

**AvenuePM-KidSpeak – a Gamified Tool for Progress
Monitoring Oral Reading Fluency**

Jian Liao

Department of Learning and Performance Systems
The Pennsylvania State University
University Park, USA
314 Keller Building
University Park, PA. 16802
Email: jx11089@psu.edu

Michelle Hepfer

Department of Educational Psychology, Counseling, and Special Education
The Pennsylvania State University Park, USA;
1801 Gibson Building SE, Apt 1102
Albuquerque, New Mexico, 87106
Email: mjh6114@psu.edu

Simon Hooper

Department of Learning and Performance Systems
The Pennsylvania State University, University Park, USA
314F Keller Building
University Park, PA. 16802
Email: sxh12@psu.edu

Susan Rose

Department of Educational Psychology
The University of Minnesota, USA
245 EdSci Building, 25 East River Road
Minneapolis, 55455
Email: srose@umn.edu

Rayne Sperling

Department of Educational Psychology, Counseling, and Special Education
The Pennsylvania State University Park, USA;
278 Chambers Building
University Park, PA. 16802
Email: rsd7@psu.edu

Laura Stover

Department of Educational Psychology, Counseling, and Special Education
The Pennsylvania State University Park, USA;
176 Faith Circle
Boalsburg, PA, 16827
Email: ljw42@psu.edu

Alicia Hart
Department of Communication Sciences and Disorders
The Pennsylvania State University
University Park, USA
508, Duncan Court
Cranberry Township, PA, 16066
Email: aliciahart1622@gmail.com

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Abstract

Oral reading fluency (ORF) is important for reading since it can help learners make connections between ideas in a passage. However, the process of administering and scoring students' ORF tests is time-consuming both to administer the assessment and to record student performance data. Moreover, computers have the potential to enhance the assessment process by incorporating gamification elements. We designed a Gamified ORF progress-monitoring tool, KidSpeak. This paper describes the design of KidSpeak and discusses the application of KidSpeak to help teachers monitor students' literacy development.

Introduction

Reading is recognized as a foundational skill: reading-success not only dictates school-success, but also improves self-esteem and enhances opportunities for higher education and future employment (Hudson, Lane, & Pullen, 2005). Oral reading fluency (ORF) has been identified as one of five essential components of reading by The National Reading Panel and National Institute of Child Health and Human Development (2000).

However, the process of administering and scoring ORF tests is time-consuming since it requires individualized administration and for performance scores to be manually recorded. In addition, the reliability of scoring paper and pencil ORF tests is questionable since teachers generally cannot review student's reading for errors and tests be re-scored. However, a computer-based assessment system could ameliorate these limitations and allow game elements, such as levels, points, and badges to improve learners' motivation. In this manuscript, we KidSpeak, a gamified ORF progress-monitoring tool, designed to help teachers monitor ORF.

Oral Reading Fluency

ORF has a close relationship with comprehension; fluency helps students to make connections among the ideas in a passage and supports comprehension (Stanovich, 1991). Moreover, the results of ORF tests can help teachers to identify students at risk of reading failure and to make data-driven instructional decisions that improve students' academic outcomes (McMaster, Shin, Espin, Jung, Wayman, & Deno, 2017).

To assess ORF, teachers often administer assessments weekly. The student reads a brief passage while the teacher listens to the child read, and notes reading errors. The student's score is calculated by counting the words read correctly per minute (WCPM) (e.g., Hudson, Lane, & Pullen, 2005) as research has shown WCPM to be an indicator of overall reading proficiency and is predictive of reading comprehension (e.g., Decker & Buggey, 2014; Fuchs, Fuchs, Hosp, & Jenkins, 2001). However, counting the number of WCPM is a time consuming and error prone process that could be improved by using computer technology.

Progress Monitoring Systems

A progress monitoring system is frequently administered set of measures used to determine whether the students are making satisfactory academic performance (Stecker, Fuchs, & Fuchs, 2008). Progress monitoring has been developed to measure mathematics (Ysseldyke & Tardrew, 2007) and literacy (Espin, Wallace, Lembke, Campbell, & Long, 2010; Shinn, & Shinn, 2002; FastBridge, 2019). In our system, we added gamification elements to an ORF progress monitoring measure.

Gamification

Gamification refers to the use of game elements, such as points, levels, and badges, to improve user experience and engagement (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). Although gamification is not

associated with improved reading knowledge or skill, studies have shown that gamification can improve learner motivation (Brull & Finlayson, 2016) and motivation is associated with reading engagement, strategies, and success (e.g., Aarnoutse & Schellings, 2003; Fink & Samuels, 2007; Guthrie & Humenick, 2004; Guthrie & Wigfield, 1997). Gamification is also appealing since it can be applied to learners with different learning styles, including auditory, visual, and kinesthetic (Pettit, McCoy, Kinney, & Schwartz, 2014).

Design of KidSpeak

In order to make ORF measures more efficient, informative, and reliable, we designed an ORF progress monitoring tool, KidSpeak, as part of a larger progress monitoring system known as AvenuePM (<https://avenuepm.org>). KidSpeak includes separated student, scoring, performance charts interfaces.

KidSpeak: Student Interface

The student interface was originally designed as an iPad app, since iPads are commonplace in schools in the US and the touch screen is easy for children to use. Recently, we developed a gamified version of KidSpeak, for use on mobile devices and computers (see Figure 1). The database includes 237 KidSpeak passages across 12 reading levels from mid-first to end of sixth grade. Each level is associated with a criterion score that constitutes success. Table 1 shows the success criteria for each level. Levels are indicated by images representing an animal hierarchy. The bar at the top of the page indicates the student's current level. The student moves up a level by achieving success on 3 successive trials. Each success is indicated visually as a step toward the goal. In Figure 1, the current level is represented by a fish and the next level by a seahorse.

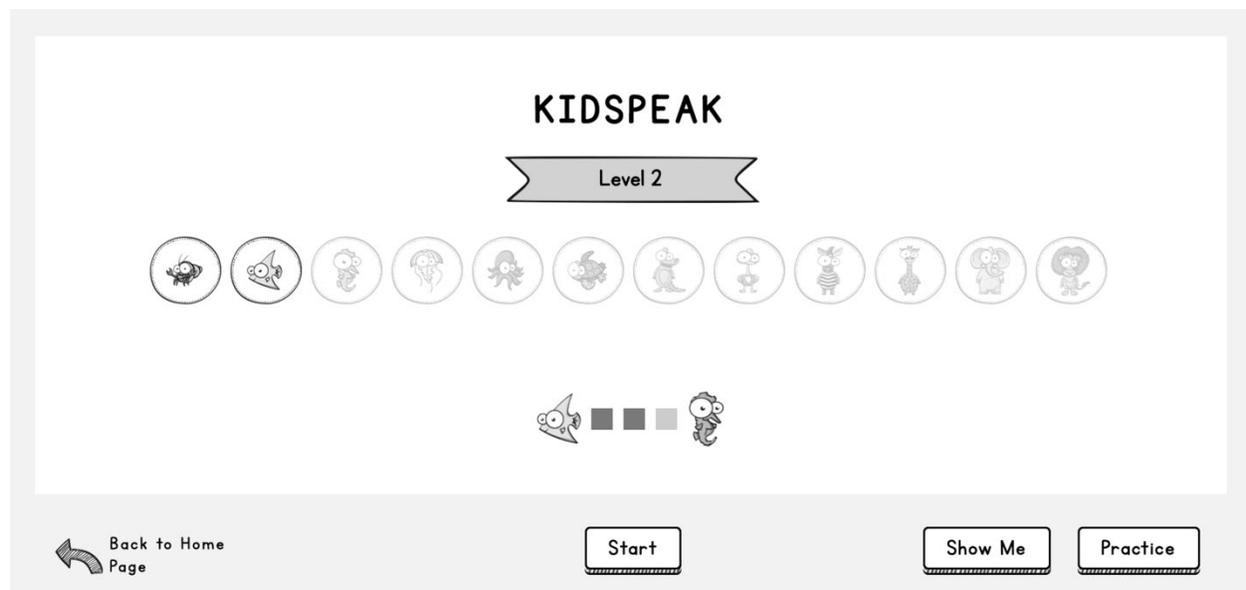


Figure 1. Gamification feature of KidSpeak

Table 1. Criteria for moving up a step

Level	1	2	3	4	5	6
Criterion	1	23	53	72	89	92
Level	7	8	9	10	11	12
Criterion	107	112	123	127	139	140

After starting a task, a text passage at the student's reading level is shown on the screen (see Figure 2). After pressing the record button, the students are given one minute to read the passage aloud. A clock in the bottom right corner of the screen shows the time remaining. Upon completion, an audio file is uploaded to a server for scoring and analysis.

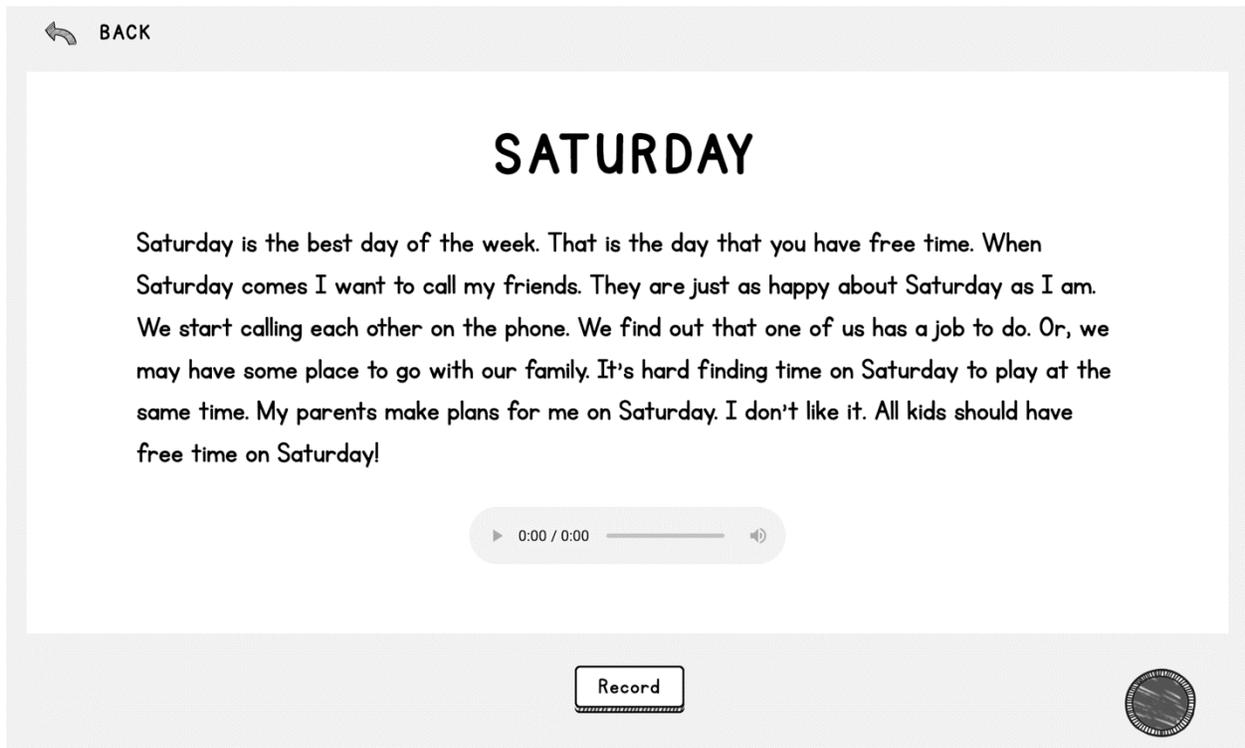


Figure 2. Interface of KidSpeak test

KidSpeak: Scoring Interface

KidSpeak tests are scored in a custom scoring interface (see Figure 3). A scorer listens to a recording of a student reading and scores the test by selecting misspoken words in the interface. An 'incorrect' icon is placed over each misspoken or missed word. To complete the scoring process, the scorer selects the last word spoken by the student. Next, the scorer selects the Auto Correct button which marks all words up to the last identified word as correct. Finally, the software calculates the number of correct/incorrect words and adds this information to a student performance chart.

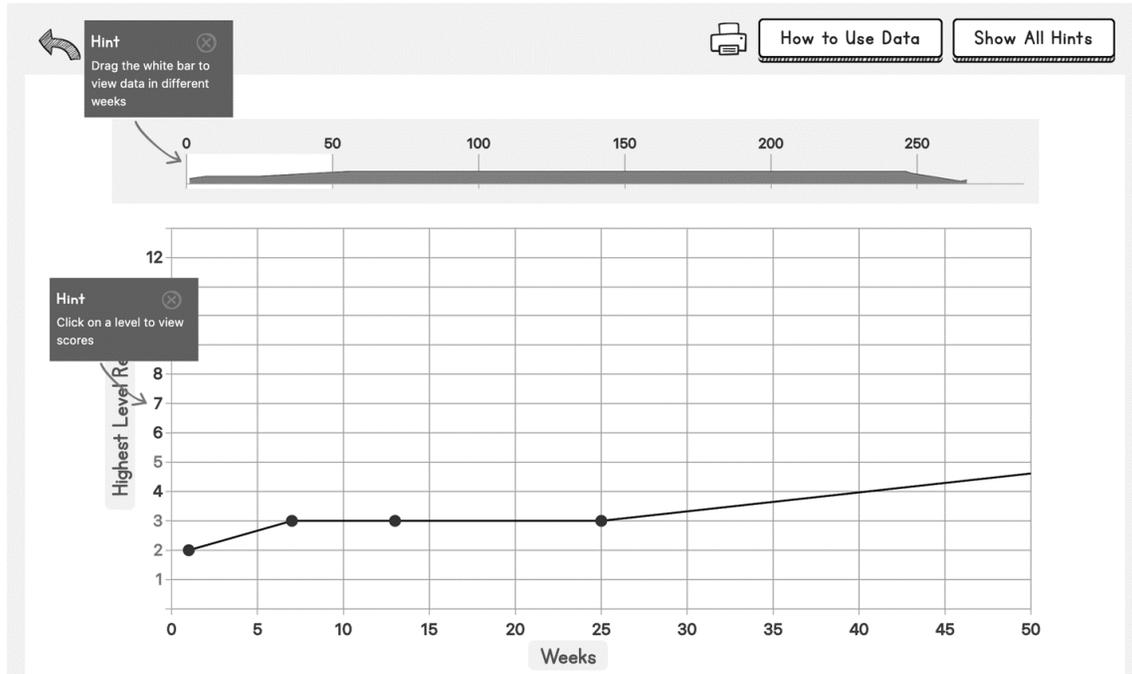


Figure 4. KidSpeak macro-level data display

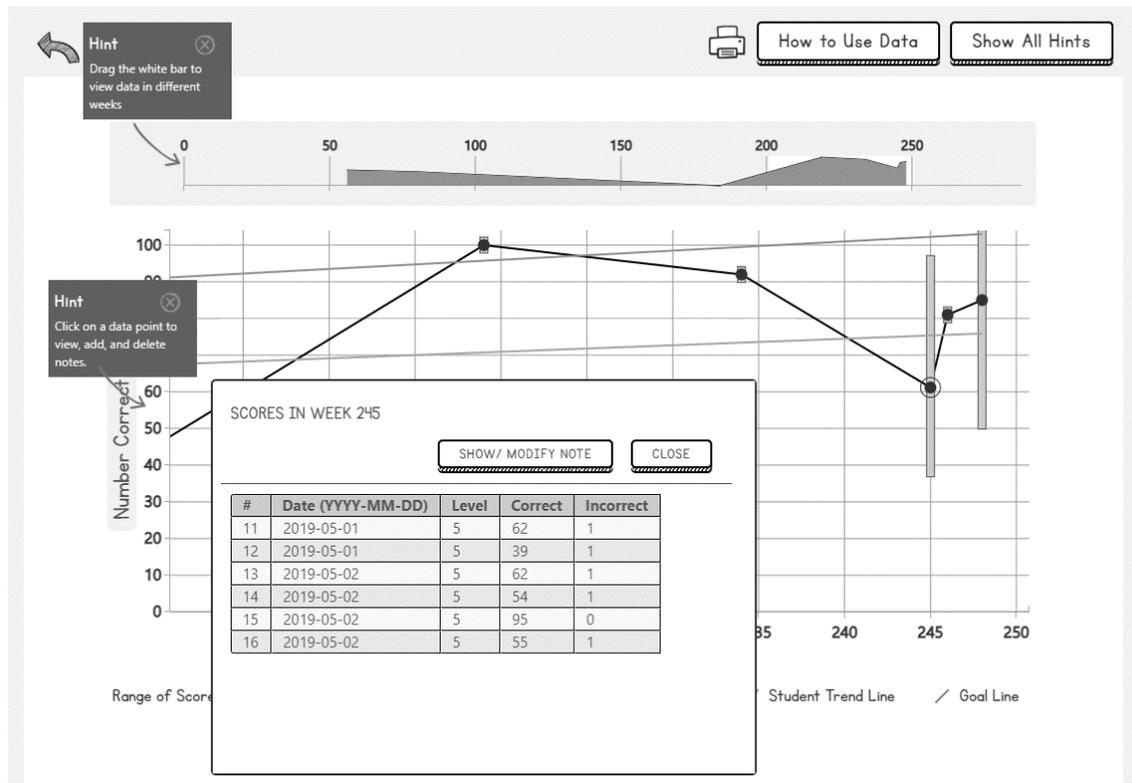


Figure 5. KidSpeak micro-level data display

Discussion

ORF is accepted as a valid approach to monitor early reading development, but the processes of administering and scoring ORF tasks can be inefficient, time-consuming, and unreliable. This paper reports on the design of a gamified progress-monitoring tool, KidSpeak, which has potential to improve teacher efficiency and to provide teachers with information that can help identify students who are making inadequate reading progress.

The AvenuePM website, including KidSpeak, is free for teachers and students. We plan to develop more passages and conduct further studies to investigate the effectiveness of the tool. The following research questions are planned:

1. What are test-retest and alternate form reliability of the KidSpeak passages?
2. How valid the KidSpeak measure?
3. To what extent does KidSpeak save teachers when compared to traditional paper and pencil ORF tests?
4. Does the KidSpeak data chart help teacher to identify students who are not meeting their ORF goals?
5. To what extent does the gamification feature affect learner motivation?

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