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# **GAMIFIED PEDAGOGY: EXAMINING HOW A PHONETICS APP COUPLED WITH EFFECTIVE PEDAGOGY CAN SUPPORT LEARNING**

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## **Abstract**

Research has demonstrated that educational game-based apps may provide an approach to instruction in education that allows for greater learning outcomes. The focal context of this paper centres around the discussion of how gamified pedagogy supports learning. The first part of this paper will delve into the components of gaming, including the application of gamification to education and the methods by which digital game-based components such as scores and rewards are used to engage and motivate learners. The second part will focus on existing research on gaming pedagogy and the gaming elements of a phonetics app developed by the Resource Centre for Ubiquitous Learning and Integrated Pedagogy (ULIP) at Hong Kong Baptist University. The gamified pedagogical element of the app is designed to offer levels of challenge that motivate the players by making learning more exciting and rewarding. The game-based elements of the app promote active student involvement in learning, as the games are specifically designed to provide challenges and goals for players. Moreover, the need to capture and maintain the players' attention through visual experiences and audio designs is also an important element in the design of the app. When learners are engaged in a game-based app of this nature, they are not only reinforcing their cognitive skills, but they are also constantly drawing connections between images, text and sounds, thereby allowing students to learn and practise basic skills in order to master complex tasks.

## **1 Introduction**

Research has shown that technology-based games and simulations are conducive to learning (Erhel & Jamet, 2013; Kiili, 2005; Rosario & Widmeyer, 2009). The appeal and motivational pull of gaming among learners has led to the increasing use and successful application of next generation digital game-based learning environments. Many learners are interested in gaming, so it is important and relevant for educators and instructional designers to understand the key elements of digital game-based applications from a pedagogical perspective (Hsu & Wang, 2010). Given the recent advancements in technology, the unpredictable nature of technological change and the increasingly ubiquitous nature of mobile computing devices (for

example, smartphones and tablet computers), these learners are likely to be concurrently fluent and flexible technology users, who expect teaching styles and content delivery to meet their learning needs and adapt to changes in their environment (Chang et al., 2009). Game elements are defined as “a set of building blocks or features shared by games” (Deterding et al., 2011). Prior studies have made important contributions to gaming literature in developing methodologies for designing games that solicit or retain the players’ engagement, while also achieving some explicit learning objective (Mitgutsch & Alvarado, 2012; Von Ahn & Dabbish, 2008). Amory, Naicker, Vincent and Adams (1999) assessed different digital game-based elements to engage learners such as logic, memory, visualisation and problem solving. Based on the results of their study, they proposed a model for the development of educational adventure games that linked pedagogy with game-based elements and a variety of tasks to reinforce problem solving skills and mastery of concepts. A review of research in gamification has illustrated the importance of using game mechanics for improving motivation and achievement (Deterding, 2012; Kapp, 2012). Hence, games that are pedagogically driven potentially present learning opportunities, using strategies that allow for technology enabled contextualised learning. Additionally, digital game-based learning may offer learners a credible means of practising and applying skills that they have acquired, in addition to visually presenting content in a manner that positively influences their learning (Van Eck, 2006).

Gamification, the inclusion of digital game-based elements in non-game contexts, has proven effective in supporting learning with a significant impact on motivation and on levels of interaction (Deterding, 2012; Kapp, 2012). The concept behind using gamification from a pedagogical standpoint, is that it piques the learners’ interest, keeps them engaged and enhances their learning environment (Deterding, 2012). Prior studies have explained that technology-based games are particularly relevant in learning contexts, when they exhibit the elements of intrinsic motivation (Garris et al., 2002; Malone, 1981; Shroff et al., 2007) and flow (Hamari et al., 2016), which are inherent in game-play and significant to learning and for learner engagement (Klopfer et al., 2012; Squire & Jenkins, 2003). Furthermore, active engagement has been recognised as a key factor in learning and this active engagement is also the core design goal of gamification. When a learner is engaged and is able to stimulate enjoyment and interest in a task, the learner is more likely to persist at that task. Moreover, prior research has indicated that gamified experiences help support deeper learning, problem solving and critical thinking (Kapp, 2012).

The purpose of this paper is to examine how key elements of a gamified phonetics app coupled with effective pedagogy support learning, thereby allowing for greater learning outcomes. Identifying these key elements and understanding how they motivate learners will help educators improve pedagogical strategies and correspondingly, help learners learn through activities that interest and engage them. Past studies have demonstrated that digital game-based activities which focus on educational content serve as effective instructional tools. Hence, the goal of this paper is not only to augment the ways we talk about “gamification”, but also to extend the reach of that conversation toward the more obscure category of “gamified pedagogy”. Gamification, when coupled with well-designed pedagogy, may provide learners an engaging and effective way to learn introductory phonetics. In summary, games support learning by using play to promote engagement, interest, and enjoyment. This may be particularly useful in teaching introductory phonetics to students with limited exposure or no previous experience in phonetics.

## **2 Digital game-based learning**

The affordances of digital games to transform teaching, learning, and assessment have catalysed recent developments in the area of game-based learning (Mitgutsch & Alvarado, 2012). Early research on computer game-based learning focused on exploring what, why, and how elements of computer games are adopted to make the process of learning more motivating and stimulating (Malone, 1981). The basis of those studies was the ability of computer games to support learners in working towards their goals, making decisions, and experiencing the consequences of those decisions with appropriate judgment in a learning environment. Based on the evidence of a number of prior as well as more recent empirical studies (Devlin-Scherer & Sardone, 2013; Garris et al., 2002; Lepper et al., 1997), learners typically perceive that through learning in the form of a game, the process of learning becomes more interesting. Moreover, extensive empirical literature effectively expounds that game-play is beneficial for learning, both motivationally and cognitively (Chen & Law, 2015; Erhel & Jamet, 2013; Garris et al., 2002; Gee, 2008; Hamari et al., 2016; Schwabe & Göth, 2005).

Games have the potential to engage learners with varying learning styles, together with promoting interest in a topic in which it may be difficult to find any interest (Watson et al., 2011), to facilitate active participation, and finally, provide students attainable yet challenging goals (Callaghan et al., 2013). However, learning in games is often implicit and learners require some degree of support in connecting game experiences with the formal knowledge that they are expected to master in a course (Barzilai & Blau, 2014). Game-based learning facilitates learning through the use of games and/or simulations. Games are a series of interactions that follow a predictable pattern, and more importantly, provide challenges and goals to players, which keep them actively engaged and motivated (Callaghan et al., 2013; Kapp, 2012).

In brief, digital game-based learning elements are designed not only to provide entertainment, but they also possess the principal objective of enabling and supporting learning using interactive and multimodal technologies (Cohen, 2011). Digital games present “challenges to players that require them to think, to strategise, to solve problems, and to acquire a range of cognitive skills” (Gee, 2008. p. 20). Moreover, these games are educational applications that afford players a large degree of repetitious practice, thus enabling them to learn how to play, while concomitantly accessing the embedded contents through rote learning.

## **3 Gamification**

Until now, limited academic attention has been centred upon what is defined as the concept of “gamification”. Gamification is a purposely-broad term, which includes the process of using gaming elements to engage users in non-game contexts, in an effort to improve learning and user-engagement (Deterding, 2012; Nicholson, 2012). Hence, any task, process, activity, context or application can theoretically be gamified. Although extensive current examples of “gamification” are digital, the term should not be limited to digital technologies. As a consequence of the need to narrow down the scope of this paper to a manageable level, we have chosen to focus only on digital game-based learning, defined in the context of academia. A review of research on gamification has emphasised the significance of using game

mechanics for improving achievement, motivation and engagement (Deterding, 2012; Kapp, 2012). Games potentially present learning opportunities, using strategies that allow contextualised learning. Moreover, games offer a means by which players are able to practise, reinforce and apply what they have learned in the game experience to the real world (Van Eck, 2006).

However, gamification is not about creating games at all, but is about incentivising the right behaviour and aligning it with learning outcomes by using gaming attributes, where learners are engaged in both a rich and challenging learning environment (Arnold, 2014). Unlike most institutional learning systems, “games associate learning with fun and allow for trial and error (basically the freedom to make mistakes)” (Cohen, 2011, p.17). This low-risk failure transforms learning from a short-term to a long-term goal, in which mastery learning is the end goal, not points or scores. By taking on a gamified mindset, learning returns to its original form, thus allowing students to learn through trial and error, engagement, and interaction with content (Liu et al., 2011).

Karl Kapp (2012) defined gamification as “a careful and considered application of game thinking to solving problems and encouraging learning using all the elements of games that are appropriate” (p.12). Game elements are represented by the rules and competition towards a goal (Deterding et al., 2011, para. 6). These elements are also contingent on the players and the desired end goal. Kapp (2012) proposed that the key components of a well-designed game should include abstractions of concepts in which the game-based environment offers a representation of reality, whether hypothetical, imaginary, or fictitious. According to Jonassen (1994), “purposeful knowledge construction may be facilitated by learning environments which provide multiple representations of reality” (p. 6) and, hence, game-based learning may be able to simulate various representations of reality for solving complex problems. All games must have goals to add purpose and focus to the study process, together with measurable outcomes and rules that essentially define the game. These goals are defined as operational (i.e., how the game is played), foundational (i.e., underlying formal structures), implicit/behavioural (i.e., defining the social contacts between players) and instructional (i.e., what the learner is required to know and internalise after interacting with the game). Previous studies have identified the following four key dynamics of gamification that have been affirmed as successful in learning applications: 1) the freedom to fail, 2) rapid feedback, 3) player progression, and; 4) player-defined goals. Moreover, Arnold (2014), Deterding (2012) and Nicholson (2012) distinguish between two types of gamification that support these four dynamics: structural gamification and content gamification.

### ***3.1 Structural and content gamification***

Structural gamification is the “application of game elements to propel a learner through content with no alteration or changes to the content” (Kapp, Blair, & Mesch, 2014, p. 55). The learning content itself does not become game-like — instead, the structure around the content integrates gaming elements into the design. The principal focus for this form of gamification is to motivate learners to explore the content and, through that method, allow them to engage in the learning process through rewards. The most common features in this type of gamification are badges, points, levels, achievements, leaderboards, various other ways of tracking the learning process, as well as social aspects, whereby learners are able to share their attainments and achievements with others (Kapp et al., 2014). Awarding an individual

points for watching a video, which would assist the player in progressing to the next level, is an example of structural gamification. However, focusing only on the structural dimension is considered a superficial use of gamification as an instructional strategy (Kapp, 2012; Nicholson, 2012). Furthermore, past studies emphasising structural gamification fail to explore the success of particular game elements used for gamification, and propose that gamification itself is the solution to enhanced learner outcomes (Landers, 2014). The method by which gamified elements are incorporated into the app may have varied outcomes, depending on the intended learning context. Likewise, a focus on learner attitudes is a significant missing segment in the literature available on gamification. Enhancing learning through gamification implies understanding why gamification is used and how it influences the learning process including learner behaviour, attitudes, application and progress (Landers, 2014).

Gamification not only shapes behaviour, but also increases motivation and creative thinking, including the development of higher cognitive skills, supporting collaboration and increasing user engagement (Browne et al., 2014; Hamari et al., 2014; Walsh, 2014). The use of structural gamification presents a number of affordances to assist learners to gain the knowledge, understanding and skills they require, while simultaneously providing them with flexibility and control over when they learn, how they learn and the pace at which they learn during the learning process (Nicholson, 2012). Kapp, Blair, and Mesch (2014) contend that communicating with, and establishing clearly defined goals for the user, augmenting incremental goals and rewards, and setting transparent rules and criteria, all help to promote effective structural gamification.

Content gamification, on the other hand, uses game-like elements to impact intrinsic motivation by applying game mechanics and game design techniques to motivate users to achieve their goals (Kapp et al., 2014). Adding story elements (for example, a narrative) including missions, quests and objectives are examples of content gamification (Kapp et al., 2014). Stott and Neustaedter (2013) examined three reasons using content gamification: 1) specifically freedom to fail, 2) rapid feedback, and 3) progression and storytelling. Each gamification element in their study was shown to successfully impact motivation, behaviour change and student achievement, but the context of each course was crucial in this success. The results of their study concluded that content gamification was validated as effective as long as the context of course content was taken into consideration during the design of the app (Stott & Neustaedter, 2013).

### ***3.2 Gamification of instruction***

The extraction of design elements from games and embedding them into learning contexts as a method of gamifying instruction has the potential to increase learner motivation and engagement (Van Eck, 2006). By using goals, rules, interaction, time, rewards, feedback and challenges, players reach their own levels of mastery. and fail with minimal consequences, hence, resulting in learning environments that foster increased motivation, retention and application of learning (Garris et al., 2002). However, the main goal of gamification is to improve instruction, not replace it, therefore, if the content is not already compelling and of high value, then adding gamification will produce few or no results (Kapp et al., 2014).

The most often trivialised and perhaps misconstrued element of gamification, to some varying degree, is what Kapp (2012) labels as reward structures, including points, badges or a leaderboard. Kapp (2012) contends that all these elements need to be carefully implemented as essential and requisite parts of the game and are not to be merely perceived as gamification add-ons. Kapp (2012) also emphasises the importance of defined levels of increasing complexity in an effective game; levels keep a game manageable and allow for building and reinforcement of skills necessary for success in the game. Kapp's (2012) elements suggest that developers need to determine precisely how a game would hold a learner's attention, and thereafter, chart the level of interest through time. Besides, aesthetics — suitably aligned visuals, demonstrating the designer's attention to detail — help create an immersive learning environment that contributes to the overall gaming experience by immersing and engaging the learner. Failure in a game equates to an additional level of content, as it makes the players reassess their approach to the game (Kapp, 2012). The act of losing in the game multiple times makes the act of winning more entertaining and enjoyable. A preliminary investigation of the growing body of research in gamification indicates that specific elements keep recurring and finally, become established components of all games. Elements such as 'levelling up,' leaderboards, and immediate corrective feedback are all part of the approach referenced invariably by Nicholson (2012) and Kapp (2012).

### ***3.3 Gamification techniques***

One of the principal design principles of gamification is to "provide feedback so that players can achieve a sense of mastery" (Richards et al., 2014). Mastering an activity, and learning through failure, are often characterised in gamification in the form of achievements, badges, high leaderboard rank, reaching the maximum level, etc. (Richards et al., 2014). Games provide this positive relationship with failure by ensuring feedback cycles are immediate and ensuring the stakes are low — players keep trying until they succeed and they risk very little by doing so. Furthermore, gamification shortens feedback cycles, by presenting learners with low-stakes methods to assess their own skills and capabilities, and as a result, creates an environment in which effort in learning is rewarded. Hence, students, in turn, learn to see failure as an ally to self-mastery.

### ***3.4 Motivation for game play***

Not all intrinsically-motivated learning behaviour and activities are games, and not all pedagogical issues/problems are capable of being solved using games. Nonetheless, it is argued that well-designed games that achieve specific learning goals, are a source for highly varied, interesting and motivating activities and their components should not be overlooked in the instructional design process (Malone, 1981). Several attributes of motivation can be deduced when considering online games. These attributes include curiosity, fantasy, control, skill development, challenging elements and effective stimuli of game play (Deterding, 2012; Kapp, 2012). Higher levels of motivation are achievable, along with more time spent interacting with the game by redesigning those environments in which, for example, dimensions of fantasy and control are present, in an intrinsically appealing way. (Shroff et al., 2008). Hence, a better understanding of the nature of motivation and the ability to gauge students' intrinsic motivation while interacting with games, promises to contribute to the design of more effective game-design and thus, ultimately to higher educational performance (Schwabe & Göth, 2005; Shroff et al., 2008).

#### **4 Gamified pedagogy**

Unfortunately, there is, to date, relatively little information on exactly what types of apps best enhance and promote student learning in various disciplines. This then presents a challenge for instructional designers and app creators to design appropriate interactive mobile features, and to subsequently assess what feature is most effective for delivering the content to learners. However, what seems to be emerging from the educational use of games is the following: (1) games present authentic experiences to the learners through which they may be able to learn through the content presented in the game; (2) the learning that may occur is situated in an authentic context; and (3) learning is made more engaging through games. The use of gamified elements in an app may have potential benefits for learners. One of the most important benefits is that it gives learners a sense of control over how their learning takes place (Venkatesh, 2000). Another major benefit is that the use of gamified elements in an app keeps learners motivated by giving them a goal to reach. Essentially, this goal involves taking the principles of game-play and successfully integrating them into a course. For example, a levelling system could be added to a mundane or repetitive task, in order to enable learners to observe their progression. Prior studies have elucidated that this use of a levelling system keeps learners motivated and engaged to continue progressing through the game (Deterding et al., 2011; Von Ahn & Dabbish, 2008). Moreover, it is possible to accomplish this same result by using some type of quest or achievement system, and in this way, learners are appropriately rewarded after completing the task.

One question that might, and should come up is how a gamified element of a mobile app is pedagogically-driven to enhance learning? Gamification has many benefits for education but the most important benefit is that it gives learners a sense of control over how their learning takes place. The goal of game-based learning is to increase learner motivation, retention and learning in a learning context. Research has demonstrated that pedagogically-driven games improve motivation, engagement and long term retention (Huizenga et al., 2009; Papastergiou, 2009). When students actively participate in the learning process, the educational experience becomes more engaging and motivational for the learner. Recent studies have also established that simulations improved the process of learning and learning outcomes, particularly when simulations represented complex real-world processes (Hamari et al., 2016; Hsieh et al., 2016; Tsai et al., 2016). Furthermore, Kirriemuir & McFarlane (2004) ascertained a common premise in the development of games for education: a belief that “learning through doing” in games such as simulations, offers a novel and engaging learning tool. In addition, they indicated that context in games may be relevant and should offer varying cognitive style opportunities and engagement at differing levels of difficulty. Hence, the use of a game-based app not only allows for interactions among learners, but also provides active learning that may simulate real-world situations and environments by creating a setting within which learners engage with the experience of learning through doing (Kirriemuir & McFarlane, 2004).

Common implementations of gamification as pedagogy include the integration of scoring elements of games, such as points, levels, and achievements, and applying them to an educational context (Deterding, 2012). As indicated by Deterding (2011), effective and compelling gamification allows learners to use gaming elements as a way to cogitate on their completion of a learned activity. Hence, gamification as pedagogy has the potential to



increase learner engagement, while simultaneously providing feedback on that learning. Since learners often report a lack of engagement, gamification has the potential to provide a way to promote learner motivation and engagement, while also furnishing feedback with immediacy and accuracy on the learners' level of competency (Richards et al., 2014).

One of the key design principles of gamification is to “provide feedback so that players can achieve a sense of mastery” (Richards et al., 2014). Successfully completing a task, mastering an activity, and/or learning through failure, is often characterised in gamification in the form of badges, high leaderboard rankings, achievements, attaining the maximum level, etc. (Richards et al., 2014). Games maintain this positive relationship with failure, which serves as an integral part of the learning experience, by making feedback cycles expeditious and keeping the stakes low. Hence, players keep trying until they succeed and they tend to risk very little by attempting different options and/or selections. Games give players timely, if not instantaneous, feedback. Gamification shortens feedback cycles and as a consequence, presents learners with low-stakes methods to keep track and assess their own skills and performance, thereby creating an environment in which learners are rewarded for their efforts in learning. Students, in turn, begin to view their mistakes as a learning opportunity, and not as a failure. This may be particularly useful in teaching introductory phonetics to students with limited experience in phonetics. Gamification, applied to introductory phonetics pedagogy, may provide students an engaging, effective, and novel approach to learn phonetic skills and through this method increase attraction and retention for students who are new to the field of phonetics.

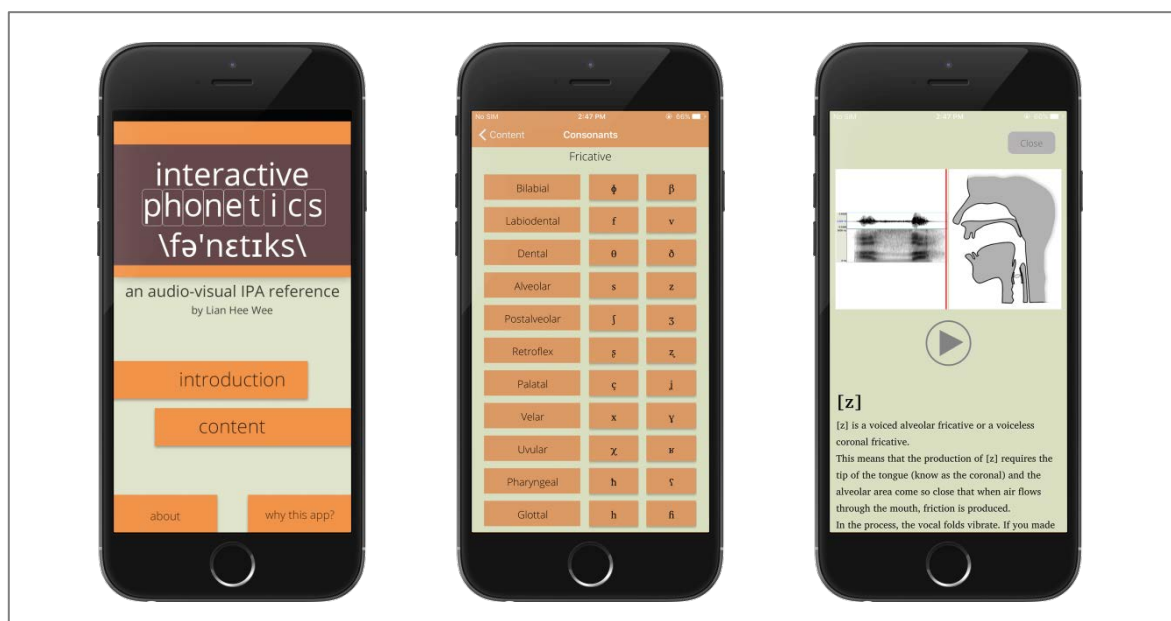
## **5 Mechanics of gaming and learning**

Game mechanics are the rules or methods designed for interaction and used for gamifying an application. They delineate the game in the context of a rule system, determining how players behave within a set of rules and “how players are able to interact with the game-world and how that game-world reacts to the choices players make” (Rouse III, 2010). An example of game mechanics elements are achievements, points, badges, levels and leaderboards. Moreover, in gamification, players are required to know where they are positioned at all times and what they are expected to do after a particular move, in order to progress to the next level. Creating compelling game dynamics and accompanying them with apt game mechanics is a challenging task. For example, the acquisition of demonstrative knowledge entails a great deal of association and repetition. From this, we are able to surmise that game mechanics which support the repetitive performance of tasks without making them mundane would be best employed for this form of knowledge acquisition. For example points, levels, feedback, progress bars and countdowns can all be incorporated into appropriate game mechanics — this is because they invoke game dynamics, such as an impression of urgency in players and transform the repetition of the same type of activity and/or task into something engaging and appealing. Hence, the implementation of badges, points and achievements has been verified to support self-directed learning (Fuchs, 2014). Through these game elements, learners decide which goals and tasks to perform and focus their efforts on these tasks, thus supporting individual autonomy. Moreover, learners have control over when they learn and how best to approach the learning process and take control of their own learning (Kapp et al., 2014; Nicholson, 2012).

## 6 An example of a gamified phonetics app

We now present an overview of the “Interactive Phonetics - An Audio-Visual IPA Reference” app, before proceeding to discuss the various parts of the app in detail. Speech pathologists and linguistic students must have a firm grasp of the physiology and anatomy associated with speaking. In learning phonetics, it is very important for students to understand the articulatory mechanisms underlying the production of speech sounds. This basic understanding of articulatory mechanisms is the foundation upon which the *International Phonetic Alphabet* is developed for precise transcription of speech sounds. To effectively learn, grasp and use the IPA for transcriptions of speech sounds is the most fundamental and yet one of the most demanding tasks facing students of linguistics and other language-related professions. The “Interactive Phonetics - An Audio-Visual IPA Reference” app designed and developed by the Resource Centre for Ubiquitous Learning & Integrated Pedagogy (ULIP) at the Hong Kong Baptist University is inherently a game-based mobile app, which provides comprehensive coverage in its description of the articulatory properties of nearly all of the speech sounds recognised by the International Phonetic Association. The visual presentation of articulations in this app adopts sagittal cross-sections of the laryngeal, oral and nasal cavities, together with the movements of active articulators such the tongue and lips, accompanied by a synchronised audio transmission of each speech sound aligned with the movement of the articulators. Visualisation through the aid of animation, perception through the audio transmission and understanding through careful descriptions, all serve to combine into a powerful learning tool, which aids in the provision of a stimulating learning experience. The app is implemented for both iOS and Android, and students are able to access this app by simply loading it on their smartphones, just as they do with all their other smartphone applications.

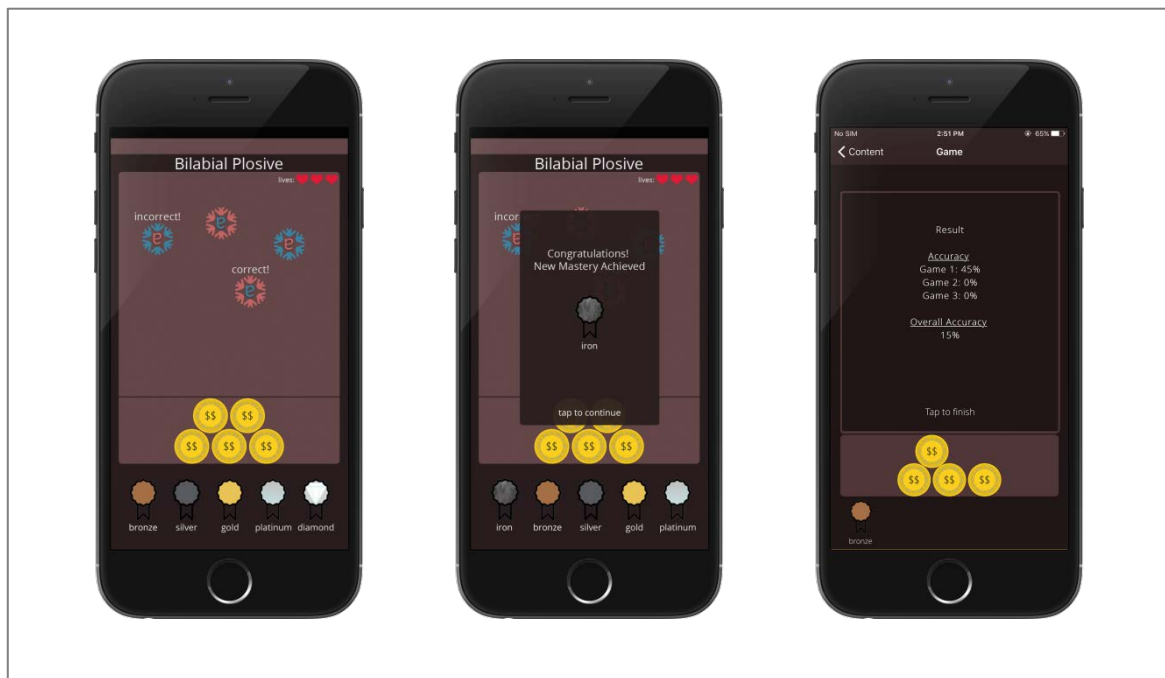
Screen layouts of the app interface design are depicted in Figure 1. Key features include an intuitive touch interface with clear graphics, high quality audio transmission and textual descriptions of speech sounds, accompanied by cross-section animations, and illustrating the articulations of the consonants, vowels and tonal symbols suitable for understanding sounds of known human languages. Further, a completely original and aptly challenging game concept, augmented with detailed game statistics, makes learning exciting and rewarding.



**Fig. 1. Interactive Phonetics app with audio transmission and textual descriptions of speech sounds, coverage of consonants, vowels, tonal symbols and cross-section animations**

The gaming element in the app combines both logic and creativity, producing greater learning outcomes than traditional rote learning or text-based pedagogy. Students take pulse of their learning through a challenging game component crafted to test various skill sets in phonetics. Penalties, coupled with rewards and achievements make for an engaging learning experience through appropriate use of drill-and-practice approaches. This enables eventual mastery of human speech sounds and the methods to describe or transcribe them with effective accuracy. In so doing, the gaming element contributes to learning outcomes simultaneously at the levels of conceptual knowledge and application skill.

Fundamentally, the app was designed based upon the concept of mastery, meaning that in order to exhibit knowledge and understanding of a given speech sound, a two-way association between the corresponding phonetic symbol and its articulatory properties must be correctly identified. The gaming elements (see Figure 2) consist of the following: 1) matching symbol with audio pronunciation, 2) matching symbol with descriptive label and 3) matching descriptive label with audio pronunciation.

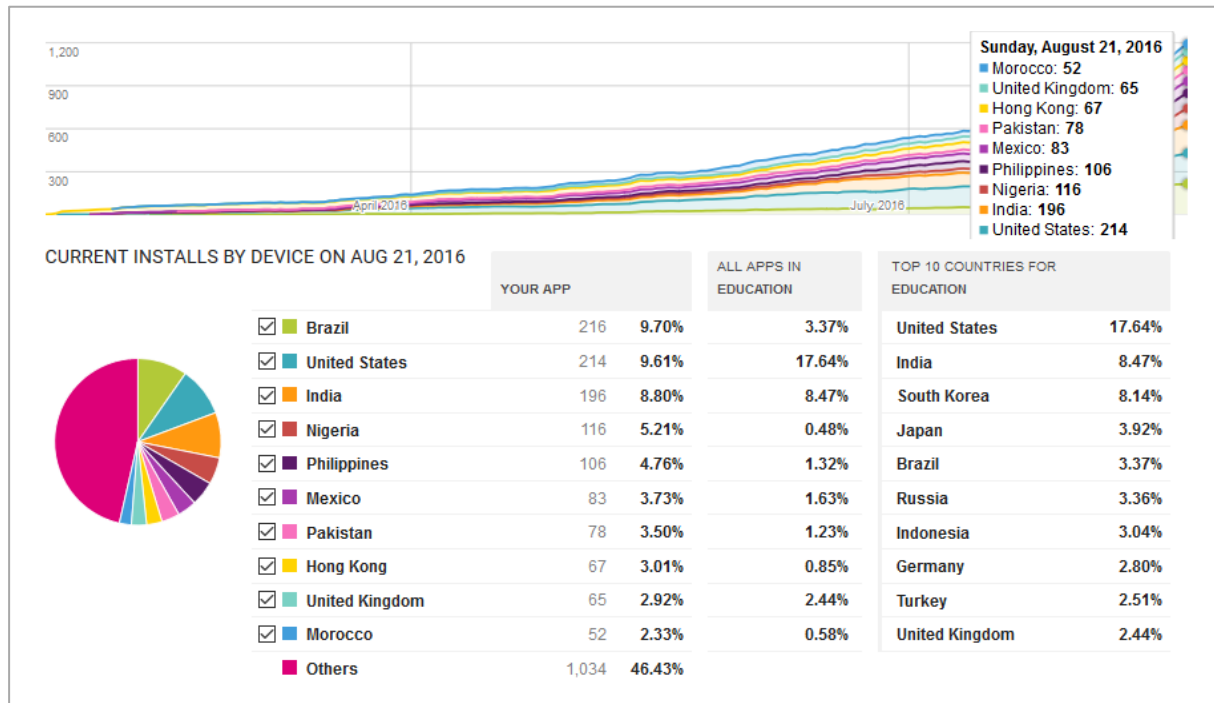


**Fig. 2. Interactive Phonetics app illustrating gaming elements (i.e., the use of drill-and-practice approaches for learning speech sounds and visual recognition of phonetic alphabets)**

Figure 2 depicts screen layouts of the mobile app running on an iPhone. The user-interface design and each of the twelve crossword puzzle games are consistent in colour scheme, font and layout. These assist players by providing consistency in locating specific features and by presenting only the required information, without a barrage of other distracting items. In addition, the players are actively involved with game play that requires finger movements across the screen. Hence, the need to gather and maintain the players' attention through visual experiences and audio designs is also an important element in the design of this specific app. The uptake of the phonetics app by students is impacted by their confidence in using the app and their awareness of how the app is able to assist their overall learning experience. The users' experiences within the app transcend multiple dimensions. In certain cases, this depends on the app's design and how different features of the app appeal to each user. Specifically, one way to address the challenge of assessing student learning effectiveness is through data collection and analysis of responses to questionnaires, feedback gathered through structured interviews as well as comments from users through the App Store and Google Play. Acceptance of the phonetics app has been impacted by users' positive feedback and confidence, ranging from having a visually appealing design to a seamless, responsive and user-friendly interface. To date, the feedback and data received for both our iOS and Android versions have been very positive and usage statistics confirm that the app is becoming the preferred channel of engagement for students of linguistics and other language-related professions.

Moreover, app statistics are regularly tracked to collect data to better understand the geographic distribution (see Figure 3) of users and monitoring of user downloads. For example, the interactive phonetics app was downloaded more than 2,000 times (see Figure 4) within the first three months of being available on Google Play. This indicates that our

students/users are compelled to download the app because it offers rich and relevant content, combined with unique gaming elements, which other apps that are currently available on the market may not offer.



**Fig. 3. Android version for Interactive Phonetics app showing current installations by device by country**



**Fig. 4. Android version for Interactive Phonetics app showing the number of active devices on which the app is currently installed**

While designing the app, game theory recommended taking into consideration the reward features necessary in order to retain the players' interest (Keyes et al., 2016). The design mechanisms that go into a game, and provide reward through variability in level difficulty and scoring, are developed based upon the players' cognitive abilities. Malala, Major, Maunez-Cuadra, and McCauley-Bell (2007) demonstrate that "one way to generate interest on the part of students is to institute a rewards system that promises immediate gratification to performance" (p. 4). This happens by means of an increase in points and a rise in the difficulty of the game. For each game in the phonetics app, the players are required to progress through the following four levels: Iron > Bronze > Silver > Gold > Platinum. Players are only able to progress to the next level if they collect five coins (that is to say, for each

correct answer, one coin is awarded). For each game, the players have three lives represented by a “heart” symbol. For every incorrect answer, one heart disappears. So if the players select three incorrect answers, then all three hearts will disappear and the game ends. The difficulty of each “level” does not actually increase, but rather each level symbolises a different challenge. The system awards points for completing certain tasks and presents badges based on the number of points earned. These scores are recorded on a leaderboard, with the intention that players are able to track their performance. The theory behind this type of gamification is that users are challenged to overcome their own new best scores and are therefore, incentivised to replay the game. Liu et al. refer to this as the “gamification loop” (Liu et al., 2011).

It is evident from the above that the use of rewards increases motivation and the drive to succeed in a game (Keyes et al., 2016). Correspondingly, the rewards or scoring of points signify the growing achievements earned by each player, because every player’s experience is different with the same game (Crawford, 1984). The reward features inherent in the design of this app not only provide instructive information immediately to the players regarding a correct answer, but also allow the players to appropriately acknowledge a correct response. Adding a gaming element to the app also helps the players monitor their learning progress, and gain confidence in preparing for more summative assessments. In summary, an essential component in game design is not only to create a delicate balance by which the players advance progressively in the game, but also to ensure that they continuously acquire the cognitive processes required to do so (Keyes et al., 2016). It is here that the scoring mechanism within the phonetics game provides a means for the players to monitor progress. In addition, the design components that go into the phonetics game offer assessment and feedback (i.e., affirmation of performance that communicates information to players about their progress toward their goals) through scoring and are developed based upon the players’ distinctive cognitive skills and abilities.

## **7 Conclusion**

The adoption of gamification as pedagogy into the educational curricula provides opportunities for instructional designers to evaluate the impact of games on the learning process. Hence, the use of gamification as pedagogy provides numerous benefits for education. One of the most significant benefits is that it gives learners a sense of control over how their learning takes place. Another key aspect is that it keeps learners motivated by giving them a goal to reach and thereby, attain a level of mastery in the use of the app. For the phonetics app to be pedagogically significant, it needs to satisfy several conditions: 1) the app should focus on specific pedagogical problems that are demonstrably difficult to address in the classroom; 2) the overall design of the app must be transparent and fun to use, and aesthetically pleasing in order for the app to compete in the mobile ecosystem of other apps, all vying for the attention of users; and 3) the reasoning/logic behind the significance of the app’s content and how it will be used and/or assessed in the course, must be easily comprehensible to the learner. Typically, the phonetics app affords learners a chance to play at their own level and at their own pace. When learners are engaged in a game-based app of this nature, they are not only developing and reinforcing their cognitive skills, but they are also making constant connections between text, images and sound.

The primary advantage of using a mobile game-based application such as the “Interactive Phonetics - An Audio-Visual IPA Reference” is the ease of repeated opportunities available to learners to engage in a task or learning activity. The valued addedness of a mobile game-based version of phonetics, and other learning tools, includes opportunities for relatively short but frequent repetitions of learning activities on a device that students usually have with them at all times during a day. By adding appropriate audio and gaming components, mobile apps create an especially rich, engaging and immersive learning environment, and offer that environment at any time and place based on students’ preferences. The reuse and multiplicity of learning pathways through the app are also a pedagogically important aspect (Keyes et al., 2016). As an extension into other disciplines, learning activities, and pedagogical needs, mobile apps may increasingly provide rich, ubiquitous and immersive experiences, both useful and practical for building a foundation for the learning of many subjects.

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