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Using Augmented Reality for Academic Instruction with Postsecondary Education Students with Intellectual Disability and Autism

by Don McMahon, David Cihak, Rachel Wright, and Sherry Bell

This study examined the use of an emerging technology called augmented reality (AR) to teach science vocabulary words to college students with intellectual disability and autism spectrum disorder (ASD). AR combines a live view of the physical world and digital content including pictures text, audio, and video (Craig, 2013). Recent improvements in mobile devices have helped to increase the growth of AR applications, but many of these have not been empirically examined as educational tools.

There is a limited amount of research on using AR to support the needs of students with disabilities. Many of the current AR studies applied AR to support STEM instruction for students without disabilities (e.g., Dunleavy, Dede, & Mitchell, 2009; Yoon & Wang, 2014). McMahon, Cihak, and Wright (2015) demonstrated that AR navigational prompts could increase the independence of postsecondary education students with intellectual and developmental disabilities. Although the technology of AR shows promise, its potential to support academic activities needs to be examined.

METHODS

PARTICIPANTS AND SETTING

One student with ASD and 3 students with intellectual disability participated in a multiple probe across behaviors (i.e., acquisition of science vocabulary words) design. The students were in the FUTURE postsecondary education program at the University of Tennessee. FUTURE is a 2-year postsecondary education program with classes 5 days a week in the fall and spring semesters. Students take classes with traditional university students, take FUTURE program classes (life skills, career and life planning, digital literacy, etc.), and engage in work internships on campus.

The study was conducted during the digital literacy class and during unscheduled student time. Instruction was delivered by the digital literacy instructor and preservice special education teachers.

MATERIALS

The mobile app used was Aurasma (Aurasma, 2014), which provides thousands of different AR content viewing experiences. This app also allows users to create their own AR experiences by matching trigger images/objects with user-created digital content that can include images and video.

The words used were technical science vocabulary terms that had become relevant in the program. A bones and organs list was chosen because a student was pursuing a job in the medical field, and a part of the plant cell list was selected because of a student taking a biology/ecology course.

DESIGN

A multiple-probe across-behaviors/skills design was used to examine the relation between the AR-based vocabulary intervention and each participant's performance to correctly identify and label the meaning of the science vocabulary word. The AR intervention was introduced systematically across 3 science vocabulary word sets. First, AR was introduced to target words related to human anatomy (bones). Then AR was introduced to target words also related to human anatomy (organs), and finally AR was introduced to teach plant cell biology words.

KEY FINDINGS

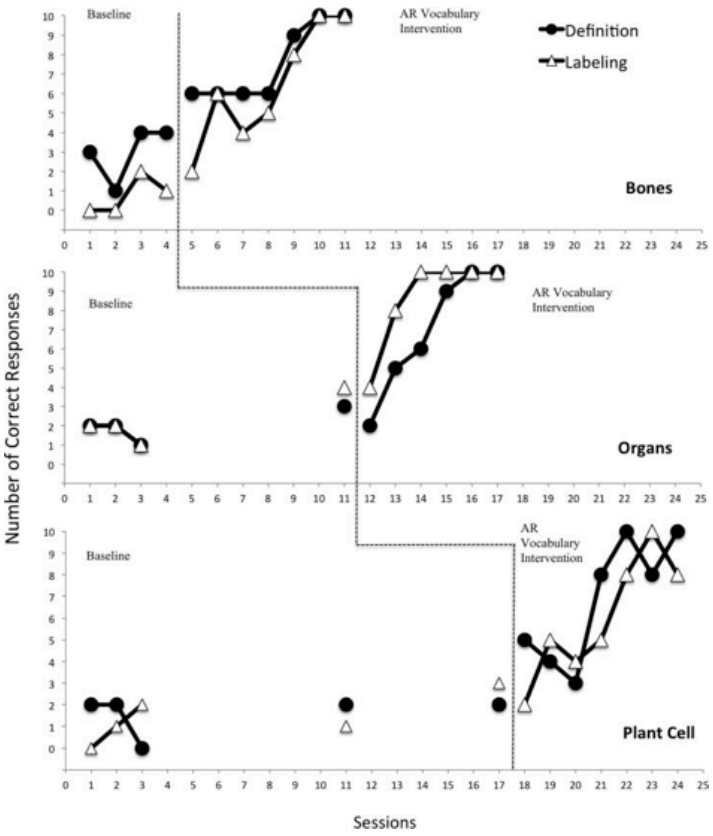
Augmented reality for academic instruction was effective for helping the students to achieve the mastery criteria for identifying the definition and labeling of science vocabulary terms (see Figure 1). The AR vocabulary intervention produced a positive impact on student mastery of the science vocabulary terms through its combination of real-world and digital content.

Using the AR vocabulary intervention was a positive experience for all the students according to the social validity data. The findings of the study support further examination of AR as a medium for science and vocabulary instruction for students with intellectual disability and ASD.

IMPLICATIONS

This study should be examined in the context of applying universal design principles with emerging technologies to create authentic opportunities for students with intellectual disability and ASD. Although the study was limited to applying AR on mobile devices to teach science vocabulary, this technology could be applied to many academic or functional skills. For example, postsecondary education staff could use these tools create videos on how to complete a work-related task. Students could then use AR on mobile devices to "trigger" a video explanation of how to solve the work-related problem.

Figure 1. Number of correct responses with and without use of AR



LIMITATIONS

One of the limitations of this study, like most single-subject research, is the small sample size, limiting external validity and generalizability. In addition, all of the participating students were highly motivated adults with disabilities attending a postsecondary education program. All students also participated in a digital literacy course, and had relatively strong basic computer skills. All students were familiar with the types of mobile devices used in this study. Therefore, AR may have been easier for these students to use and benefit from than it would be for students with intellectual disability who are less digitally literate.

GETTING STARTED WITH AUGMENTED REALITY

Immersive learning tools such as augmented reality can support the academic and functional needs of individuals with intellectual and developmental disabilities. Keeping up with new technologies and implementing them in postsecondary education settings can be a challenge. As a starting place, making students aware of immersive technology offerings available on their mobile devices is a low-cost and easy way to increase their familiarity with these technologies.

Professionals supporting individuals with intellectual and developmental disabilities will need training to expand the use of these technologies. Postsecondary education programs with digital literacy classes could include activities to support using these and other immersive technologies to support inclusive education and independent living.

READ THE FULL STUDY:

McMahon, D., Cihak, D. F., Wright, R. E., & Bell, S. M. (2016). Augmented reality for teaching science vocabulary to postsecondary education students with intellectual disabilities and autism. *Journal of Research on Technology in Education, 48*(1), 38–56. doi:10.1080/15391523.2015.1103149

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