Urban Culture and Constructing Video Games

JeeHye Hong, Cameron Fadjo, Chun-Hao Chang, Ellen Geist AND John Black
Teachers College, Columbia University
USA
jh2896@columbia.edu
clf2110@columbia.edu
chc2137@columbia.edu
eag2147@columbia.edu
jbb21@columbia.edu

Abstract: In this paper we propose that combining urban culture with individual video game artifact creation leads to increased engagement in the instruction of computer programming to primary school students. Recent studies have examined the use of Scratch, a programming language developed by the LifeLong Kindergarten Group at the MIT Media Lab, with urban elementary school students as they design artifacts with urban cultural references and integrate these elements into their computer programming projects (Maloney, et al., 2008; Kafai, et al., 2007). Additional studies have examined the use of video game design and development to create individual interactive meaning-making spaces (Robison, 2008). In our proposed study fifth grade students develop their own video game artifacts through the combination of storyboards; game mechanics, design and development instruction; and computer programming lessons. Level of engagement is measured based on the frequency and complexity of Simple and Complex Conditional Statements (Fadjo et al., 2009a) implemented within the subjects' video game artifacts.

Keywords: Video Games; Design; Development; Computer Programming; Constructionism; Conditional Logic; Urban Culture

Introduction

Recent advances in technology are driving a demand for new modes of interaction with new media. This trend has led to the common reference of teenagers as "Digital Natives" (Prensky, 2001) since they have grown up fully immersed in digital technologies. A great number of young people spend much time on playing online games, browsing the Web, or chatting via Instant Messengers. According to a recent survey conducted by the National Institute on Media and the Family (2002), 92% of children and adolescents ages 2 – 17 play video games. In tandem with this exponential growth in technology literacy, there has been a proliferation of research and exposure on playing video games (*see* Hammer & Black, 2009 *for review*). Yet there is a small body of work that is currently being conducted that explores the use of creating video games as production tools in a constructionist environment (Robison, 2008; Fadjo, et al., 2008, 2009a, 2009b). In our proposed study we combine the construction (Papert, 1980) of a video game artifact (Kafai, 1996, Salen, 2007) with children's urban culture (Kafai, et al., 2007) to increase engagement in the instruction of computer programming to primary school students. We posit that by constructing video games and integrating cultural artifacts, student's level of engagement will increase during computer programming instruction and that this increase will lead to more Complex Conditional Statements (Fadjo, et al., 2009a).

We begin by exploring the task of constructing video games as a pedagogical activity. Resnick and colleagues have developed Scratch, a programming language, to support the creation of individual art projects and narratives (Resnick, 2002; Resnick et al., 2003) which has been subsequently used to explore the learning of mathematics concepts (Fadjo et al., 2009b) during after school program instruction. We then review recent work conducted by Maloney and colleagues on the use of Scratch in an urban environment (Kafai, et al., 2007) to increase technology fluency and develop computer programming skills "in the absence of instructional interventions or experienced mentors" (Maloney et al., 2008, p. 367). We conclude by providing an introduction to our proposed study on the creation of a video game artifact, coupled with urban cultural references, in the learning of conditional statements in computer programming.

Constructing Video Games

"Humans seem to learn more deeply, and more equitably, without gaps between rich and poor, when they learn outside of school in areas they choose and for which they are motivated" (Gee, 2009; *see* Gee 2003, 2004). To promote effectiveness of constructing video games, students should be actively engaged in the meaningful activities of computer programming, game design, game development, and individual cultural identity integration. Through the use of a computer programming environment to produce a video game, young people

learn to integrate skills and knowledge across disciplines. In addition, the task of game creation allows users to develop their learning skills by solving problems that result in meaningful learning experiences. Since the solving of problems during game development is highly interactive, the challenge gives students immediate feedback on the success of their actions. Ultimately, we believe students find the act of creating and playing of video games extremely motivating as they become very active in trying out different skills and strategies during development sessions (Collins et al., 1996). To support the creation of a video game, we used Scratch, a highly interactive and engaging development environment created by the LifeLong Kindergarten group at the MIT Media Lab.

Scratch is a visual, block-based, computer programming environment with integrated assets (such as images and sounds) and extensible functionality (such as audio recording and image import features)[1]. Because Scratch is a programming environment, computer programming concepts (Resnick, Kafai & Maeda, 2003; Maloney et al., 2004) are integral to artifact development. Frequently this environment is used in the teaching of rudimentary principles to students both young and old (Malan & Leitner, 2007; Fadjo et al., 2009a, 2009b). Resnick and his group developed Scratch to make programming accessible and engaging for a wide audience using the principles of a 'low floor, high ceiling, and wide walls' (Resnick et al., 2009). What this principle espouses is that it is easy to get started with the environment (the *low floor*), that complexity of the project is not limited by environmental constraints (the *high ceiling*), and that the types of projects being created are not constrained by type or nature of the environment (the *wide walls*). In our endeavor to find an environment suitable to the task of complex syntactical development without the barrier of a 'high' floor (that is, an environment with a characteristically 'steep learning curve'), we decided to use Scratch as the environment within which the students would create their individual video game artifacts.

"Programming languages are the construction kits of the computational world (Resnick & Silverman, 2005)." Designing video game in Scratch will introduce children to computer and information technology. By enabling students to take on a role of a video game designer, they not only learn to program but also learn to extend the range into promoting technology literacy (Resnick & Silverman, 2005). Scratch is well suited to the project because it is provided with a variety of functionalities so that diversity has capabilities to "reformulate knowledge, to express oneself creatively and appropriately, and to produce and generate information (rather than simply to comprehend it)" (National Research Council, 1999). These capabilities enable students to be a producer and active participants in technology literacy.

While playfully and creatively creating their own games, students need to learn more and even expand the range of what children can create, design, and learn in regular classroom settings. Situating students into designing video game contexts, they use Scratch as a tool in a variety ways to resonate with their own personal passion and interest. It will be leveraged to meet higher goals of media literacy lessons because students are highly engaged and involved in deep level learning. Scratch provides diversity to incorporate multiple media at user's choice, resulting in customizing their project. It contributes to widening their social practices as well. It explicitly shows how user interface design can transform their experiences (Peppler & Kafai, 2007).

Cultural Representation in Artifacts

The Computer Clubhouse is a community technology center to teach computer literacy marginalized youth. Its intention is to create equitable technology participation in creative design across all communities (Kafai et al., 2007).

Given limited resources, there has been the digital divide between urban and suburban cultures. "Highly effective learning tools really are is a combination of the most compelling and interactive design elements of the best video and computer games with specific curricular content (Prensky, 2003)". As Prensky proposes, video game design will be appealing with a great deal to students in an urban setting. We applied Prensky's and Resnick's idea into our afterschool program in an urban setting in New York City. Scratch allows for an educational tool to close the participation gap.

Video game is such a popular and influential medium for a combination of many factors ranging from emotion to culture. By owning authorship of video games, young people can produce their own video game by creating sounds, characters, animation, a series of events, backgrounds, or their behavior. When they make a character move, they tend to associate themselves with it (Kafai, et al., 2007). Because when they learn programming concepts, they build knowledge structure in contexts.

Youth are encouraged to foster cultural representation and artifacts on their code. These activities enable them to learn about various programming as well as genres of media (Peppler & Kafai, 2007).

Programming plays a role as a vehicle to express their experience and allow them to augment cultural representation. Urban youth learn by connecting themselves to prior knowledge to include their cultural presence. By expressing themselves, it allows students to feel a sense of importance, success, and their confidence. A number of researches documented the development of kids' video games using Scratch promote

---

[1] http://info.scratch.mit.edu/About_Scratch

the development of cultural representation (Resnick, Kafai, Maloney, Peppler, and etc.). Students' authorship experiences make their learning more authentic and professional, leading to their increased engagement level.

Proposed Study

In our proposed study we will evaluate multiple artifacts from projects created by fifth grade students. These students, hailing from an urban public school, will create individual storyboards in support of their individual video game artifacts. For our proposed study we designed instructional sessions to provide students with opportunities to design and develop their own personal video game. In doing so, our students learn new computer programming concepts and how to express themselves through computer programming language. Additionally, we provide the students with chances to integrate urban cultural references throughout the video game artifact. This is done during the planning and design stages of video game development.

To explore the possibilities of integrating computer programming language with augmenting cultural artifacts, our group co-organized an afterschool program with ps-115 in New York City where Hispanic descents are the predominant. In the afterschool program, fifth grade students will design their own game based on their storyboards and skills using Scratch programming language. In creating storyboards, they are encouraged to connect themselves to schema, represent cultural identity, cultural artifacts, and creativity. During developing their own game, students will integrate their knowledge and skills to express their ideas and representation. Unlike traditional programming environments, designing and developing video game task will give students control over programming language. This authoring experience will help students gain and sustain their newly learned conditional logic statements, making learning more relevant and engaging.

Our hypothesis is that students with opportunities to manipulate, develop, plan, and implement their own ideas and concepts through the use of programming can augment the ability to represent their cultural identities. To evaluate, we are looking for evidence of urban cultural references in their storyboards as well as evidence of these same artifacts (references) in their games. If they have references in both places, then we will consider it as culturally-grounded artifact. Before assessing their level of engagement we need evidence of culture in both places. It will be measured by number of scripts in video game project, number of conditional statements, and quality of conditional statements. Number of scripts in video game project will provide evidence of general engagement and activity. Number of conditional statements will show the evidence of project complexity. In addition, quality of conditional statements will be evaluated by measuring number of simple conditional statements that turned into complex conditional statements over a long period of time. Quality of conditional statements will serve evidence of active program logic refinement and code efficiency.

References

Collins, A. (1996). Design Issues for Learning Environments. In S. Vosniadou, E. De Corte, R. Glaser, & H. Mandl (Eds.), *International perspectives on the psychological foundations of technology-based learning environments* (pp. 347-361). Hillsdale NJ: Lawrence Erlbaum Associates.

Fadjo, C. L., Lu, P., & Black, J.B. (2009a) 'Instructional Embodiment and Video Game Programming in an After School Program.' Presented at Ed-Media: World Conference on Educational Multimedia, Hypermedia & Telecommunications, Honolulu, HI

Fadjo, C. L., Hallman, G., Harris, R., & Black J.B. (2009b) 'Surrogate Embodiment, Mathematics Instruction, and Video Game Programming.' Presented at Ed-Media: World Conference on Educational Multimedia, Hypermedia & Telecommunications, Honolulu, HI

Fadjo, C.L., Shin, J., Lu, P., Chan, M., & Black, J.B. (2008, June) 'Embodied Cognition and Video Game Programming.' Brief Paper presented at Ed-Media: World Conference on Educational Multimedia, Hypermedia & Telecommunications, Vienna, Austria

Gee, J.P. (2003). What video games have to teach us about learning and literacy. New York : Palgrave MacMillan.

Gee, J.P. (2004). Situated language and learning : A critique of traditional schooling. London : Routledge.

Gentile, D. A. (2009). Pathological video game use among youth 8 to 18: A national study. *Psychological Science, 20*, 594-602.

Hammer, J. and Black, J. (in press). Games and (preparation for future) learning. *Educational Technology*

Kafai, Y.B., Peppler, K.A., & Chin, G. (2007). High Tech Programmers in Low Income Communities: Creating a Computer Culture in a Community Technology Center. In C. Steinfeld, B. Pentland, M. Ackermann, & N. Contractor (Eds.), *Proceedings of the Third International Conference on Communities and Technology* (pp. 545-562). New York: Springer.

Malan, D.J., Leitner, H.H. (2007). Scratch for Budding Computer Scientists. *SIGCSE 07,* Covington, KY.

Maloney, J., Burd, L., Kafai, Y.B., Rusk, N., Silverman, B., Resnick, M. (2004). Scratch : A Sneak Preview. Presented at the Second International Conference on Creating, Connecting, and Collaborating through Computing. Kyoto, Japan

Maloney, J., Peppler, K., Kafai, Y.B., Resnick, M., Rusk, N. (2008). Programming by Choice: Urban Youth Learning Programming with Scratch. *Proceedings of SIGCSE '08* (pp. 367-371). New York, NY: ACM Press.

National Research Council (1999) Being fluent with information technology. *A report of the Committee on Information Technology Literacy.* National Academy Press, Washington DC.

Papers, S. *Mindstorms: Children, Computers, and Powerful Ideas*. Basic Books, 1980.

Peppler, K. & Kafai, Y.B. (2007). From SuperGoo to Scratch : Exploring creative digital media production in informal learning.

Prensky, M. (2001). Digital Natives, Digital Immigrants. *On the Horizon, 9*, 5, 1-6.

Prensky, M. (2003). Digital-game based learning. Computers in Entertainment (CIE), v.1 n.1, October 2003

Prensky, M. (2006). Don't bother me mom—I'm learning. St. Paul, MN: Paragon House.

Resnick, M. (2002). Rethinking Learning in the Digital Age. In The Global Information Technology Report: Readiness for the Networked World, edited by G. Kirkman. Oxford University Press.

Resnick, M., Kafai, Y.B., Maloney, J., Rusk, N., Burd, L., & Silverman, B. (2003). A Networked, Media-Rich Programming Environment to Enhance Technological Fluency at After-School Centers in Economically-Disadvantaged Communities. Proposal to National Science Foundation.

Resnick, M. & Silverman, B. (2003). Some Reflections on Designing Construction Kits for Kids *Proceedings of the 2005 Conference on Interaction design and children* (pp. 117-122). Colorado: Boulder.

Robison, A.J. (2008). The Design is the Game: Writing Games, Teaching Writing. Computers and Composition, 25, 359 – 370.

Salen, K. (2007). Gaming Literacies: A Game Design Study in Action. Journal of Educational Multimedia and Hypermedia, 16, 301 – 322.