KC Empower: Universal Access to After School STEM

Exploring After School Science for Kids with Disabilities

AAAS

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1 Background

KC Empower: Universal Access to After School STEM is an NSF Pathways project focused on making informal STEM activities more accessible to students with disabilities, with a focus on children in grades 3-5.

The American Association for the Advancement of Science (AAAS) runs the program, with EDC's Center for Children and Technology conducting formative evaluation and research. "KC" refers to *Kinetic City*, an award-winning, NSF-supported AAAS program that has produced over 80 activities in areas typical of after school activities: computer games/simulations, hands-on activities, active play, art, and writing.

For the KC Empower project, five Kinetic City activities have been selected for redesign by a working group involving persons with disabilities, after school educators, and experts in disability, technology, informal science education, and after school curriculum development.

2 Methods

 Researcher Babette Moeller, from the Educational Development Center's (EDC) Center for Children and Technology (CCT) division, observed children with a range of disabilities performing the activities, and conducted interviews with the children, their teachers and their parents. At a two-day Advisory Board meeting, Dr. Moeller shared results with our Advisory Board members, who also had the chance to interact with additional children who tested the activities. The Advisory Board and staff developed a set of recommended changes to the activities to improve their usability with our target groups.

These meetings and workshops, together with Dr. Moeller's findings, led to a set of recommendations regarding the activities. Project staff worked to revise the activities according to these recommendations—work that is nearly complete.

The next step is to return to the original sites, where Dr. Moeller will study children and teachers performing the revised activities, and look for differences. If successful, the revised activities will lead to increased engagement and improved outcomes.

The findings will be written up in a form useful to other STEM activity developers, to help them ensure that their resources will be accessible to the widest possible audience of children with and without disabilities.

3 Results

Moeller noted that students were able to participate in the activities either independently or with the help of teachers, and most, if not all, students were engaged in the activities.

However, engagement was frequently not optimal, leading to a series of suggested revisions for each activity.

Activity Name	Activity Type	Suggested Revision
All Systems Are Go	Computer Game- Players retrieve Arnold Rutabeggar's lost internal organs, one system at a time.	• Add audio for all text • Add keyboard controls to augment drag and drop play • Add pop-up explanations to identify targets • Improve contrast
Dunk and Flip	Hands On Activity- Participants perform demonstrations revealing the power of air pressure	• Replace text instructions with pictorial instructions • "Blow up" activity to use larger, more easily manipulated materials • Create multiple modes of expression to help children share their ideas, including digital tools with writing supports
Respiration Stations	Physical Activity- Relay race in which children pretend they are red blood cells running through the circulatory system, carrying oxygen molecules to muscles, and carbon dioxide away from them	• Add floor templates and pictorial instructions • Replace red and blue foam molecules with models that rely on texture, shape and size rather than just color • Emphasize control rather than speed • Make sure lung, heart and leg muscles use sound to indicate their function and location
Blueprint for a Beast	Art Activity- Draw a creature suited for life in an unusual environment, like in a cloud or inside a nose. Account for how the creature finds food, water and defends itself from danger.	• Rather than default to drawing, allow players to build, draw or describe their creature; provide suitable raw materials • Include group discussions • Consider make activity team based
Where the Weird Things Are	Writing Activity- Players receive drawing of a very odd creature and must make up a story about it, including where it lives and how its strange features help it survive	• Create 3D printed models of the creatures • Add creative modes that do not require writing, like dictating the story, possibly with voice recognition software • Make activity more grounded in reality by including a picture of a real environment with different organisms adapted to living in different niches • Consider adding comic-stripping app to help players tell their story

4 Conclusion

The final stages of the project are still underway, as we complete the extensive revisions to the activities and return to our sites to test the new activities with kids. We are testing effective and inexpensive 3D printing solutions to augment flat graphics, along with speech to text programs robust enough for use by children with disabilities. Computer game revisions are complete.

Thus far, we project that the revisions made will enhance the activities for children with and without disabilities, and won't require disability-specific modifications. This meets our goal of ensuring that the activities will be usable by mixed groups of students without any reduction in playability.

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