

A Propose Conceptual Framework for Development of an Immersive VR Application in Gamified English Spelling, Vocabulary and Reading Comprehension

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ABSTRACT:

Developing an immersive VR application that gamifies English language learning that focus on aligning the game mechanics with learning outcomes is challenging. The aim of this study is to provide a conceptual framework for development of an immersive VR application in gamified English spelling, vocabulary and reading comprehension that provides a structure, cohesive direction and guide. The design and gamification elements in a VR environment that support the development of English language skills consists of game mechanism, dynamics, aesthetics and VR features. The learning outcome, learning materials, test modules and multimedia modalities are the parts for gamified English language learning. The iterative and incremental practices which make the learner builds knowledge in incremental steps and iterate to deepen or refine the understanding of each concept through practice and feedback.

Keywords: immersive VR application; gamification elements; gamified English language learning; conceptual framework

I. Introduction

Focused on the integration of innovative pedagogical tools, the systematic application of game design elements in non-game contexts, known as gamification, serves primarily to

motivate and increase user engagement [1]. This approach transforms potentially tedious or serious knowledge acquisition into a more enjoyable and engaging process [2]. The basic tools deployed are often referred to as game

components or elements [3]. Among the most frequently utilized and foundational elements in educational practice are points, badges, and leaderboards [4]. Points are assigned numerical values to provide users with feedback on their progression [1]. Badges serve as visual representations of achievements, acting as virtual trophies often used to encourage early participation and completion of tasks, while also conferring status. Leaderboards introduce competition by displaying an individual's performance relative to other users [4].

Beyond these foundational components, game design elements are categorized across three conceptual levels: dynamics, mechanics, and components. Game mechanics are the underlying processes that drive user interaction and action [3]. Examples of specific mechanics include challenges (tasks requiring effort), feedback, rewards, competition, and cooperation. Other critical components frequently integrated include Avatars (visual representations of players), Levels (indicators of progression or difficulty), Quests (predefined challenges with specific objectives and rewards), and Reputation (credibility often associated with badges or customized graphics). For complex gamified experiences, elements like Customization (tailoring the path or interface to learning styles) and the Balance mechanism are included. The Balance mechanism adjusts the complexity of the learning path to maintain engagement for all students by compensating lower performers (e.g., with bonuses) or increasing the challenge for those excelling [5].

The technological features of Virtual Reality (VR) provide a high degree of fidelity and real-time interactivity essential for simulation technology, making it a powerful complement to gamified learning [6]. VR is a technology that generates virtual immersion in a simulated digital environment, allowing users to interact with an artificial three-dimensional (3D) visual or sensory environment through computer modeling and simulation [7]. The core features of VR leveraged in educational applications are Immersion (Presence), Interaction, and Imagination. Immersion refers to the degree of reality experienced by the user in the virtual

environment [6][7]. Significantly, studies show that Immersive VR (IVR) promotes greater student learning outcomes compared to semi-immersive or non-immersive systems. Interaction pertains to the user's ability to maneuver objects and receive natural feedback in the simulated environment. This interaction can be categorized as 3-degree-freedom (3DoF), typically for viewing a 360° environment, or 6-degree-freedom (6DoF), necessary for playing and manipulating virtual objects using accessories like data gloves or sensors [6]. In contexts like anatomy education, technical requirements for VR software emphasize the ability for students and professors to simultaneously inhabit the virtual environment and manipulate, rotate, zoom, dissect, hold, and highlight 3D models [8].

For gamification to be successful, particularly when integrating advanced features like VR, it must follow a formal and clear design process [4]. A design methodology, such as the one proposed by the Sparks project, employs an iterative and incremental approach. This gamification design process begins with defining the structural framework, including Goals and Outcomes and analysis of the target audience. A crucial step is defining the Environment, which specifies if and how virtual environments using VR will be integrated and the nature of the tools and interactions used within those spaces. The design phase meticulously outlines how learners will explore and interact, utilizing concepts like Skill Atoms to define fundamental competencies acquired through activity loops [5]. This systematic approach ensures that game attributes are strategically chosen and deployed to modify the student's psychological state (affect, cognition, behavior) and, consequently, improve engagement outcomes such as learning achievement and motivation [9].

The conceptual frameworks for successful gamification highlight a systematic approach to leveraging game design elements to enhance the learning environment and drive specific behavioral and academic benefits. Gamification has specific goal of influencing motivation, increasing user engagement, and promoting learning. Conceptual frameworks designed for

positive results, such as the Gamified Learning Management System (GLMS) model, combine gamification mechanisms, multimedia elements, and relevant learning theories [1]. The core aim of these frameworks is to transform the serious knowledge process into a gamified flow that provides a more enjoyable and entertaining learning environment for students [2], thereby increasing their enthusiasm for learning [1]. This systematic application is intended to translate the high level of commitment and motivation seen in game players into the educational context [1].

The realization of these positive effects relies on specific game mechanisms integrated with psychological principles. The most frequently utilized game mechanisms include points, badges, and leaderboards. Points provide numerical feedback on progress, badges represent virtual achievements and recognition of accomplishments, and leaderboards display comparative performance to foster healthy competition and motivate participation. Underlying these mechanisms is psychological support, often rooted in Self-Determination Theory (SDT), which suggests humans are intrinsically motivated by the needs for competence, autonomy, and relatedness. A meaningful gamification design should support these intrinsic needs, encouraging motivation and engagement during the learning process [1]. The introduction of elements like Challenges, Rewards, and Progression is crucial for making the training learning experience more engaging and exciting. Furthermore, game elements that stimulate creative thinking and facilitate conversation and knowledge sharing among peers enhance the collaborative aspects of the overall learning experience [5].

Ultimately, the conceptual frameworks aim to link these enhanced states of motivation, enjoyment, and engagement to quantifiable academic improvements. The Gamification for Student Engagement Framework specifically proposes that gamification modifies student engagement states (affective, cognitive, and behavioral) to support the achievement of learning outcomes [10]. Evidence suggests that students using a gamified approach can score

significantly higher—for example, one study found students scored 14% higher than those in traditional courses [1]—directly impacting their academic performance [2]. The integration of game attributes is selected based on supporting desired learning objectives (categorized as cognitive, affective, and psychomotor), ensuring that the design purposefully modifies the student experience to achieve improved learning outcomes. By clarifying the goal, tracking progress, and ensuring that the systems foster enjoyment and address the complexity of student engagement, these conceptual frameworks provide a robust structure for producing strong pedagogical and successful academic performance outcomes [9].

Research Objectives

The main objective of this study is to propose a conceptual framework for development of an immersive VR application in gamified English spelling, vocabulary and reading comprehension.

Specifically, the research aimed to:

1. determine the design and gamification elements in a VR environment that support the development of English language skills; and
2. propose conceptual framework for an immersive VR application that gamifies English language learning.

II. Materials and Method

The researcher used Design Thinking methodology to guide for achieving the research objectives.

2.1 Empathize

Gamification in learning faces challenges centered on balancing engagement with educational goals, including poor alignment with curriculum, over-emphasis on rewards over learning, and high design complexity [10]. These are the identified challenges for the design and development of gamification and its conceptual framework.

2.2 Define

The needs for the design and gamification elements in a VR environment that support the

development of English language skills are critical to the design process that communicate the challenges to address. The research study proposed a conceptual framework for an immersive VR application that gamifies English language learning that addresses the challenges in gamification such as game mechanics does not align with the learning objectives and outcomes.

2.3 Ideate

The researcher gathered and collected the learning materials, learning outcomes, test modules and multimedia modalities for the English language skills in spelling, vocabulary and reading comprehension. The published related studies were the sources of data to gather information on game mechanics and VR features. Learning theories and learning approach are educational approaches considered in acquiring cognitive abilities for the learner.

2.4 Prototype

The proposed conceptual framework integrates gamification, VR, immersive learning theory and behaviorism learning theory. The immersive VR application is an on-going iterative and incremental features software development that gamifies English spelling, vocabulary and reading comprehension skills. The concepts of the mentioned framework implemented in the VR application.

2.5 Test

The researcher conducted a lot of tests while developing the VR application in order to refine

the solutions or features and make them better. Also, feedbacks from some users for the improvement of the features were highly considered. In the future, once the VR application is complete then the researcher will measure the level of usability of the VR application that gamifies English language learning and level of improvement of the learners' English language performance using the immersive VR-based gamified platform.

III. Results and Discussion

Game Mechanics and VR Features

There are 3 components of gamification such as game mechanism, dynamics and aesthetics. These components are the design and gamification elements for the development of an immersive VR application in gamified English spelling, vocabulary and reading comprehension.

The game mechanisms are the following:

1. Points

The learner receives points for every correct answer in the test. There are 10 items per sub-level thus each sub-level has 10 pts. The total points garnered not only indicate the intellectual performance but also used to grant rewards. The learner must garner 5 or more points to proceed to the next sub-level as shown in figure 1. If the learner got below 5 points, then the learner will repeat the test. The points garnered for each sub-level will be gathered & totaled and used to compute the grade.



Figure 1 Level up

2. Badges

The badges are like trophies that represent the skill proficiency level of the learner. There are 5 badges such as advanced(90% – 100%),

proficient(85% – 89%), competent(80% – 84%), developing(76% – 79%) and beginning(75% and below). The computed grade will be the basis for the badges as skill proficiency level as shown in figure 2.



Figure 2 Badges

3. Levels

There are 10 levels each for spelling, vocabulary and reading comprehension. Each level has 10 sub-levels. Easy and difficult items are assigned in incremental levels.

4. Challenges

When the learner moves to the next sub-level the time limit decreases. The difficulty gradually

increases as the learner moves to the next higher levels.

5. Leaderboard

The leaderboard shows the comparative ranking of the learners. The leaderboard shows the top 10 learners for each spelling, vocabulary and reading comprehension skills as shown in figure 3.

LEADERBOARD		
SPELLING	VOCABULARY	READING COMPREHENSION
1. John Lacea 92.50%	1. John Lacea 97.50%	1. John Lacea 95.00%
2. Pedro De la cruz 87.50%	2. Pedro De la cruz 87.50%	2. Pedro De la cruz 82.50%
3.	3.	3.
4.	4.	4.
5.	5.	5.
6.	6.	6.
7.	7.	7.
8.	8.	8.
9.	9.	9.
10.	10.	10.

Back

Figure 3 Leaderboard

The dynamics are the following:

1. Rewards

The learner will be given a reward based on the passing score garnered. The rewards are coins in Philippine denominations such as 1, 5, 10, 25 and 50 sentimos as shown in figure 4. The learner will

receive 1 sentimo for the score of 6 pts, 5 sentimos for 7 pts, 10 sentimos for 8 pts, 25 sentimos for 9 pts and 50 sentimos for perfect score of 10 pts. The accumulated coins will be used to buy time in seconds for extending the time period of answering the test as shown in figure 5.



Figure 4 Rewards



Figure 5 Buy Time

2. Achievements

The learner acquires new knowledge and skills from one sub-level to another and includes feedback into each successive iteration. The learner must pass the sub-level in order to

proceed to the next sub-level and this will achieve the mastery of the English skills as shown in figure 6. The next level will be unlocked when the learner completed the 10 sub-levels. The total money as reward is another achievement that helps to prolong the time limit of the test.

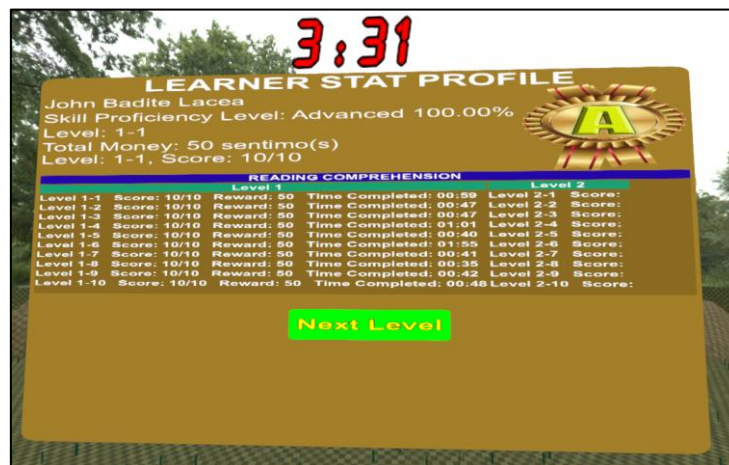


Figure 6 Achievements

The aesthetics are the following:

1. Fun

Using the VR controllers to point and click the boxes in answering the test is enjoyable and pleasurable as shown in figure 7. Navigating the

virtual environment is an amusing immersive experience. The VR application shows feedback when the learner makes mistakes. The learner learns from mistakes instantaneously through the test as shown in figure 8.

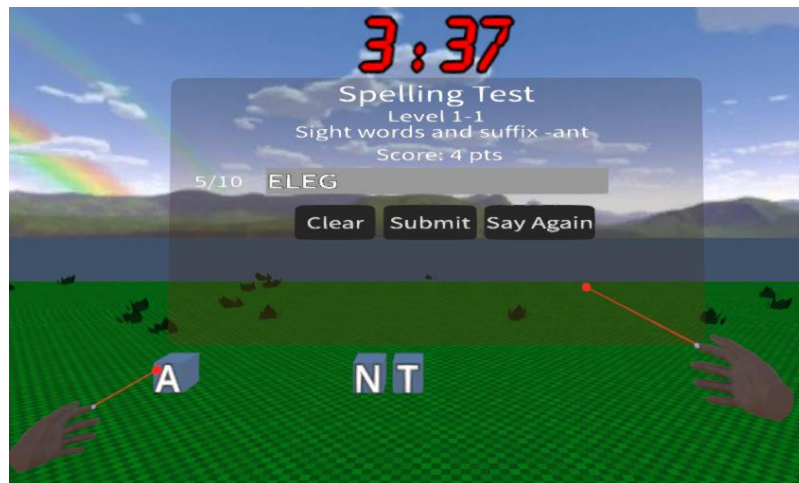


Figure 7 Fun



Figure 8 Feedback

2. Credibility and surprise

The test items and choices are randomly shuffled to surprise the learner and not to memorize the

answers. If the learner failed the test in that sub-level, then the learner will retake the test until the learner succeed as shown in figure 9. This provides reliability of the knowledge learned.

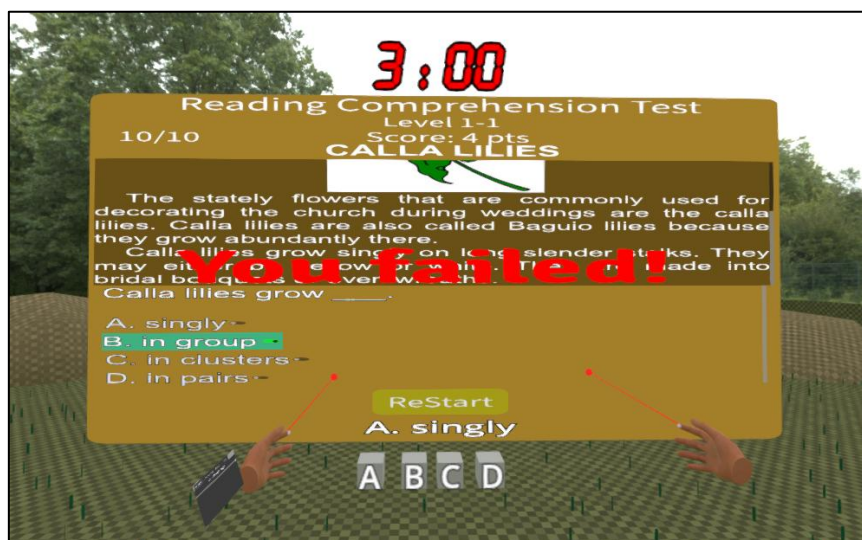


Figure 9 Failed test

3. Game appearance and multimedia

The game appearance is 3D nature-inspired virtual environment with background sounds for

nice calm and relaxing atmosphere as shown in figure 10. The annotations are A.I. natural-sounding speech. The compliments are expressed in 3D animation with sounds.



Figure 10 Game appearance and multimedia

The VR features are the following:

1. Immersion

The VR application provides the feeling of being “present” in the virtual environment. This is

achieved through a combination of a wide field of view, high-resolution displays, and spatial audio that changes as the user’s head moves as shown in figure 11.

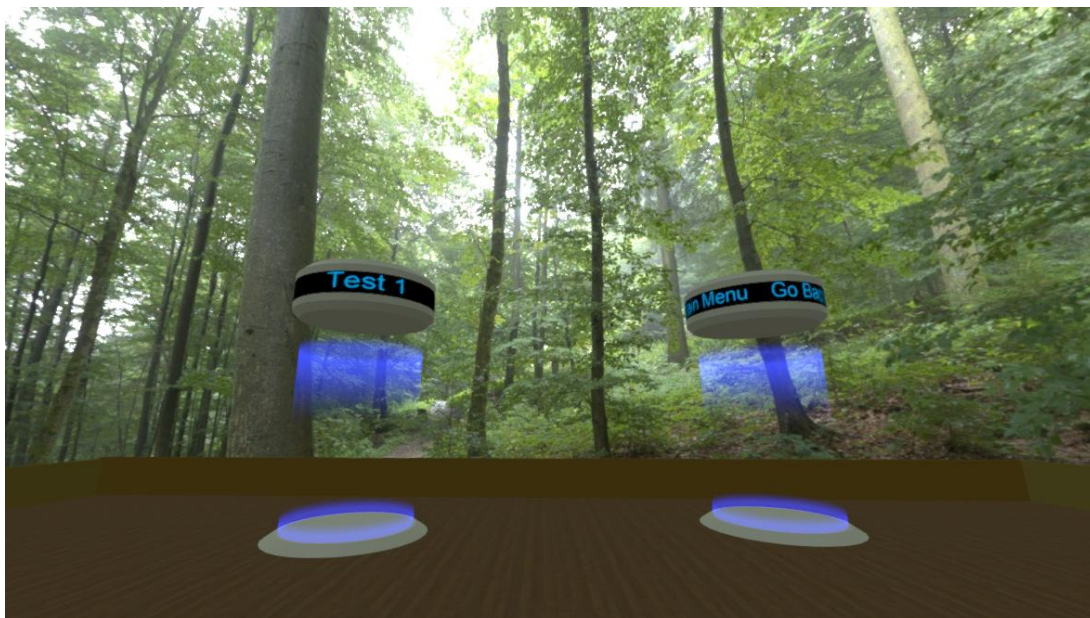


Figure 11 Immersion

2. Interactivity

The VR application has portals that transport the learner to another place in the virtual environment. It has both 3D and 2D objects to

interrelate between the learner and the VR application. In the virtual environment, the learner has 3D hands used to point and click objects and to touch for the attached UI on the left wrist as shown in figure 12.

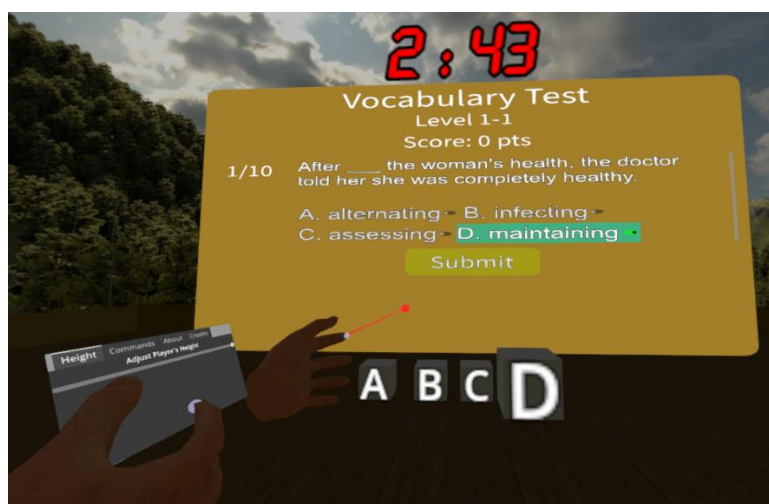


Figure 12 Interactivity

3. 3D Visuals

The virtual reality environment is rendered in 3D graphics with 360-degree views that provides deep, lifelike immersion, enhanced spatial understanding, and improved learner engagement. The VR application has augmented

reality feature. The learner has the option to switch between augmented reality and virtual reality. In augmented reality, the 3D objects are overlayed onto the real-world environment that enables immersive education as shown in figure 13.

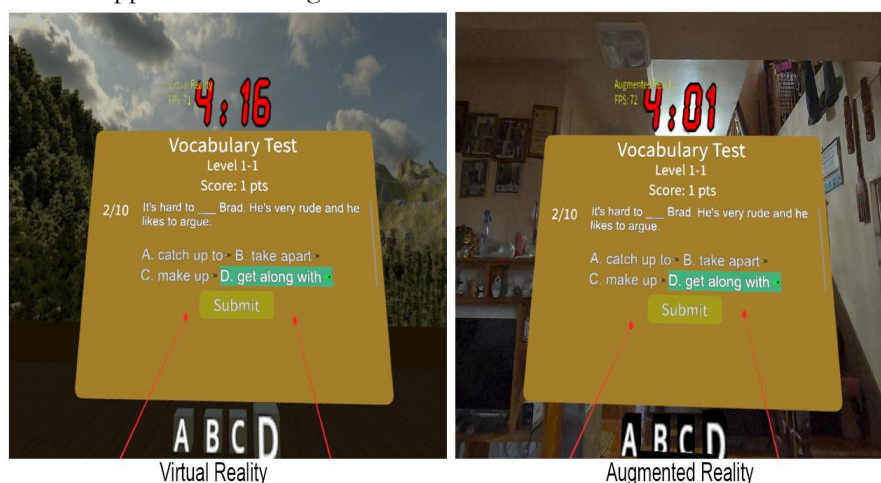


Figure 13 3D Visuals

4. Spatial Audio

The VR application has 3D spatial soundscapes that significantly enhances realism, improves situational awareness and reduces nausea by aligning auditory input with visual movement.

5. Motion Tracking

The VR headset translates the learner's physical movements into the virtual environment which allows for both rotation and movement in any direction. This will reduce motion sickness by

minimizing the disconnection between what the eyes see and what the inner ear feels.

6. Sensory Haptic Feedback

The VR controllers have haptic feedback. If the learner makes mistakes, then the VR controllers vibrate in which the learner feels the sensation of committing the wrong answer. This will increase immersion & realism and motivation for the learner to answer well.

Conceptual Framework

The learning outcome, learning materials, test modules and multimedia modalities are the ingredients for gamified English language learning. The learning outcome provides clear understanding of what learners are expected to know, do, or value upon completing a test. The learning materials are sources of knowledge to facilitates gamified learning, support learning outcomes, enhance learner engagement and make learning more effective. The test modules are structured, organized units of assessment designed to evaluate a learner's proficiency in spelling, vocabulary and reading comprehension. The test modules are used to measure the learning outcomes or knowledge assessment, diagnose gaps, monitor progress, and provide feedback to improve learning. The multimedia modalities such as visual and auditory are used to present information in learning. By combining spoken words, sound effects, animation, graphics and texts, the learner improves memory capacity and reduces cognitive load, enhancing comprehension. The gamified learning transforms traditional learning into interactive experiences, offering immediate feedback and encourage active participation.

The learning approach suited for gamification is the iterative and incremental practices. It is where new knowledge is progressively acquired over time and incorporating feedback into each successive iteration. The learner builds knowledge by learning one concept or module thoroughly before moving to the next. This

allows for a structured, cumulative buildup of knowledge. The learning approach involves repeating cycles of learning, applying and reviewing. The learner tackles an English skill, receives feedback (or experiences failure), and returns, to refine the learner's understanding, often starting with a rough overview and adding detail in later iterations. This approach promotes faster comprehension, allows for early identification of weak areas, and encourages active, hands-on learning rather than passive study.

The behaviorism learning theory complements the gamification of learning the English skills. It emphasizes shaping the learner's behavior through positive or negative reinforcement. Positive reinforcement thru rewards increases desired behavior while negative reinforcement thru penalty strengthens desired actions. The immersive learning theory is an educational approach that uses simulated or virtual environments like VR. It allows learners to feel as though they are actually in the virtual environment, increasing focus and reducing distractions. It boosts knowledge retention, active learning and immediate feedback allowing for rapid skill refinement. These narrative concepts aforementioned establish the structure, cohesive direction and guide as conceptual framework for the development of an immersive VR application in gamified English spelling, vocabulary and reading comprehension. as shown in figure 14.

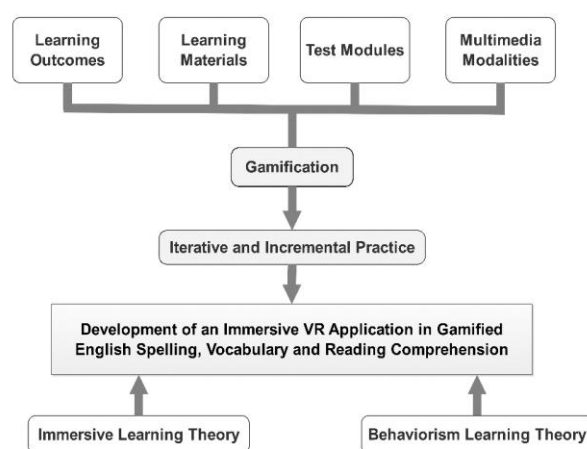


Figure 14 Conceptual Framework

IV. Conclusion

The design and gamification elements in a VR environment that support the development of English language skills consists of game mechanism, dynamics, aesthetics and VR features. The game mechanisms contain of points, badges, levels, challenges and leaderboard. The dynamics composes of rewards and achievements. The aesthetics comprise of fun, credibility & surprise and game appearance & multimedia. The VR features that provide immersive gamified learning are immersion, interactivity, 3D visuals, spatial audio, motion tracking, and sensory haptic feedback.

The learning outcome, learning materials, test modules and multimedia modalities are the parts

for gamified English language learning. The iterative and incremental practices which make the learner builds knowledge in incremental steps and go back to deepen or refine the understanding of each concept through practice and feedback. The behaviorism learning theory uses rewards or penalty to increase or decrease the likelihood of a behavior. The immersive learning theory emphasizes deep engagement by stimulating realistic environments for learning practice using VR technology. These connected concepts mentioned previously provide a structure, cohesive direction and guide as conceptual framework for the development of an immersive VR application in gamified English spelling, vocabulary and reading comprehension.

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Disclosure

Software Patronage: One of the outputs of this research is a VR application that gamifies English spelling, vocabulary and reading comprehension but it is an on-going software development. The Lacea's VR in English Skills software application, which is 56% in progress, is available to download and test and can be obtained at this URL: https://drive.google.com/file/d/1k5sDBMXyQZV5PnVe5TfQGYF_QM2viWle/view?usp=sharing. Also, you can watch the demo at this URL: <https://youtu.be/qcIOabffj-E>

Conflicts of Interest: None.