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The Application of Game-and-Simulation-Based Online Learning in Elementary School

A. Jaya¹, Y. Sunarya¹, M. Supriatna¹, D.S. Fuadi², W.R.M.I. Wahyono³

¹ Guidance and Counselling, Universitas Pendidikan Indonesia, Bandung, Indonesia

² Community Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

³ Computer Science, Universitas Pendidikan Indonesia, Bandung, Indonesia

Abstract: This study examines the suitability of games and simulation to be applied to online learning. It aims to generate a new concept for online learning activities and provide interactive learning, particularly for elementary students. The new idea is presented in a certain method that can be adjusted to the existing learning strategies. This research was conducted by collecting related literature containing relevant ideas to the indicators that must be achieved through game and simulation, namely: learning concepts, learning theories, and learning strategies. After the literature analysis, it can be inferred that this study offered a new method of online learning that is more effective and can replace rigid virtual learning methods with a new fun learning concept for elementary school students during the pandemic.

Keywords: game, simulation, learning method, online learning

基于游戏和模拟的在线学习在小学中的应用

摘要：本研究考察了游戏和模拟在在线学习中的适用性。它旨在为在线学习活动创建一个新概念并提供互动学习，特别是针对小学生。新思想以某种方法呈现，可以根据现有的学习策略进行调整。本研究收集了相关文献，其中包含与必须通过游戏和模拟实现的指标相关的思想，即：学习概念、学习理论和学习策略。通过文献分析可以推断，本研究为疫情期间小学生提供了一种更有效的在线学习新方法，可以用一种新的有趣的学习理念代替死板的虚拟学习方法。

关键词：游戏、模拟、学习方法、在线学习。

1. Introduction

The COVID-19 pandemic caused a major impact in many sectors, one of which is education. During this condition, all teaching and learning activities were carried out online (virtually). This condition causes teachers and students to adapt to the existing changes. One of the adaptations to existing change is that teachers must determine learning methods that are relevant and appropriate to use through online learning. The use of appropriate learning methods can make it easier for students to understand the learning material.

Currently, online learning is only available through video conferencing and online classes. Both methods

have many limitations in terms of delivering learning materials. For example, using video conferencing, teachers can display various documents and videos directly shown to students. However, this is not enough for elementary school students to understand the material presented by their teacher due to differences in the thinking process and perspectives on the learning material discussed. An elementary student does not have the same perspective as a teacher, according to the cognitive learning theory proposed by Piaget [1], [2]. In addition, an elementary student is still not able to think abstractly and logically. This condition is different from a teacher who already has cognitive

Received: June 1, 2021 / Revised: June 6, 2021 / Accepted: August 10, 2021 / Published: September 30, 2021

About the authors: A. Jaya, Y. Sunarya, M. Supriatna, Guidance and Counselling, Universitas Pendidikan Indonesia, Bandung, Indonesia; D.S. Fuadi, Community Education, Universitas Pendidikan Indonesia, Bandung, Indonesia; W.R.M.I. Wahyono, Computer Science, Universitas Pendidikan Indonesia, Bandung, Indonesia

maturity. Therefore, we need a specific method that can assist teachers in delivering learning materials for elementary students through online learning by performing games and simulation methods.

Teachers can use Game-based methods to analogize learning materials into a form that students can understand. This method will make students understand the learning material provided easily. The simulation method, namely the concept of modeling from the real world, can be used by a teacher to transform something that existed in the real world into an imitation arrangement. If implemented in learning activities, the simulation method can be applied to suitable learning materials. So with the simulation method, practical learning can still be explained and taught online.

If it is associated with the definition or understanding of learning, online learning that uses game and simulation methods can promote learning activities to become meaningful [3]. The game and simulation method can clarify learning materials so that students' competence (ability), especially at the elementary school level, can increase. After all, the understanding of elementary school students also increased [4].

2. Methods

The method used in this research is a literature review. The ease of implementing this method is the main consideration for use in this study. Because the idea put forward in this research is in the form of a design, the literature review method is the right choice to support the discussion that has been designed with the existing theory. The literature review method is also used to find the relationship between the solutions offered and the indicators that must be met in this study. In addition, the literature review is also used to find new references that can be used for developing ideas that have been formulated. By using the literature review method in this study, researchers can obtain information from various thoughts of previous researchers and other experts, making it easier to formulate ideas to be discussed.

3. Results and Discussion

Online learning methods through games and simulations are used to improve student interest, especially at the elementary school level in terms of learning. It follows the theory of humanistic, where a student will learn what he or she wants to learn. So, by improving the students' interests, it is hoped that the students will be able to carry out learning activities better so that learning objectives can be achieved. Online learning with game and simulation methods also aims to use students' potential to the fullest according to students' learning styles. These types of learning styles include visual types of learners (learn better by seeing and reading), auditory (learning better

from auditory media), and kinesthetic (learning better from direct experiments) [5], [6].

This method can be applied in the online learning system in the elementary school environment. The first step that a teacher can take is to determine the learning strategy to be chosen, which includes accelerated learning, inquiry-discovery learning, or scientific learning. By determining the type of learning strategy to be used, the teacher can then determine what type of game or simulation is following the chosen learning strategy, both types of games and simulations that already exist or are still in the form of designs. If the selected game is still in a design, the teacher needs assistance and collaboration with an application developer.

Several game concepts can be made according to the chosen learning strategy. The concept of a game with a strategy learning inquiry is a role-playing game that uses learning materials as an attribute or part of the game.

3.1. Role-Playing Games

Role-play games are one of the game concepts that are in great demand by game lovers. According to data published by [7], role-play games ranked third in sales in the United States in 2018, around 11.3%. This figure shows that role-playing games can be enjoyed by many people so that these games can be applied in online learning without worrying about being disliked by elementary school students.

3.2. For Students

Students will get an account from the school. The account can then be linked to parents' e-mail or other media that can be accessed by parents so that even in terms of play, the child will learn and discover what he will learn for himself (according to the discovery-learning strategy) parents can still monitor the activities and development of children through parental control. According to a study conducted by [8], parental control has a function to protect children from accessing various information from the media. So, parents can calmly let their children learn through inquiry-discovery learning in this role-playing game.

After getting an account, students will log in to the game, and on the main menu, students must first create an avatar or character that they will play in the role-playing game. Students can customize the avatar according to what they want, as in role-playing games in general. Those customizations can include hairstyle, skin tone, outfit default, and gender. In addition, they also have to determine the role or roles they will play; for example, it can be a fighter, wizard, healer, etc.

After they finish creating the character meant to play, they will enter the virtual world where they learn. The concept of the world for play is a fantasy world. The world is fiction, so students can learn in a new

environment that can attract their enthusiasm for learning.

In that world, they will get various challenges that their respective subject teachers will input to reach the maximum level (learning is complete). The challenge is in the form of a quest. Students obtain the quest through NPC (Non-Playable Character). The NPC in question can be a villager character (a village or urban dweller in the world), a merchant, and other characters in the role-playing games. The NPC that gives quests to players (students) will later ask players to complete the given task (in the form of the quest earlier). Usually, players are told to visit a place; it can be another village, city, or even a "dungeon" containing various monsters or villains that the player must defeat to complete the quest they are given. Players can also form parties (groups) to work on quests together, so the task will be easier to complete.

Because this is a learning game, the quests given are various kinds of material packaged in the form of stories containing riddles. The game player must solve riddles related to a subject at school. The answer from the riddle contains the location of the monsters that the player must defeat to increase the level. To make it easier to complete the quests, students can work together to solve the riddles. In such groups, the composition must be taken into account. For example, some are proficient in doing math, science, social studies, etc. If the group contains students with competencies in the same field, it will be more difficult. Each quest contains material from different subjects, so the composition (diversity) must be considered. So, in this case, the concept of role-play games also applies scientific learning strategies. Children are collected to solve existing problems according to children's creativity [9], [10]. Riddles can be completed by searching for various information from the NPCs contained in this role-playing game. If students are still having trouble solving the riddles in the quest, then players (who join the group or not) can take advantage of the hint feature provided at each NPC. The hint will be different from the information for completing the quest. In other words, information can be found on NPCs that do not provide quests, namely through dialogue between players (students) with these NPCs. Meanwhile, hints will be given to students through NPCs who provide quests undertaken by players.

Players can determine their adventure path without having to be limited by anyone. It can be linked to pirates who are both looking for treasure but with different routes. The system will analyze the route taken by students, so it can also bring up evaluation materials related to each student's interest in playing this role-playing game.

The concept of this game can also facilitate children with genius or gifted criteria at the elementary school level; with learning activities based on role-play games,

the genius student can complete quests given by the teacher faster, so that the concept strategies of accelerated learning can be carried out. The strategy is accelerated learning intended for genius children who can complete their studies faster than their peers. In which elementary school children usually complete their studies for 6 years, genius children can complete their studies in just 2 years [11].

Student performance during play can be seen through the student's character in the game, which will also be shared with parents. The performance contains details of the subjects completed (quests done by students in the game), cooperation, leadership, contributions, etc. So, parents and teachers can see student learning outcomes through this game role-play.

3.3. For Teacher

The role of the teacher in this role-playing game is quite simple. The teacher will be given an account from the school. After that, as usual, the teacher will log into the system. In the system, the teacher will input questions in the form of quests that students can complete in the game. Teachers can also customize the appearance of the NPCs they will use as characters who will give quests to students in the game. The teacher must also provide hints for each quest that is designed.

Teachers can also monitor the performance results of the students they teach through the system. In the system, there are various data analyzes of student performance results during play. With this data, the teacher will find it easier to arrange quests for the next semester, according to the student's condition. In data analysis, some quests are often completed by students and are the most difficult for students to complete.

3.4. For Parents

Parents only act as observers, so parents can give their children the freedom to complete the game role-play. Parents can also get notifications of their children's performance or create a special account for parents. The parent account has a feature to contact the teacher concerned so that that good communication can be established between parents and teachers in developing children's learning (students).

3.5. Discussion Game Concept

In contrast to the concept of role-playing games, discussion games focus on developing students using strategies of scientific learning. Learning strategies use the principle of active and cooperative students [12]. That is following the concept of a discussion game.

The way it works, the system will generate a problem, then each student will be gathered into small groups containing about 4-5 people, each student will get a turn to have an opinion which the system will randomly set. They will continue to discuss until the allotted time is over. After the time is over, the small

group of 4-5 members must determine the conclusions or solutions to the problems raised. After students finish determining their solutions, the system will display the available solutions to compare their solutions with the solutions contained in the game system.

The teacher is in charge of inputting the problems that will be discussed in the game. The inputted problem must be relevant so that children's creativity in solving new problems can be seen. In addition, students are indirectly directed to be more cooperative and active in learning. It is also following theory behavioral according to where students experience changes in behavior due to the game environment that requires students to change [10] because they must be more cooperative and active in learning.

3.6. Simulation-Based Video Conference

The concept of online learning using simulation can be applied by developing technology video conferencing; one way is by raising the concept of video conferencing simulation-based. In contrast to video conferencing in general, video conferencing simulation-based is created like a school environment. With this concept, the application video conference has similar features such as role-playing games (with the implementation of a virtual world); the video conference contains virtual images such as hall buildings, classrooms, fields, etc. That allows students to experience an atmosphere closer to that of an online school. Students and teachers can enter a video conference this simulation-based using their own (such as character creation in a role-playing game). This application, video conferencing, can also use talking technology through distance. Let us take, for example, a student's character in the application of simulation-based video conference. When away from other characters, the voice of the character will not be heard by the student. That is a simulation of what happens in the real world, where a human has a range or distance in using his sense of hearing.

Then, how do students talk to the teacher? As we know, in an offline school environment, the teacher is positioned at the front of the class facing the students. To create the same situation as in the real world, applications video conferencing simulation-based can take advantage of the feature raise hand. When students press the raise hand button, a one-room video conference can listen to their voices. That way, media video conferencing can create an atmosphere like offline learning.

4. Conclusion

This study aims to examine the concept and application of Game-based and Simulation during the pandemic to replace conventional virtual video conferencing. That is because, during the pandemic, all levels of education were required to study from home

using a virtual-video conference system. In Indonesia, the online learning system still uses the lecture method where students listen to the teacher explain the material, and the method also applies to elementary schools. This method is not suitable for age in the elementary school range because students do not feel the real learning atmosphere.

Elementary school-age tends to prefer interactive learning that is playful by involving cognitive, affective, and psychomotor aspects. The concept of Game-based and Simulation is relatively new and has never been applied to the concept of virtual learning. This concept can replace rigid virtual learning methods with a new and fun learning environment for elementary school students during a pandemic.

This new learning concept will create more fun and interactive learning style to stimulate student interest during the COVID-19 pandemic. This new idea can improve students' imaginative and cooperative abilities because students will be directly involved in the virtual world to seek and find ideas from problems in the game.

The involvement of students in the virtual world makes students more active in seeking and finding ideas so that they can increase students' creativity and imagination. This game will also help students establish social relationships with classmates because some obstacles require cooperation to improve interactive skills and communication to solve existing problems.

Online learning through game-based simulations is an appropriate learning method to adjust to the current educational situation (online learning). Both of these methods can be adapted to the strategy learning that will be applied. Using game and simulation methods, students can more easily use their learning style because, with this method, they can take advantage of the senses of sight and hearing. It allows students to achieve the learning experience firsthand, both in groups and individually. That is certainly very influential in developing cognitive and behavioral for children at the elementary school level, where learning is interactive and free. It follows learning characteristics, namely: changes in behavior in terms of cognitive, affective, and psychomotor, new experiences that result in student changes, and these changes will always be remembered and applied (settled in the student's brain and instincts). In this way, the learning objectives can be achieved.

Acknowledgments

We would like to thank to UPI (Universitas Pendidikan Indonesia) for academic support and LPDP (Lembaga Pengelola Dana Pendidikan) for funding this study.

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