

# Word Towers: Assessing Domain Knowledge With Non-Traditional Genres

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**Abstract:** This paper presents the design, development and the results of a pilot study for Word Towers (WT), an educational game that combines gameplay mechanics from board-style word building and arcade style tower defense games. To our knowledge, this is the first ever attempt to merge these game genres into a functional educational game. Our efforts open the possibility for other learning games to be reworked into new genres, increasing novelty and player engagement. Expanding the range of genres also allows for learning games to reach a wider audience. The goal of the WT is to provide a natural method for measuring domain expertise and knowledge by hiding the complexity within the level progression. In the prototype developed for showcasing our design, the domain is chosen to be the English language and the entire English dictionary is available to the player. While a design goal is to have WT eventually measure several different constructs of the English language, spelling was the only construct used for this pilot study. Each level is designed to not last longer than two minutes to promote reinforcement of the learned concepts by repetitive gameplay. Methods for integrating pedagogical principals with the game mechanics of the word games and tower defense genres are discussed. Results of a study on non-native English speaking students by measuring their performance via level progression and comparing these to native English speaking students are presented. Participants in the pilot study also provide feedback on their enjoyment of the game. These responses were mostly positive and showed initial promise that learning games can be moved successfully into new genres and still result in an enjoyable playing experience. Finally we measure learning gains in WT and prove that the gains are not compromised by the shifting of genres.

**Keywords:** language games, tower defense, game mechanics for assessment, word games, The LM-GM model

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## 1. Introduction

Developers of learning games have a tendency to restrict games for certain learning domains to specific game genres. Children of different ages and genders prefer different gaming genres (Sherry et al, 2013) and restricting learning domains to specific genres limits the game's potential audience. Being flexible in regards to game genre allows games for some learning domains to reach a wider audience than they normally would. There is some debate as to the wisdom of even classifying games into genres, a concept some argue is carried over from older forms of media and does not apply well to games (Apperley, 2006). Boundaries between genres often collapse under close scrutiny and this opens the ability to shift genres without damaging the core mechanics of the game. One example of a learning domain that has a genre restriction is word games. The classic word game is Scrabble, and Words with Friends is a recent example of a popular word game. Both of these games follow a very similar gameplay style. While they have both been successful commercially, those who do not enjoy this style of gameplay are left out of the experience. In an effort to break word games out of this gameplay style, we created a tower defense word game called Word Towers (WT). Players spell a word to build a tower, which then shoots at passing enemies. The longer the word is the more powerful the tower is and the farther it can shoot. Through this mechanic, players are encouraged to find and spell longer words. A player can also upgrade a tower if they can build a new word by adding some letters to the pool of letters in an existing word tower. As the player advances through levels the difficulty increases as more enemies with more health pass by. This in turn forces the player to build more towers and try to make each one as strong as possible. This made level advancement a measure of spelling skill. This project had two research questions.

- Can level progression be a successful measure of skill?
- Do players enjoy a word game in this genre?

Successfully placing the learning of a word game into a new genre would imply that a similar genre transfer of other learning games would also succeed. This paper will discuss the reasoning behind this attempt to transfer learning games. Section two discusses related work and challenges facing learning games. The third section analyzes how to design game mechanics for skill assessment. Section four discusses hybrid models of pedagogy and game mechanics, and the modifications we made to build WT. We then discuss word games and tower defense games and how their mechanics can be combined. Section 6 covers our design of level difficulty as a means of player skill assessment. We then present our methodology and results in sections seven and eight.