PDAS Scratch

An After School Social-Emotional Learning Curriculum Using Scratch to Nurture Creativity, Communication, and Collaboration

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Background and Motivation

Educational technology has been an ever growing field, and its products hail from the then-innovative blackboards and transparencies to the high-tech Smartboards and collaborative media that one might see in classrooms today. Technology is now an inescapable part of our society, and students are expected both to use it in its various forms in education and to help develop the up and coming forms of tomorrow. In recent years, we've also heard of the "Math and Science Crisis", which bemoans that the US is falling more and more behind other world powers in math and science scores. Both local and national leaders have tried to rise up to this threat, calling for more education, more technology, more integration, more standards and more strictness, culminating perhaps at the No Child Left Behind policy of 2001. Schools are expected to conform to their specific state standards, at the risk of losing their teachers or even their entire institution. In addition to the "Math and Science Crisis", there is now more and more talk of the "Creativity Crisis" that America faces (Bronson & Merryman, 2010). US students are said to be less creative and innovative, and concern has once again risen to national levels. President Obama announced recently in his address during the launching of the *Change the Equation* effort, a push for more STEM curricula and programs around the country, "Our nation's success depends on strengthening America's role as the world's engine of discovery and innovation." The future, as always, is thrown into the hands of our children.

Many of the complaints about the current education system are directed toward the evaluation of students through exams and the heavy focus on quantitative measurements of success. A movement proposing Social-Emotional Learning (SEL) sprang up, declaring the necessity of educating the whole child. Advocates of this philosophy stress the importance of nurturing the social and emotional intelligences and wellbeing of each student, and are supported by recent neurological studies detailing how emotional stability is the basis for effective cognitive processing

(Immordino-Yang, 2007). Social Emotional Learning curricula focus on nurturing social and emotional intelligence and well-being as foundations for academic learning (Johnson & Johnson, 2009). According to research, students who exhibit positive social behavior tend to do better academically, and students who are liked and accepted by their peers also tend to do better than those who are not (Hennessey, 2007). Comprehensive SEL curricula such as the Open Circle Program (OCP) have made their way into schools, and schools that implemented these programs saw improvements in both student behavior and academic performance (SEL Research Group, 2010).

Technologies should be created in ways that are aligned with such shifts in thought, and support the whole child's development rather than just facilitating the presentation of information in classrooms. Though much of educational technology has focused on enhanced methods for students to view and understand information, not as much has focused on allowing students to creatively produce their own information or creations. One of the latter is a programming application called Scratch, developed by members of the Media Lab at MIT. Scratch embodies MIT's constructionist philosophy of playful learning and tinkering. Its simple block interface allow its users to click programmable instructions together like a puzzle pieces, and allows even very young children to create their own projects. Children are able to create movies, games, images, and anything else they can imagine through it. Scratch has been used successfully in classrooms, after school programs, and in homes by young children and older folk alike. It was designed based upon Mitchel Resnick's learning spiral, which starts with imagining, then creating, playing, sharing, and reflecting on one's creation and process, and then going back to imagination once again. Scratch has allowed students to engage in projects of their own choice, and through settings such as the Computer Clubhouse, enabled even students who do not normally do well in school to pursue their interests. It has also been used by educators and researchers to develop students' empathy and civic engagement through storytelling (Brennan & Daily, 2008). Scratch is a promising tool that serves to introduce young students to technical subjects such as computer

programming, and also shows potential as a tool for developing social skills necessary for life.

Questions and Objectives

How can an after school STEM outreach curriculum be designed to support creativity and social-emotional learning, specifically targeting the development of communication and collaboration skills? How can Scratch be used in this curriculum in a way that supports SEL, and helps to develop a sense of community among students?

My main objectives are to:

1. Increase student interest and comfort with technology and in technical fields of computer science through Scratch.

2. Promote development of students' communication and collaboration skills.

3. Support students' development of computational thinking and problem solving.

4. Evaluate the program's impact and effectiveness through pre- and post-surveys and teacher observations.

Setting and Approach

Project Destiny Autumn to Spring (PDAS) is an after school program in Chinatown. It meets from 3-6pm every weekday and provides mentorship, tutoring, and organized activities for its students. It originated as a summer outreach program targeted at middle school students, and evolved to become year-long in order to maintain mentorship relationships with the students. In the last three months, the after school component of the program was opened for the first time to high school students. Unfortunately, students in the program have faced bullying, and there is also very little interaction between high school and middle school students. Thirteen of the fifteen middle school students have reported feeling anxious or unhappy with math, science, and technology, and six students are either on the verge of or already failing their math or science classes. Although they are unfortunate statistics, these setbacks also make PDAS a fertile ground for the implementation of an SEL curriculum, and a wellspring of potential for technology education and outreach.

The main goals of the curriculum are to engage students in active, project-based learning to develop their computational thinking skills, to nurture social skills of communication, and collaboration through incorporation of Open Circle techniques, and to increase students' interest in and comfort with using technology.

Some constraints of this program include:

1. Time – students will have roughly 1.5 hours each week to participate in this curriculum, and 10 weeks total.

2. Materials – the program has 5 laptops, which must be shared among all students.

3. Students – there are currently 5 regular high school students and 15 regular middle school students that attend.

4. Staff – there are 4 staff members on site on each given day, two of which are there full time.

Design

Overview

This curriculum spans 10 weeks in Spring of 2011 from the beginning of February to mid-April. Middle school students from PDAS will be placed into teams of three to work on projects, and high school students will be solicited to participate as teaching assistants and student mentors. Students will engage in one hour of lessons and work time on Wednesdays, and another half hour to 45 minutes of organized work time on Fridays. They will be allowed to work on their projects any other time of the week during their free hours, and any such occurrences will be recorded as part of the evaluation. More information about evaluation is given on page 9 of this document.

Students are to work together on projects with two other teammates. Teams will be selected randomly, and students will play a team building game at the start of each lesson. Team building games require high levels of effective communication and collaborative, and a short debriefing will take place between the games and the Scratch lesson.

The first half of the semester incorporates 4 weeks of lessons in Scratch. Each week's lesson will incorporate four major components, which will be expanded upon later in this paper:

1. Review of the previous weeks' lessons (if applicable).

2. Introduction of the major concept through a physical activity or game.

3. Explanation of the concept in terms of community and programming (in Scratch).

4. Application of the concept through a Scratch mini-project.

Curricular Goals

Students will work in their teams to create each week's Scratch mini-project, which will lead to their first major project. The first project asks students to tell a story involving each teammate, and can be as simple or involved as they would like. Through the 4 weeks, other students and staff provide informal feedback on their progression. After 5 weeks into the semester, students can join forces with other teams to create their final project. The final project will be one of their choice which, along with adhering to PDAS rules, must meet the following requirements:

1. Use at least 5 sprites.

2. Be either at least 60 seconds long or process keyboard inputs.

3. Make use of all concepts learned in classes.

The final projects can either be presented in a competition or exhibition format, which students will jointly decide. Regardless of this initial format, students will be able to present their projects as a year-end exhibition to parents and friends at the

end of the semester in June.

Timeline

The final schedule is a 10 week curriculum, beginning the week of February 7th and running until the week of April 15th. One week of training is provided for any high school students willing to participate from January 31st to February 4th, designated as Week 0. A tabular overview of the curriculum is provided below.

Week 0*: Jan 31 – Feb 4	Training of high school students
Week 1: Feb 7 – Feb 11	Scratch 1: Sprites and stage
Week 2: Feb 21 – Feb 25	Scratch 2: Loops, Conditionals
Week 3: Feb 28 – Mar 4	Scratch 3: Broadcasting, User input
Week 4: Mar 7 – Mar 11	Scratch 4: Collaboration
Week 5*: Mar 14 – Mar 18	Present Project 1 (Compilation of tutorials)
Interim: Mar 21 – Mar 25	Spring Break
Weeks 6 –9: Mar 28 – Apr 15	Work on Final Projects
Week 10*: Apr 18 – Apr 22	Final Presentations

* denotes evaluation week

Role of High School Students

High school students are asked to be mentors for a few major reasons. Currently, the five high school students interact only with each other or with staff members, and

this lack of cross-age interaction contributes to the sense of a lack of community in the after school program. Research has shown that the success of technology integration and outreach in schools is dependent on multiple environmental factors, including program support by the administration, positive attitudes held by teachers, teacher leadership and support, and student leadership and support (Yong & Frank, 2002). PDAS is not a school institution, but these factors should still apply to an after-school environment. Participation and support from high school students would greatly enhance the integration of Scratch and participation of the middle school students. By default, high school students are not required to attend the after school program, so their presence at the program each day is already a positive indication of their attitudes toward the program, albeit not something shown through their interactions. Also, as an incentive for high school students to participate, volunteering hours will be credited as their schools require varying hours of community service.

Evaluations

There will be three phases of evaluations during the semester. Phase one occurs at the beginning of Week 0, the training week for high school students. Teachers and staff will be solicited to fill out the brief survey and answer informal questions about the environment of the after school program, student behavior, and student attitudes toward each other, staff, and math and science subjects. Middle school students will also be asked to fill out a brief survey indicating their likelihood of participating in a few given activities during free time. These activities will include their present activities (doing homework, playing video games, playing board games) as well as a few options to use the computer for purposes other than web surfing and homework (such as creating projects, programming). Phase two will take place at the end of week 5 after presentations of project 1. In this round, teachers will be solicited for feedback on the same items as before. Phase three will occur at the end of week 10 after presentations of the final project. Teachers again

will be solicited for feedback of the after school environment, student behavior, and student attitudes toward each other, staff, and math and science subjects. Students will fill out a brief survey about their likelihoods of participating in the a few activities during free time, and asked to describe in informal interviews whether they have noticed any changes in their and classmates' behavior throughout the program. They will also be asked if they would want to participate in something similar to this program or use Scratch in the future. Throughout the curriculum, full time staff and other volunteers will be asked to code for certain student activities. These include:

1. Voluntary student use of Scratch during free time – coding for increased intrinsic motivation in using Scratch and computer technologies

2. Aggressive student behavior toward other students or adults

3. Positive student behavior toward other students or adults

4. Negative student comments about the program

5. Positive student comments about the program

Coding will be done by all teachers and staff. All staff except the head of program and me (currently seven) will remain blind to the measured evaluations of the curricula, that is, to develop communication and collaboration skills and increase interest in technology.

Lesson Plans

The first four weeks of lessons contain the majority of the semesters' learning goals. Final lesson plans are still in development, as they will be constructed with the help of other staff members and with input from any high school mentors/teaching assistants. However, all lessons will be designed in an approach that combines Open Circle techniques and lessons similar to "CS Unplugged", which seeks to teach computer science concepts without the use of a computer. An example lesson plan for weeks one is given below:

Week 1: Sprites and stage

Starting activity: role-playing directors and actors, 30 minutes

Students are split into two groups and given a script they must follow. Roles for each student are drawn from a box and include the Director 1 and 2, Camera-man/woman 1 and 2, Actors 1 and 2, and Stage Hands 1 and 2. Scripts include one short cooperative script and one short uncooperative script, both attempting to run a play and perform for their families. Students are asked to first role-play their parts according to the written script for 10-15 minutes, and spend the remaining time reflecting and sharing about the experience. Specifically, students are asked to share in their role-playing groups about an experience they have had with cooperative or uncooperative interactions, and their reflections about those experiences.

Scratch activity: Sprites and Stage

Students will be introduced to the sprites and stage of Scratch, and given a 5 minute tutorial on how to direct the characters on their screen to speak and move. Students will be assigned their first project with their partners. Project one will require each team to introduce all three teammates in some way. Students will be given the remaining time to work on this project. They will also be given 30-45 minutes on Friday to work on their project.

As the weeks progress, the beginning activity will continue to start as hands on, in either a game or other structured activity, and end with 15-20 minutes of reflection and sharing circle time. The remaining half hour will be used to link the concepts introduced in the first half hour to a mechanic in Scratch, and then handed to the students as work time for their ongoing project.

After week 5's presentations, students will be given the opportunity to link their team with another team, and create any type of project they choose. At that point, the beginning 20-30 minutes will be spent in circle for sharing and reflection on a series of topics, and the remaining time will be used on creating the final project. Each week's topic will be prepared closer to the given week, so as to account for any subjects of concern that may arise. Some potential subjects include bullying, gossiping, and group work/accountability. Remaining lesson plans are still in development.

Future Work

This curriculum will be integrated in Project Destiny Autumn to Spring starting January of 2011. As the semester progresses, the curriculum may undergo changes to cater to any specific needs of students as they arise. Because the curriculum has not yet been tested in the PDAS program, specific changes cannot yet be prescribed. However, further development of surveys and questionnaires must be implemented, and a clearer lesson outline for each week must be crystallized.

References

Albion, P., Ertmer, P. (2002). Beyond the foundations: the role of vision and belief in teachers' preparation for integration of technology. Techtrends, 46 (5), 34-38.

Baylor, A., Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms? Computers and Education, 39, 395-414.

Bronson, P., and Merryman, A. (2010). The Creativity Crisis. Newsweek (July 10).

Golinkoff, R., Hirsh-Pasek, K., and Singer, D. (2006). Why Play=Learning: A Challenge for Parents and Educators. In Singer, D., Golikoff, R., and Hirsh-Pasek, K. (eds.), Play = Learning: How play motivates and enhances children's cognitive and social-emotional growth. Oxford University Press.

Hew, K. (2007). Integrating technology into k-12 teaching and learning: current knowledge gaps and recommendations for future research.

Immordino-Yang, M. (2007). We feel, therefore we learn; the relevance of affective and social neuroscience to education.

Johnson, D., Johnson, R. (2009). The importance of social and emotional learning. In LeBlanc, P. && Gallavan, N. (Eds.) (2009). *Affective Teacher Education: Exploring Connections Among Knowledge, Skills, and Dispositions*. Maryland: Rowman & Littlefield Education.

Miller, E., and Almon, J. (2009). Crisis in the Kindergarten: Why Children Need to Play in School. Alliance for Childhood.

Resnick, M., Maloney, J., Monroy-Hernandez, A., Rusk, N., Eastmond, E., Brennan, K., Millner, A., Rosenbaum, E., Silver, J., Silverman, B., & Kafai, Y. (2009). Scratch: Programming for All. Communications of the ACM, vol. 52, no. 11, pp. 60-67.

Rusk, N., Resnick, M., & Cooke, S. (2009). Origins and Guiding Principles of the Computer Clubhouse. In Kafai, Y., Peppler, K., and Chapman, R. (eds.), The Computer Clubhouse: Constructionism and Creativity in Youth Communities. Teachers College Press.

Scardamalia, M., Bereiter, C. (2006). Knowledge building: theory, pedagogy, and technology.

SEL Research Group (2010). The benefits of school-based social and emotional learning programs: highlights from a major new report. *CASEL Update*, July 2010.

Staples, A., Himes, D., Pugach, M. (2005). Rethinking the technology integration challenge: cases from three urban elementary schools. Journal of Research on Technology in Education.

Yong, Z., Frank, K. (2002). Conditions for technology integration in schools: an ecological perspective. American Educational Research Journal.