The Explode the Controller Project: Making Creative Computing More Inclusive by Incorporating Physical Play

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ABSTRACT

The Explode the Controller project integrates physical play with creative computing by challenging students to create video games for large scale, homemade input devices that encourage actions like running, jumping and balancing. Explode the Controller activities were run in two after school programs over the past year, and were shown to be accessible and engaging coding projects for students of varying backgrounds, ages, interests, and previous experience levels. The novelty of the devices seems to promote collaboration within groups of mixed age and experience, and to encourage participation in the activities. Additionally, the common, inexpensive materials and basic construction of the devices allow for easy reproduction and modification. These results encourage further development of this approach to game design curriculum, especially by STEAM educators of diverse learning groups.

Keywords

Game Design Curriculum; Inclusive Creative Computing; Physical Play

1. DESCRIPTION

1.1 Educational setting

The Explode the Controller project began as a coding curriculum experiment in the summer of 2018 for the 'Learn 2 Teach, Teach 2 Learn' program at the South End Technology Center at Tent City, a not for profit, neighborhood education organization for underserved youth in Boston, Massachusetts (SETC). The devices and lessons developed for the project have since been used in SETC's pop-up STEAM events for Boston youth programs, and in a weekly coding club in partnership with the Vibrant Boston after school program at the Lenox-Camden housing project.

At the SETC 'Learn 2 Teach, Teach 2 Learn' program, 30 youth teachers from neighborhood high schools were trained over twelve weeks in educational technologies, including fabrication techniques, 3D design and printing, Scratch programming, and the use of various microcontrollers. Explode the Controller activities were included as part of their training in Scratch coding and video game design. Students' previous coding experience varied from first-time coders to students familiar with multiple coding languages. Students in this group were predominantly african american. Most students attended public schools in Boston.

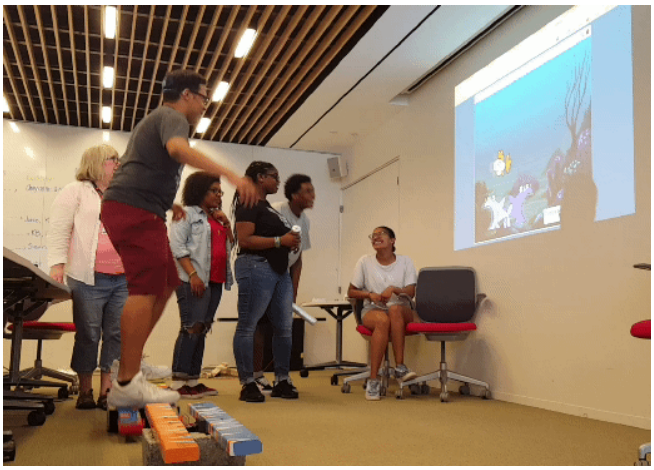
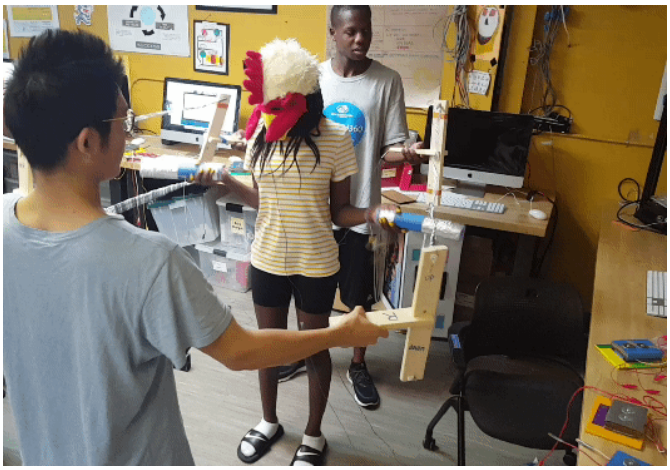
Since October 2018, Explode the Controller activities have also been offered as a weekly coding club at the Vibrant Boston after school program. Participating students are 7 to 16 years old, and are residents of the Lenox-Camden housing project or surrounding neighborhoods. Again, previous coding experience ranges from first-time coders to students with multiple years of instruction in Scratch or other languages. Students in this group are predominantly african american or hispanic. Most students attend public schools in Boston.

1.2 Description of the educational experience

Explode the Controller activities connect physical play with creative computing by replacing the traditional video game user interface (mouse, keyboard, etc.) with homemade devices that encourage dynamic motions like jumping, running, or balancing. In 2018, students most often worked in pairs or small teams to create a Scratch game that could be played on an 'exploded controller.' Working sessions were concluded with an 'arcade' where teams shared progress on their games, asked questions and got feedback.

For example, students created a simple Avoider-type game in Scratch 3.0 where the player must dodge incoming asteroids by balancing on the see-sawing '❤️ Rocks Board' and tilting it to move the ship. A micro:bit microcontroller attached to the controller sends tilt angle data from its accelerometer to the game via bluetooth, and Scratch uses this information to change the position of the ship sprite (video demo of this game: https://twitter.com/Mittensbrother/status/1024700411574476802).

A prebuilt controller device was usually provided for students to play their game on, though many teams made physical modifications and a few designed and fabricated their own controllers (an original student game and controller design: https://twitter.com/Mittensbrother/status/1030882008778657794).

For ease of reproduction and modification, all controller designs use common, inexpensive materials and basic construction methods. Free build instructions and links to students' Scratch games can be found on the Explode the Controller website (http://mittensbrother.com/projects/explode-the-controller/).

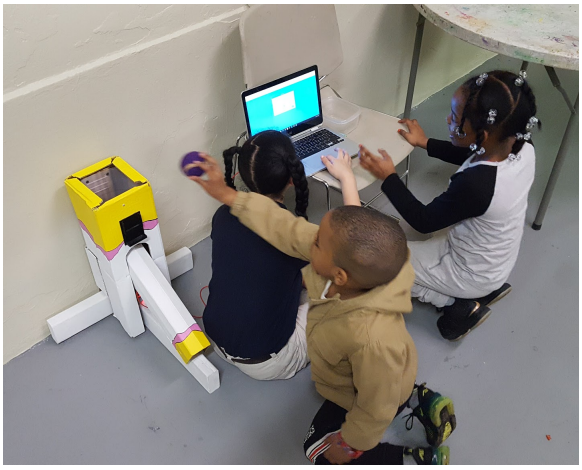
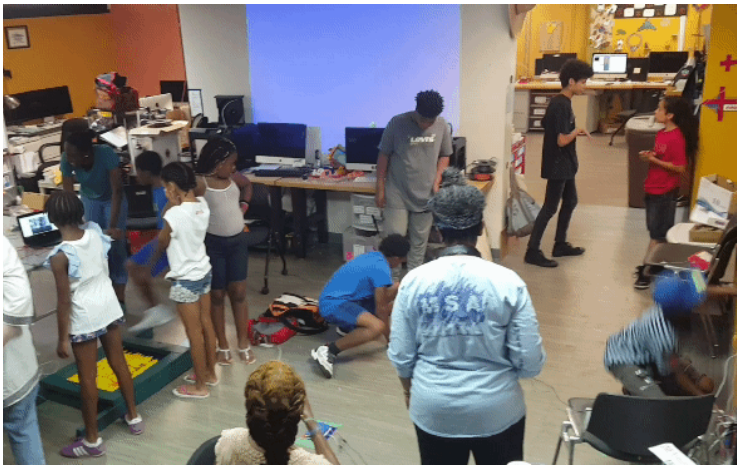
2. CONCLUSION

2.1 Results

Unsurprisingly, adding large scale controllers and dynamic, unfamiliar actions to the game design curriculum made the SETC computer lab a boisterously fun place in the summer of 2018. Fun is critical in both good game design and meaningful education, but while Explode the Controller definitely produced lots of joyful yelling, there are many ways to create excitement.

What emerged as the more exciting aspect of this approach was that it also appeared to motivate students of diverse age and coding experience to participate in the programming and design parts of the challenge. Most all students enjoyed the novelty of the jumping and balancing, but the novice coders, in particular, seemed more invested in their games and more collaborative with peers when designing for an 'exploded controller' than they did when designing for familiar user input devices. While this assertion requires further study, it is based on observations that novice coders asked for more precise assistance (i.e. How can I make this move faster? Where can I change that color?).

Why should novices be more engaged with designing games for an exploded controller? Perhaps they are encouraged by the integration of familiar, physical play elements within their first programming experience. Or for students who are easily frustrated, it may be that the novel input device prevents a disheartening comparison of their work with professionally developed software. In any case, the broad appeal of these activities to diverse learning groups is a valuable attribute.

2.2 Relevance to Fablearn 2019 Theme

The Explode the Controller project has always been, first and foremost, a teaching experiment to improve my afterschool work with underserved students. Most of them attend schools without rigorous STEAM curricula, especially regarding exposure to creative computing. While a few have developed coding skills outside of school, the majority are authoring their first projects, and require significant support to get started successfully. The wide range of ages and backgrounds in this learning community present additional challenge to engaging all students in collaborative work.

These challenges are hardly unique to my local learning community, and represent significant practical obstacles to including more students in high-quality maker education. The Explode the Controller project's success in engaging diverse groups of novice programmers suggests that examination of its core principles - physical play and collaboration in STEAM - would be valuable to the greater effort.

3. Author Bio

John Lynch is an elementary teacher focused on creating opportunities for underserved students to author their own video games. His classrooms and after school groups include a wide range in age and prior coding experience, so projects must be accessible to beginners while presenting an authentic design challenge for all. He created the 'Explode the Controller' project in 2017, and inspires new game designers in partnership with the Learn 2 Teach, Teach 2 Learn and Vibrant Boston organizations. He has presented at the 2018 Scratch@MIT and ASTC conferences, and was a featured educator on the JoyLabz MaKey MaKey blog.