Get ‘em Moles! : Improved Spelling and Pronunciation through an Educational Game

**Abstract**
Get ‘em Moles! is a single-player educational game inspired by the classic arcade game Whac-A-Mole. Primarily designed for touchscreen devices, Get ‘em Moles! aims to improve English spelling and pronunciation in players by supporting learning with engaging game play. This paper describes the game, design decisions in the form of elements that support learning and engagement, preliminary results, and future work.

**Author Keywords**
Educational Games; Learning Technology; Game Design; English Vocabulary, English Spelling;

**ACM Classification Keywords**
K.3.1;

**Introduction**
Effective verbal communication calls for good pronunciation, and effective written communication requires a good knowledge of spelling. According to the ERIC report [3] ‘Why Teach Spelling?’, a skilled speller is both a strong reader and a strong writer. Through Get ‘em Moles!, we attempt to improve English spelling and pronunciation in players by integrating learning...
with an engaging arcade gaming experience. We designed and developed a prototype of the game using the Unity 3D game engine [6] in the Javascript and C# programming languages, and compiled builds to run on the Windows Phone and Android platforms.

**Learning Objectives**
The game is aimed at helping children between the ages 10 and 13 with spellings and pronunciations of English words. A basic knowledge of phonetics, alphabets, and reading English are the prerequisites to play the game. However, the game can be easily extended to use multiple word lists, each with a different level of difficulty. This can be useful to students from different backgrounds, for instance, to undergraduates preparing for the Graduate Record Examinations (GRE), an essential component of graduate school applications.

Through the game, we expect to achieve better English spelling and pronunciation of common to advanced words for the target age group. We also additionally expect faster typing speeds through continued usage of the QWERTY keyboard layout in the game.

**Game Play**
The game is a quest to defuse bombs planted by Murphy the Mole (the antagonist) under the keys of a keyboard before they detonate. This is done by typing the right spellings of words spoken by the in-game voice.

The main game screen (Figure 2) comprises of a stylized on-screen QWERTY keyboard, score meter, pause/play button, a speaker button to listen to the pronunciation of a word again, and a text area that displays letters of the word already typed in. The game play is divided into pulses of levels: each level comprises of a set of words that are served in succession. The in-game voice speaks out a word, and waits for the player to hit the letters corresponding to its spelling on the keyboard, one-by-one.

*Figure 1: Get 'em Moles! Start Screen*

*Figure 2: Main game screen showing a stylized keyboard and other components*

If the player hits the correct letter, the letter turns green with a chime and the correct letter appears in the text area above. Simultaneously, the letter is spoken by the in-game voice. However, if the player does not hit any letter within a fixed period of time, some letters on the keyboard glow red and small bomb symbols appear next to them. One of these letters is correct and the rest are decoys. This provides the player a choice of possible answers to the next letter in the word as a hint. The player can use the hint and hit the correct letter, although this earns the player lesser points than hitting the correct letter without the hint. If the player does not hit any letter, the glowing letters burn up and explode after a fixed period of time, revealing Murphy the Mole under the correct letter (Figure 3). The player

*Figure 3: Giveaway hint revealing the next letter for the word “occurrence”*
is then left with no choice but to hit the correct letter and move on to the next letter of the word. This does not earn the player any points. At any stage, a wrong hit causes a wrong buzzer to sound, and turns the hit letter red to indicate a wrong choice. The correct letter is then revealed through Murphy the Mole’s appearance under the correct letter.

A high score streak invokes a bonus round (Figure 4), where players get to play Whac-A-Mole and increase their overall score. The bonus round is time-limited, and fast-paced.

Game Elements Supporting Learning and Engagement

Get ‘em Moles! attempts to create a multi-sensory learning environment to achieve a better rate of learning [5], by using a combination of visual and audio cues to support correct answers. The game features that support learning are as follows:

- The start of every word is accompanied with its audio pronunciation, binding the word to its pronunciation.
- Every correct hit is supported by a chime, followed by a pronunciation of that letter for further reinforcement.
- The hint system helps players navigate through common confusions, by providing a choice of possible answers.
- A giveaway hint revealing the correct letter is provided when the player doesn’t hit any letter within a given delay, presumably since the player doesn’t know the correct letter. This enables the player to learn and progress further.

Elements that support player engagement include features such as:

- An intuitive touch interface inspired by the popular arcade game Whac-A-Mole, with an upbeat accompanying background score.
- Sound effects and in-game audio that registers input.
- A fast-paced bonus round that adds an incentive element of gamification, and acts as an extra element of engagement.

Play Testing and Preliminary Results

We obtained feedback on the game from 5th and 6th graders from a local school in Bangalore, India, through interviews and observed the impact the game has on them through preliminary tests. Our goal was to see if the game has educational value and to get useful insights and building blocks for a more formal study evaluating and quantifying its impact.

We first gave the students a pre-test, asking them to write, on separate sheets of paper, the spellings of a set of words dictated to them. The set comprised of words that are commonly misspelled by children of their age (for example, ‘weird’ being spelled as ‘wierd’, and ‘pronunciation’ being spelled as ‘pronounciation’). Each student then played the game, which featured a superset of the set of words from the pre-test, for about 30 minutes each on a Windows Phone device. We downloaded the pronunciations of this superset of words in advance from Google’s dictionary service for our game. For a complete version having several word lists, the game can be easily modified to pre-cache the pronunciations of words via AJAX at the start of every level to provide a seamless game play. After playing
the game, the students were interviewed to obtain feedback: they reported liking and enjoying the game. The students then took a post-test, in which the same set of words from the pre-test were dictated to them and they had to write down the spellings of the words on separate sheets of paper. Through this strategy, we wanted to see if there were instances where a word was misspelled by a student before playing the game and spelt correctly by the student after playing the game. To our delight, we did observe such instances, which serve as a preliminary ground to believe that the game has educational value.

Future Work
In our future revisions of the game, we plan to include many word lists of different levels of difficulty to target a wide range of age groups. We also plan to make the difficulty in the game adaptive, which has been shown to lead to better learning outcomes [4]. This would allow players to automatically graduate to words of greater difficulty depending on their performance. The technique of spaced repetition [2] could be used and immediate feedback [1] on performance could be provided to further facilitate learning.

We plan on undertaking a formal evaluation with a more complete version of the game to better assess its learning potential. We would like to see if our preliminary observations scale with the number of players, and repeat with a wide range of audience: young children to old people. By following the evaluation strategy described previously in combination with other strategies, and recording and analyzing the results as a whole, we hope to be able to conclude with a high degree of confidence that our game indeed achieves the impact we set out to seek.

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