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 not only support active student engagement but are specifically designed to offer 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 essential and relevant for educators and instructional designers to understand 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 validating methodologies for developing games that solicit the players' engagement behaviors, in supporting the learning activities to achieve the desired learning outcomes (Mitgutsch & Alvarado, 2012; Von Ahn & Dabbish, 2008). Amory, Naicker, Vincent, & Adams (1999) identified various digital game-based elements to engage learners such as abstract thinking, visual logic and problem solving. Gathering evidence on the results of their study, they proposed a model for constructing adventure-based learning games linking pedagogy with gaming features and a variety of tasks to reinforce problem solving skills and mastery of concepts. A review of research in gamification has indicated the significance of utilizing gamified learning for augmenting the overall learning experience and maximizing learning (Deterding, 2012; Kapp, 2012). Hence, games that are pedagogically driven have the possibility to demonstrate learning opportunities, utilizing solutions 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 displaying content in a visually compelling manner that positively influences their learning (Van Eck, 2006).

Gamification, which encompasses digital game-based elements in non-game situations, 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 situations, when they show elements of intrinsically motivated behavior (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 game-based experiences assist in providing opportunities for students to acquire higher-order thinking skills and competencies (Kapp, 2012).

The objective 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 objective of this paper is not only to add to the methods by which we discuss the concept of "gamification", but also to extend our conversation beyond the more obscure concept of "gamified pedagogy". Gamification, when combined with well thought out pedagogy, may afford learners a powerful and compelling way to learn introductory phonetics. In summary, games facilitate learning by utilizing play strategies to promote engagement, interest, and enjoyment. This may be especially effective in teaching phonetics to students with little or no prior background of phonetics.

2 Digital game-based learning

The impact of digital games to support teaching and learning have propelled current developments in the area of game-based learning (Mitgutsch & Alvarado, 2012). Early research on computer game-based learning has centered 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, learners require some degree of support in linking game experiences with the implicit knowledge that they skillfully apply 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 players in non-gaming contexts, with the objective of improving learning and player 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 emphasizes the significance of utilizing game mechanics to positively support intrinsic motivational behavior, achievement, and engagement (Deterding, 2012; Kapp, 2012). Significant learning opportunities are presented through games by encompassing strategies that support contextualised learning experiences. Moreover, games present a method 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 only about designing and constructing games, 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). Cohen (2011) notes, "games associate learning with fun and allow for trial and error (basically the freedom to make mistakes)" (p.17). By taking on a gamified way of thinking, students are subsequently able to learn through trial and error, engagement, and interaction with content (Liu et al., 2011).

Karl Kapp (2012) expounded the definition of the term gamification by describing it 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 elements of a well-designed game should offer a representation of reality, whether imaginary, fictitious or pretended. 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 has the potential to mimic various representations of reality for solving complex problems. It is imperative a game has objectives to add direction and focus, together with measurable outcomes and rules that essentially define the game. These goals pertain to how the game is played, the social interactions connecting players and what the learner is required to know and internalize subsequent to interacting with the game. Previous studies have identified the following four key notions of gamification that have been affirmed as effective in learning applications: 1) latitude for failing, 2) immediate feedback, 3) player advancement, and; 4) player objectives and decisions. Moreover, Arnold (2014), Deterding (2012) and Nicholson (Nicholson, 2012) delineate between structural and content gamification that support these four dynamics.

3.1 Structural and content gamification

Structural gamification is defined as 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). It is essential to emphasize that the learning content by itself does not emerge as game-like — instead, the design and construction around the content must be able to integrate gaming features into the design. A principal focus of this form of gamification is to engage and support learners to explore the content and, through that method, allow them to engage in the learning process through reinforcements and practice. Some of the common features in this form of gamification include badges, points, levels, achievements, leaderboards, various other methods of keeping track of the learning process, as well as social aspects, whereby learners are able to appropriate their attainments and achievements with others (Kapp et al., 2014). Awarding the player points-based scoring would assist the player in progressing to the next level – this illustrates the use of structural gamification. However, paying close attention on only the structural dimension is considered a superficial use of gamification as a learning design strategy (Kapp, 2012; Nicholson, 2012). Furthermore, prior research highlighting structural gamification has neglected to explore the advancement of particular game-based features used for gamification, and propose that gamification on its own may be a solution to enhanced learning performance (Landers, 2014). The method by which gamified elements are incorporated into the app may have different outcomes, contingent upon the intended learning context. Moreover, subsequently focusing on learner motivation and attitudes is a significant missing element in the literature available on gamification. Enhancing learner outcomes

through gamification implies an understanding of reasoning for using gamification and how it impacts the learning process including learner behavior, attitudes, application and progress (Landers, 2014).

Gamification not only shapes behavior, 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 utilization of structural gamification presents various ways to assist learners to gain the knowledge, understanding and skills they require, while at the same time, providing them with flexibility and control over when they learn, how they learn and the pace at which they learn during their learning trajectory. Kapp, Blair, and Mesch (2014) noted the importance of communicating with, and setting clearly defined goals for the user, augmenting additional goals and rewards, and setting transparent rules and criteria, all help to promote effective structural gamification.

Conversely, content gamification uses game-like features to positively effect intrinsic motivation by employing game mechanics and game design approaches to motivate players to accomplish their tasks and objectives (Kapp et al., 2014). Supplementing story elements including missions, quests and objectives is a way to illustrate some of the features of content gamification. Stott and Neustaedter (2013) identified the following rationales for using content gamification: 1) latitude for failing, 2) instantaneous feedback, and 3) progression. All three of these gamification features in their study indicated a positive impact on motivation, behaviour change and student achievement, but conditions of each course was crucial in this success. The results of their study concluded that content gamification was validated as effective by taking into consideration the context of course content during development (Stott & Neustaedter, 2013).

3.2 Gamification of instruction

The extraction of design features from games and firmly implanting them into learning systems as a method of gamifying instruction, presents an opportunity for increasing learner engagement and retention and sustaining motivation (Van Eck, 2006). By embedding goals, rules, interaction, penalties, rewards and feedback into the game, players are able to attain their own levels of mastery and subsequently fail with minimal consequences, resulting in learning environments that foster higher levels of motivation, retention and engagement (Garris et al., 2002). Thus, the main objective of gamification is to enhance instruction. Moreover, if the content is not in itself compelling and of high value, then adding gamification will produce few or no results (Kapp et al., 2014).

Perhaps the most misconstrued element of gamification, to some varying degree, is what Kapp (2012) labels as reward structures, such as the use of awards, levels or bonus elements. Kapp (2012) contends these elements should be carefully implemented as essential and requisite elements of the game and should not to be merely perceived as gamification add-ons. Kapp (2012) further emphasizes the importance of having clear and discernible levels of increasing complexity in a game that is both compelling and engrossing; the different levels of attainment keep a game manageable, thereby enabling the player to build up his/her skills that are necessary to be successful in the game. Kapp's (2012) elements suggest that developers need to determine precisely how a game is able to capture a learner's immersion, and thereafter, charting the level of interest as the player progresses through the game. Aesthetic elements are also significant in creating an immersive learning approach that that impacts the gaming experience by subsequently immersing and engaging the learner. Moreover, failure in a game

allows the player to reassess his/her approach to the game (Kapp, 2012). When the player repeatedly loses in the game, it makes winning more entertaining and exciting. A preliminary investigation of the growing body of research in gamification indicates that specific features keep recurring and finally, become established components of all games. Features such as points, levelling up, leaderboards, and awards are all part of the approach referenced invariably by Nicholson (2012) and Kapp (2012).

3.3 Gamification techniques

A principal design element of gamification is to "provide feedback so that players can achieve a sense of mastery" (Richards et al., 2014). Gaining mastery over a task, and learning by failure, is often characterized in gamification through the use of leaderboard ranking, attaining the highest level, rewards, etc. (Richards et al., 2014). By ensuring feedback cycles are immediate and ensuring the stakes are low, players continue to persevere until they are successful and subsequently do not risk much in doing so. Furthermore, the feedback loop in gamification is substantially reduced, by presenting learners with methods to assess their own performance and improve their capabilities, and as a result, this creates conditions in which earnest attempts to learn are rewarded. Hence, students learn to see failure as an ally to self-mastery.

3.4 Motivation for game play

Behavior is primarily motivated by intrinsic factors that are not always embedded in all games, and not all pedagogical issues are capable of being explained using games. Nonetheless, it is claimed that well-designed games that achieve specific learning goals, are a source for highly varied, interesting and challenging tasks should not go unnoticed in the instructional design process. 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). Increased 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 appears to unfold from the use of games in an educational environment is the following: (1) games offer authentic learning experiences to the learners through which they have the competencies and skills to learn through the content embedded in the game; (2) the learning that takes place is situated in an authentic or simulated context. The use of gamified features 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 provides learners with 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, presents a novel and engaging learning tool. In addition, the authors indicated that context in games should be relevant and could present varying cognitive challenges 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).

The typical practice of gamification as pedagogy includes the integration of scoring features such as badges, levels or leaderboards and making them applicable to an educational context (Deterding, 2012). As indicated by Deterding (2011), compelling gamification that evokes engagement, allow the learner to use gaming features as a way to cogitate on their core achievements of a learning task. Hence, gamification as pedagogy has the possibility of increasing learner engagement, while simultaneously delivering feedback on that learning. Subsequently, learners frequently complain of a lack of interest and engagement - gamification supports learner motivation and engagement, by furnishing feedback with immediacy and accuracy on the learners' level of competency (Richards et al., 2014).

A key design principle of gamification is to "provide feedback so that players can achieve a sense of mastery" (Richards et al., 2014). Successfully completing and mastering a task and/or learning by failure, is typically characterized in gamification by medals and/or badges, rankings and scores, etc. (Richards et al., 2014). Failure in game is an essential component of the learning experience, subsequently ensuring feedback cycles are expeditious and stakes are low. Hence, players will repeatedly try until they are successful and they are inclined 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 of their own skills and performance, thereby creating a learning situation 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 which could be especially effective in teaching an introductory phonetics course to students with limited knowledge and/or experience in phonetics. When gamification is applied to a

course, it may afford students a compelling and unique approach to learn skills and through this method increase attraction and retention for students who are new to the field.

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 effective game dynamics and accompanying them with apt game mechanics may be a formidable task. To illustrate, the acquisition of demonstrative knowledge entails a great deal of association and repetition. Moreover, levels, badges, avatars and leaderboards are fittingly incorporated into appropriate game mechanics — this reinforces game dynamics by giving an impression of seriousness in players and by transforming the same sort of repetitive tasks into more engaging and appealing tasks. Hence, the implementation of levels, badges, avatars and leaderboards has shown to support self-directed learning (Fuchs, 2014). By implementing these types of game elements, learners are able to decide which activities and/or tasks to perform and subsequently concentrate their efforts in performing these tasks, thereby supporting informed choices and fostering learner autonomy. Moreover, learners have control over how they learn and the way in which they approach the learning process and subsequently 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 essential 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.
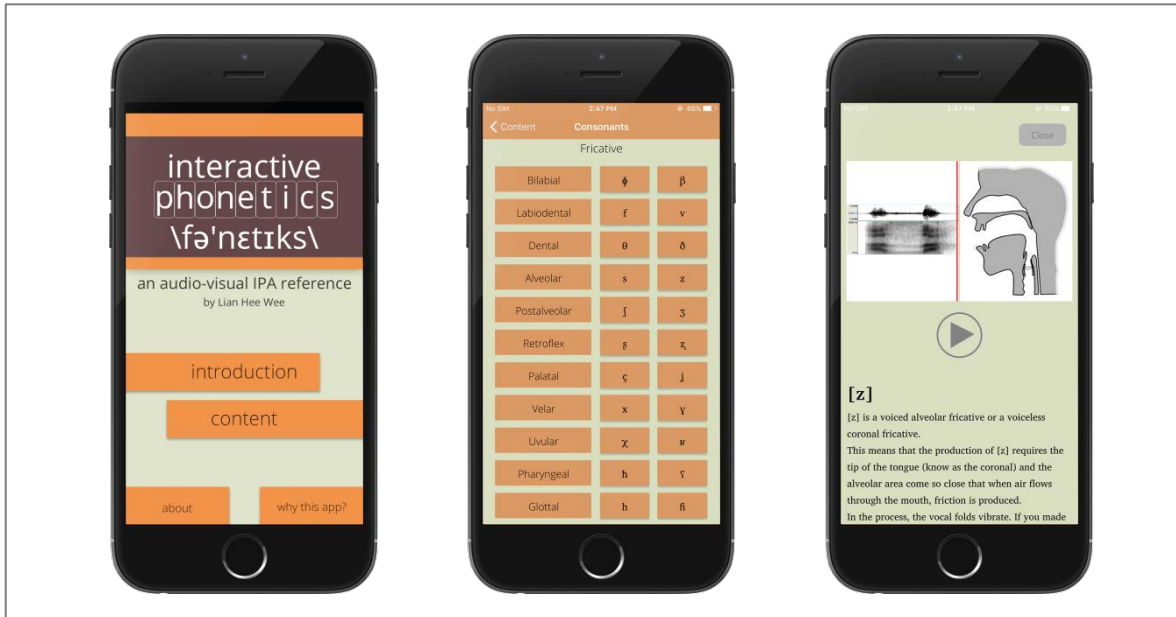
Fig. 1. Interactive Phonetics app with audio transmission and textual descriptions of speech sounds, coverage of consonants, vowels, tonal symbols and cross-section animations

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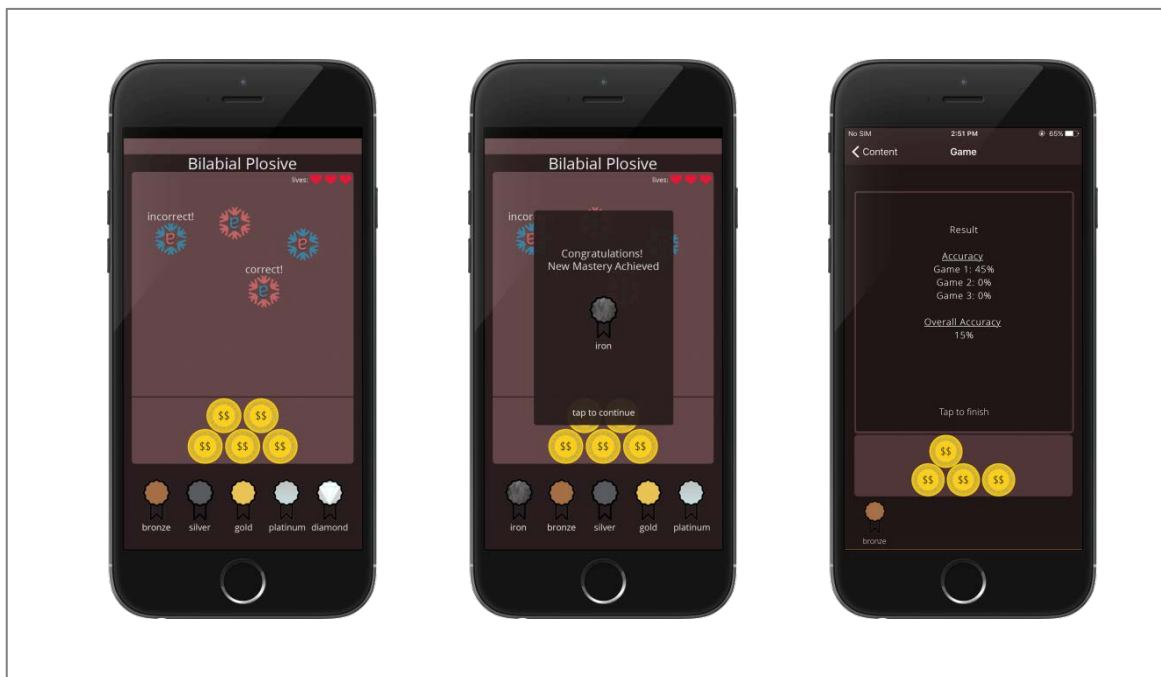
Fig. 2. Interactive Phonetics app illustrating gaming elements (i.e., the use of drill-and-practice approaches for learning speech sounds and visual recognition of phonetic alphabets)

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 embedded in the app and by displaying the required textual content, without a barrage of other distracting items. In addition, the players are actively involved with game play and can successfully navigate through required finger gestures across the device. 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 transcends multiple dimensions. In certain cases, this is contingent upon the app's design and how various features of the app draw in 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.
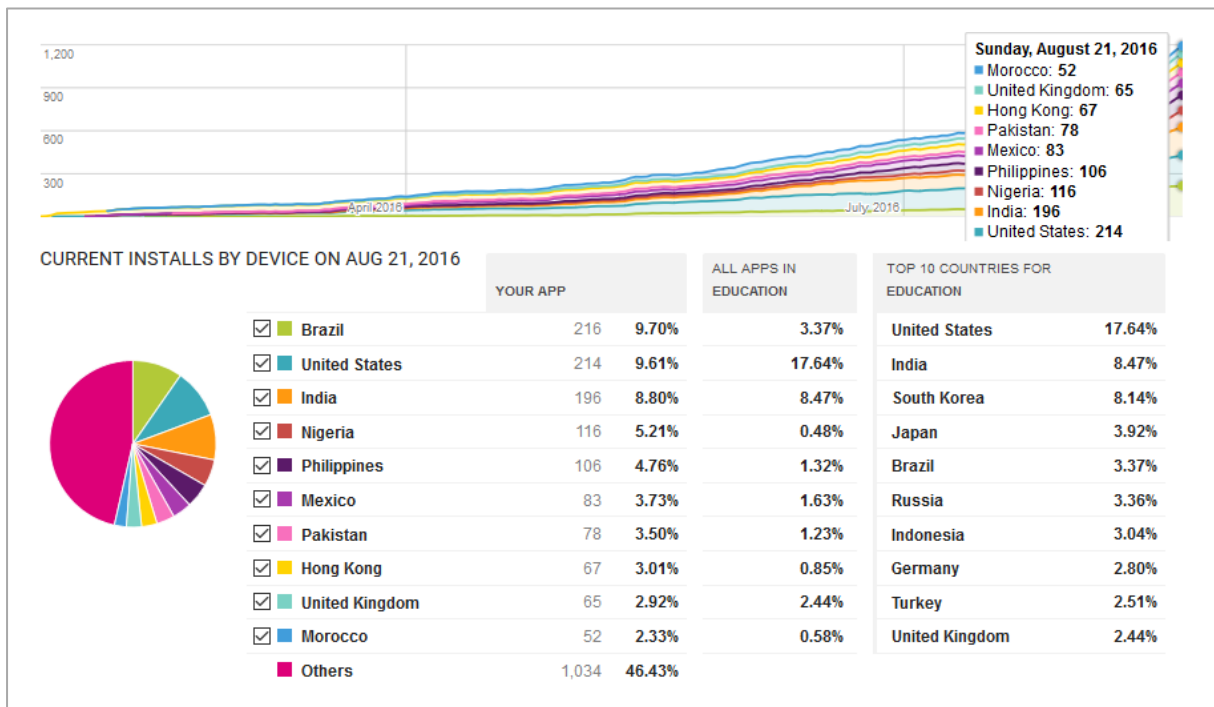
**Fig. 3. Android version for Interactive Phonetics app showing
current installations by device by country**
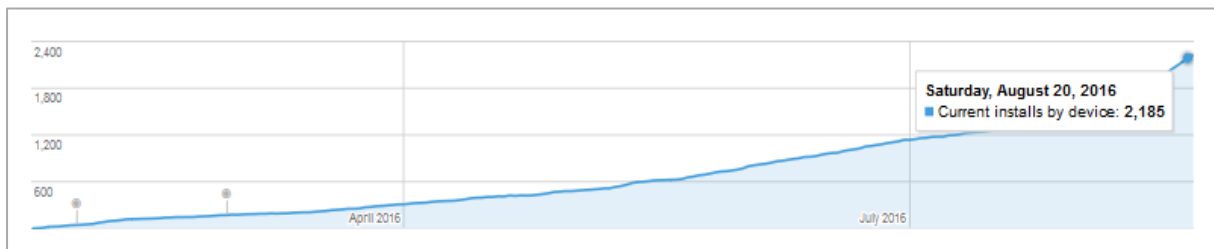
**Fig. 4. Android version for Interactive Phonetics app showing
the number of active devices on which the app is currently installed**

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) though an increase in points and by raising the level of 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. Points are awarded for the completion of certain tasks and badges are presented contingent upon how many points are accumulated. The scores are shown on a leaderboard, which allow the players to be able to track their performance. The rationale for this form of gamification is that the

player is challenged to beat his/her own new best scores and are therefore, motivated 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 indicate a rise in achievements attained by each player, because each player's encounter will be different when immersed in 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 integration of gamification as pedagogy into the educational domain allows instructional designers to assess the effect of games on the learning behaviours of students. Hence, the use of gamification as pedagogy provides numerous benefits for education. One of the most significant benefits is that it provides learners with a sense of control over how their learning takes place. Another key aspect is that is 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 solid learning foundation for many subjects.

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