



# Phontasia - a Game for Training German Orthography

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## Abstract

For the English language, decades of research have gone into the study of phonics, the systematic instruction of letter to sound connections in context, culminating in the National Reading Panel in 2000 that anchored phonics in the US elementary curriculum. It has affirmed that phonics is an important ingredient in standard teaching methodologies for English. No similar approach exists today in German elementary school books. Recently, the syllable method is starting to grow next to other popular methods like whole-word approach or teaching that there is a 1-1 Grapheme-Phoneme correspondence. In our work, we have started to look at structured teaching of German orthography through a game that uses speech synthesis and pre-structured syllables in order to teach regular patterns of grapheme usage to children. Previous publications have shown some success. The game will be available for users to test out their German skills.

**Index Terms:** Orthography, Phonics, German, Text Analysis, Educational Application

## 1. Introduction

Gamification uses addictive methods from games and applies these methods to other applications like marketing, tedious tasks or learning [1]. The most popular and easy mechanic to start with gamification is called *PBL*: Points, Levels and Badges. Players go through various stages of being drawn into a game, starting with "onboarding", forming habits and then moving on to an elder stage. Each of these phases has different methods of getting their players to return to the game. During the onboarding stage the player is lured into the game by gaining easy rewards and positive feedback for first efforts, requiring little skills. As the players move up the first levels, they get hooked by their successes, seeing a progress bar, stars and awards, wanting to finish a level in order to reach the next stage with new challenges. With the acquisition of more skills, new levels unlock, each one more difficult than the previous one. Key factors in hooking players in addition to *PBL* are graphics and acoustics. The aesthetic experience is a major motivational component of a game. Learning in games integrates "spectacular failure" and immediate feedback and mastery. A spectacular fail leads to the enjoyment of mistakes through funny sounds, graphics or results, like finding your player gobbled up by the pursuing monster in *TempleRun*. Failing to kill all the pigs in *AngryBirds* results in Pigs laughing at your incompetence and may result in the player's anger to come back and play repeatedly until winning. "Hard fun" is the enjoyment of such a user who will not give up against all failure, defeating the pigs by mastering the necessary physics skills, even if it takes 10

hours of endless shooting practice. Immediate feedback provides instant learning effect. Endless practice until mastery then, is the direct result in such games, without the user noticing the stupidity of repetitive action (like feeding animals or watering plants or in our case, selecting the correct graphemes to construct words), as the user is engrossed in graphics, sound effect, loss of lives, gaining of stars and focused on a progress bar that slowly inches up to the next adventure and mastery of the underlying skills.

If we contrast these features of gaming to the school experience, then we can see why "reality is broken" in most school learning environments [2]. Reward and feedback rarely exists if we put the emphasis on immediacy, mastery and spectacular failure. A kid writes on paper and spelling errors will not get corrected by a cringing paper or vibrating pen or an ink that turns red immediately. A failure to write well does not result in an enjoyable sound but rather in a bad mark that can not be replaced by later mastery. Even using a word editor which marks mistakes, is not in a position to make learning fun or sequence the learner's skill acquisition. The show-and-tell event will demonstrate a game that applies gamification mechanics to the "mindless repetitive act" of practicing correct orthography. The game is relevant to the speech community because it depends vitally on correct pattern-based speech synthesis even for non-words and uses deep knowledge of linguistics for structuring the learning sequence for German appropriately.

The work presented here is based on research in gamification, language acquisition and pedagogy. Work in that area can be summarized to say that structure in language teaching helps all students [3, 4, 5]. Explicit focus on scope and sequence of well-defined skills are the most important components of systematic instruction [6]. This is especially true for weak students or second language learners [7].<sup>1</sup> German is mostly based on the syllable structure [8, 9] with a few orthographic particularities. The scope and sequence that we present for German through this game, must therefore focus on the syllable because the orthographic principles are derived from the position of the letters/graphemes both at syllable and morpheme boundaries [10, 11]. Previous work employs this game in a school and has shown positive results on children's orthographic skills (submitted to SLaTE).

## 2. Game Levels

Phontasia is an app for the iPad and is set in the magic world of letters. The lowest levels are intended to be used by a pre-

<sup>1</sup>A recent data collection in Karlsruhe showed that there is an average of about 60% of children in a classroom with a multilingual biography.

school and first grade child without prerequisite of knowledge of letters. The upper levels cover more complex constructions that are often expected to be mastered only by grade 6 [12]. The levels are designed to progress the learner through the sequence from simple syllable structure to more complex constructions [13]. Figure 1 shows the simple structure for Consonant-Vowel-Consonant-Ending (*CVC.ending*). It shows how the player is presented with a sequence of letters and a picture of the word. The player has to then find the graphemes in the tubes to replicate the word. Four tubes with few graphemes appear as soon as the window shown here is closed. Figure 2 shows how the tubes are used to highlight the difference between the two functions of letter <h>, as vowel or consonant, made visible through the syllable structure represented through the arrangement of the tubes.



Figure 1: Copying words into the magic tubes.



Figure 2: Higher level including complex syllable onset, distinguishing the two uses of grapheme <h> as consonant or vowel and employing morpheme boundary for word collection.

### 3. Gamification Elements

In a study over 12 weeks, children were asked to play with the game once a week as part of a project to study the effect of the game on their spelling abilities. The children did not tire of the game during this time and reached higher levels than originally expected.<sup>2</sup> The morpheme boundary was used to quickly construct new words from old ones, to gain quick points. A list of gamification methods that contributed to the children's motivation to continuous game playing is given in Table 1.

<sup>2</sup>Grade 2 children at the end of the study where able to explain syllable structures, usage of the silent consonant, and the role of the letter "e" depending on the position within the syllable. Children's texts reflected significant improvement in orthographic ability.

Table 1: Game Mechanics.

Pattern	Examples
Points/Badges	1 star = 5 correctly entered words
Levels	5 stars = 1 Level
Progressbar	shows number of words until next star
Onboarding	the first levels are very easy
Challenges	new levels are more difficult
Graphics	rainbow colors, tubes, bubbles
Acoustics	all interaction has sounds
Spectacular Fail	lose a life, create a nasty sound
Feedback	immediate points/lives/sounds speech synthesis for all possible letter combinations
Repetitive action	letter selection
Lives	three mistakes and the level is lost

### 4. Acknowledgements

This work was sponsored by Inline, Internet Online Services GmbH who owns the copyright for Phontasia.

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