Highlights of the Findings

Augmented Reality (AR) Exploratory Study to Support the Development of PBS KIDS AR Games

A Report to the CPB-PBS Ready To Learn Initiative

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WestEd — a national nonpartisan, nonprofit research, development, and service agency — works with education and other communities to promote excellence, achieve equity, and improve learning for children, youth, and adults. WestEd has 16 offices nationwide, from Washington and Boston to Arizona and California, with its headquarters in San Francisco. For more information about WestEd, visit WestEd.org; call 415.565.3000 or, toll-free, (877) 4-WestEd; or write: WestEd / 730 Harrison Street / San Francisco, CA 94107-1242.

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WestEd conducted an exploratory mixed-methods study for the CPB-PBS Ready To Learn Initiative to better understand how AR games might be incorporated into early elementary classroom instruction and to provide feedback to the Corporation for Public Broadcasting (CPB) and PBS about potential educational benefits and drawbacks of AR technology for students 6 to 8 years old so that PBS can improve future development. Researchers evaluated the learning potential of two augmented reality games which focus on basic arithmetic skills for early elementary children: *Fetch!* Lunch Rush, developed by the Public Broadcasting Service (PBS) for the CPB-PBS Ready To Learn Initiative, and *Monster Plus*, a game developed by the Georgia Institute of Technology. Overall study findings are highlighted below.

• On average, there was a small gain in student performance on a math assessment from pre-test to post-test, but this gain was not statistically significant. Student performance on the assessment was quite variable.

• As currently designed, teachers would primarily use these AR games to help students improve their speed and accuracy with existing math skills or as supplements to whole-class lessons rather than stand-alone teaching tools.

• Providing more in-game instruction and support for students would enhance the utility of the AR games in classroom environments and increase their learning potential. In-game instruction and support could include more frequent hints, the ability to adjust game difficulty, and tutorials to help students learn new skills and problem-solving strategies.

• Students experienced significant usability issues that may have interfered with their ability to learn from the games. Problems included difficulty holding and manipulating the devices as well as problems with the AR technology itself.

• AR technology has great potential for increasing students’ motivation and engagement in the classroom, not just by providing more interesting learning activities, but also by piquing students’ interest in the technology itself.

• AR technology can help teachers meet the needs of diverse learners by allowing children to engage in physical activity and use their tactile sense, and by providing more introverted children a safe, private place to make and learn from mistakes.
A particular strength of AR might be to provide teachers with many sets of virtual manipulatives, which would be more concrete and reality-based than purely digital objects but also do not have the cost and storage requirements associated with physical manipulatives.

Teachers expressed concern about not having access to certain types of technology needed to use AR in their classrooms and that substantial time and training would be needed in order to use AR effectively in traditional classroom settings.

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