EdTech
@WestEd

Improving education technology through research & evaluation

EdTech Partnerships
Key Findings

2022–2023 Report

About EdTech@ WestEd

WestEd is a nonpartisan, nonprofit research, development, and service agency based in San Francisco, California. WestEd works with education and other communities throughout the United States and abroad to promote excellence, achieve equity, and improve learning for children, youth, and adults. The EdTech@WestEd team is a leader in education technology research. We have extensive experience conducting research and evaluation for small businesses and entrepreneurs in the education technology sector. Our EdTech team strives to provide our clients with actionable research and insights that help improve their product development and increase impact. We offer expertise in education research, academic content areas, learning science, and product implementation.

Our Small Business Innovation Research Partnerships

Since 2013, WestEd has served as the research partner for more than 60 successful Small Business Innovation Research (SBIR) Phase I, Phase II, and FastTrack proposals from the Department of Education, Institute of Education Sciences; National Science Foundation; and National Institutes of Health. The following 2022–23 SBIR projects showcase the types of EdTech partnerships that WestEd has established and the impact that each project has on promoting success for every learner.

Pictoword School

Combining AI (Machine Learning) and Game-Based Learning to Support English Learners (Multilingual Learning)

According to the National Center for Education Statistics, in 2017, 10.1 percent of students—approximately 5 million in the U.S.—were multilingual learners of English. Projections from the National Education Association suggest that by 2025, about one in four K–12 students will be multilingual learners. Research by Chao and Schenkel (2013) has shown that such students often face more significant academic challenges than their native English-speaking peers.

Pictoword School (PS) is a supplementary program designed for English language learners. The PS application (app) offers engaging word puzzles aimed at enhancing vocabulary acquisition, encompassing word recognition, spelling, pronunciation, and sentence usage (Chao & Schenkel, 2013).
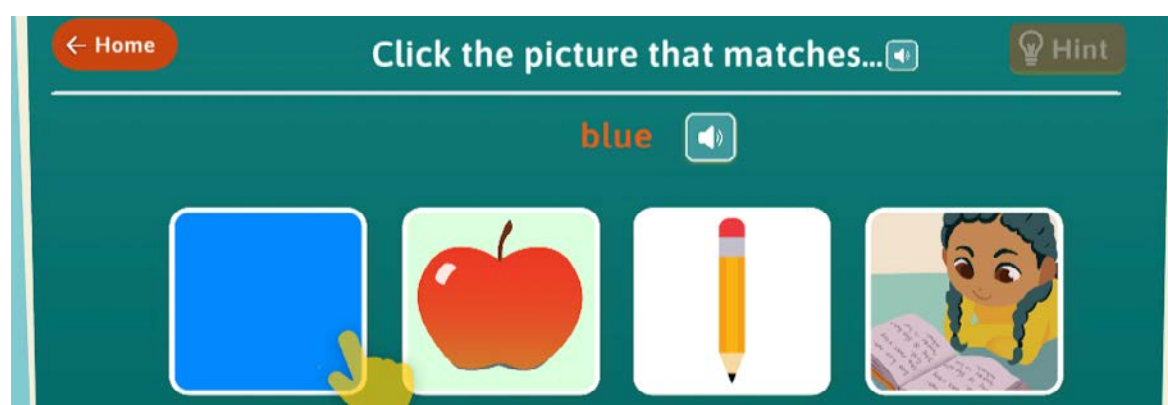
GOALS AND STRATEGY

From December 2022 to June 2023, WestEd conducted a pilot study involving 13 teachers to assess the potential of the PS app by exploring the evidence of its promise, feasibility, and fidelity. Teachers were randomly divided to one of two groups: the treatment group, which incorporated the PS app into their English language instruction as part of their curriculum, and the control group, which maintained their regular teaching practices. Treatment teachers were instructed to incorporate the PS app into their English language instruction at least three times a week for a duration of 10 weeks, while control teachers maintained their usual teaching routines.

Research Questions

The following overall research questions guided the pilot study.

Evidence of Promise

- Does the PS app show promise in delivering positive outcomes, particularly for emerging bilingual learners?

- What effect does the PS app have on students' understanding of and attitudes about vocabulary and spelling, particularly among English learners?

Feasibility and Fidelity

- How effectively does the PS app assist students, especially emerging bilingual learners, with vocabulary?

- To what extent is the teacher dashboard effective in providing valuable student information for instructional decisions?

- What challenges do teachers encounter when using the PS app for language support?

- How do students and teachers perceive the usefulness of PS for learning and teaching vocabulary and spelling?

KEY FINDINGS

- Preliminary data from the student content assessment suggests that the PS app shows promise in enhancing English vocabulary acquisition for all students. The findings indicate a statistically significant improvement in post-test scores when transitioning from the control group to the treatment group, with a change of 0.91 ($p < .05$).

- When asked if they thought playing Pictoword School was fun, 90% of students agreed.

- An impressive 89% of students found that Pictoword School was easy to use and reported learning new words and definitions by playing PS.

- Teachers stated that they would recommend the PS app to other teachers of English learners and strongly agreed with the statement, "My students were consistently engaged with the PS app Playground Mode puzzle."
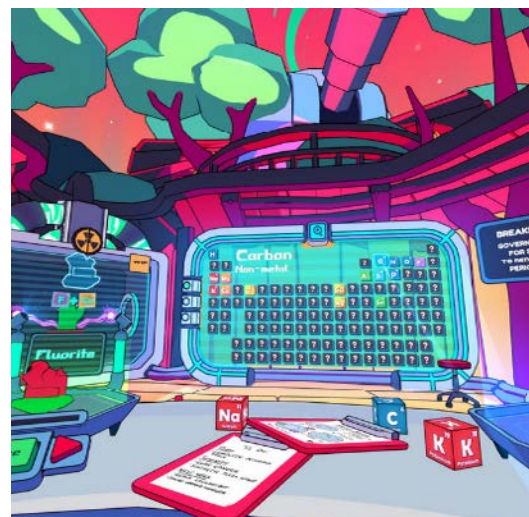
Tablecraft

STEM Engagement Through Collaborative Virtual Reality (Science)

Tablecraft is a multi-platform scientific game that can be played with tablets, computers, and virtual reality (VR) headsets. Its primary goal is to pique student interest in science while also encouraging student collaboration.

In Tablecraft, players are transported to a dynamic sci-fi lab teeming with fascinating experiments and gadgets. Within this virtual lab, they have access to machinery that allows them to combine elements and create anything from carrots to toothpaste. Additionally, the game includes proton and neutron modder machines for discovering new isotopes and elements.

Furthermore, Tablecraft assists schools in gradually introducing VR technology by allowing students to interact with another group of peers engaged in VR gameplay via the companion app.

GOALS AND STRATEGY

From May to June 2023, WestEd ran a pilot study to investigate the feasibility and potential impact of the Tablecraft Virtual Reality (VR) experience in real educational settings.

Research Questions

The following key research questions guided this study.

- **Functionality.** Can teachers use Tablecraft in the classroom setting as intended?
- **Student Engagement.** How does Tablecraft engage students in science?
- **Improvement.** How might the Tablecraft experience for teachers and students be improved?
- **Usefulness.** In what ways can Tablecraft be used in the classroom setting as an effective tool for increasing student engagement?

Teachers were asked to implement Tablecraft into their classes for a minimum of four class periods throughout the pilot research. They provided up to six Tablecraft exercises, each lasting 20 minutes or more and covering themes such as the periodic table, radioactive decay, and rock and mineral production.

The lessons were designed for students to work in small groups of 3–5 people, with one group member using a VR headset to access Tablecraft's virtual environment, while others engaged with Tablecraft via the mobile-based companion app. Throughout gameplay, approximately a quarter of the class (8 students) or fewer used a VR headset, while the remaining three-quarters of the class utilized the mobile app. Students were asked to rotate their use of the VR headset within their small group every 10 minutes.

KEY FINDINGS

- Teachers demonstrated readiness to implement the Tablecraft activities, utilizing a combination of Tablecraft-provided resources and slides they generated themselves. They adequately prepared students by presenting Tablecraft materials and introducing science content ahead of implementation.
- Overall, teachers were able to effectively integrate Tablecraft activities within their regular teaching routines, despite certain challenges that hampered implementation. These obstacles included technological difficulties as well as some students' reluctance to use the VP technology, thereby influencing student engagement.
- While most students found the VR headsets simple to use, some struggled to understand the activity instructions.
- Teachers described their students as highly engaged with Tablecraft, and slightly more than half of the students typically reported a high level of engagement when using it.
- Teachers described the Tower Building Relay Race as a highly interesting and successful exercise, and they asked for more materials to promote and assess student learning.
- Student attitudes toward science remained predominantly consistent both before and after utilizing Tablecraft.
- The platform effectively immersed students in scientific concepts, typically found in traditional textbooks and videos.

Teachers identified Tablecraft as a helpful tool for sparking student interest in science while adding an element of fun within the classroom environment. They did, however, note that it does not seamlessly align with their existing curriculum.

MusiQuest (Music)

MusiQuest, a cloud-based software platform developed by Edify Technologies, Inc. for online music education, is specifically designed for schools that lack formal music programs. This program, which features a teacher dashboard, a student portal, and tailored lessons, aims to facilitate music education in general classroom instruction, even for non-music teachers.

The development of MusiQuest received essential support through partial funding from the Small Business Innovation Research (SBIR) program of the United States Department of Education. Edify Technologies collaborated with research partner WestEd to conduct extensive usability tests, a classroom feasibility study, and a pilot trial to refine the platform's functionality.

Throughout this development process, numerous tests were carried out to gather valuable data on how to enhance MusiQuest for classroom use by teachers with no prior experience in music education. The research also explored the software's potential applications within a homeroom setting, emphasizing its adaptability to diverse educational contexts.

GOALS AND STRATEGY

Research Questions

The following research questions guided this feasibility study.

- To what extent do teachers implement MusiQuest as intended? How do students engage with MusiQuest?
- Does using MusiQuest increase student knowledge of music in target modules?
- Does using MusiQuest increase student self-efficacy and attitudes toward music, the arts, and careers in the arts?
- What modifications to MusiQuest would maximize its value and feasibility for use in homeroom classes?

The study involved six elementary school teachers and their students. Teachers were tasked with teaching eight MusiQuest lessons which were spread over either a 10-week or 5-week period. As part of the study, teachers administered pre- and post-surveys and assessments developed by researchers to evaluate student attitudes and understanding of the music content presented in the MusiQuest classes. Teachers also filled out logs and took part in post-study interviews.

KEY FINDINGS

- Students were both highly engaged and enjoyed using MusiQuest. In teacher log responses, teachers either strongly agreed (48.9%) or agreed (48.9%) that students were engaged in the lesson. All teacher responses indicated that students enjoyed the instructional activities.

- Students easily used MusiQuest. Based on teacher log responses, all students were able to grasp how to utilize MusiQuest lessons (100%), the majority found MusiQuest easy to navigate (97.9%), and an overwhelming percentage expressed enjoyment in utilizing MusiQuest throughout the lessons (95.7%).

- Student knowledge of music increased, as measured by the researcher-developed student pre- and post-assessments. Student scores showed statistically significant improvement from the pre- to post-assessments.

- All teachers used MusiQuest as intended and found it to be well-suited for classroom use. According to teachers' feedback, MusiQuest was deemed suitable for regular classroom integration and was perceived as a valuable addition to the learning environment.

Teachley

Fractions Boost Intervention (Mathematics)

One of the factors contributing to the academic gap between students in the United States and their international peers is the continued emphasis on procedural learning and repetitive practice in mathematics courses. This research study examines how an online fractions software, Teachley: Fractions Boost Intervention (FBI), can assist 3rd and 4th graders in deepening their understanding of mathematical practices and addressing common misconceptions across various mathematical domains.

How can students immerse themselves in innovative and interactive mathematics learning? Teachley offers an inventive approach for elementary students by integrating storytelling and diverse transmedia elements into their supplementary mathematics curriculum. This method encourages students to tap into their imaginations in exciting ways, making abstract fraction concepts such as strategy use more explicit and accessible.
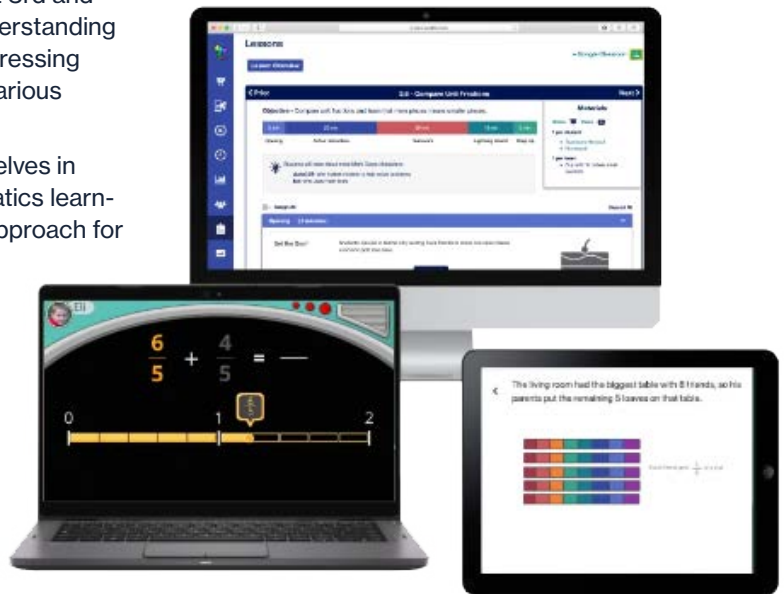
GOALS AND STRATEGY

Research Questions

The following research questions guided this research study.

- What does successful and reliable implementation of Teachley FBI look like in whole group and small group settings?

- Does FBI demonstrate potential for enhancing students' comprehension of fraction concepts, the practice standards, and the ability to address common misconceptions?

The current study used an underpowered randomized control trial design with twenty 3rd grade teachers and 403 students to examine the impact of Teachley's fraction curriculum on students' learning. Teachers were randomly assigned to either a treatment or control group. For 13 weeks, treatment teachers taught 16 Fractions Boost Intervention sessions in whole class and small group settings.

Students who received small group teaching scored poorly on the study's pre-assessment. Teachers in the control group taught their usual curriculum and were directed to provide some extra support to their class's low-performing kids.

KEY FINDINGS

Teachley provides engaging and easy-to-implement fractions lessons.

- Teachers indicated that Teachley lessons were simple to implement in their classrooms and had a positive impact on student learning, engagement, and math attitudes. Teachers also indicated that students were more interested and looked forward to mathematics instruction when they used Teachley.

Learning gains made by low performing students exceeded those of the rest of the class.

- Students identified as low performing in math showed bigger effect sizes than the gains produced by the rest of the sample in terms of learning gains.

Student persistence and teacher confidence levels increased after using Teachley.

- After using Teachley, teachers reported increased confidence in their arithmetic teaching abilities.

- Students stated that they had a better knowledge of what it means to persevere when faced with a challenging challenge or difficulty.

PocketLab

TaylorAI (Science)

How can students get real-time feedback on their science understanding? TaylorAI, created by Myriad Sensors, Inc., is an artificial intelligence (AI) assessment system integrated into PocketLab Notebook, a cloud-based software platform. TaylorAI has two main roles: (1) it helps teachers provide timely feedback to students during hands-on labs and (2) offers students instant assessments and hints as they work with experimental science data.
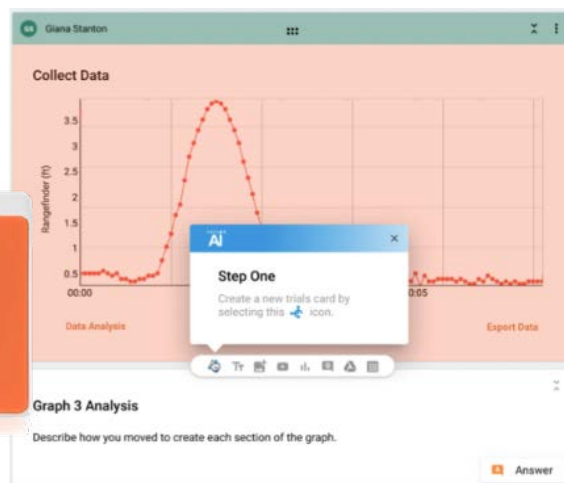
GOALS AND STRATEGY

In a randomized controlled trial, the study aimed to assess the influence of PocketLab, with a particular focus on TaylorAI's formative assessment features within the online science PocketLab Notebook. The evaluation was conducted to examine the impact of TaylorAI on student learning and teacher confidence, in comparison to traditional classroom approaches. It specifically focused on middle school students' science performance and engagement.

Research Questions

The following research questions guided this controlled trial.

- Do PocketLab TaylorAI features increase students' science engagement and motivation?
- Do PocketLab TaylorAI features increase students' learning of science content and practices?
- Do PocketLab TaylorAI features increase teachers' confidence in conducting formative assessments?
- Are the key components of PocketLab TaylorAI features implemented with fidelity?

Researchers randomly assigned 19 middle school science teachers to either the treatment group (9 teachers) or the control group (10 teachers). Teachers in the treatment group used the PocketLab Notebook with TaylorAI features and PocketLab Voyager sensors to conduct eight science investigations in 7th and 8th grade classrooms. Students took pre- and post-assessments measuring their science comprehension and data analysis skills. The students also completed a survey about their science learning and engagement. Teachers maintained weekly logs to report their implementation. Researchers interviewed teachers and observed classrooms for insights into the impact of implementation.

KEY FINDINGS

- Study findings revealed that TaylorAI did not result in increased engagement, improved learning, or enhanced science self-efficacy among students.
- Students in the treatment group showed a neutral response to TaylorAI features during the post-test stage, primarily due to the absence of AI-driven components. The assessment prompts used in the study may have impacted how students viewed the benefits of using PocketLab sensors and notebooks in their learning.
- According to the data collected from teacher logs, treatment teachers tended to report both higher levels of extreme student engagement and more instances of lower student engagement when compared to the control classrooms.
- Teachers in the treatment group found that the PocketLab science investigations offered various opportunities for conducting investigations, gathering and analyzing data, and developing explanations.
- Several actionable suggestions for enhancing the TaylorAI tool for future use were identified, including the following:
  - » shortening the length of labs,
  - » providing additional teacher resources for evaluating students' open-ended responses and assisting with the set-up of science investigations through short videos, and
  - » restructuring text blocks to make them more accessible for middle school students.

Prisms of Reality

NSF Phase II (Mathematics)

Prisms represents a groundbreaking shift in mathematics education, fundamentally transforming the way students learn. Unlike traditional methods, Prisms immerses students in a dynamic environment where math goes beyond being just a subject and becomes an interactive experience. In this innovative approach, mathematics is taught through active engagement, discovery, and the use of virtual reality (VR), creating an immersive and effective learning experience.

GOALS AND STRATEGY

Research Questions

The following primary research questions guided this study.

Student Questions

- Does the use of Prisms impact students' engagement, perseverance, and mindset toward math learning?
- Do students who use Prisms outperform their peers on an exponential functions-focused algebra test?
- Does the use of Prisms result in a shift in students' self-perception as math learners?

Teacher Questions

- Do teachers report any changes in student engagement, perseverance, and mindset toward math learning after the use of Prisms versus the control group?
- Do participating Prisms teachers use Prisms modules in the way that the developer intended? To what extent do implementation and fidelity differ?

Middle and high school Algebra 1 teachers were randomly divided into two groups: the business-as-usual (BAU) control group and the treatment group. The BAU teachers were instructed to cover their linear functions and exponential functions units by the end of the study period. In contrast, teachers in the treatment group were tasked with integrating two Prisms Virtual Reality modules into their existing mathematics instruction, with the option to incorporate a third module.

KEY FINDINGS

- Students in the Prisms treatment group performed better than those in the business-as-usual control group in the study's assessment of exponential functions.
- There were no significant differences in students' self-reported mathematical mindset and confidence between the treatment and control groups.
- Teachers reported increased student engagement, especially in whole-class discussions, when using Prisms lessons.
- Future research should explore the impact of additional Prisms modules on students' mathematics learning, going beyond just exponential functions.

Partner With WestEd

WestEd continues to partner with EdTech companies and school districts every school year. If you are interested in staying informed about opportunities to use education technology products in your school and district, email EdTech@WestEd.org.

For more information, visit our website: EdTech.WestEd.org

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