Gamification in economics and its impact on students' achievement: Lesson from covid-19 in Indonesia

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Abstract

Providing teaching and learning activities during the Covid-19 pandemic has been a global challenge, and the government has responded to this issue by conducting distance learning using technology. This study introduces and evaluates gamification learning in economics employing to enhance the students' achievements. This study elaborates on a new learning model, "e-crowdwar mobile game," that can be used for distance learning activities. This research adopted classroom action research to gain an understanding of the implementation of this new model for students' achievement. The work involved senior high school students in several regions in East Java of Indonesia. Accordingly, the data were analyzed using both quantitative and qualitative approaches. The findings indicate that the implementation of gamification learning faces some difficulties in both teachers and students. However, this new model outperforms the conventional learning model with the teacher-centered approach, and it can be considered an alternative learning model for distance learning using technology.

Keywords: E-crowdwar, gamification learning, mobile-Learning, students' achievements

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1. Introduction

The Covid-19 pandemic has spread out throughout the world, and it has impacted several sectors linked with human life (Verma & Gustafsson, 2020; Dwivedi et al., 2020). The government has responded to this central issue by providing a physical or social distancing policy as an attempt to manage the number of infected people (Rubin et al., 2020; Siron et al., 2020). As a consequence, many regular activities have transformed from conventional to online-based activities. Formerly people going to the market to make an economic transaction, but it has moved to online-based in a marketplace. On the educational side, it has remarkable changes in its system from face-to-face being online-based learning using technology (Narmaditya et al., 2020).

Since the pandemic has unpredictably deployed, it has been challenged for educators to set up an educational model or method that provides the same benefits as conventional learning. In fact, many teachers and lecturers are not ready yet for this situation, and it has forced them to use technology in education (Mishra et al., 2020). The problem is double, which is adapting with technology in education and how to create a great concept for this movement (Fujimura & Mistilina, 2020; Donitsa-Schmidt & Ramot, 2020). On the other hand, educators should provide successful learning, which can be illustrated in students' learning achievement (Maharani et al., 2020).

In the positive matters, the Covid-19 pandemic has brought educators' creativity to promote a learning model or method relevant to students' characteristics (Kalloo et al. 2020). However, some scholars believe that the educational process during this pandemic eliminates some components such as students' activities, critical thinking skills, creative thinking skills, and motivation to learn (Baber et al., 2020; Yustina et al., 2020; Wargadinata et al., 2020). Dealing with this issue, game-based learning is an alternative method that can be adopted during this pandemic (Troussas et al., 2020). The fundamental rationale is that this method involves students' activities during learning process using web-based learning that leads to the students' motivation to learn as well as managing their accomplishment.

Technology adoption plays a pivotal role in supporting 21st-century learning and skill-building. Technology-based learning using the internet has a wider scope than conventional learning, for example, a shared community. Learning using the internet is more likely convenient in presenting and representing itself for each user. Also, there is an independent evaluation and learning outcomes (Thomas et al., 2011). The main value of internet-based education and learning is the emergence of new knowledge based on user interaction. Thus, each individual is able to develop his / her potential and increase their professionalism profile effectively by carrying out the work process stages of a job they do on the internet.

One of the uses of technology as a learning resource is smartphones as a medium of inquiry in higher education (Gikas & Grant, 2013). Some scholars believe the use of smartphones creates dynamic learning where students have the opportunity to interact and collaborate with many sources and partners (Al-Emran, et al., 2016; Lin, et al., 2016; Huang & Chiu, 2015). In more detail, Al-Emran et al. (2016) showed that smartphones can be a promising medium for improving pedagogic aspects. In this case, an increase in readiness and independence in the teaching-learning process, as well as an increase in cognitive aspects on both parties, can be expected. Therefore, the use of smartphones as learning media will increase the teaching and learning process dynamics.

In general, people play games to find fun things and to reduce stress levels due to work or study loads. However, all the processes they do in playing the game are basically a learning process (Gee & Ave, 2005; Satrio et al., 2020). Players need to understand the rules in play, starting from determining

the character, understanding the game's flow, and increasing the level of the game. This is consistent with the 16 learning principles contained in the game proposed by Gee (2004); Gee and Ave (2005), which consisting of interactivity, creation, exploratory, personalization, involvement, well-ordered problems, challenge and opportunity, on demand, situated meanings, pleasantly obstructing, thinking system, investigating, rethink achievement, advanced tools and distributed comprehend, cross-functional groups; and performance before competence. The educational principles proposed above enclose cognitive, psychomotor, and affective dimensions required by learners in the 21st century.

Castells (2010) described the 21st century as a vigorous transformation that has started an era of change in which the real study of business is emphasized in the field of science. Based on the philosophy of education, especially in the 21st-century learning framework, it is explained that three main factors in the 21st-century learning targets are life career skills, learning and innovation skills, information, media, and technology skills. Combining the three keys includes the use of information and communication technology to increase the efficiency and effectiveness of learning. The role of the teacher is more to the facilitator who provides input on high-level thinking elements. The teacher must assign assignments at the application, analysis, evaluation, and creation levels. This will further motivate students to think critically and dig deeper information in completing assignments using media and electronic learning resources.

Several prior studies related to the learning process during the Covid-19 pandemic have been provided among scholars. For instance, Narmaditya et al. (2020) conducted a study that concerned the impact of blended learning and students' critical thinking skills with focus on a using problem-based learning. Additionally, Siron et al. (2020) focused on the perception of adopting technology in the learning process, while Cerezo et al. (2020) concerned with self-regulated learning for students during the pandemic. The major scholars have demonstrated that problem-based learning, project-based learning, as an attempt to achieve learning goals (Chang et al., 2020; Pohan et al., 2020; Almulla, 2020). However, game-based learning for economics has been overlooked by scholars.

The contributions of this current work are provided threefold. First, this is a first study that examines the implementation of game-based learning "e-crowdwar" in Economics and social sciences. Second, this work highlights the existing literature on creating a learning model that is effective for students, primarily in the Covid-19 pandemic. Third, this study offers a new model for teachers and lecturers in the field of economics and social sciences that possible to be adapted as an alternative learning model to deal with students' learning achievement.

2. Methods

To achieve the purpose of this work, we adopted the quasi-experiment method with a single-case pre-test and post-test design following Klassen et al. (2012). The adoption of this method is to gain a deeper understanding of the existing phenomenon in the implementation of game-based learning "e-crowdwar" and its impact on students' learning achievements. This study was conducted in three discrete areas with concern of signal coverage, where the outputs of the pre-test and post-test in each region will be emulated with calculating the differences in student learning outcomes after the use of the "e-crowdwar" game in classrooms based on regions using Kruskal Walis with the hypothesis:

H0: There is no significant difference in students' accomplishment after involving the "e-crowdwar" game in a class by region.

H1: At least one pair of regions has significantly different student learning outcomes after the "e-crowdwar" game is implemented.

2.1. Participants

The category of participant selection is based on the level of school at the second level of high school that is currently pursuing a social studies program with economic subjects in several high schools in East Java in Indonesia. The curriculum that applies in Indonesia is set with the same meetings and discussions. When the research was carried out, each senior high school was still under discussion of employment material. Because the research objective is more to the application of a game-based learning model and employment material is still suitable if applied to this learning, the researchers follow the discussion/material that is running in class, and it is solely the researcher provides treatments with a game-based learning model. In more detail, the demographics of respondents are provided in Table 1.

Table 1. The demographic of respondents

S/No.	Characteristics	Frequency	Percentage (%)
1.	**Age**	**945**	**100**
	15 years old	155	16.40
	16 years old	316	33.44
	17 years old	230	24.34
	18 years old	244	25.82
2.	**Sex**	**945**	**100**
	Female	710	75.13
	Male	230	24.87
3.	**Area**	**945**	**100**
	Blitar	228	24.13
	Tulungagung	306	32.38
	Kediri	411	43.49

What is interesting in Table 1 is that 945 respondents are spread over the age range of 15-18 years, with 33.44% of the most respondents at the age of 16, the least 16.4% at the age of 15, the rest are evenly distributed at the age of 17-18 years. The majority of gender respondents are female students, with a percentage of approximately 75%. Based on the distribution of sample data areas, it is known that 43.49% came from the Kediri area, 24.13% from the Blitar area, and the rest is from Tulungagung of Indonesia.

2.2. Procedures

This study was conducted using online-based learning with the "e-crowdwar" approach. However, before it was implemented, the researcher provided the introduction and training of gamification learning to teachers, intending to enhance students' interest and learning achievement in times of social limitations due to the pandemic. In more detail, some of the steps taken are consisting of introduction and gamification learning steps; the teacher is taught several Learning Management System (LMS) applications (Nearpod, Moodle), and the application of "e-crowdwar" educational games with the theme of economic problems in students' environment in the form of multiple-choice questions that must be resolved. Lastly, in the first week of class, the educator teaches with researchers' assistance in online classes; in the second week, the teacher independently applies game-based learning to the class.

2.3. Data Collection and Analysis

The data collection techniques used in this study were observation and documentation. In detail, the implementation of game-based learning was observed and documented by the teachers' group, while to understand the effectiveness of this model, we involved the scale of assessment from validated questions to students and made a comparison between pre-test and post-test scores. The calculation of instruments' reliability indicates that Cronbach's alpha was 0.849, meaning that it has met the validity. Also, we involved two senior colleagues in evaluating the validity of the constructs of instruments. To measure the success in this study used two observations. First, using the indicator that the average post-test class score is higher than the pre-test. Second, the number of students who scored more than 75 in the range 1-100 according to the Minimum Study Completion Standard.

3. Results and Discussion

3.1. Learning Process

Game-based learning procedures implemented using the Classroom Action Research (CAR) approach with the stages of planning, implementing, observing, evaluating, or reflecting. This CAR is carried out in two cycles, and each cycle is carried out in one meeting. At the planning stage, the teacher prepares game-based learning tools and instruments that have been provided in training. Second, the implementation stage, in the implementation step of learning is carried out with steps for application preparation, elaboration of learning content (concepts of demand and supply in economics), game sessions (using e-crowdwar mobile gaming), discussion and explanation of material, evaluation (assignment structured) (See Table 2).

Table 2. The Implementation of gamification learning in the classroom

Action	Information
Opening	Description of learning objectives
Learning instruction	The teacher describes the gamification learning flow to students.
Learning activities	- Students learn lesson materials that have been inserted in the learning management system - Students work on as many questions in the "e-crowdwar" game as possible in predetermined areas.
Analysis and evaluation	- Teachers evaluate learning outcomes based on learning objectives. - The teacher uses student participation data in questions and the leader board in evaluating learning

The third stage is the observations made during the implementation of the action. Observations were performed by two observers - the researcher and the collaborative educator. Observations are focused on the application of game-based learning steps. The reflection stage is a reflection in which collaborative researchers and teachers discuss the evaluation of learning carried out in the first cycle. The results of the reflection become the base for improvement in the next cycle.

3.2. Testing Differences in Students' Achievement

Figure 1 illustrates the differences in students learning accomplishment by using the "e-crowdwar" game. From the figure, it can be seen that the student learning outcomes before using the "e-crowdwar"

game in the class had an average of 76.032 with a standard deviation of 7.674. Thus, it can be said that students' learning accomplishment before using the e-crowd war game centred on the numbers 76.032 ± 7.674. Meanwhile, after using the "e-crowdwar" game in the classroom, student learning outcomes have an average of 85.392 with a standard deviation of 7.079. Thus, it can be said that student learning outcomes after using the "e-crowdwar" game centred on the numbers 85.392 ± 7.079. Therefore, it can be concluded that there is an enhance in students learning achievement before and after using the "e-crowdwar" game in the classroom.
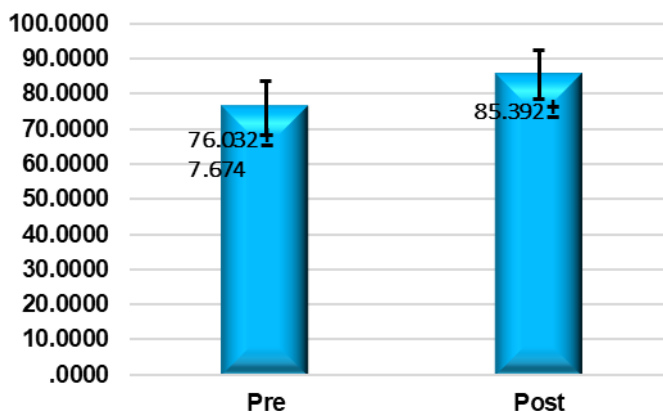

Figure 1. Pre-test and Post-Test Results

4.3 Hypothesis Testing

The test criteria states that if or the probability ≤ level of significance (alpha = 5%) then H0 is rejected, so it can be stated that there is a significant difference in student learning outcomes before and after using the "e-crowdwar" game in class. The results of testing the difference in student learning outcomes before and after using the "e-crowdwar" game in the classroom can be seen in Table 3.

Table 2. The hypothesis testing comparing pre-test and post-test

	Average	Z-statistics	Probability
The conventional learning	76.032	-23.877	0.000
After treated using e-crowdwar	85.391		

Based on the test results listed in Table 2, it can be seen that the resulting t statistics is -23.877 with a probability of 0.000. This means the probability is less that the level of significance (alpha = 5%). Thus, there are significant differences in student learning outcomes before and after using the "e-crowdwar" game in the classroom. Judging from the average value, the average student learning outcomes after using the "e-crowdwar" game in the class were higher than the average student learning outcomes before the use of the e-crowd war game in class. This means that the use of the "e-crowdwar" game is declared optimal in improving student learning outcomes.

4.4 Discussion

This study examines the effectiveness of game-based learning toward students' achievement of the Covid-19 pandemic employing learning technology and identifies the influence of supporting facilities on game-based learning outcomes. The limitations of distance learning policies require students to have learning facilities such as laptops and the Internet to support online learning (Gikas & Grant, 2013). Also, smartphones provide a fairly dynamic role in learning during this pandemic (Al-Emran et al., 2016; Lin

et al., 2016; Huang & Chiu, 2015). The classroom action process quites a time-consuming process of transferring game-based learning steps to the teaching teacher. The majority of teachers need several experiments to understand the use of games as a learning medium. This condition does not support the research of Castells (2010), which described three factors of 21st-century learning, where teachers and students are expected to have life career skills, learning and innovation skills, information, media, and technology skills in increasing the effectiveness and efficiency of learning.

In accordance with the target of researchers who adopt the views of previous studies that in general, a person plays games to seek pleasure and reduce stress and the need for students to adopt 21st-century skills into learning (Gee & Ave, 2005). They are more motivated to follow the learning. This condition may occur because there is something new in learning that was previously more traditional (lectures and discussions) online into learning using games as a learning medium. In particular, the appearance of mobile gaming (e-crowdwar) in this study presents economic questions based on the discussion based on the economic learning objectives being discussed (employment). In addition, the researchers added a leader board that can be known along with the assumption that it fosters a competitive spirit. This assumption of a competitive spirit supports previous research, which explains a spirit of competition among students to be ranked in the top (Landers et al., 2017).

We confirm that accumulative game-based learning has a difference in learning outcomes in areas with different signal conditions. The role of games is extraordinary in learning activities during the pandemic to be a crucial point. Referring to this study results, the regional average experienced a significant increase in learning outcomes after participating in game-based learning. This is in line with preliminary work that explained that there are positive implications of game-based learning methods on student learning (Thomas et al., 2011) and promotes further support that testing effects are effective in online learning (Tokac et al., 2019; Hartt et al., 2020).

Contrary to researchers' theoretical assumptions, the findings of the test results of economics before using the game-based approach have a standardized average (minimum completeness criteria in Indonesia) and dramatically increase after participating in game-based learning. This illustrates that students in distance learning (online) have less accuracy in answering than after game-based learning. Also, this study complements the findings of prior studies on the effect of individual differences on gamification (Landers & Armstrong, 2017). This study noted that demographic differences such as gender, location of residence, and school location impacted signal strength were not interpreted robustly on game-based learning outcomes after the difference test. However, some students were found to score lower or be interpreted as having slightly positive effects from game-based learning.

4.5 Challenges and Difficulties

Game-based learning is relatively new in Indonesian teaching and learning activities. Adopting an "e-crowdwar" strategy may well be informed in detail to teachers and students to have a comprehensive understanding. This is important because, at the beginning of learning activities, both teachers and students seem confused, leading to more time. However, after some time, students feel enjoyable about this alternative learning approach. Moreover, various students' skills in game-based learning are dominant in determining the course taken in learning. The social restriction policy during the pandemic, some learning facilities in "e-crowdwar" in the form of moving classes with global positioning system (GPS) media could not be implemented optimally.

4. Conclusion

This study is intended to propose and examine the implementation of game-based learning "e-crowdwar" and its impact on students' achievements. The findings indicate that the involvement of game-based learning can explain students' accomplishments in economics. The adoption of game-based learning outperforms conventional synchronous learning solely using web-based learning. The finding suggests an alternative approach in teaching materials in economics, primarily using distance learning. However, this study lies limitations, first this study did not examine the skill factor dynamics, interest in technology, and learning fatigue factors in adolescents over time. Even though the scale used in our study has good validity and reliability, social desires are sufficient to influence the expectation of the accuracy of these findings.

5. Recommendation

Further research is suggested to elaborate on students' technological competence as an internal factor, educational facilities, socio-economics, and education in the family as an external factor must be considered when discussing student learning development. It is essential to pay more consideration to basic technology skills in game-based learning with overall learning and psychological fatigue because this can help formulate prevention and intervention methods in game-based learning.

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