

Design of an Educational Game for Blended Learning Environment

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Abstract

With the effects of the Internet and Education 4.0, online learning has increasingly become a common choice in higher education. However, despite some great characteristics of online learning (e.g., flexibility in learning), we cannot deny the role of traditional face-to-face learning, where the teaching content can be effectively delivered through direct communication between lecturers and learners. To leverage the advantages of these learning styles, numerous universities have been implementing the so-called blended learning as an innovating teaching method. Nevertheless, the teaching effectiveness of this method is still a big concern of educators (e.g., unattractive video contents in e-lessons). Meanwhile, recent studies have shown that teaching using digital games is more attractive than online learning alone since it can bring excitement and competitiveness to the learners. Therefore, in this study, we propose to build an educational game scenario that is adaptive to blended-learning environment. Thereby, the students will gain practical experiences while learning. In this approach, the students can play games and study together through either websites or mobile applications. The proposed blended learning approach as an innovating teaching method implemented soft-skills subject is being taught in a blended learning environment at Hanoi University of Science and Technology.

Keywords: Digital games, ADDIE model for educational games, blended learning, soft skills.

1. Introduction

Since the academic year 2018-2019, blended learning has been implemented bringing positive signals as an innovation of teaching method in Hanoi University of Science and Technology (HUST). In fact, blended learning meets the demand for access of learning materials anytime, anywhere for learners. In this method, a large amount of theoretical knowledge has been transmitted online, which greatly contributes to the enhancement of face-to-face interaction between teachers and students. To provide blended learning at HUST, the Moodle learning management system which was installed on a server of HUST is utilized. The system can be accessed from different types of devices such as computers or cell phones inside and outside HUST, by using either students' or Lecturers' Office 365 accounts.

Currently, the system is serving more than 35,000 regular students participating in the system, along with the participation and guidance of teachers. The system includes many well-designed courses with rich content by prestigious lecturers of HUST. According to a general picture of blended learning at HUST, there exists advantages and disadvantages that can be recognized, as follows.

Advantages:

- No geographical limitation.

- Availability 24/7. This refers to the abilities of allowing multiple accesses, searching documents quickly, storing data conveniently, connecting via the Internet.
- Reducing costs for students and university.
- Providing adaptability allowing students to adjust their own learning speed according to their ability and improving their knowledge through online libraries.
- Allowing students to participate, track their learning progress and learning outcomes.

Disadvantages:

- For practical and experimental subjects, the online lessons cannot meet the subject's requirements, and in the online lessons, there is still not any solution for learners to practice their hand-out skills and experimental skills.
- The link between online lessons and face-to-face lessons is simple, most of teachers just record video lessons for online learning and spend time in class correcting assignments.
- Activities on face-to-face lessons have not yet promoted learners' initiative and have not created motivation to stimulate learners to explore and experience learning.

- Learners do not easily accept new teaching methods that require positivity, initiative, and high self-discipline from the recipients of knowledge.

In general, even though creating an appropriate environment for interactive and personalized teaching method, blended learning still seems to be imperfect due to abovementioned disadvantages. Therefore, it is necessary to have interactive solutions to make the lessons interesting and engaging, and to deploy experiential learning strategies in accordance with the characteristics of the technical learning environment at HUST. With the characteristics of teaching using digital games, which is built according to the learning perspective of constructivism, learners actively learn and do everything to form their own knowledge and experiences related to the trained professions.

Furthermore, through interactions with the learners around them, they test and refine their own knowledge. Therefore, the integration of digital learning games is one of the promisingly positive aspects for improving the quality and effectiveness of higher education [1]. The contributions of this study are as follows:

- Provide an overview of studies on digital games-based teaching.
- Propose a procedure for developing a digital educational game according to an instructional design model (ADDIE: Analysis - Design - Development - Implementation - Evaluation).
- Apply this procedure into building an AR-based gamification for teaching “soft skills” which is being implemented in a Blended Learning form at HUST.

2. Related Works

In Vietnam, many authors have studied the design and use of educational games from different aspects. Some authors have researched and compiled several educational games [2]. These educational games mentioned by these authors are mainly aimed at consolidating knowledge for several subjects such as: forming elementary math symbols, getting acquainted with the surrounding environment, training the performance to pay attention, remember, develop thinking and language for children. These authors are particularly interested in the developmental meaning of educational games, not only in the development of the senses but also in the development of the learners' general psychological functions. However, in these studies, they have not studied the construction and the use of teaching games for the cognitive process of learners.

Recently in the work "kids' games", N.A.Tuyet mentioned intellectual games. This type of game has the effect of promoting children's intellectual activity.

In this work, the author introduced some mind games for children. (Tuyet, 2000) [3]. Also, author T.T.N. Tram designed a system of learning games to develop the generalization ability of pre-schoolers. (Tram, 2003) [4]. Recent dissertations and researchers have also mentioned the construction and use of educational games to promote the activeness of learners. However, each author considers educational games in different subjects, for example: T.T.X. Hue studied the construction and the use of games to form initial math symbols for children (5-6 years old) [5]. More concretely, the author outlined several measures to promote the active learning of students through the construction and use of learning games. However, the authors only limited the scope of the study to mainly young children.

The Covid-19 pandemic has introduced a strong impact on the teaching process, creating the inevitable trend of digital transformation in education in general and the application of technology in the teaching process in particular. In Vietnam, during the complicated development of the Covid-19 epidemic, nearly 80% of students studied online, ranking 17th out of 200 countries and territories. In this process of bringing digital technology into teaching, game-based learning is a method that creates a lot of excitement for learners but also requires the creativity of teachers. In higher education, students are mature learners and they have equipped themselves with experiences and learning skills from high school, besides, they have habits of using technology in learning and entertainment quite frequently, especially playing video games.

According to the survey results of online game services in Vietnam in the context of international integration, the Vietnam Institute of Sociology said that game players focus on the young group (under 20 years old) accounting for 68.4% and the majority is the group of 16-20 years old (accounting for 42.1%); more than 26% are children in the 10- to 15-year-old group. The proportion of game players attending school accounts for two thirds (71.7%) and most of them are students [9,3]. The research team of the Institute of Sociology also asked the question: How can video games be useful and effective? 71.5% of respondents say that it is necessary to create many attractive and educational video game scenarios; 67.2% suppose the necessity of classifying video games according to age; 65% feel the need to encourage the production of video games with healthy content to educate the nation's cultural traditions and history; 51.6% find it essential to control the age of people accessing the internet at agents under 14 years old (51.6%); 50.4 % strongly recommend the negative side of video games... (Chuong, 2011) [6].

In the world, digital games have been studied from different angles, integrating theoretical and conceptual frameworks from many different fields

recently. According to Nicola Whitton, the use of digital game learning aims at enhancing teaching effectiveness, while not requiring prior technical knowledge [7]. For this idea to be implemented, it is necessary to provide design outline and development processes for incorporating digital gaming within education. In these games, interaction is also an essential component of learning, providing mechanisms for learners to identify misconceptions and to test and revise understandings. Providing feedback is key, as without identifying errors and areas for improvement it is difficult for individuals to expand their knowledge, improve their skills, or review problems from different aspects. Learning from others through mentoring, discussion and teamwork is also an important part of learning in higher education.

Nicola Whitton [7] emphasized that this ability is important for learning since it stimulates curiosity in the subject itself and from the questions that arise during learning process. In addition, Nicola Whitton also believes that the presence of other participants such as teachers, mentors, facilitators, and other learners in such the learning process is also a key factor. Therefore, games as basic learning environments are an important step towards realizing their full potential for learning.

Referring to the components of a digital game, Prensky (2001) described six structural elements of the game: rules, goals, results and feedback, competition/challenge, interaction, and representation / story [8]. Moreover, Coffey (2009) stated that Digital Game-Based Learning (DGBL) is a learning method that incorporates the use of digital games to explore or practice an educational content that integrates learning principles while engaging learners in the game environment (Coffey, 2009) [9].

Since digital games enable students to gain essential skills in an information-based culture and learn in an innovative way, the interest in learning games has increased dramatically over the past decade. Aslan (2011) hoped that children today are as interested in learning at school as they are in playing video games. They show competitiveness, inquisitiveness, dynamism, persistence, and finding new information while playing video games [10].

Consider to AR-based games, McGonigal (2011) developed the Alternate Reality Game (ARG), a game requires participation in the real world [11]. Unlike most other game genres, ARG uses real-world media to provide its composition. Barlow argues that ARG is a game in which gamers can play in both real and online virtual worlds under the assumption that a virtual event occurs in the real world [12]. Awareness of some basic concepts associated with ARG, such as puppet masters, veils and predecessors, will help to better understand ARG.

In general, the application of digital games in teaching has many positive points for both teachers and students such as providing a new approach to problems, creating excitement for learners, clearly defining the objectives of the lesson, objectively evaluating the results achieved by the players when participating, as well as increasing the motivation and competitiveness of learners when the game results are included in the learning results of the subject to which the game is applied.

3. Developing a Digital Education Game for Teaching “Soft Skills” in Blended-Learning Environment

An instructional design model can be used to define the activities that will guide the way to develop a digital game for learning. There are many instructional systems design models, most of which are based on popular ones such as the ADDIE model (Fig.1).

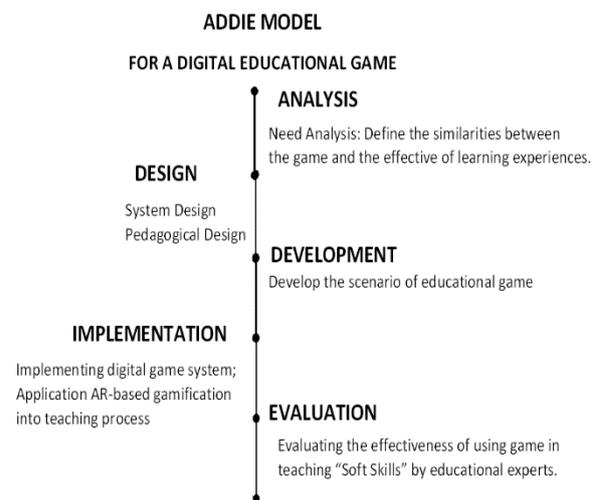


Fig. 1. The ADDIE model for digital educational game

3.1. Needs Analysis

From an educational perspective, there are many similarities between the characteristics of the game and the characteristics of the effective learning experience. A needs analysis should be conducted at the start of any development effort to determine these similarities between games and learning process. Good learning activities are challenging in nature but can be achieved that prolongs and engages learners through increasing levels of difficulty [7].

The provision of clear achievable goals that are incorporated into higher education practice through the provision of learning outcomes or objectives associated with each course. These goals are intended to be clear, realistic, and measurable so that learners are clear about what is expected of them and that they can be formally assessed in an appropriate manner.

This assessment can give students an indication of their progress, equivalent to results in a game.

Moreover, the competitive environment in the learning process can motivate students, but also put unnecessary pressure on the others. However, we recognize that undertaking any systematic assessment where grades are compared and publicly available will inevitably create a competitive environment for students. Indeed, cooperation is better than competition or one-on-one effort in many learning and work situations, but also highlight the situations where competition supports learning such as when between groups rather than between individuals.

The last feature, fantasy is perhaps the least obvious feature of learning in higher education. However, imaginary situations and simulations are commonly used in many aspects of higher education, business, and medicine. In this context, scenario realism is important as this will impact both students' willingness to participate and their ability to transfer learning to the real world. Thus, in general, the characteristics of the game discussed in this study should be closely related to the characteristics of the learning environment of the subject of "Soft Skills".

Based on the above analysis, aligning to the purpose and needs of the Soft Skills subject currently taught on the HUST's LMS system, we propose to build a digital game with puzzle adventure genre.

3.2. Design a Digital Education Game

The outcome of the design stage is a blueprint that will be used as a reference to develop the game. The blueprint illustrates the system design and the pedagogical design (educational goals, challenges of the game, plot of the game, rules of the game).

The scenario of the game will be developed around seven gems, each of which corresponds to a lesson in the subject of Soft Skills. Each gem will appear on the map, using actual data to display, the location of each gem will be each location on the current map, using data from MapBox. Lecture data will be designed by each lecturer as to which content should be studied first in the contents of the soft skills subject. Corresponding to a gem point, there will be questions related to the previous lesson, for the purpose of helping learners to systematize old knowledge, learners are required to overcome challenges related to the question to be able to receive the secret message and decode it to find the location of the next gem.

The number of players will consist of 5-10 people depending on the number of students in classes. Due to the characteristics of the soft skills subject (with contents such as: teamwork, communication skills, presentation skills ...), this game will provide a

mechanism to help each team member increase communication, working together to accomplish tasks. When all members complete a task of the gem, the whole group can pass the challenge. At the same time, the results of the groups will also be saved on the system with a website associated with the game "Dragon Ball".

3.2.1. System design

Based on the idea of developing digital games for "Soft Skills" subject and combining with online teaching, the system's components consist of two main parts (Fig. 2):

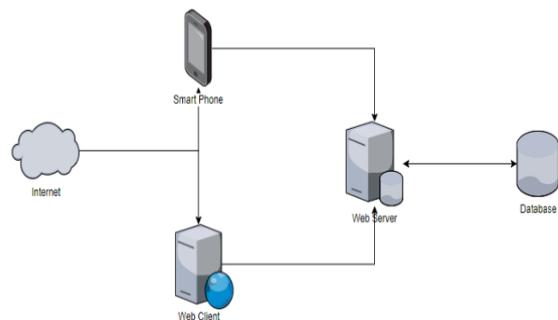


Fig. 2. Physic model to implement the system

1) Website system:

- is where to administer the game, design data such as: questions, lectures, and campaigns, where each gem appears on the map.

- is where to evaluate and report the results of students after they complete each lesson. The process of statistics and evaluation will run throughout the Soft Skills course, helping students understand their own progress and learning results. Through the Website, teachers can coordinate the learning process of their class.

- is where to exchange, discuss issues related to learning, through forums and comments after each lesson.

- is where to rank members, groups with high achievements, in order to increase competition in the subject.

The technology used to construct administrative website includes: ReactJS, ASP.NET, SQL Server. The main functions of administrative website are designing contents, presenting contents, managing and tracking students learning progresses via digital games (objective users: lecturers and students). Administrative website will be built under the form of a data dashboard displayed as corresponding class code and credit. The system operates with 2 main rolls from users which are lecturers as admin and students as users.

2) Game system:

- The game enhances the learner's experience by using virtual reality technology in addition to building the game's plot in the form of puzzles and adventures to create conditions for learners to explore and develop creativity.

- Due to the characteristics of soft skills, the rules of the game are divided into many different groups, each group has 4-5 people, the team members will accompany each other in the process of overcoming challenges that are difficult to overcome game posed. Thereby, teamwork spirit and other soft skills will be promoted.

By connecting the internet, users from client side will send a request for data to server side. After processing the request from client side, server side will respond with corresponding data. The system can be extended to apply for many subjects (Fig. 3).

3.2.2. Pedagogical design

1) Educational goals

The game designed in this system has clear goals and missions. The goal of the game is to convey the content of each lesson through each challenge that the game poses, specifically through each gem in the story. In order to improve the player's learning motivation, the game has set specific goals and tasks to get the gem. The player will have to overcome all the challenges that the game offers, including all seven gems, corresponding to the content of each lesson (Fig. 3).

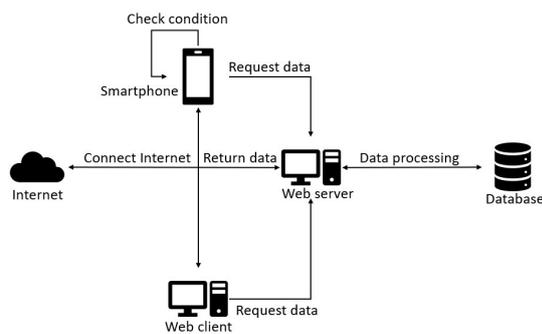


Fig. 3. Logic model to implement the system

2) Challenges of the game

With the plot of the game, the team members will overcome the challenges together. In each challenge, the knowledge content of each lesson will be included, through components such as: exercise questions, electronic lectures, etc. Learning materials such as questions and lectures will be provided by the instructor, based on the knowledge of the lesson that the lecturer wants to convey to the learners through a website system linked to the game (Table 1).

The system allows lecturers to design different types of questions such as true-false, multiple-choice, single-choice/multi-choice... In this study, there is only one video lecture for each lecture.

Table 1. The main functions of system

User case	Function names	Description
UC01	Registration function	The system administrator adds new users (lecturers, students) to the system, including personal information, usernames and passwords.
UC02	Login function	User logs in with the registered account and password to access the system
UC03	User management function	Manage the list of users in the system
UC04	Subject management function	Set up the list of subjects implemented in the system
UC05	Class Management Function	Set up a list of classes
UC06	Group management function	Divide students in a class into groups to serve the learning process.
UC07	Decentralization management function	Set up decentralization for the system. Help the system determine the role of each user
UC08	Function to add new lectures	Add new lectures to serve the learning process
UC09	Campaign management function	Add new, edit and delete campaigns, which is data to provide for digital games.
UC10	Lecture preview function	Preview a lecture after it's created or after students have permission to view it
UC11	Statistics function	Statistics of scores, learning progress of each student or group of students.
UC12	Function to view personal information	View users' personal information

3) Plot of the game

The game uses virtual reality technology to give learners real experiences when participating in solving problems that the game poses. The game's plot is also a factor to increase the experience for learners, with the game genre being adventure and puzzle, requiring team members to think together, solve problems, overcome together. As the result, the learners can complete the challenges and obtain a good result at the end of the game.

4) Rules of the game

With the game applied in the system, in each gem there will be questions to assess the learner's understanding after each lesson. Particularly, the set of questions will be displayed at the beginning of each challenge after that. All team members will have to pass that set of questions before the group can continue to take on the challenge.

The score of the group and each member after completing each challenge will be counted and ranked on the website system. The results of the challenges will be the basis for assessing the course score for the course.

3.3. Development a Digital Education Game

The game that is utilized in this study is called "Seven Dragon Ball". The scenario of the game will be developed around seven gems, each of which corresponds to a lesson in soft skills. Each gem will appear on the map, using actual data to display, the location of each gem will be each location on the Current map, using data from MapBox.

Lecture data will be directly designed by the lecturer, required to match the level required in the lesson design regulations. Corresponding to a gem point, there will be questions related to the previous lesson, allowing the learners to systematize obtained knowledge. The learners are required to complete challenges related to the question in order to receive the secret message and decrypt it to find the location of the next gem.

In the scope of research and experimentation in a soft skills class with 200 students, we consider seven gems corresponding to seven weeks of actual learning. It means that when the learners complete seven gems, they fulfil the course requirement.

Scenario of a digital game in Soft Skills subject:
A. Preparation: Install the game from the GAME.apk file (Android operating system required); **B.** How to play: Launch the app, allowing it to access GPS and camera. When a gem point appears, click on this icon to get access link to video lectures; Show hints where gems appear on the map; Choose AR or map mode. Application users click directly to redirect to the lecture, other members of the group scan via QrCode (Both IPHONE and ANDROIND can scan and play).

The number of players in each team will consist of 4-5 learners depending on the number of classes. Such the division manner is based on the characteristics of the soft skills subject (with contents such as: teamwork, communication skills, presentation skills ...). Thus, the proposed game in this study will provide a mechanism for each team member to communicate and perform together once all members complete the task. In each gem, the whole group can overcome the challenge. At the same time, the results

of the groups will also be saved on the system with a website linked to the game "Seven Dragon Ball".

This game can be used at the beginning of class since it is capable of initiating the students' thinking, leading students to learn the content, study in groups in a natural, comfortable and fun way. Not only that, but it can also be used when transitioning to a new learning content in class. This transition helps students to change their state, stimulate intellectual activity to achieve lesson goals.

The teacher makes a script for the game in the campaign section on the administrative website, including location, secret message, lecture content, multiple choice questions ...

The teacher will ask each group to decode the password and find the location where the dragon ball is hidden in the password. After arriving at the venue, the playgroup will receive a lecture and multiple-choice questions. After logging in and completing the lecture with multiple choice questions with an average score of at least 7/10 of all group members, the group will receive the next password and continue to complete the campaign.

Group members have two ways to access the lecture: who uses the software can directly link on the device via the button in the game, the rest of the members connect by scanning the QRCode on the software.

3.4. Implementation

3.4.1. Implementing digital game system

The system is built on the restful API model including:

- Client side: Digital game; administrative website.
- Server side: Web API; Database.
- Technologies used to complete the game include Unity, MapboxAR, ASP.NET, SQL Server.
- Target users: students.
- Configuration requirements: Android operating system, internet connection, camera with built-in AR and GPS navigation.

When launching the application, the player allows the camera and GPS to work. After logging into the game, the game will get campaign information from the server according to the player's information. The game will continuously check and return the player's current location via GPS as the player moves.

When checking that the player has moved to the place where the gem is located and found the gem, the game will send a request to the server to get the URL of the lecture. Then the QRCode from which the player will forward to the video lecture and complete

Multiple-choice questions and lectures, information about the time to complete the lecture.

The player's multiple-choice results will be sent to the processing server, after successfully processing the data from the game, the server will send information about the secret message so that the player can decode it and move to the next gem location of the current campaign.

- Technologies used to build administrative websites include ReactJS, ASP.NET, SQL Server. The main function of the administrative website is to design learning materials, display lectures, manage, track and measure student learning through digital games.
- Target users: lecturers and teachers.

The administrative website will be built in the form of a dashboard page, the data will be displayed according to the corresponding class and course code. The system operates with two main rights from the user side: administrator rights (admin) corresponding to lecturers as administrators and user rights (user) corresponding to students. The website includes the following functions:

- Registration function
- Login function
- User management function
- Subject management function
- Classroom management function
- Group management function
- Decentralization function
- Function to add new lectures
- New campaign function
- Lecture preview function
- Statistics function
- Function to view personal information

3.4.2. Application AR-based gamification into teaching process for "soft skills"

When using the application in learning, students are divided into groups to perform challenges and content related to digital games. At the end of the course, the student's score will include the total score achieved by the group during the study.

As for the quiz management function, the system allows to create questions in each quiz with the purpose of making learning materials for the lecture. The quiz list will be applied to the entire Soft Skills course, thus allowing the use and inheritance of

quizzes from many different classes. The lecture is designed to include an electronic lecture video and a set of questions that have been set up in the quiz management function. For electronic lectures, they will be stored on a cloud system, ensuring the system's performance.

For the campaigns set up in the system, each campaign will be information, the content for each gem point in the game, especially the location where the gem points appear. Therefore, the system allows setting the location of gem points based on Google Maps technology.

After clicking the URL or scanning via QRCode, the player will be redirected to the lecture content at the location containing the gem. After correctly completing and setting the required score of the multiple-choice questions, the player will be transferred to the lecture video. After the player completes the video lecture, the content of the secret message will change, and the player will decide that secret message and move to the location containing the next gem (Fig. 4).

In addition to displaying the game interface in Augmented Reality, players can use Mapbox's map to be able to determine their own location.

3.5. Evaluation the Effectiveness of Using Game in Teaching Soft Skills by Experts Evaluation

For evaluating the effectiveness of the proposal game, a discussion panel was set up with 22 educational experts (7 respondents in major of Educational Science, 8 respondents in major of ICT, 1 respondent in major of Educational Technology, 2 respondents in major of Electrical Engineering, 1 respondent in major of Engineering Pedagogy, 1 respondent in major of Mechanics, 1 respondent in major of Technology Education and 1 respondent in major of History Education). According to the educational experts' opinions, this AR-based gamification has gained effective aspects in education, such as: Improving learning motivation (95.23% of interviewed expert); obtaining knowledge through playing games (95.23% of interviewed expert); Enhancing the learning experience (90.47% of interviewed expert); Measuring and evaluating Learning Outcomes instantly (80.95%). However, educational experts suggest designing video lectures associated with the practical context that the subject meets, and the questions bank need to be built to assess at various range of cognitive levels according to the Bloom scale.

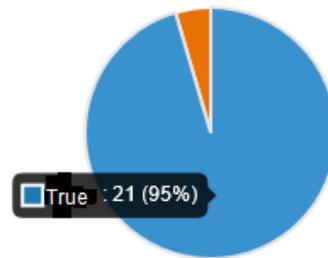
Asking expert advice on the scenario of the educational game "Dragon Ball" (22 Responses) (Fig. 5a, 5b, 5c, 5d):



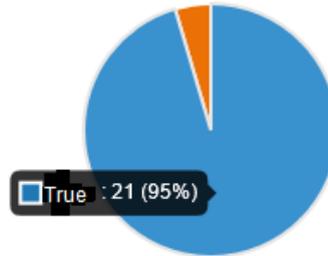
Fig. 4. Procedure of playing game “Seven Dragon Balls” in the subject “Soft Skills”

4. Conclusion

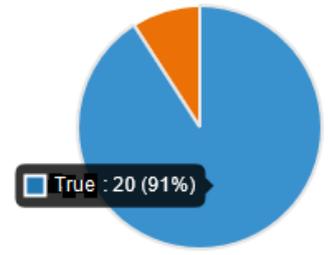
The teaching model using digital games has appeared for a long time, but in the innovation movement to reform the teaching form, it has created an opportunity for this learning system to promote its strengths. In addition, the strong development of Internet technology and digital devices has made the construction of online learning content and online learning environment for students increasingly accessible and popular. Learners are free to study at their own learning pace that suits their personal



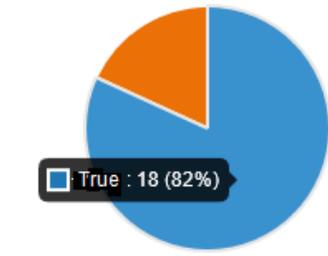
a. Teaching using the game scenario "Dragon Ball" improves learners' learning motivation



b. Teaching using the game scenario "Dragon Ball" helps learners achieve knowledge through games



c. Teaching using the game scenario "Dragon Ball" enhances learners' learning experience



d. Teaching using the game scenario "Dragon Ball" measures and evaluates learners' learning results quickly

Fig. 5. Evaluation the Effectiveness of game scenario "Dragon Ball"

interests. It is an inevitable trend that today's students need to pay attention to. Therefore, the online learning system using digital games in teaching has been researched and developed with functions to stimulate students' interest in learning and help students achieve high learning efficiency. This is an optimal solution learning system and in line with current trends.

In this study, we have proposed the model of an AR-based gamification and experimental teaching through Soft Skills subjects. By building the game "Seven Dragon Balls " with AR augmented reality

technology through GPS connection and using Mapbox map, allowing students to learn through the game. In addition, the system includes an administrative website that allows lecturers to create campaigns to build scripts for games, administer classes, monitor statistics, and evaluate student learning outcomes.

In our next research, we will continue to study new criteria to make our methods for continuing to build and develop and expand the system for many online courses at higher education. The team will build more digital game genres and use cross-platform to integrate into the system to refresh and enrich the teaching content.

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References

- [1] N.T.H. Giang, L.H. Cuong, Evaluating feasibility and effectiveness of digital game-based instructional technology, *IJET. International Journal of Emerging Technologies in Learning*, vol.16, no.16, eISSN 1863-0383, 2021, pp. 4-19, <https://doi.org/10.3991/ijet.v16i16.23829>
- [2] Vu Minh Hong, *Learning Games*, Vietnam Education Publisher, 1980.
- [3] N. A. Tuyet, *Kid's Games*. Hanoi: Women's Publishing House, 2000.
- [4] N. N. Tram, *Design and use learning games to develop generalization abilities in older children*. Hanoi, Doctoral thesis in education, Vietnam Institute of Educational Sciences, 2003.
- [5] T.T.X. Hue, *Build and use developmental games to form early math symbols for 5-6-year-olds*. Hanoi, Doctoral thesis in education, Institute of strategy and educational programs, 2005.
- [6] P. T. Chuong, *Limitations of video games* (2011, 6/21), Retrieved from People's Newspaper, [Online] Available: <https://nhandan.com.vn/dien-dan-nhan-dan-hang-thang>.
- [7] Nicola Whitton, *Digital Games and Learning: Research and Theory* (Digital Games, Simulations, and Learning), Routledge Publish, 2014.
- [8] Marc Prensky, *Digital Game-Based Learning*, McGraw-Hill, 2001.
- [9] Coffey, H, *Digital Game-Based Learning*, University of North Carolina at Chapel Hill School of Education, Chapel Hill, NC, 2009.
- [10] Aslan, S., *Game-based improvement of learning fractions using iOS mobile devices*. Master's Thesis etd-04282011-130352, Digital Library and Archive, Virginia Polytechnic Institute and State University, Blacksburg, VA, 2011.
- [11] McGonigal, J., *Reality is Broken: Why Games Make Us Better and How They Can Change the World*. New York, NY: Penguin, 2011.
- [12] Barlow, N., *Types of ARG*. Print IGDA Alternate Reality Games SIGNED.), 2006 Alternate Reality Games White Paper, The International Game Developers Association, 2006, pp.15-20.
- [13] FAO, *E-learning methodologies, A Guide for Designing and Developing E-Learning*, 2011.