Collaboration Blockchain Technology and Gamification in iLearning Systems

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Abstract.

Purpose: Currently, many fake certificates or diplomas are used to apply for jobs to get a better paying job. With that said, currently certificates cannot prove a person's expertise or skills. However, some students have implemented a Blockchain system in securing their certificates so that data manipulation is minimized, but only partially. Therefore, this research aims to motivate anyone, especially students in this Blockchain system and students will get incentives from all activities that are followed by racing in Blockchain gamification concept 4.0.

Study design: This study uses the Pieces method to classify a problem (problem), opportunities (opportunities), and existing directions. Data collection techniques used primary data obtained by distributing questionnaires in the form of google form to respondents by involving students (n = 1129). Conclusions were analyzed with the SUS trial using a Likert scale with the cut and SUS method.

Result: The results of this study are expected to Gamification in the system Blockchain can run optimally in implementation. The use of Gamification on the Alphabet Blockchain is included in the acceptable category.

Value: The platform can check certificates that are not genuine.

Keywords: Gamification, Blockchain, Certificate, PIECES

Received: August 2021 / **Revised** October 2021 / **Accepted** November 2021

INTRODUCTION

The Ministry of Industry strongly supports the development of Industry 4.0 in Indonesia. The development of Industry 4.0 technology from the beginning of its appearance was classified as very fast. Almost all aspects of life have adopted digital technology [1], [2]. The industrial revolution directly or indirectly changes the educational and economic order of a country [3]. The "Making Indonesia 4.0" movement launched by the 7th (seventh) president of the Republic of Indonesia is a government commitment to entering the era of technology 4.0 [4], [5]. There is a lot of speculation in Indonesia's world that needs to improve and prepare to enter the era of this 4.0 revolution, including making various changes, including applying learning methods [6]. Educational institutions in Indonesia are required to support the progress of education in Indonesia and be able to change learning methods or models by optimally utilizing technological advances [7], [8].

Satosi Nakamoto originally introduced Blockchain in the field of cryptocurrency [9]. However, now Blockchain has developed rapidly and has been implemented in various fields including digital identity recording, health systems, supply chains, and printing certificates [10], [11]. The current problem is considering the negligence and lack of awareness of the importance of certificates, which causes the circulation of fake certificates to be widespread, there have even been many fake certificates being used to apply for jobs in order to get jobs with much better salaries [12], [13]. As a result, nowadays certificates no longer prove one's expertise or skills as evidence of what has been achieved. The world of education also feels the impact of the problem of circulating fake certificates [14], [15]. Because it will reduce public interest in dealing with formal education with this problem, so certificate security must be improved, so that it will overcome data manipulated by officers [16]. Currently, many diplomas are equipped with security printing to ensure the authenticity of those issued by an institution. Even though it is equipped with security printing, diplomas can still be faked. However, for some people who have had important files such as certificates or diplomas with the Blockchain concept 4.0 system, others have [17].

Gamification has become popular and a new trend among individuals and groups in cyberspace in recent years [18], [19]. The main goal of Gamification is to increase the user's role, motivation, and performance in carrying out certain tasks by combining game mechanics and elements which result in more productive tasks. The addition of this game-like feature has been known by many parties and has been applied to several applications including enterprise information systems [20], [21], mobile and web applications, and IoT applications [22].

Previous researchers revealed that Blockchain technology can improve certificate security, the authenticity and validity of fake certificate data, and the existence of duplicate data will be minimized. In addition, the uses, functions and benefits of certificates as printed or written certificates issued by the authorities or related institutions as ownership rights will be used as evidence values or rights to student achievements [23]. The implementation of Gamification in the iDu (iLearning Education) class increased student motivation to learn optimally so that they were not bored in the learning process and were more enthusiastic about doing the tasks given by the lecturer [24]. Students can also develop mindsets and creativity and add insight and knowledge in all fields that are taught while in lectures [25]. The learning process in the Economic Education Learning Renewal course with the concept of Gamification based on Blended Learning runs effectively, most of them are interested because Gamification is a new thing for them. Points, badges and trophies are rewards for this educational gamification concept, as long as the gamification concept in education is applied in the classroom, communication patterns between students are more re-established, students are more technologically literate and students' perceptions of the pedagogic and professional abilities of lecturers are increasing [26]. The application of Blockchain in education is very good in certificate security but the lack of awareness and interest of students to use the Blockchain concept 4.0 system has resulted in the circulation of fake certificates being widespread [27]. By interfering with Blockchain with the context of games or Gamification, it is expected to increase the attractiveness and motivate students to participate in securing certificates or diplomas using Blockchain technology so that Blockchain concept 4.0 users can increase and the spread of fake certificates can be minimized.

METHODS
In this research, a designed system requires a research method to overcome the problems that exist above. In this study using research methods, namely formulating problems, designing research, collecting data, processing data, presenting data, analyzing data and research reports. Method flow can be seen in Figure 1.
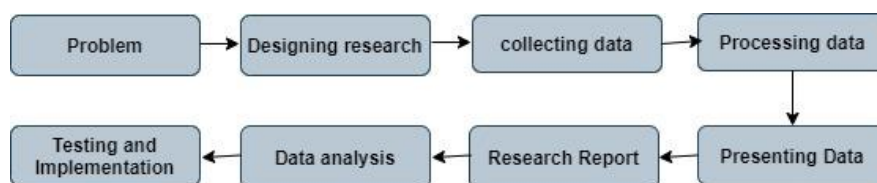

Figure 1. Research method flow

There are 8 (eight) information in the research method as follows: (1) Formulate the problem, in formulating the problem, we need to make observations to find out the background of the problems that occurred in the previous Alphabet Blockchain system that was already running. (2) Designing Research, designing the concept of Gamification on the Alphabet Blockchain system to make it look attractive and increase user attractiveness. (3) Collecting data, preparing the necessary data in designing the Alphabet Blockchain. (4) Processing data, integrating Gamification with the Alphabet Blockchain system. (5) Presenting Data, a useful system, especially for students, will appear. Where the system presented is very useful in securing valuable files such as certificates or diplomas. (6) Data analysis, analyzing the results of the initial process to formulate existing problems. (7) Research reports report the results of all research in detail which in the end the problem is resolved properly. (8) Testing and Implementation, testing and implementing Gamification on Alphabet's Blockchain system in the process of securing their certificates and diplomas.

This research was conducted on students in Tangerang City. The instrument in this study uses a quasi-experimental research design that defines experimental research as research intended to determine whether there is an effect of treatment on the subject under study [28].

The sample in this study were all students, totaling 1129 students. The data collection technique used in this study is primary data obtained by distributing questionnaires in the form of google form to respondents.

Respondents are Alphabet Blockchain users. Sorong or in this case are students with a total of 1129 students. Then the data will be processed to determine the number of samples using the Slovin formula and then the number of samples is processed to determine the final results of the respondents using the SUS method. In the calculation of the Slovin formula, the value of the margin of error is said when the margin of error (error size) continues to be small, until the illustration value continues to be large [29]. There is also a margin of error which is generally written in percentage. It uses the slovin formula as follows:

$$n = \frac{N}{1 + Ne^2}$$

Where n = the number of data samples, N = the number of the general population, e = the error tolerance.

The error tolerance limit of the calculation that has been obtained according to the number of samples. Then the data will be used by looking for the SUS (System Usability Scale) which aims to enable researchers to implement the system properly. The following is a formula for finding the overall value of SUS:

Where X = total score on SUS, N = number of certificate data, R1 to R10 are variables from the respondent's statement on the questionnaire that has been given. In this evaluation stage, the researcher will provide a subjective assessment of ten questions with the statements "Strongly Agree," "Agree," "Neutral," "Disagree," "Strongly Disagree," which is the answer to each variable R1 to R10. The questionnaire was distributed to Alphabet Blockchain website users via Google Form. After the respondent will get the overall SUS results based on the acquisition of the average SUS value.

RESULT AND DISCUSSION

This study identifies and discusses key issues related to user motivation and curiosity in Blockchain-based decentralized systems. Blockchain is still not exploited because the area of education where Blockchain technology is applied is still limited [30]. And the Blockchain system also relies heavily on active participants. This causes passive users to be less motivated because the user has not mastered the existing level of complexity. User curiosity becomes fuel for users in participating in the educational process using gamification [31]. Therefore, if users' curiosity continues to increase along with their educational history, this can maintain and trigger their motivation to actively participate in this system. The decrease in user curiosity can be triggered by several things, one of which is boredom. Gamification has been used all over the world, Gamification is an innovative teaching strategy using digital games in an educational environment, which functions primarily as a learning support tool. The formation of an attractive gamification layer at the basic level of the application and an easy-to-understand and simple interface can increase the motivation and curiosity of users to continue to actively participate in the Blockchain concept 4.0 system. The potential of this method is also seen in the fact that gamification learning is introduced into educational activities regardless of education level [32].

An efficient and effective way to provoke user motivation is to provide rewards/awards and points that can impact user satisfaction. In addition, holding a joint race to complete a certain mission and also giving a tag (a special sign of the user's achievement) can have great potential in provoking user motivation. This is because humans are basically attracted to things that are challenging. In addition, giving motivation and praise to users can also increase users' enthusiasm in completing the missions they are currently living. Therefore, by developing these things, it is believed that it can provoke user motivation so that the previously mentioned boredom can be avoided and the decrease in active users can be overcome.

The gamified game is internally diversified in terms of its components which are rated by students as: strongly agree, agree, neutral, disagree and strongly disagree. The results show that: (a) users can get different results depending on the feature project in gamification learning, (b) different mechanisms in gamification learning attract students to play, (c) elements that trigger different user processes in Gamification depending on individual to the game, (d) the selection of gamification components and the context of their use in education can influence previously passive users. The following is a recapitulation of the analysis results from the calculation of the research sample using the Slovin formula. First, enter the population into the variable N = 1129, and the error tolerance limit is 10% so that the required sample size is as follows:

$$n = \frac{1129}{1 + 1129.(0,01)^2}$$

$$n = \frac{1129}{12,29}$$

$$n = \mathbf{91,86}$$

So, the total sample data on the Alphabet Blockchain website is 91.86, which is rounded up to 92 sample data so that if the percentage will get the following number:
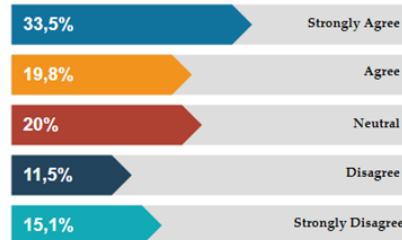

Figure 2. Diagram respondents

Based on the diagram in the picture above, 33.5% of respondents gave statements on a Likert scale of 5 points, 19.8% with 4 points, 20% with 3 points, and 11.5% with 2 points, 15.1% with 1 point. From the information obtained, we enter the variables R1-R10 to find the total SUS:

$$x = \frac{\left(\left((R1) + (R2) + (R3) + (R4) + (R5) + (R6) + (R7) + (R8) + (R9) + (R10)\right) * 2,5\right) * N}{N}$$

$$x = \frac{\left(\left((1) + (5) + (5) + (4) + (5) + (3) + (5) + (5) + (4) + (5)\right) * 2,5\right) * 92}{92}$$

$$x = \frac{7.360}{92} = 80$$

The calculation is carried out using the SUS formula from the questionnaires distributed to the entire population so that X is obtained as the SUS score. These results determine that the mean is 80, where the SUS score is a global subjective assessment of usability aspects such as efficiency, effectiveness, and user satisfaction with the system used.
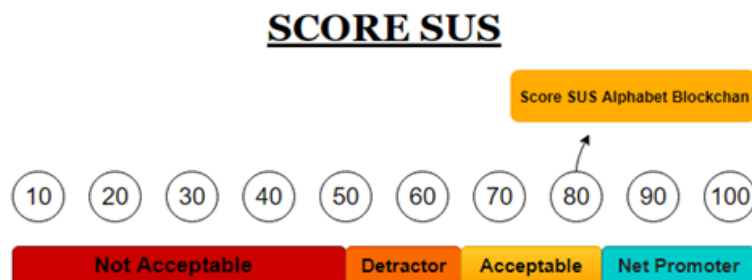
Figure 3. Score SUS

The results of the SUS Calculation Score on the Blockchain Alphabet are 80, it can be stated that the Blockchain Alphabet is included in the Acceptable category.

Gamification elements or game elements are applied to the Blockchain concept 4.0 system, where the addition of gamification or game elements usually allows players to start over or play again. The gamification context is if the user registers, he will get 3 points and when the user logs in on the Alphabet Blockchain website, he will get 1 point per day. Points awarded can be exchanged for prizes offered in this certificate authentication service. Below is the official website in operation:

Display of the Alphabet Blockchain website home can be seen in Figure 4.

Figure 4. Main Page Display

Figure 4. shows that the main page display of each user enters the website https://blockchain.alphabetincubator.id.

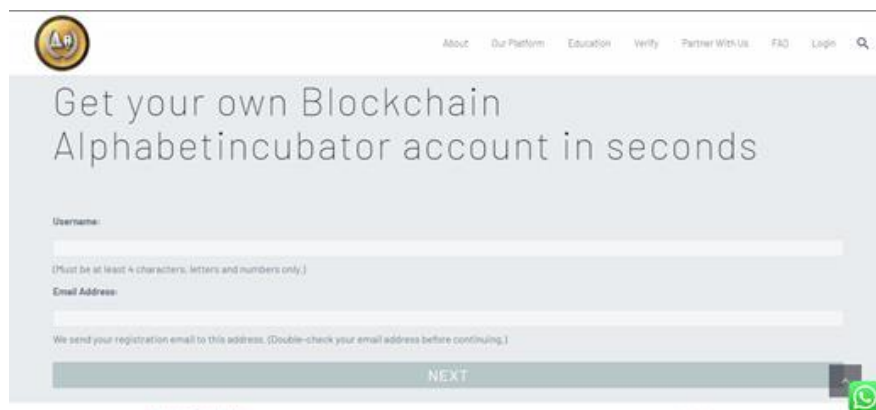The display of the Register Menu on the Alphabet Blockchain website can be seen in Figure 5.

Figure 5. Display Menu Register Alphabet Blockchain

On the register menu display, users are expected to register on the Alphabet Blockchain website. Users can only register once using one account name. When the user registers, the user will get three coins.

Display the Login menu on the Alphabet Blockchain website as shows in Figure 6.
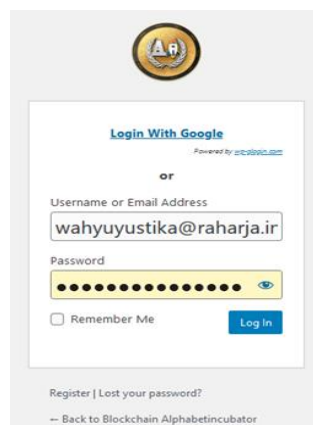
Figure 6. Login Menu Display

You can be sure that the user must register first on the login menu, then they can directly input the email and password. After logging in, the user will get 1 point.

Display Menu partner with us Blockchain shows in Figure 7.

Figure 7. Display of the Partner with us menu

Application of Gamification on the Alphabet Blockchain website can be seen in Figure 8.

Figure 8. Implementation of Gamification on the Alphabet Blockchain website

Application of gamification technology on the Alphabet Blockchain website: When the user registers, he will get three coins. When logging in to the Alphabet Blockchain website, he will get one coin. Moreover, these coins can be exchanged for attractive offers on the Alphabet Blockchain website.

Notifications get coins on Gmail users shown in Figure 9.
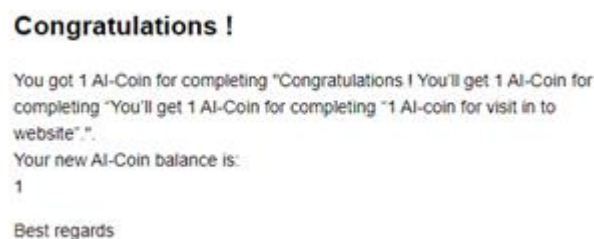

Figure 9. Notification of getting user's Gmail coins after visiting the Alphabet Blockchain website

Figure 9 displays what the user will get when registering, logging in, or visiting the Alphabet Blockchain website daily. This notification also displays the total income of all coins that the user has earned. This display will be received via email to the Alphabet Blockchain website user.

Display Script in the application of gamification shows in Figure 10.

Figure 10. Script for implementing Gamification on the Alphabet Blockchain website

HoToKen, Sandblock, and POINT Token aim to improve Blockchain to solve gamification problems [33]. These systems operate reward and loyalty programs on the blockchain system by utilizing rewards and points collected in a single unified entity and distributed to various parties. Blockchain promises rewards and loyalty programs such as secure records, transparency, and ease of transactions using crypto-tokens based on this system [34]. Furthermore, general criticisms highlight centralized loyalty by assuming that Gamification is only designed to maximize company profits, making it difficult for users to receive rewards and commitment for their efforts.

Furthermore, only a few platforms use the blockchain system to implement this game-like educational model. For instance, consider the learning website brainly. This site uses the social learning model developed by Albert Bandura in 1925 as its learning method, allowing it to invite users (in this case, students) to participate in crowd learning directly. Crowd learning is defined as learning by interacting with one another through the web, social skills, and a broad range of scope to focus on existing problems using iLearning and stimulate interaction and ideas. -Use your ideas to solve the problem. Brainly can also pique the interest of users/students of various levels. Furthermore, Brainly implements a reward system in the form of points for users who correctly answer questions. Users will later use these points to create the questions they require. This encourages users to collect as many points as possible to make the questions they need.

The conclusion from what has been discussed is that this research conducts discussions that aim to enter into a more in-depth theory and empirical research on the infrastructure of the software engineering community. In addition, the results of our study can be seen that the current research is insufficient to support and investigate all aspects of decentralized blockchain technology and gamification technology, especially in terms of certificate security. With the Alphabet Blockchain, it is hoped that it can provoke the motivation of many people and open the eyes of other researchers to understand the importance of certificate security so that fake certificates circulating can be minimized.

CONCLUSION

The results of the analysis show significant results for the application of Blockchain gamification concept 4.0 to students, so that Alphabet Blockchain can influence student motivation to increase in activities using the platform. As for the gamification technique that affects the overall coins that students have obtained.

So that they can be reused to develop knowledge so that they get a verified Blockchain certificate. This Alphabet Blockchain becomes a Blockchain technology that disrupts education in increasing student motivation globally. Future work that can be developed can be more directed towards a learning management system based on Blockchain gamification.

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