gamification ubiquitous learning-based that is compiled can be an initiative of open-world metaverse conversion for problem-based learning (PBL) in business and management courses
2. Based on the results of expert testing on the application, it is clear that the experts in this research agreed to approve the assembled gamification of learning material. It is an efficient learning tool that may be utilized in business and management courses.

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