

Improving English Learner (EL) Language Proficiency Through a Multimodal Language Software Platform

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Abstract: Poor English skills are correlated with low academic outcomes, putting English Language Learners (ELs) at higher risk than native English speakers for academic failure. STORYWORLD is a digital learning platform that enables ELs to practice and improve their skills in reading, listening, speaking, and writing. The platform includes a Formative Evaluation Dashboard that provides teachers with actionable data to assess language proficiency. The present work outlines an approach for evaluating the efficacy of STORYWORLD in an authentic setting. The approach is guided by the product’s logic model, which itself is based in the scientific literature on reading development. The manuscript presents preliminary evidence that STORYWORLD can be used effectively for classroom learning and concludes with steps for future work.

Introduction

English Language Learners are the fastest-growing student population in US schools (Grantmakers for Education, 2013). The US Department of Education reports nearly one in ten US public school students (4.6 million students) are ELs (US. Dept. of Ed. NCES, 2017), and approximately three in four US classes include at least one EL (Sargrad, 2016). Some estimates project that by 2025, the proportion of ELs will increase to nearly one of every four students (NEA, 2008).

Despite this rapid increase, there is a persistent achievement gap between English Learners (ELs) and native-English (NE) speaking students (Reardon, 2011). 92% of 4th grade ELs score below “proficient” in English vs. 62% of 4th grade NEs (NAEP, 2015). ELs are twice as likely as NEs to dropout of high school, and only 1.4% of ELs who graduate from high school take college entrance exams like the SAT (Moll, 2017).

Teachers are overwhelmingly unprepared for the challenge of helping ELs catch up to their NE peers: 85% of U.S. teachers are monolingual, and 87.5% have had little or no training in teaching linguistically diverse students (Frankenberg & Siegel-Hawley, 2008). Many ELs are tracked into academically segregated programs and wind up falling behind in other basic subjects as well.

To better support ELs, teachers need improved tools to assist and evaluate student language capabilities and learning progress in real time (Colombo, McMakin, Jacobs, & Shestok, 2013; Samson & Collins, 2012). Research also shows that teachers of ELs feel more confident and are better able to intervene and provide effective support when provided with actionable data on their students (Task Force on Educator Excellence, 2012). Evidence also suggests increased instructional practice for ELs in all four language modalities - reading, listening, speaking and

writing - improves academic vocabulary and overall language proficiency. As an illustration, the IES's Practice Guide notes "strong" research evidence to support EL instruction and academic vocabulary development using multiple modalities in addition to reading: writing, speaking and listening (IES-NCES, 2014).

STORYWORLD

The above research motivated the development of STORYWORLD – an educational technology platform that aims to facilitate student oral and written expression by providing practice and assistance in all four language modalities (reading, listening, speaking, and writing). STORYWORLD uses advanced technology to present oral and written narratives to ELs in the second language (e.g., English) while simultaneously providing oral and written scaffolding in their first language (e.g., Spanish and Mandarin) to bridge the two languages. These scaffolds include word-by-word, audio read-alouds recorded by native speakers, word-by-word translations, the ability to switch target languages at any time, and related vocabulary and comprehension exercises. The STORYWORLD platform includes a Formative Evaluation Dashboard (henceforth referred to as the "dashboard") that enables teachers to evaluate reading proficiency (i.e., vocabulary and comprehension) and evaluates how the students and class as a whole progressed while reading on the platform. STORYWORLD's platform includes:

- A student-facing learning platform that enables opportunities for reading, listening, writing, and responding to questions.
- A teacher-facing dashboard, derived from student work, offering quantitative data (reading and listening) and qualitative (speaking and writing) data to track student proficiency.
- Student-and teacher-facing features that facilitate sharing of student written and oral work (i.e., original stories) in any language.

Approach Based on Logic Models

The goal of the present work was to evaluate the STORYWORLD platform for supporting English language learning in classroom settings. The approach we take is one based on the product's logic model (Kao, Matlen, Tiu, & Li, 2017), which involves evaluating the links between the products' inputs and activities that are hypothesized to the desired outputs – in this case, English learning. Towards this effort, STORYWORLD partnered with (Authors) – an independent educational research agency – to collaborate on ongoing and iterative research and development work aimed at improving the product for classroom use.

The present study conducted by (Authors) is part of a broader program of research aimed at supporting the above goal. It represents an initial first step into assessing whether the platform operates as intended and according to its logic model. This is a needed, and often overlooked, first step in assessing the overall viability of educational technology products (Kao, Matlen, Tiu, & Li, 2017). The goal of this study is specifically to explore the feasibility of using STORYWORLD in elementary school classrooms, and to gauge its potential to support student learning and engagement in reading (per the logic model assumptions).

The logic model is presented in Figure 1. The theory of change for this product is that by providing practice and assistance opportunities to ELs, students can engage in meaningful learning opportunities, connecting concepts in their primary language with English, and be supported through feedback and targeted assistance in the platform. Furthermore, teachers receive detailed information about student progress and struggles, allowing them to intervene

more timely and effectively. This individualized and on-time support helps students to build confidence in their English skills and positive attitudes towards English learning, leading to improved academic outcomes.

Method

Sample. The intended users of the updated STORYWORLD product are EL students and educators of ELs. The focus of this study was on students and teachers in grades 1-2 because the highest proportion of ELs (17%, or about one in six ELs) are concentrated in these grades (IESNCES, 2017). Participants in the present study were 44 ELL students (27 first grade, 17 second grade) across four classrooms (2 first grade, 2 second grade). All four teachers had at least seven years of teaching experience, as well as experience teaching ELs. Two students did not complete the post-survey and were excluded from analysis.

Procedure. Teachers received training on how to use the STORYWORLD student platform and teacher dashboard and about the research activities required for study participation. Students completed a Motivation to Read Profile—Revised (MRP-R) student pre-survey, adapted from the Motivation to Read Profile (Gambrell, Palmer, Codling, & Mazzoni, 1996), to establish baseline reading motivation. The attitude pre-survey was administered with an online assessment platform. Using the MRP-R scoring guideline, a 1-point to 4-point score for each item was determined based on the student's answer selection (Assessing Motivation to Read, Malloy et al., 2013). The Reading Attitudes Survey was broken into two sub-scales (Self-Concept as a Reader and Value of Reading) for scoring and analysis. For each sub-scale, the total possible points students could receive was 40, and the higher the students' score, the more motivated to read they were considered to be. Exploratory analyses were conducted on the survey results including descriptive statistics, paired t-tests, and one-way ANOVAs. These tests were run to explore the impact of the STORYWORLD platform on students' attitudes towards reading.

Teachers were asked to incorporate STORYWORLD into their existing ELD activities at least three times per week for 2 weeks, having students read at least one book per session for a minimum of 15 minutes. Teachers were also asked to track student progress using the dashboard. How STORYWORLD was implemented in the classroom (i.e., whole class instruction, small group work) was left to teacher discretion. Each week, teachers completed an online log about their classroom's STORYWORLD use. Researchers visited all four classrooms once during study implementation to observe STORYWORLD as it was used for ELD instruction. Following the 2-week implementation period, students completed the reading attitude post-survey. All four teachers were interviewed by phone.

Results

Teacher interview and classroom observation data indicated that the reading and listening modalities worked consistently. Student engagement was extremely high across all classrooms (no off task behavior was observed), and teachers were able to successfully integrate STORYWORLD into their existing curriculum. Technical difficulties were an impediment to successful use of the writing and speaking modalities of the STORYWORLD platform. However, once the challenges are surmounted during the next phase of product development, all participating teachers indicated that they believed STORYWORLD would function as a valuable tool for EL language support in elementary classrooms.

To explore whether STORYWORLD supports student attitudes towards English learning, we examined pre to post changes in students' attitude scores on the sub-scales a) self-concept and b) value of reading. The mean total scores of participating students on both sub-scales increased after two weeks of using the STORYWORLD product. A main effect on self-concept was positive (gain=1.2, $t=1.951$, $p=0.058$, $d=0.4$), and the effect on value of reading was both positive and significant (gain=4.6, $t=5.63$, $p<0.001$, $d=1.26$).

One-way ANOVAs were used in an exploratory manner, to determine if there were significant differences between individual teachers' changes in mean scores. The results of the ANOVA showed that there were statistically significant differences between the classroom's score changes from pre to post, confirming that the amount of score change was not consistent across all four classes (see Table 1). While three classrooms had a positive increase on one or both sub-scales, the fourth class had a negative sub-scale change after having experienced technical difficulties with the STORYWORLD product. The negative scores may have been a result of the technical issues and not a reflection of the STORYWORLD product impact.

As teachers were not randomly assigned to use STORYWORLD and the sample size was small, it is possible that other variables (such as student maturation) contributed to the improved student reading attitudes. Thus, the results should not be used to claim that STORYWORLD caused improvements in students' reading attitudes without completion of further studies.

Discussion

The intent of this study was to explore STORYWORLD's classroom feasibility and to judge its ability to support student learning and engagement in reading. High student engagement was observed across both grade levels and in all four classrooms, and importantly, students gained overall in their attitudes towards English learning- a key assumption of STORYWORLD's logic model. At the same time, a subset of classrooms did not show gains. Observations suggested this result may be due to technical implementation difficulties, and to remedy this, the research team recommended multimodal response options and write-assist to support beginning readers. These results – both expected and unexpected – are important for ongoing improvement of English learning technology products, and illustrate the necessity of early-stage validation of logic model components (e.g., if STORYWORLD is used, then it will improve motivation for English learning). Overall, the study both provided evidence the product can support intended outcomes as well as generated suggestions for improvement.

This study is part of a broader program of research aimed at more comprehensively evaluating the efficacy of the STORYWORLD platform, in which we will study the platform over longer periods with more rigorous experimental controls. We are currently planning a larger-scale evaluation of the product, involving hundreds of ELs and approximately 36 teachers, in which EL groups will be randomly assigned to either the treatment (STORYWORLD) or control (business as usual) groups, and field-tested assessments will allow for estimations of student performance on both proximal and distal outcomes. The study will take place in the fall of 2019 and preliminary results from this study will be available to be shared by the time of the conference.

With the availability of technology in classrooms, digital products for education are becoming increasingly common. This technology boom is exciting, on the one hand, as it offers increased opportunities for educators to take advantage of technological innovations to support student outcomes. On the other hand, technology on its own is not a universal cure for educational improvement.

What's needed then are research partnerships that support the iterative development of these products, that are based in an understanding of how a product operates in the intended settings to produce its desired effects and complementary interaction with a teacher informed by formative feedback. Our approach is based on assessing links within a product's logic model to support the product's ongoing development. Our future work will continue this effort, and we hope it can support related efforts in developing effective products for English language learning.

Figure 1. Theory of Change

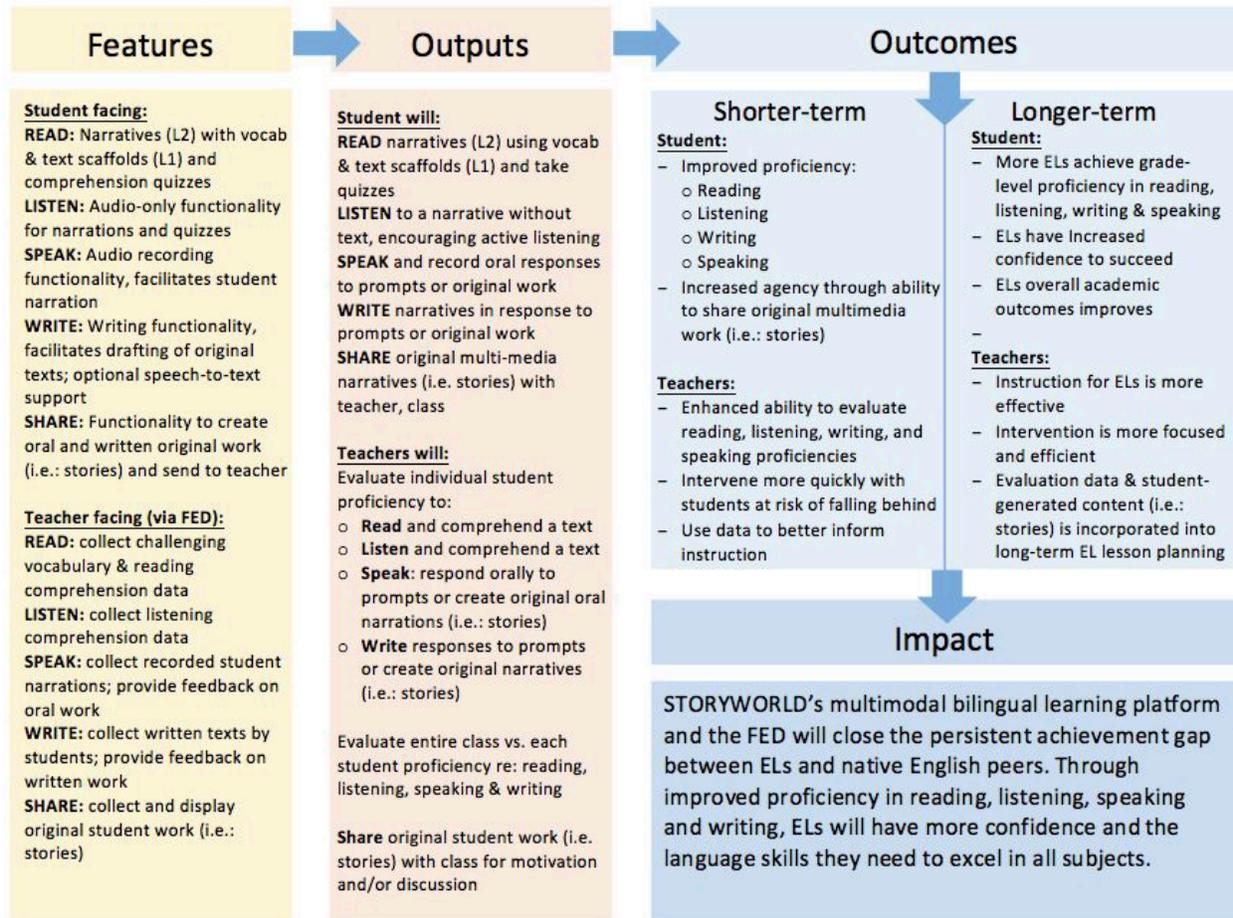


Table 1. Change in Mean Attitude Survey Score, By Class

Classroom	Self-Concept Sub-Scale Change in Mean Score	Value Sub-Scale Change in Mean Score
Teacher A	+2.615	+7.615
Teacher B	+3.375	+3.375
Teacher C	-.375	-2.000
Teacher D	-.539	+6.384