Designing Digital Educational Games by Integrating Teaching Process into the Technology Platform of Entertainment Games

Le Huy Cuong[1], Nguyen Thi Huong Giang[2]

[1] PhD Candidate, Faculty of Education, Hanoi University of Science and Technology, Vietnam

[2] PhD in Education Science, Faculty of Education, HaNoi University of Science and Technology, Vietnam

ABSTRACT: This study presents a method for designing Digital Educational Games (DEGs) that integrates educational content with entertainment game technology. The purpose is to create engaging learning experiences by leveraging theories of learning, emotion, and motivation. Methodology includes selecting popular entertainment games and incorporating educational objectives to enhance both learning and gameplay. This design has been applied into teaching Soft Skills according to the game based learning approach. This application was evaluated to find the effectiveness of this proposal and the way to improve the scenario of the "The Energy Bus Journey". Results indicate this approach increases student engagement and learning efficacy. The conclusion suggests that while promising, further optimization is needed to perfect the balance between educational content and gaming enjoyment.

KEYWORDS: Balance of Educational games, Digital Educational Games, Educational Game Design, Educational Game Evaluation, Game-Based Learning.

INTRODUCTION

Game-Based Learning (GBL) or learning with digital education games (DEG) has been one of the most discussed and propagated media-based learning forms in recent years [1]. Some programers [in [2], [3], and [4] are extremely optimistic about the potential benefits of GBL, and more and more empirical studies on the use of DEG in education [5]; [6]. However, standard digital games are information-oriented applications, where the development process usually follows a traditional software development approach, but so far, there has been very little systematic analysis of the theoretical foundations of learning with digital games [7]. Through research, the authors' group found that there are several design methods to develop entertainment games, in which game design is a process that includes a series of activities or continuous operations leading to a predetermined goal. However, designing digital educational games (DEG) requires a specific design method. The complexity of designing DEGs has created several approaches related to different processes and operations.

Marfisi (2012) proposed a design method for Learning Games (LG) used in adult technical training [8]. This method models the LG script to help designers understand the needs of stakeholders. This method is divided into seven stages: 1. describing the needs of stakeholders; 2. describing pedagogical goals; 3. conceptual formation; 4. quality control; 5.production; 6. testing within the target audience; 7. maintenance. Each stage will involve different experts. In the stage of describing the needs of stakeholders, there is the participation of stakeholders and project managers. In the stage of describing pedagogical goals, it includes a subject matter expert (SME) and a cognitive expert. The conceptual formation stage involves a pedagogical expert, a game designer, and a screen designer. The quality control stage involves a pedagogical expert. In the production process, this stage involves developers and graphic designers. In the testing phase, the target object includes pedagogical experts and students. Finally, the Maintenance stage involves students. The most important stage of this design method is the conceptual formation stage when the LG story script is designed.

Jan Hense and his associates (2012) analyzed learning in conventional digital games from the perspectives of learning theory, emotion theory, and motivation theory. He and his associates believe that players of conventional digital games often acquire a range of skills and content while playing [1]. To answer questions related to the quality of digital learning games (DLG), it is first necessary to better understand the learning processes that take place while playing the game [9]. Initially, the analysis of non-learning games for entertainment purposes with the idea of taking effective learning mechanisms from conventional digital entertainment games and transferring them to the development of digital learning games. In addition, when analyzing computer games from a theoretical perspective, it is important not only to consider aspects related to teaching and learning theory but also to consider from a motivational

and emotional perspective playing an important role while playing these games [10]. Therefore, designing digital educational games must build the theoretical foundation of learning (learning theory, emotion theory, and motivation theory) with and in DLG.

Aslan (2015) educational proposed a design method to develop digital educational games (diGital educational Ational gaMe dEvelopment -GAMED), including a group of methods, rules, axioms, and embedded in digital games integrated into the software lifecycle. The DEG lifecycle includes four stages: 1. Game design stage; 2. Game software design stage; 3. Implementation and publication stage of the game; 4. Learning and stage feedback based on the game. Each stage includes several sub-stages. Each stage displays tasks, but this design method does not specify users and experts involved in each stage. The working group consists of: a subject matter expert, experts on game-based learning, a game designer, students, and software engineers.[11]

INTEGRATING TEACHING PROCESS INTO TECHNOLOGY PLATFORM OF THE ENTERTAINMENT GAMES

The design methodologies employed so far fundamentally showcase the approach of Game-Based Learning (GBL) by gamifying the educational content (seriousness). This implies that starting from a teaching scenario, designers will undertake the design, development, implementation of educational games, and assess their pedagogical effectiveness. For a high-quality Digital Educational Game (DEG), it must encompass both seriousness and game elements; They must scientifically support players to achieve specific learning goals (the serious part) while simultaneously engaging and maintaining the player's experience (the game part).
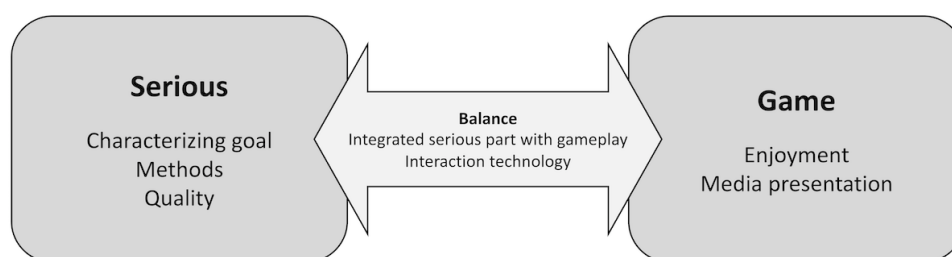
Figure 1. The balance of educational games according to the gamification of teaching content [12]

An alternative design concept, opposite to the prevailing approach mentioned above, that our research team aims for in this article is designing educational games via an approach integrating teaching into the technology platform of entertainment gaming. To execute this approach, based on learning theories, the design team needs to analyze the learning topic's needs such as objectives, content, and learning activities required to build learners' competencies. The analysis results will guide the research team in selecting simple, popular, highly entertaining games. Subsequently, the design team supplements suitable teaching content into the entertainment gaming platform, cleverly integrating it into the selected games to achieve a dual objective: balancing the educational (seriousness) and entertainment aspects of a high-quality DEG.

The most critical design stage of this concept is analyzing the necessary learning theories for the teaching topic to identify information for the additional content integrated into existing entertainment games. Learning theories considered during the topic analysis, as per Jan Hense and colleagues (2012), include three fundamental theories: learning theory, emotion theory, and motivation theory.

From the learning theory perspective, the teaching topic needs analysis based on three fundamental principles: behavioral, cognitive, and constructivist principles. Regarding emotion theory, the teaching topic analysis focuses on how positive and negative emotions impact students. From the motivation theory perspective, the teaching topic analysis relies on the effectiveness of games for students, through achievement motivation, social motivation, engagement, seamlessness, and autonomy especially in decision-making.

The basic principles present in typical entertainment games can be utilized for designing digital learning games to achieve high effectiveness. From the learning theory perspective, many games teach new skills and content through reinforcing positive behaviors and positive punishment. Reinforcement in games is often achieved by completing tasks or levels, collecting symbolic currency, or achieving high scores. Contrary, positive punishment might involve losing a life or position in a race or ranking. This behavioral principle is frequently used in action games, racing games, and those require motor skills and perception, continuously providing players with immediate feedback on success or failure. The principle of perception is reflected in game design, where many digital games focus on problem-solving activities, ideal for training problem-solving skills in various fields. Adventure and role-playing

games are classic applications of these principles. Besides fostering problem-solving skills, these game types can also promote knowledge acquisition and cognitive abilities by providing information to solve specific problems.

The game design principle of construction can be considered as providing a rich environment for exploring learning activities based on problems. Prerequisite conditions for this involve tasks or issues related to the game's reality or the students' knowledge. Based on such issues, games enable students to analyze situations and experiment with multiple solutions, reflecting acquired knowledge about a specific field or phenomenon.

Concerning emotional theory, the impact of emotions on the learning process is often overlooked. Particularly in the context of learning through digital games, emotions play a crucial role. Positive emotions like joy or satisfaction generally have a significant influence on effective learning. Addressing negative emotions, it is important to distinguish between deactivating negative emotions like boredom or despair and activating negative emotions like fear or anger. Excitement and enjoyment are typically the first emotions considered when examining personal emotions related to games. Reasons might include aesthetic aspects such as graphics, animation, music, sound effects, or aspects of the game's storyline. Furthermore, games often provide players with the opportunity to immerse themselves in a virtual world, experiencing the joy of success and other social aspects of the game. Another important aspect is that the enjoyment of playing a game does not decrease due to difficulty or usability issues. Apart from excitement and enjoyment, other positive emotions like curiosity, satisfaction, and pride can also benefit the learning process. Fear can also play an essential role in certain game genres, especially in horror scenarios. When considering using games for learning purposes, maximizing positive emotional experiences and avoiding negative emotions is essential. It is crucial to note that if one aspect fails to meet expectations, games can still succeed, indicating that different emotional aspects can compensate for each other to a certain extent. Therefore, the diverse interests of individual players play a crucial role and need to be carefully considered.
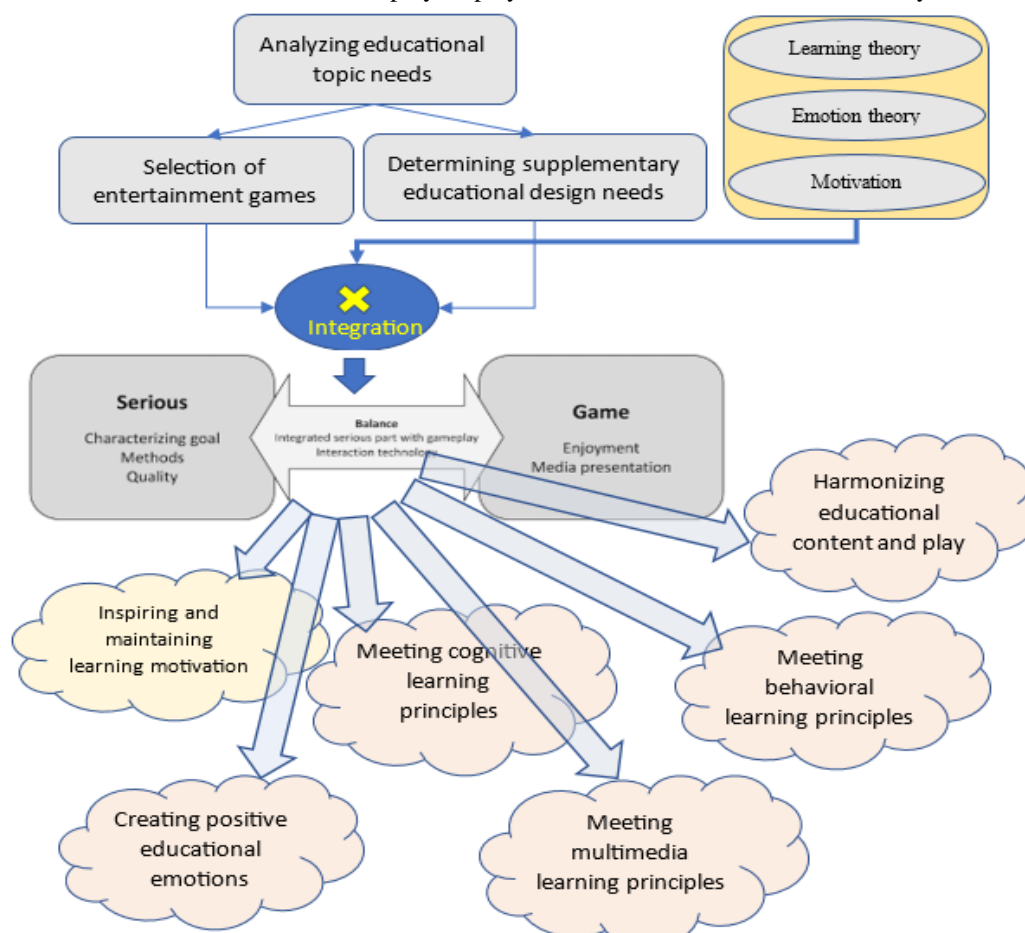

Figure 2. Designing education games via integrating a teaching process into the technology platform of entertainment gaming

From the motivational theory perspective, the final important theory for analyzing learning processes in digital games, several approaches can be drawn to understand why digital games are so engaging and drive players to such extents, especially the structures like achievement motivation, social motivation, interest, flow state, and particularly, self-determination theory. Notably, the self-determination theory integrates certain elements of other approaches previously mentioned. It focuses on explaining intrinsic motivation, effective for learning because it is not driven by external rewards. The self-determination theory suggests that intrinsic motivation depends on meeting three basic psychological needs: competence, autonomy, and relatedness. Competence relates to believing in one's ability and describes how students can control and master situations. This is one of the most important and attractive features of games, as they consistently allow students to perceive their own competence. Autonomy describes the ability to pursue goals, interests, and talents without being influenced by external factors. While some games have linear structures, most provide a certain degree of freedom in specific aspects. Of course, there are limitations to autonomy due to simulation rules and other constraints. Therefore, the task of game designers is to provide a sufficient level of freedom and encouragement to stimulate players' exploration. The third crucial prerequisite to drive behavior recognized by the self-determination theory is relatedness. Relatedness can be defined as a sense of belonging to a social community, whether it is with like-minded individuals, peers, or colleagues. In this aspect, social factors are highly crucial in every game. Even outside the game, this can be observed in many online communities formed around games. Two other important motivational structures besides self-determination that should be mentioned are interest and the flow state. Interest can be defined as a particular relationship between a student and a specific content or knowledge area. In relation to games, the motivational potential of interest is relevant because it highlights the role of game genres and storylines. Both are essential criteria for a game's success among different player groups..As the results, it is essential to note that the player's diverse interests play a significant role.

DESIGNING EDUCATIONAL GAMES FOR TOPIC "POSITIVE THINKING" IN SUBJECT "SOFT SKILLS" AT HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY, VIETNAM

A. Educational Aspect of the Game

Hanoi University of Science and Technology, Vietnam is an engineering university where students are mostly passionate about technology and engineering. They devote a significant amount of time to study but have limited interaction and development of personal skills. In oder to enhance interactive learning, attract and engage learners in soft skills courses, the authors proposed a game scenario called 'The Energy Bus' to facilitate easy access to Positive Thinking skills aimed at developing Proactive Habits.

The game scenario was designed following an integrated approach of teaching on the platform of an existing entertainment game. The selected game title was Subway Surfers, the first game to reach 1 billion downloads on CHPlay, a remarkable achievement for game developers. The educational content embedded within the game focuses on Soft Skills, a course within the curriculum of Hanoi University of Science and Technology. This course aims to emphasize the importance of personal development skills in education, work, and life, providing students with core knowledge to develop their personal skills, allowing them to practice and build fundamental personal development skills. As a result, students gain a proper understanding of the necessity to cultivate essential learning and working skills, adapted to modern society and future professional practicality.

To increase the game's appeal, we chose a storyline based on the book 'The Energy Bus' by Jon Gordon[13]. The game's plot revolves around George, a busy office worker preparing for the company's new product introduction. He must ensure a smooth presentation, as it's his final chance to keep his job. If the presentation fails, he'll be fired. Fortunately, during his bus rides, he meets Joy – the bus driver who transmits energy and inspiration, allowing him to drive his own energy bus to overcome immediate challenges and reach success. While playing the game, the learner, in the role of George, will reinforce their knowledge of positive thinking and the development of proactive habits through 6 game stages:

- Stage 1: Thinking is fuel for the mind.

After completing Stage 1, learners understand that thinking is mental energy that can be expended and regenerated. Therefore, the quality of thinking affects one's well-being.

- Stage 2: The theory of the brain's three regions and the mind.

After completing Stage 2, learn and comprehend the functions of the reptilian brain (the unconscious mind), the mammalian brain (the subconscious mind), and the human brain (the conscious mind). They can utilize both conscious and unconscious mind to create the desired life.

- Stage 3: Thinking and relationships.

After completing Stage 3, learners understand that thinking is the source of emotions, words, and actions.

- Stage 4: Types of thinking.

After completing Stage 4, learners can distinguish between positive thinking, necessary thinking, superior thinking, wasteful thinking, and impositive thinking.

- Stage 5: Selecting and controlling thoughts.

After completing Stage 5, learners can choose positive thoughts for positive emotions, words, and actions in education, work, and life.

- Stage 6: Tools to support and maintain a positive state.

After completing Stage 6, learners know the importance of self-reflection and self-react. They focus on examining and changing themselves rather than trying to change others.

B. Entertainment Aspect of the Game

Players embody the character George and control the energy bus moving forward while avoiding obstacles and collecting items to achieve set goals for each stage.

The game begins with a scene introducing George and his energy bus, along with the game's objective. This part provides an overview of the lesson's goals. At the end of the introduction, George steps onto his energy bus to commence the journey of acquiring knowledge.

During gameplay stages, players control the bus's movement left or right to collect items and avoid obstacles. The bus moves at a predetermined speed within the expected playtime of the lesson (40 minutes) to ensure the transmission of the lesson's content. The educational content of each lesson topic is broken down to fit the gameplay time and transferred into each stage of the game. Players simultaneously control the bus and absorb lesson information displayed on the game screen. Players skillfully maneuver the bus to collect randomly appearing items on the road (Stars, Knowledge Boxes, Energy Bottles), where each knowledge box contains a keyword and each star contains a letter. Collecting these words/letters completes the hidden message of the stage. These messages typically consist of essential keywords related to the Positive Thinking lesson. When players have gathered all the words/letters of the hidden message, the bus stops at a station for passengers to board/disembark. Here, players are required to arrange the collected words into a meaningful message relevant to the lesson. If arranged correctly, an Angel passenger boards the bus, increase its energy; if arranged incorrectly, a Demon passenger boards, depleting the bus's energy. At the end of each stage, a screen appears with the character Joy (the fairy) providing an explanation of the stage's message.

In addition to collecting items, players must also maneuver their bus to avoid obstacles (other vehicles, pedestrians crossing the road, speed bumps, manhole covers, road construction barriers, etc.). If the bus hits an obstacle, the player must answer a multiple-choice question taken from the corresponding question bank for each stage. A correct answer allows the bus to continue, while an incorrect answer results in the loss of one energy bottle or requires replaying the stage if no energy remains.

The game concludes when the bus completes all stages (victory) or when the time runs out (defeat). The score of each playthrough is calculated based on the time taken to complete the stages and the number of Angel passengers boarding the bus.

Through the game's visual effects and sounds, players continually absorb the lessons knowledge in a conscious, gentle, and relaxed state.

EVALUATING THE EFFECTIVENESS OF THE 'ENERGY BUS JOURNEY' GAME SCENARIO

With the rapid development of digital learning games, there is a need for a set of criteria to evaluate the quality of digital educational games to ensure they provide the best possible outcomes for students. Analyzing learning theories for game design, Jan Hense and colleagues proposed criteria and guidelines for designing and applying effective Digital Learning Games (DLGs) based on their prior theoretical analysis. The authors applied Hense's perspective to propose a design approach integrating teaching into existing entertainment games to create educational games. Additionally, Hense and colleagues developed quality assessment criteria for educational games based on the analysis of skills and content across three platforms: learning theory, emotional theory, and motivational theory. Based on Hense's criteria, this evaluation proposed assessment tools the effectiveness of the game storylines.

A. *Objectives of Evaluation*

Our study aims to gather feedback from learners regarding the 'Energy Bus Journey' game scenario. This feedback will serve as the basis for appropriate adjustments in order to improve this educational game and refine the integrated educational game designs for university courses. Obtaining evaluations from the students themselves, who are the learners of this course, will assist this research in enhancing this learning game specifically and refining the strategy for incorporating educational games into university courses in general, thereby contributing to more effective and engaging learning hours.

B. *Population and Sample of Evaluation*

The evaluation evaluated the opinions of students enrolled in the Soft Skills course at Hanoi University of Science and Technology during the 2021-1 semester (from September 2021 to January 2022). This semester faced spatial limitations due to the application of lockdowns and social distancing measures amid the Covid pandemic. Out of the total 2703 students enrolled in the Soft Skills course for the 2021-1 semester, 284 students participated in the survey. With this sample size, at a confidence level of 95% and p=0.5, the sample's precision level achieved is 93% [14].

C. *Assessment Tools*

The evaluation criteria (as shown in Table 1) were built based on learning theory, emotions, and motivation, encompassing six main aspects: (1) Harmonization of learning and gameplay content, (2) Adherence to behavioral learning principles, (3) Adherence to cognitive learning, (4)) Adherence to constructive learning principles, (5) Creating positive learning inspiration, and (6) Generating and sustaining learning motivation.

Table 1. The criteria of Evaluation

I. The educational game scenario "Energy Bus Journey" harmoniously integrates educational content and entertainment	
1.1	To what extent does the educational game scenario "Energy Bus Journey" target the educational content of the Soft Skills course taught to students at the Hanoi University of Science and Technology?
1.2	How well does the educational content (Positive Thinking in the Soft Skills course) align with the educational game "Energy Bus Journey"?
1.3	According to the scenario's description, what level of learning effectiveness will studying the Soft Skills course through the "Energy Bus Journey" game offer to learners?
1.4	To what degree is the design of the educational game scenario "Energy Bus Journey" compatible with the learning objectives of the Positive Thinking lessons within the Soft Skills course?
1.5	At what level is the educational game scenario "Energy Bus Journey" designed to be engaging and entertaining for the learners?
II. The educational game scenario "Energy Bus Journey" adheres to the principle of behavioral learning	
2.1	To what extent does the educational game directly respond to the actions of the learners?
2.2	At what level does the educational game "Energy Bus Journey" provide opportunities for learners to practice and apply what they've learned?
2.3	How appropriate is the level of practice and application of lessons within the educational game "Energy Bus Journey"?
III. The educational game scenario "Energy Bus Journey" aligns with the principles of cognitive learning	
3.1	To what extent does it address synthesized lesson situations that fit into the context of the game?
3.2	How well does it provide information for players to resolve synthesized lesson situations?
IV. The educational game scenario "Energy Bus Journey" adheres to the principles of constructive learning	
4.1	How personalized are the synthesized lesson situations tailored to each player?
4.2	To what extent does it address appropriate contexts for each lesson content?
4.3	Based on the storyline from the book with the same title and the character George, how does it create a social context that makes learning more relatable?
4.4	How much educational support does it provide?
4.5	What opportunities does it offer for learners to construct their knowledge and study skills?

V. The educational game scenario "Energy Bus Journey" fostering positive learning motivation	
5.1	How engaging is it for the players?
5.2	How user-friendly is the game?
5.3	To what extent does it stimulate players' curiosity and exploration?
5.4	What positive feedback does it provide for the players' achievements?
5.5	What level of support does it offer to players when they struggle to overcome challenges?
VI. The educational game scenario "Energy Bus Journey" inspiring and sustaining learning motivation	
6.1	To what extent does it nurture learning motivation for the players?
6.2	How much emphasis is put on player scores and rewards?
6.3	Does it allow players to set their own goals for each game segment based on their abilities?
6.4	Does it enable players to control their successes based on the game's criteria?
6.5	Does it allow players to make decisions during the learning and playing process?
6.6	Does it enable player interaction with other real or virtual characters in the game?
6.7	Does it offer various choices for players based on their preferences?
6.8	How clearly are the objectives communicated to players at the beginning of each game segment?
6.9	Does it allow adjusting game levels to match the player's abilities and skills?
6.10	How consistent and regular are the feedback loops provided to the players throughout the process?

D. *Assessment Methodology*

The effectiveness criteria for the educational game scenario "Energy Bus Journey" were structured into an online survey using the Microsoft Form platform. The survey, along with the game scenario, was distributed to students studying Soft Skills in the first semester of the 2021-2022 academic year (this was during the period of online learning due to the Covid pandemic). The criteria were designed using a 5-point Likert scale: Completely Inappropriate – Inappropriate – Neutral – Appropriate – Completely Appropriate.

E. *Findings and Discussion*

Table 2. Descriptive Statistics on the Harmony of Learning and Play Content

	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
I1.1 Learning game aiming at educational content	284	1.00	5.00	4.0106	.85104	3
I1.2 Educational content suitable for the game	284	1.00	5.00	4.1162	.81758	2
I1.3 Learning game's effectiveness in learning	284	1.00	5.00	4.0000	.81505	4
I1.4 Learning game aligned with learning objectives	284	1.00	5.00	3.9859	.79740	5
I1.5 Learning game designed to be engaging and entertaining	284	1.00	5.00	4.1796	.83188	1
Valid N (listwise)	284					

As illustrated in Table 2 above, the learning game scenario "Energy Bus Journey" was evaluated by learners as having a strong ability to integrate learning content and gameplay (with an average score for all criteria above 3.9 on a maximum scale of 5). specific, 4 out of 5 criteria scored above 4, indicating a high level of integration between play and learning as assessed by the learners. However, the alignment with learning objectives needs further improvement to reach the same level as the other integration criteria.

Table 3. Descriptive Statistics on the compliance with the principles of behavioral learning

	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
I2.1 The educational game directly responded to the learners' actions.	284	2.00	5.00	3.9366	.82123	2
I2.2 The "Energy Bus Journey" game provided opportunities for learners to practice and apply what they've learned.	284	2.00	5.00	4.0141	.79295	1
I2.3 The level of practice and application of the lesson within the "Energy Bus Journey" educational game was suitable.	284	1.00	5.00	3.9824	.81269	3
Valid N (listwise)	284					

The ability to adhere to the behavioral learning principles of the "Energy Bus Journey" educational game was also rated quite well by learners. Creating opportunities for learners to practice and apply their knowledge was rated the highest (with an average score of 4.0141 out of 5). However, providing direct feedback on learner actions and the level of practice and application still needs improvement to receive higher ratings, thereby enhancing the game's ability to meet behavioral learning principles (see in Table 3).

Table 4. Descriptive Statistics on the Cognitive Learning Principle Responsiveness

	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
I3.1 Situations presented in the lessons align well with the game's context.	284	1.00	5.00	3.9085	.88493	2
I3.2 Providing information for players to resolve lesson-based synthesized situations.	284	1.00	5.00	3.9894	.78630	1
Valid N (listwise)	284					

The scenario of the game "Energy Bus Journey" has been rated by learners to moderately meet the principles of cognitive learning (Table 4.). This suggests an expectation for improvements in the game's design to better integrate learning scenarios within the game context and enhance the delivery of information to assist learners in problem-solving during the lessons.

Table 5. Descriptive Statistics on the responsiveness to the principles of constructive learning

	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
I4.1 Personalization of lesson scenarios for each player	284	1.00	5.00	3.9225	.84128	4
I4.2 Appropriate context for each lesson content	284	1.00	5.00	3.8768	.85460	5
I4.3 Creating a social context and making learning more familiar	284	1.00	5.00	4.0246	.90703	2
I4.4 Providing learning support	284	2.00	5.00	4.0176	.78166	3
I4.5 Providing opportunities for learners to build their own knowledge and study skills	284	1.00	5.00	4.0528	.84110	1
Valid N (listwise)	284					

Regarding its ability to meet the principles of constructive learning, as assessed by the learners, the game "Energy Bus Journey" has performed well in aspects related to creating a social context, making learning relatable, providing learning support, and enabling opportunities for self- building of knowledge and study skills. However, according to learners (as shown in Table 5.), the game has only achieved a fairly good level in terms of personalizing scenarios within the lessons and particularly in having context suitable for each lesson's content. Therefore, this game's script needs further improvement in personalization and contextual design to achieve a higher level of evaluation.

Table 6. Descriptive Statistics on the ability to create a positive learning inspiration

	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
I5.1 Player engagement level	284	1.00	5.00	4.0282	.89319	4
I5.2 Ease of use level	284	2.00	5.00	4.1479	.82751	1
I5.3 Level of stimulating player curiosity, exploration	284	2.00	5.00	4.0246	.90313	5
I5.4 Positive feedback on player achievements	284	2.00	5.00	4.0845	.80627	2
I5.5 Support for players when they don't overcome challenges	284	2.00	5.00	4.0599	.87361	3
Valid N (listwise)	284					

All 5 criteria for creating positive learning inspiration have an average score above 4.0 (Table 6.). Therefore, creating a positive learning inspiration is a well-assessed aspect of this educational game by the learners. According to Hanna Dumont and colleagues, motivation and emotions are crucial components determining individual learning because learning essentially occurs within each learner, rather than with teachers or other external entities [15]. Hence, the positive evaluation results demonstrate that the game script has been successfully designed to engage learners with the content of the Soft Skills course.

In the ten criteria regarding the ability to inspire and sustain learning motivation (Table 7.), learners have rated 8 criteria with an average score above 4.0, indicating that most criteria have achieved a good level. Particularly, the game received high ratings in clearly communicating objectives to players at the beginning of each stage, allowing adjustments in game difficulty according to players' abilities and skills, and providing continuous, consistent feedback throughout the process. However, the game needs improvement in nurturing learning motivation (ranked 9th out of 10) and enabling player interactions with other real/virtual characters involved in the game (ranked 10th out of 10). The positive evaluation results of criteria related to inspiring and sustaining learning motivation demonstrate that the game scenario "The energy bus journey" has met basic requirements for fostering learning motivation similar to educational games, as per Polona Caserman and colleagues [16].

Table 7. Descriptive statistics on the ability to create inspiration and sustain learning motivation

	N	Minimum	Maximum	Mean	Std. Deviation	Ranking
I6.1 Fostering learning motivation for players	284	1.00	5.00	3.9577	.83114	9
I6.2 Not placing heavy emphasis on players' scores or rewards	284	1.00	5.00	4.1162	.88403	5
I6.3 Allowing players to set their own goals at each stage according to their abilities	284	1.00	5.00	4.1092	.84405	6
I6.4 Empowering players to control their successes based on the game's standards	284	1.00	5.00	4.0704	.82922	8
I6.5 Allowing players to make decisions during the learning and playing process	284	1.00	5.00	4.1338	.85507	4
I6.6 Allowing players to interact with other real/virtual characters involved in the game	284	2.00	5.00	3.9401	.88566	10
I6.7 Providing players with various choices based on their preferences	284	2.00	5.00	4.0775	.79374	7
I6.8 Clearly notifying players of objectives at the beginning of each stage	284	2.00	5.00	4.1831	.82041	1
I6.9 Allowing adjustments of game difficulty according to players' abilities and skills	284	2.00	5.00	4.1725	.83337	2
I6.10 Providing continuous and regular feedback throughout the process to players	284	2.00	5.00	4.1479	.83176	3
Valid N (listwise)	284					

CONCLUSION

The game scenario design phase marks the initial creative step for the educational game, determining the quality of the learning process through gaming. Based on three theoretical aspects of learning, emotions, and motivation, assessing the "The energy bus journey" educational game scenario by gathering feedback from learners serves as the foundation for adjusting and refining the game's script. The survey results from learners show that out of 30 criteria, 9 fall below 4, representing 30%, yet all remain above 3.8. This proportion indicates that the "The energy bus journey" game scenario is well-regarded by learners, meeting the quality criteria expected of an educational game. Criteria such as alignment with learning objectives, direct feedback on learner actions, practice and application within the game's lessons, appropriate contextualization of lesson synthesis within the game environment, providing information to solve lesson-related scenarios, personalization of lesson scenarios per player, contextual suitability for each lesson content, nurturing player motivation, and enabling player interaction with other real/virtual characters in the game are aspects that need improvement. These will be appropriately adjusted within the scenario before the research team implements the "The energy bus journey" game.

REFERENCES

1. Hense, J., & Mandl, H. (2012). Quality criteria for digital learning games from the perspectives of learning, emotion and motivation theory. *Digital systems for open access to formal and informal learning: Research from CELDA*.
2. Gee, J. P., 2007. *Good video games + good learning. Collected essays on video games, learning and literacy*. Peter Lang Publishing, New York, USA.
3. Prensky, M., 2007. *Digital Game-Based Learning.* Paragon House Publishers, St. Paul, MA, USA.
4. Prensky, M., 2011. Comments on research comparing games to other instructional methods. In Tobias, S. and Fletcher, J.D., (Eds.), *Computer games and instruction* (pp. 251-278). State University of New York, Albany, NY, USA.
5. Shelton, B. E. and Wiley, D. (Eds.), 2007. *The Educational Design and Use of Simulation Computer Games*. Sense Publishers, Rotterdam, The Netherlands.
6. Tobias, S. and Fletcher, J. D. (Eds.), 2011. *Computer games and instruction*. State University of New York, Albany, NY, USA.
7. Moreno-Ger, P., Burgos, D., Martínez-Ortiz, I., Sierra, J. L. and Fernández-Manjón, B., 2008. Educational game design for online education. In *Computers in Human Behavior*, Vol. 24, pp. 2530-2540.
8. Marfisi-Schottman, I. Méthodologie, Modèles et Outils Pour la Conception de Learning Games. Ph.D. Thesis, Institut National des Sciences Appliquées de Lyon, Lyon, France, 28 November 2012.
9. Garris, R., Ahlers, R. and Driskell, J. E., 2002. Games, motivation, and learning. A research and practice model. *In Simulation & Gaming,* Vol. 33*,* pp. 441-467.
10. Barlett, C. P., Anderson, C. A. and Swing, E. L., 2009. Video Game Effects--Confirmed, Suspected, and Speculative: A Review of the Evidence. *In Simulation & Gaming,* Vol. 40 No. 3, pp. 377-403.
11. Aslan, S.; Balci, O. GAMED: Digital educational game development methodology. Simulation **2015**, 91,307–319.
12. Caserman, P., Hoffmann, K., Müller, P., Schaub, M., Straßburg, K., Wiemeyer, J., ... & Göbel, S. (2020). Quality criteria for serious games: serious part, game part, and balance. *JMIR serious games*, *8*(3), e19037.
13. Jon Gordon, The Energy Bus: 10 Rules to Fuel Your Life, Work, and Team with Positive Energy, Wiley, 2007
14. Glenn D. Israel, Determining Sample Size, University of Florida
15. Hanna Dumont, David Instance, Francisco Benavides (2010) , The Nature of Learning – Using Research to inspire practice, Centre for Educational Research and Innovation, OECD
16. Polona Caserman, Katrin Hoffmann, Philipp Mueller, Marcel Schaub, Katharina Strabeburg, Josef Wiemeyer, Regina Bruder, Stefan Goebel, Quality Critria for Serious Games: Serious Part, Game Part and Balance, JMIR Serious Games 2020 http://games.jmir.org/2020/3/e19037/