Interweaving Game-Based Learning and Competition-Based Learning Methodologies: The Letterush Case Study

Grant Woruka Ogurinka [1], Naomi Chimene-Wali[2]

Abstract— The incorporation of gaming into pedagogy has proven pivotal for bolstering knowledge transfer. A more potent dynamic emerges when the Game-Based Learning (GBL) methodology is interlaced with Competition-Based Learning (CBL). Given that GBL integrates course contents into games and CBL infuses competition into the learning process, their pairing creates a scenario where learning is fostered through competitive educational gaming. This study merges GBL and CBL through the design and development of ***LetteRush****, a mobile word game aimed at English language vocabulary building and spelling proficiency. This paper presents a content analysis of LetteRush, highlighting its conflation of GBL and CBL tenets. Adopting a qualitative, software development-centric research design, the study's findings corroborate the following: (1) vocabulary and spelling proficiency exercises can be strategically encoded into competitive educational gaming; (2) software-based educational aids like games can be developed locally and cost-effectively; and (3) educational gaming competitions present an innovative, co-curricular channel for reinforcing classroom lessons. Consequently, the study concludes that the integration of such gaming competitions into mainstream education is achievable, warranting concerted research efforts in this direction.*

Keywords: Game-based Learning; Competition-Based Learning; Pedagogy; Computer Assisted Language Learning.

[12]Department of English and Literary Studies, Rivers State University, Nigeria.

INTRODUCTION

All across the globe, societies are rapidly evolving due to drastic technological innovations. With this evolution comes an array of prospects and opportunities, and to academics, the attention ought to be on the prospects and opportunities that these changing times present to education. It goes without saying that for these prospects and opportunities to be adequately harnessed and adopted to enrich and augment education, there must be a drastic shift in thinking, strategy and approach.

Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum (WEF) used the term, the Fourth Industrial Revolution to encapsulate today's technology-driven reality. Describing this new age, the Schwab (2016) notes that we stand on the brink of a technological revolution that will extensively alter the way we live, work and relate to one another and in its scale, scope and complexity, the change will be unlike anything humankind has experienced before. Continuing, he further notes that we do not yet know just how this technological revolution will unfold, but one thing is clear: the response to it must be integrated and comprehensive; involving all stakeholders of the global polity, from the public and private sectors to the academia and civil society. For this study, the emphasis is on the role of the academia in the response to the evolutions of this fourth industrial revolution.

Granted, no one can say for certain exactly how technology will reshape our very existence in this fourth industrial revolution, but one area is apparent; mobile technology will be fundamental to the pervasion of technology in this emerging actuality, given how broadly it has grown to take the center stage in computing. According to statcounter.com, as of December 2025, an analysis of the global mobile vs desktop market share shows a dominance of mobile with a 54.23.79% market share as against desktop's 45.77%. And indeed, it will not be an overstatement to assert that smart phones are the "closest companion" of the digital native youngsters (the current school-age population) as it is centric to virtually all their daily routines.

Back in Nigeria, the mobile-desktop market share disparity is even steeper. Staying with startcounter.com, as of December 2025, data from the site shows that mobile holds a staggering 71.44% of the computing market share while desktop retains 28.56% market share in Nigeria. Buttressing this point, a 2023 report by Alliance for Affordable Internet estimates that, at the time, about 44% of the Nigerian population uses smart phones. This puts the total number of smart phones in the country at over 80 million, an appreciable growth from the 25 to 40 million recorded few years prior.

The explosion in the usage of smart mobile devices in Nigeria has in-turn orchestrated an increase in mobile and online gaming locally. Statista.com estimates that the mobile gaming market in Nigeria is currently worth approximately 126 million US Dollars. Summarizing the state of the Nigerian mobile gaming market in 2022, The Guardian Nigeria notes: the mobile gaming industry in Nigeria is thriving as is the case

in most parts of the world. Players choose mobile games for a number of reasons, besides the well-known ones like relieving stress, passing the time, and feeling accomplished for completing something challenging. The newspaper goes on to note, unsurprisingly, mobile gaming is expected to top TV/PC gaming in terms of daily screen time, with gamers spending an average of 6.5 hours a week on gaming apps and 78% of mobile game players playing different mobile games every day.

Ironically, despite this surge in mobile penetration and mobile gaming in Nigeria, considerable energy has rarely been expended in the direction of reinforcing learning through game-based learning and educational gaming competitions locally. Here is why this dearth of adoption of gaming in bolstering education is of particular concern: there is a significant prevalence of betting and online gambling and gaming platforms in Nigeria, today. These platforms are beginning to constitute an addiction problem for a number of school-age individuals, distracting their attention from educational activities. With little being done to counterbalance this ugly trend with healthy educational options, we stand on precarious grounds. Given the severity of the situation, this study was undertaken to design a game-based learning and competition-based learning tool that could be adopted to shore up traditional classroom activities.

This study, through its design and development of LetteRush, fuses the tenets of the game-based learning and competition-based learning methodologies, with the specific aim of bolstering vocabulary building and spelling proficiency. The remainder of the paper undertakes a conceptual review of key concepts relevant to the study and proceeds to content analyze LetteRush, the study's GBL and CBL design.

GAME-BASED LEARNING

Zirawaga, Olusanya and Maduku (2017) define a game as a type of play where participants follow defined rules. In other words, a game can be construed as structured play where those engaging in one, do so in a relaxed manner but within the confines of predetermined rules. Highlighting the specifics of a game, McGonigal (2011), asserts that four elements are often inherent in any game, regardless of genre or platform and these elements are: a goal, rules, a feedback system, and voluntary participation. He goes on to note that a goal is the thing which players attempt to accomplish; rules provide arbitrary restrictions on how players accomplish the goal of the game; a feedback system lets the players know the result of their in-game actions and shows progress towards the goal; voluntary participation means that all players know and accept the goals, rules, and feedback system and engage in the game willingly. In McGonigal's view, anything containing these four elements in some proportion could be adjudged a game, and this view does fine job encapsulating what a game entails.

Placing the above highlighted gaming elements presented by McGonigal side-by-side a typical classroom scenario, it becomes evident that the characteristics of a game

bear striking semblance to the attributes of the classroom. Every classroom activity is geared towards a goal; there are rules to guide conducts during lessons; students can ask questions and get responses from an instructor, and to a large extent, participation in a lesson is voluntary, given that enrolment in a class is often by volition. This reinforces the idea that gaming can be easily tweaked for educational purposes.

Actually, the idea of utilizing games and gaming activities for learning is not outlandish. Houghton et al. (2013) call games utilized for this purpose educational games, and they go on to discuss that games can be used as a support tool to complement traditional teaching methods and improve the learning experience, while also teaching other skills such as adherence to rules, adaptation, problem solving, interaction, critical thinking, creativity, teamwork, and good sportsmanship. They believe that learning should not feel dull and be reliant on rote memorization where students learn and grasp concepts through repetition or cramming. In their view, teachers can and should take advantage of the possibilities inherent in gaming by adapting gaming technology to learning to improve students' academic performance.

Interestingly, despite the disapproving attitude that had been perpetuated toward gaming in the past, games hold a lot of educational benefits. As Granic, Lobel and Engels (2014) put it, one of the fundamental advantages of adopting games for learning purposes is that gaming enhances cognitive skills as opposed to the traditionally held belief that playing games makes learners lazy. Supporting, Cruz et al. (2015) note that, particularly, playing electronic games optimizes skills such as wide attention allocation, spatial resolution in visual processing and high mental rotation abilities. The afore-stated views echo that of Rebetez and Betrancourt (2007) who hold the opinion that games influence the cognitive and psychological perspective of learners. Put differently, games help learners to nurture positive perception and visual attention as well as help them develop "aggressive" mental capabilities.

Turning to the notion of game-based learning, Kirriemuir and McFarlane (2004) define GBL as those "activities that have a game at their core, either as the main activity or as a stimulus for other related activities, and have learning as a desired or incidental outcome" (p. 7). Game-based learning is a process where learners use actual games, not gaming elements as in gamification for their learning process both inside and outside the classroom. Through game-based learning, learners or game players can set a certain learning objective and find out whether the outcome of the gameplay is beneficial to the game player or not. It also encourages game players and learners to use their problem-solving and independent thinking skills. Game-based learning can create new learning input during gameplay, and the player/learner can use and apply such background information to other learning activities besides gaming (Designing Digitally, 2017).

The game-based learning methodology has evolved in recent times to incorporate the notion of digital game-based learning, the specific module of the methodology that

is of concern to this study. It is noted that digital game-based learning is a pedagogical practice that was more recently derived from a broader term, game-based learning which involves the indistinctive use of both digital and non-digital resources (Deterding, Khaled, Nacke, & Dixon, 2011). Consequently, introducing a well-defined distinction between game-based learning and digital game-based learning has become necessary in order to specify when technological resources are used exclusively. In this sense, game-based learning could be considered the hypernym of digital game-based learning. The broadest difference between game-based learning and digital game-based learning is the fact that digital game-based learning only concerns the use of electronic games for learning objectives, while the electronic element is missing in game-based learning. In both cases, these approaches imply that the use of games can be implemented in non-playful or serious environments (Aguiar-Castillo, Rufo-Torres, De Saa-Pérez, and Pérez-Jimenez, 2018).

From a broad pedagogical perspective, Prensky (2001) classifies digital game-based learning as an approach which basically looks at the completion of tasks and role-playing simulations through electronic games. For digital game-based learning to have been considered an approach, it means it conforms to a series of learning theories. About this learning theories, Margarida, Veloso, Papastergiou and Kordaki (2010) note that three main paradigms are linked to digital game-based learning: behaviorism, cognitivism and constructivism. About the first paradigm, Casañ-Pitarch (2018) avers that digital game-based learning provides students with stimulus and positive or negative reinforcement; thus, the learning process happens when there is a change of reaction between them. On the second, he notes that "this approach also requires the students' active participation in order to learn, this involves both memorization and problem solving" (p. 1151). He then discusses the third paradigm by stressing the fact that digital game-based learning has to do with learning by doing, which suggests constructing and interpreting knowledge and applying it in the virtual world according to the learner's own knowledge and experience.

COMPETITION-BASED LEARNING

Competition-based learning (CBL) has been described as an emergent innovative pedagogical methodology that is generating interest among scholars. According to Johnson et al. (1985) in Nor et al. (2022), CBL is a methodology where learning is achieved through a competition, but the learning result is independent of the student's score in such competition. In constructing their CBL model, Issa, Hussain and Al-Bahadili (2014) note that CBL integrates two well-known learning models, namely Project-Based Learning (PBL) and Competitions.

With project-based learning and competitions noted as the chief anchors of competition-based learning, a brief description of these models is rife. About project-

based learning, Burguillo (2010) notes; it is a model that fosters learning by providing complex tasks or projects based on challenging questions or problems that involve the students' problem solving, decision making, investigative skills, and reflection that also are supported also by a tutor that provides facilitation. He adds, the classroom projects are intended to bring a deep learning in issues related with their education. On the aspect of competitions, Chung (2008) writes that one of the best ways to let students be actively involved in class would be to introduce classroom competitions. Adding, he avers that classroom competitions have been motivating and promoting students to work harder. Usually, when the competition problem is assigned to the students, students are asking more questions than regular home works; increased number of questions was asked to the instructor, and even students try to learn beyond the normal classroom curriculum in order to win the competition.

Going back to Issa, Hussain and Al-Bahadili (2014), they go on to note that when combined with PBL, competitions often enhance the learning experience for learners, improve learning satisfaction, and give learners a flavour of real-life business competitions. They Further note, the intended learning outcomes of any given course and the objectives of the learning process can be successfully satisfied through the application of the CBL model. To formalize their CBL model, they synopsize their conceptualization of the notion thus: CBL is a constructivist approach to learning in which competition is used as stimulus for the maximization of the intended learning outcomes specified in a given course or curriculum, while team members participate in a project under controlled environment. Adding, they note that a sound CBL model should comprise the following components: a) course outline based on a specific curriculum; b) a clear set of intended learning objectives that must be derived from the course syllabus and aligned with the overall intended learning objectives for the curriculum; c) project requirements and specification; d) a set of well-defined competition rules; e) a set of external incentives or a reward system; f) a socially networked environment (competition environment); g) evaluation committees or judges, and h) assessment method for intended learning outcomes.

THE LETTERUSH CASE STUDY

This section of the study undertakes a detained explication of the fusion of the Game-Based Learning and Competition-Based Learning methodologies as embodied by the LetteRush case study. A step-by-step breakdown of the intricacies of the game and its gameplay will be carried out, and a highlight of elements of Game-Based Learning and Competition-Based Learning in the LetteRush gaming experience will be undertaken alongside.

An installable LetteRush Android Packet Kit (APK) file is available for download and installation via the link below: https://drive.google.com/file/d/1n5GY2VKjzaXeXwFu--dW18nT4P5dV5_E/view?usp=drive_link

Explicating the LetteRush Gameplay

LetteRush is a hyper casual English language word game that reinforces vocabulary building and spelling proficiency. The game was designed by this study to depict how GBL and CBL can be adopted reinforce vocabulary building and spelling proficiency.

The LetteRush gameplay was designed around a philosophy that requires a deployment of the tripartite notion of Technicality, Technique and Tactic. The LetteRush Technicality is all about understanding the mechanics of the game and its scoring system, and having a grip on the workings of the entirety of the gameplay. Technique is concerned with the player's cognitive and abilities: the sheer size of a player's vocabulary, his or her reflexes, spelling expertise which includes quickness in piecing randomized letters together to spell words, etc. Tactic zeroes in strategy. The player needs to be strategic in manipulating the game's functionalities to his or her advantage.

Analytics and cloud storage were integrated into the game's architecture to track the activities of players. No matter how delicately humans try to monitor performance, we cannot beat computer programming. This why automated analysis of activities on the game is a pivotal functionality. The fine details of a player's gameplay are tracked, providing insights on the player's performance in the game. The data gathered can be used to make informed decision on bettering the player's spelling and vocabulary. Also, every detail of a player's activity on the game is safely stored on a cloud storage system. This ensures that no player loses data or progress made in the game. It is pertinent to note that if an individual desires that his/her her data be expunged, provisions are place to request data deletion.

Having undertaken an overview of the game, let us delve into a pictorial page-by-page description of LetteRush.

LetteRush Signup and Onboarding

Upon downloading the LetteRush gaming application, the player is expected to sign up. This signup requires the provision of an email address and a username. These details provide a unique identity for the player, and enables accurate storage of player data on the cloud storage system of the gaming platform.

After signing up, the player is given the option to take a tutorial that onboards him/her. The tutorial walks the player through the intricacies of the LetteRush gameplay, explaining the gameplay features and taking the player through a 20-second

trial match. This functionality is of strategic importance, as it gets the player properly integrated into the LetteRush gaming experience.

Below are pictorial depictions of the LetteRush signup and onboarding pages.

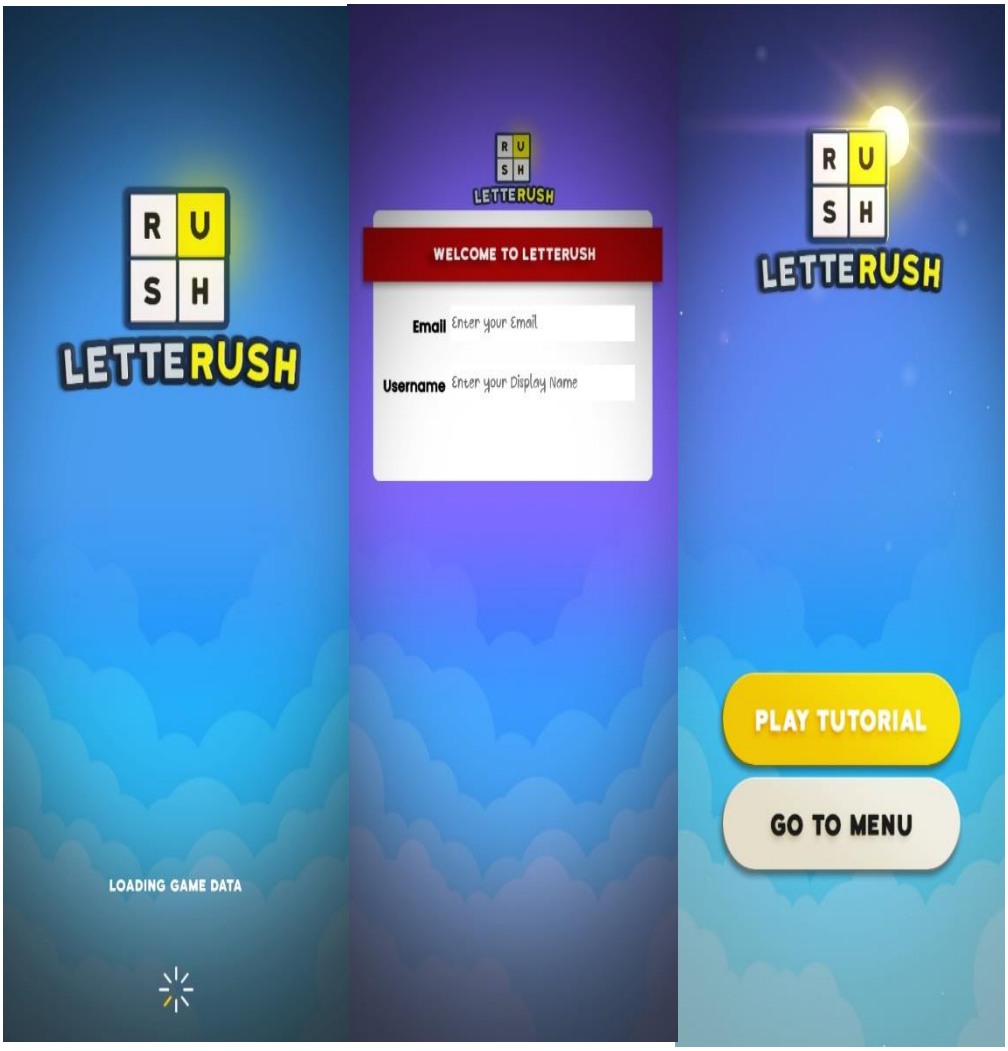

Fig. 5.1

Screenshots of LetteRush Load Screen, Signup and Tutorial Option Pages

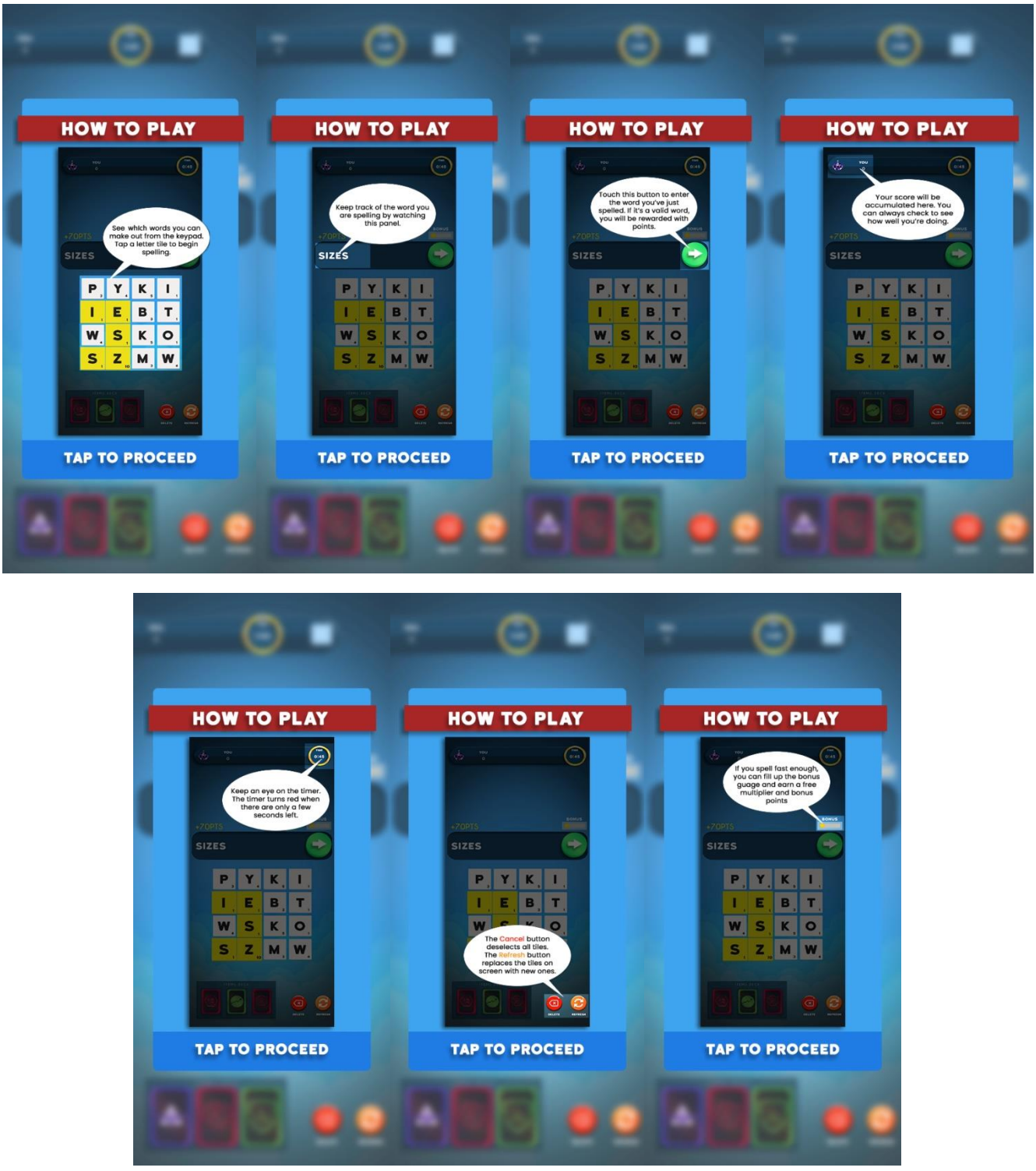

Fig. 5.2
Screenshots of LetteRush Tutorial Pages

The LetteRush Gameplay

The LetteRush gameplay is summarized thus: at every given time, a player is presented with a set of sixteen randomized English alphabet letter tiles, and said player is expected to piece the tiles together to spell words. After spelling a word correctly, the letter tiles used in spelling that word are replaced with tiles bearing new letters. Also, each letter tile in the game has a score attached to it and upon spelling a word, the scores on the tiles used in spelling that word are summed up to make up the player's score for that word.

The game has three modes: Infinite, Blitz and Versus. In the Infinite Mode, the player is given an initial time of 60 seconds but each correctly spelt word adds a few seconds to the player's time. This way, the player can stay on the game as long as she/he has the ability to spell words from the letter tiles provided by the game's algorithm. The Blitz Mode has a fixed time of two minutes. Here, the player's ability to spell as many words, he/she can within the two-minute timeframe is tested. For the Versus Mode, the player is matched against an opponent and they are given a fixed time of two minutes to duel; whoever racks up the higher score at the end of the match wins. At the end of each gameplay, a summary of a player's gameplay statistics is presented to the player in a table.

A pictorial encapsulation of the various LetteRush modes, their gameplay interfaces, and their gameplay statistics summary pages are presented in the next two page.

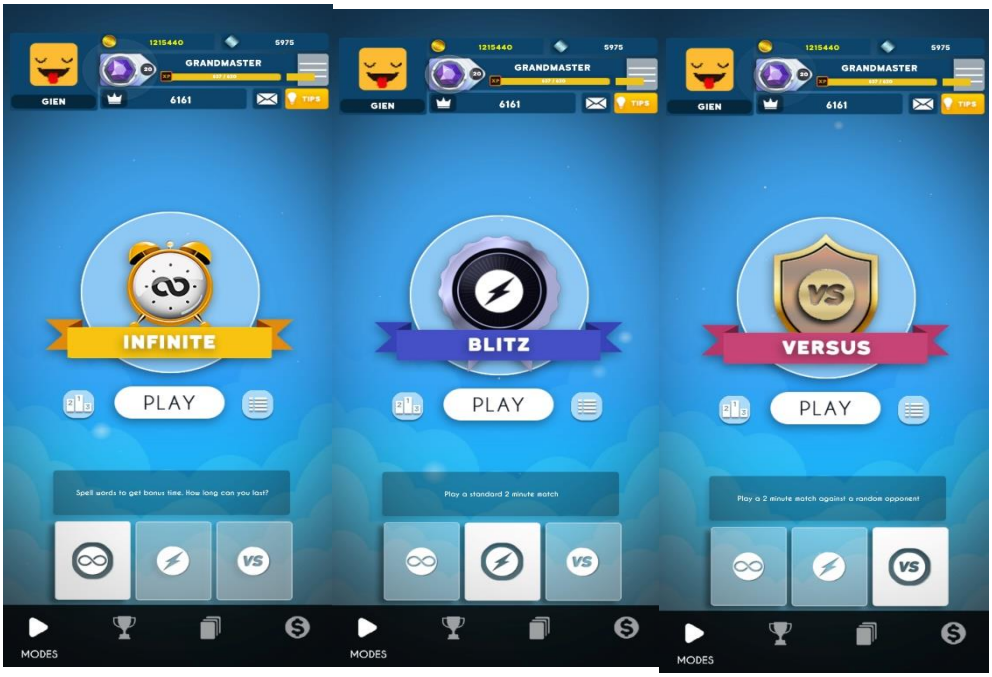

Fig. 5.3

Screenshots of the LetteRush Menu Page with the three Game Modes on Display

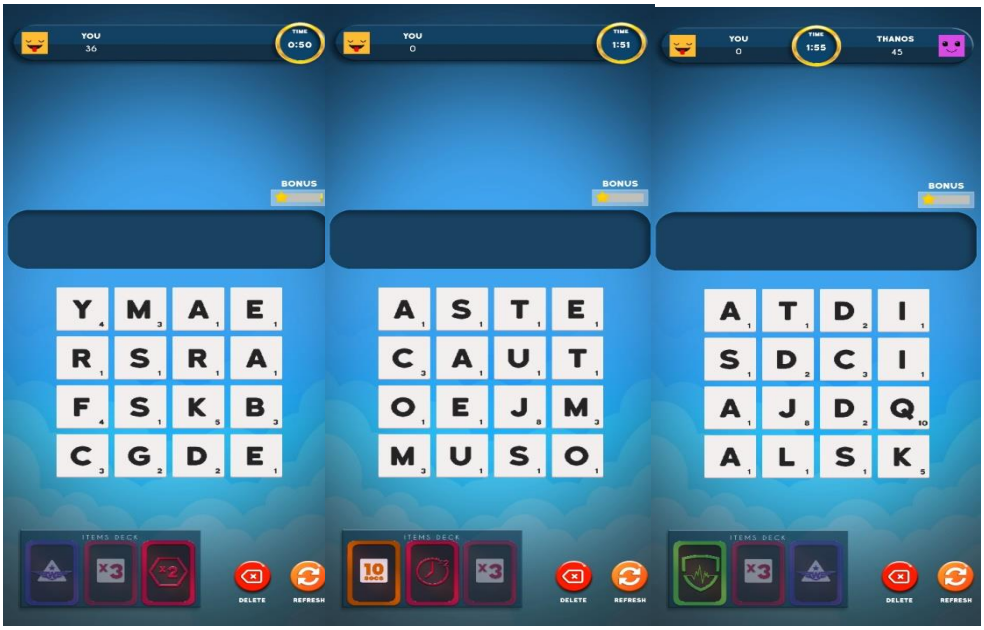

Fig. 5.4 Screenshots of LetteRush Gameplay Pages across different modes

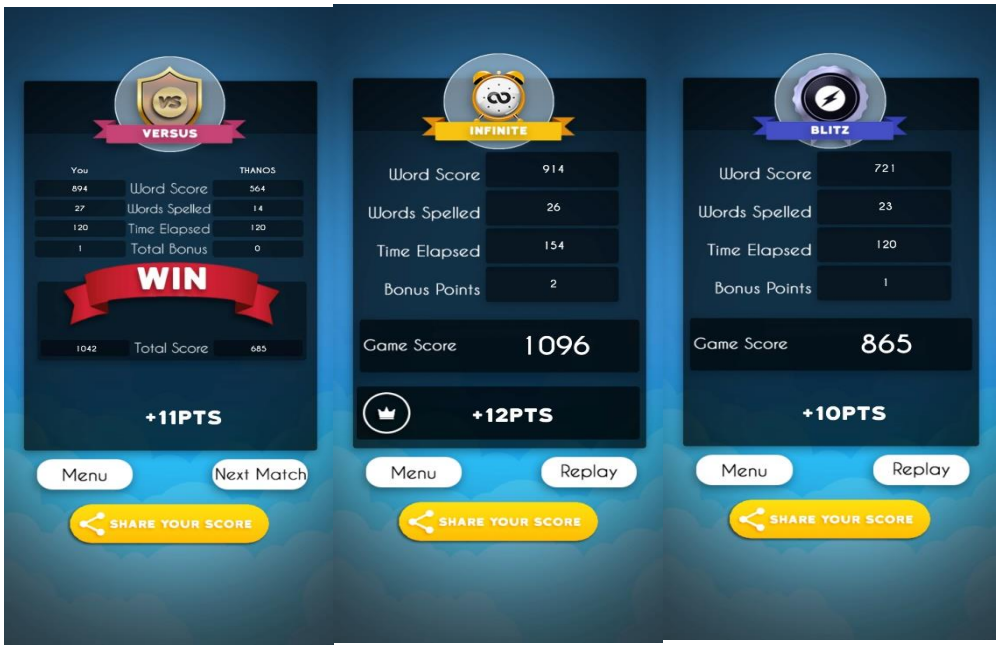

Fig. 5.5
Screenshots of the LetteRush Game Summary Pages acrossModes

Expatiating the LetteRush Competition Component

LetteRush was designed purposively to adopt competition-based learning in the reinforcement of vocabulary development and spelling proficiency. Woven into the game's architecture are such competition functionalities as the LetteRush Weekly Contest and the LetteRush Super Cup.

The Weekly Contest recognizes the top LetteRush players each week. This is achieved through an aggregation of players' scores across the three LetteRush modes every week and players with the top aggregate scores are noted.

The LetteRush Super Cup is designed as a seasonal competition that gives players the opportunity to play against themselves in the Versus Mode of the game. Each player is restricted to play 100 matches. At the end of the season, top scorers are also recognized.

To track players' scores, the game employs a leaderboard system, built on the Microsoft cloud gaming administrator, PlayFab. Every LetteRush player, upon signup, is automatically placed on all leaderboards, and their scores are tracked and saved accordingly. As a player plays and accumulates scores, he/she moves up on the leaderboard and his/her position is distinctly specified. This system automates the ranking of players, and provides a reliable and hitch-free method of determining player standings in the competition-based learning component of the game.

The following screenshots from the game highlight the different competition-based learning elements of LetteRush. Shown below are the Super Cup segment of the game and the generality of the player score tracking and player ranking systems through the game's leaderboard.

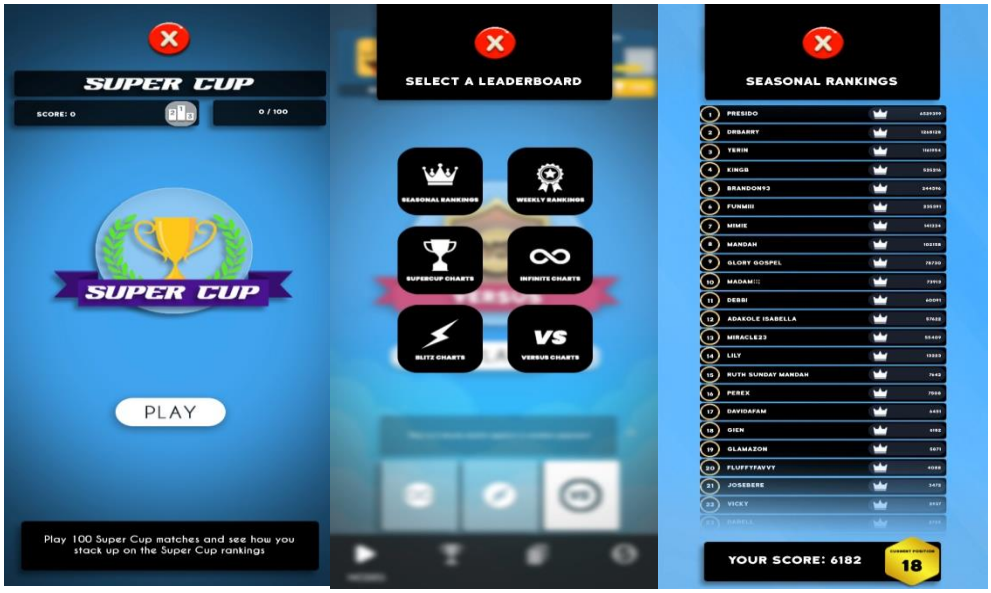

Fig. 5.6 - Screenshots of the LetteRush Super Cup Page, Leaderboard Page and Score Tracking and Player Ranking Page

Beyond its core competition functionalities, LetteRush incorporates other subtle functionalities that engender competition. To elaborate, every game played, in addition to the score earned, awards the player Spin Tokens that give the player access to the Lucky Spin Wheel where the player can win Gold Coins. Gold Coins can be used to purchase some in-game advantages. In addition to the Spin Tokens are Weekly Rewards. These are in-game rewards that accrue to players when they achieve certain weekly milestones. Additionally, the game gives display badges to players based on the experience points (XPs) they earn from their gameplay. XPs are earned depending on the overall experience of the player on the game. As a player's XP grows, the player unlocks higher display badges in the game. The display badges range from Beginner I to Grandmaster.

These extra competition-based functionalities are highlighted in the screenshots below.

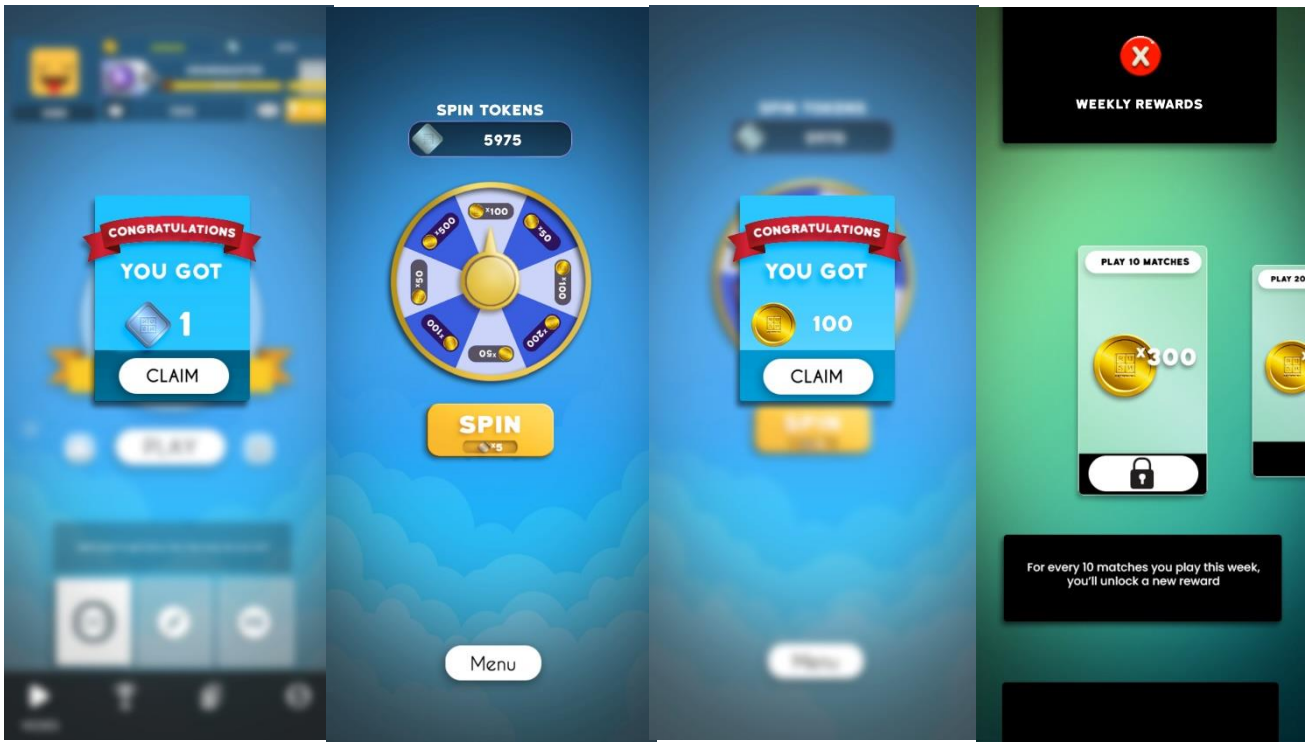

Fig. 5.7
Screenshots of the LetteRush Spin Token Claim Page, Lucky Spin Wheel Page, and Weekly Milestone Rewards Page

Although the perception of and attitude towards LetteRush by students is beyond the scope of this paper, it is imperative to note that the interlacing of GBL and CBL as undertaken by LetteRush was well-received. Between September 22, 2023 and December 31, 2023, when the game was beta-tested via a mini virtual educational competition in the Department of English and Literary Studies of the Rivers State University, the response to the game was overwhelmingly positive, with the game receiving over 1000 downloads. Within this period, a weekly virtual gaming competition was instituted, and as students of the Department played the game, the scores they amassed from their gameplay sessions were aggregated and stored on the in-game leaderboard. At the end of each week, the top three players were recognized and incentivized.

CONCLUSION

This study was undertaken with the aim to merge the GBL and CBL methodologies through the design and development of the English language mobile word game, LetteRush, with intent to bolster vocabulary building spelling proficiency. Having carried out an in-depth overview of the entirety of the LetteRush game, this paper will conclude by pinpointing the GBL and CBL specifics of the undertaking, then, move on to sum up.

From the discourse on the explication of LetteRush, it is evident that the game presents exercises that test the vastness of a player's vocabulary and his/her spelling proficiency. This underlines the game-based learning component of LetteRush. As a player engages in the gameplay, the experience tasks the player in two key respects: firstly, it prompts the individual to dig into his/her lexical repository to deploy lexical items that the letter tiles provided can be used to spell; secondly, the player's ability to accurately spell the words that come to mind is tested. All the mental processes required to achieve these tasks have to be perfected within a limited timeframe, an attribute of the game that helps to sharpen cognition.

LetteRush may not actually teach the player how to build his/her personal lexicon or how to improve on the ability to spell, but it provides an avenue via which vocabulary size and spelling expertise can be tested. It employs the game-based learning methodology, specifically, for the reinforcement of learning through the exercises it presents.

On the CBL component of LetteRush, it will suffice to measure the conformity of the game to the CBL tenets put forward by Issa, Hussain and Al-Bahadili (2014).

Although LetteRush does not distinctly conform to all eight CBL tenets postulated by Issa, Hussain and Al-Bahadili, it roughly incorporates all of them. Let us highlight:

a. LetteRush contains a clear set of intended learning objectives, derived from the course syllabus on the reinforcement of vocabulary building and spelling proficiency and these

align with the overall intended learning objectives of the curriculum on vocabulary building and spelling.

b. LetteRush clearly specifies the project requirements and specification, as enshrined in its gameplay.
c. LetteRush has a set of well-defined competition rules. These are encoded into the game's algorithm and are inviolable. For instance, wrongly spelled words are invalid, timeframe of every gaming session is strictly enforced by the game's code, ranking of players is dependent on scores earned from gameplay, etc.
d. As noted, previously, in the beta test carried out in the Department of English and Literary Studies of the Rivers State University, rewards were given out to top scorers throughout the duration of the LetteRush Weekly Contests. This conforms to the CBL component of provision of a set of external incentives or a reward system.
e. On the tenet of CBL being conducted in a socially networked environment (competition environment). The LetteRush Weekly Contests noted in item (d) above were carried out in a university environment.
f. LetteRush employs a software-based evaluation system that is made possible by analytics software. This conforms to the CBL tenet of having evaluation committees or judges.
g. Although outside the scope of this paper, the analysis of LetteRush backend data provides an assessment method for intended learning outcomes, as stipulated by the eighth CBL tenet.

Through its design and development of LetteRush, the study successfully conflated the Game-Based Learning and Competition-Based Learning methodologies. In achieving this aim, the study reinforces the notions that: exercises that test the broadness of an individual's vocabulary and their spelling proficiency can be strategically encoded in competitive educational gaming; the design and development of software-based learning aids such as educational games can be achieved locally and within a budget, and educational gaming competitions present an innovative channel via which actual classroom lessons can be reinforced in a co-curricular manner. Consequent upon these findings, the study concludes that, giving the success of the undertaking of merging the GBL and CBL methodologies to bolster learning through exercises, the integration of educational gaming competitions into the mainstream educational experience is achievable and concerted research efforts should be exerted in this direction.

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