Gaming as a Gateway to ICT Careers: Case Studies of Two Female ICT Students

Elizabeth M. King, University of Wisconsin-Whitewater, kinge@uww.edu
Barbara Z. Johnson, University of Minnesota-Duluth, umdbzj@gmail.com
Elisabeth R. Hayes, Arizona State University, Elisabeth.Hayes@asu.edu

Abstract: This study shifts inquiry from game-based content learning to broader transformational learning (Mezirow, 1997) stimulated through gaming practices transpiring longitudinally across social and formal/informal learning activities. Findings of this case study involving two young women highlight the *kinds of gaming practices* that participants actually pursue, the *social context* of gaming, and perhaps most importantly, the *meaning* of gaming for participants as crucial variables. Our study suggests that, beyond learning specific content, gaming became a significant "possibility space" for the participants. This was particularly true in relation to envisioning ICT careers, when other people (relatives, adult mentors) not only introduced them to new games, but to new practices around these games, and made explicit connections between these practices and future careers.

Introduction

Given the ubiquity of the standardized content movement throughout K-12 education, there is strong interest in integrating game-based technology into the classroom as a means of delivering content (Federation of American Scientists, 2006). Research suggests gameplay stemming from commercially available video games may support standards-aligned learning in academic areas (e.g. Squire & Durga, 2008; Steinkuehler, 2007; Steinkuehler & King, 2009), as well as broader 21st century skills (King, 2012). However, the power of game-based learning extends beyond delivering content. As simulated worlds, games are constructed from particular viewpoints, offering players access to designed experiences (Squire, 2006). Interactive technology provides a low stakes sandbox to collect experiences (Gee, 2004) that push the boundaries of "known," opening the world of possibility (King, 2011). Thus, "games are both tools for transformative learning [and] possibility spaces for meaningful experiences" (Mitgutsch, in-press).

While research points to specific forms of learning and cognition (e.g., Gee, 2003; Steinkuehler, 2008) that may transpire during gameplay, less is known about the deep, transformational learning (Mezirow, 1997) potentially sponsored through broader gaming activities situated across the lifespace (Bruner, 1986). This approach requires looking at gaming not as a "separate world" (Stevens et al., 2008) but as "tangled up with other cultural practices, which include relations with siblings and parents, patterns of learning at home and school, as well as imagined futures for oneself" (p. 64). Studies from this perspective have used ethnographic methods, particularly connective ethnography (Fields & Kafai, 2009; Leander & McKim, 2003), or more generalized cognitive ethnographic methods (Stevens, et al., 2008) to sharpen our understanding of the learning and meaning youth acquire through ecologies of gaming encompassing a variety of social interactions, informal and formal education. However, most of these studies have investigated a limited time span, typically a year or less. As Stevens et al. (2008) note, a limitation of this work is that "research also needs to look at gaming over time, taking seriously the idea that young people…have *careers*—with all that this term implies—as gamers, and that these careers lead young people toward particular experiences, people, and identities, and away from others" (p. 64).

Study Objectives

Our study shifts inquiry from content learning to broader transformational learning (Mezirow, 1997) stimulated through gaming as it transpires longitudinally across social and formal/informal learning activities. While a study of this nature makes a contribution to the literature outright, this paper focuses on a longstanding issue in STEM fields—the under representation of women in ICT careers (Fisher, 2007). Although research has investigated this particularly vexing situation, women remain strongly underrepresented in ICT-related occupational areas. Recent research (Legewie & DiPrete, 2011) suggests that women's STEM career decisions are strongly influenced by factors beyond skill mastery, most notably social factors (family, peers and role models) and the affective effects of high school coursework.

Previous research indicates interest-driven learning ecologies (Barron, 2006) offered through gameplay [particularly in conjunction with affinity space participation (see Gee, 2004)] are potentially efficacious for developing vocational aptitude and interest (Hayes & King, 2009; Hayes, King & Lammers, 2008; King, 2012-a; 2012-b), yet studies analyzing how these game-based experiences are situated across players' lifespan and lifespace have been lacking. Gee & Hayes (2010-a) state, "Learning anything, at least anything deeply, always creates a history of reaching far back into the past and extending out into the future" (p. 91). This provides a strong rationale for the study's goal of considering how gaming, throughout the lifespan, as a fundamentally social practice, has the potential to not merely develop young woman's technical skills, but capture their imaginations, ignite their passions, and serve as *gateways* to new identities and life choices (Hayes, King & Johnson, 2012).

Study Methodology and Analysis

Methodology for this case study (Stake, 1995) was informed by narrative (Reissman, 2001) and technobiographical (Henwood, Kennedy & Miller, 2001) methods that aim to collect the unique stories of participants, in particular, as associated with the use and implications of technology across their lifespan. Two female participants in their early 20s involved in longitudinal research for over five years with the study authors were purposefully selected (Creswell, 2006) based upon their participation in post-secondary education in ICT-related fields. Each participant represented a specific demographic: Nyght, a high-achieving student in her early 20s from an upper middle-class family, currently attends a private undergraduate college, majoring in computer science; Jade, a twenty year old student from a working-class, rural family, struggled in high school and is attending a private (for-profit) two year college specifically catering to ICT careers.

Both young women participated in an extensive narrative interview and follow up interviews that entailed mapping and reflecting upon significant life events related to digital media and gaming experiences. Interviews were based upon the Playful Learning Biography method (Mitgutsch, in-press) in which participants create a timeline of gaming and digital media experiences from childhood to present and then reflect on the significance of these experiences. In addition to mapping their game play, they were also instructed to design separate timelines and plot significant school and social events. Open-ended interview questions prompted participants to diagram life events along the three timelines and, thinking aloud (Ericsson, 1998), reflect upon the embedded learning and meaning, particularly addressing connections across timelines. The audio taped interviews were selectively transcribed for salient topics and coded for emergent themes and identification of significant learning moments. This then was correlated to each participant's hand-drawn timeline in order to obtain a more in-depth understanding of the sequential and developmental unfolding of events, particularly those contributing to developing skills, identity and support networks necessary to encourage pursuing a career in an ICT field. Essential themes and learning patterns were established for each participant and compared for similarities and differences.

Significant Themes Across Participant Life Trajectories

Two significant themes emerged from the study: the introduction of digital media-creation practices as legitimate career activities by mentors, and the divergent, possibly social-class based, schooling trajectories taken by both women. Although both cite experiences with videogames as significant in their career choices, they have differing school and career trajectories.

Both participants were mentored by older, female role models who introduced them to gaming practices that extended beyond playing videogames and helped make the connection between creative practice as an amateur, and professional practice in related technical fields. While participants had multiple social connections who introduced them to a variety of games, being exposed to new practices, such as creating clothing for *The Sims* or add-ons for *World of Warcraft*, opened up significant "possibility spaces" in which they began to imagine future careers in ICT occupations. Mentors, whether in a single-gender after-school program or in the household, encouraged exploration in these "possibility spaces" by providing resources, pointing out alignment with IT careers, and serving as examples themselves.

An important characteristic of these mentoring relationships is that gaming, and in particular, self-directed learning and content creation in conjunction with game-based interests, constituted a social activity. However, "social" for these young women differed from the typical conceptualization of social when considering female predispositions to digital media and gaming activities that involve collaboration and communication (c.f., AAUW, 2000; Dickey, 2006; Taylor, 2003). Instead social

meant the ability to interact with significant people in their lives, to operate on their skill level. And, for both women, their activities in and around the game involved participating in the *collective* activities of peers and the community, rather than collaborating. Each derived deep satisfaction through developing their own area of skill and expertise and contributing it; *collaboratively* developing a mod, or a design was not a noted motivation. Instead, creating something (a piece of clothing, a piece of artwork, etc…) as a skilled artisan that was then offered as a part of the collective resources available to peers or the community was something they both indicated as a unique source of satisfaction and motivation.

The two participants, however, differed significantly in their school experiences and career trajectories. Video games inspired them to pursue computer-based technology careers, but the possibilities they discovered were quite different and clearly class-based, at least in part. Nyght benefited from consistent access to computers and multiple computer games from early childhood. Her parents encouraged computer game play, particularly educational games, from an early age. She even played videogames with parents and was introduced to the practice of add-on creation by her mother, who provided study materials and encouraged her own self-directed exploration. Nyght took an independent study computer science course in high school. While attending a four-year liberal arts college with the initial goal of being a biology major, she took an introductory computer science course in which she designed a game as her course project, which she found very satisfying: “Games in relation to computer science satisfied that creative part of my brain.” She switched her major to computer science, and plans to attend graduate school where she hopes to use computers to "save the world."

Jade had uneven access to computers, software, game consoles, and the Internet. She creatively persisted in gaming by using shared equipment, often playing with extended family members and using lower quality tools for content creation. Her parents did not support computer gaming, calling it a "waste of time," and regimented technology classes in school alienated her. Not until she joined an after-school gaming club for girls did she find success with game-related computing, creating new game content and developing a new identity of herself as successful with art and technology. She credits this after-school learning experience for her desire “to be the first one [in her family] to go to college and graduate." Now, she knows "all the cool stuff you can do," in college and with computers.

Both participants played computer games throughout childhood and began to create digital media content for games while in middle school. Being introduced to these practices early in their lives influenced their choice of high school classes, although the two participants had markedly differing experiences. Nyght was given the flexibility of an independent-study computing course, while Jade experienced a boring, alienating, introductory-level graphics course. Despite their differing experiences, both moved into computer-focused courses of study in college—either enrolling in a technical college or choosing computer science as a major. Their differing college choices undoubtedly reflect in part their SES backgrounds—Nyght had college-educated parents who scaffolded her pursuit of higher education, while Jade was the first in her immediate family to attend college.

Discussion of Themes and Implications

Some scholarship questions the role of gaming as a starting point for the study of computer science and related technical fields (e.g., Wilson, 2002). However, such research has simply used “playing games” or “time spent gaming” as the variables of interest, rather than investigating, as we have in this study, the *kinds of gaming practices* that participants actually pursue, the *social context* of gaming, and perhaps most importantly, the *meaning* of gaming for participants. Our study suggests that gaming became a significant “possibility space” for these young women, at least in relation to envisioning ICT careers, when other people—particularly relatives and adult mentors—not only introduced them to new games, but to new practices around these games, and made explicit connections between these practices and future careers.

Our study provides a strong case for the potential value of game-based educational programs that provide mentoring and build on young people’s interest in games but introduce them to other, related ICT practices. The way in which students play games, and their relative expertise in that game may also be significant factors in opening up possibility spaces into which new ways of engaging with the game may enter. In both cases, the participant had hit a critical point in how she engaged with the game she was playing. Each participant had mastered the game as it was designed and was at a

cusp in which she was considering changing how she played the game or whether or not she would even continue with the game at all. Jade, for instance, had come into the afterschool group and expressed how she was getting bored with the *Sims*, sensing that she had exhausted its content and opportunities for novel experiences after years of gameplay. Nyght's experience, in contrast, was one of frustration with the limits of the interface of *World of Warcraft* since it did not provide information she needed to play the game well during challenging, group encounters. Both girls had attained a high level of mastery of their chosen game, which set the foundation for going beyond playing the game to mastering the system of the game via content creation and modification.

Our findings, however, suggest the need for broad conceptions of how gaming might be used to introduce young women (and men) to computing. Many educational programs attempt to use game design to teach a restricted set of programming skills, without considering participants' existing interests and goals. The young women in our study, in contrast, were initially engaged by creating game content, enhancing their existing game play. We posit that this approach was crucial to their ongoing interest in computing, as they learned to identify their own goals and direct their own learning.

The possibilities that these young women found in gaming were clearly mediated by their socioeconomic context and schooling. Gaming in turn affected their social and school experiences, leading them to develop different sets of aspirations and skills. The young women's families differed considerably in how they scaffolded game-related practices and learning. While we know from prior research (e.g., Heath, 1983; Lareau, 2003) that upper middle-class parenting styles more closely align with school norms and practices than those of lower SES families, researchers have given little attention to differences across social class in how video gaming is enacted, discussed, and valued within families. Furthermore, it was evident in our study that game-associated, out-of-school learning was recognized and valued quite differently in their respective high schools. Research documents how more advantaged students tend to experience additional opportunities for project-based ICT learning and the pursuit of higher level skills, while less advantaged students are relegated to rote learning and basic computer skills (Goode, 2010; Margolis et al., 2003; 2008). Jade persisted—but only barely—and we wonder how many others would have given up.

While we may celebrate the knowledge and abilities that young people develop through gaming, if this learning is not similarly recognized and valued in schools or formal credentialing systems, it may simply contribute to further alienation and disaffection from formal education and its associated opportunities. Interestingly, similar implications have been discussed in research concerning the game-based literacy practices of boys who are disaffiliated in school and the disconnect between recognizing academic looking practices or activities that may constitute academic-like learning practices (c.f. Gee & Hayes, 2010-b; King, 2012-b; Steinkuehler, Compton-Lilly & King, 2010; Steinkuehler & King, 2009) or preparation for future learning (Bransford & Schwartz, 1999) in career contexts (c.f. Hayes, King, Herro & Johnson, 2012; King, 2012). Often this discussion sparks the consideration of potential systems for formally credentialing out of school learning. The cases involved in this study can contribute to the ongoing discussion of badge and credentialing systems in informal digital media spaces (c.f. DML: Badges for Lifelong Learning) by encouraging learning environment designers to consider the importance of mentors and mentoring in helping participants develop necessary identities (Gee & Hayes, 2010-b) and clarifying the relevance of competencies and dispositions that go beyond the mere performance of skills (King, 2011; 2012-a).

References

American Association of University Women (AAUW; 2000) Educational Foundation Commission on Technology, Gender, and Teacher Education. *Tech-savvy: educating girls in the new computer age*. Retrieved from http://www.aauw.org/member_center/publications/TechSavvy/TechSavvy.pdf

Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development*, *49*, 193-224.

Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: A simple proposal with multiple implications. *Review of Research in Education*, 24, 61-100.

Bruner, J. (1986). *Actual minds, possible Worlds*. Harvard University Press.

Creswell, J. W. (2006). *Qualitative inquiry and research design: Choosing among five approaches*. Thousand Oaks, CA: Sage.

Dickey, M. D. (2006). Girl gamers: The controversy of girl games and the relevance of female-oriented game design for instructional design. *British Journal of Educational Technology, 37(5),* 785–793.
Ericsson, K. A. (1998). How to study thinking in everyday life: Contrasting think-aloud protocols with descriptions and explanations of thinking. *Mind, Culture, and Activity*, 5(3), 178-186.
Federation of American Scientists. (2006). *Harnessing the power of video games for learning*. Washington.
Fields, D. A., & Kafai, Y. B. (2009). A connective ethnography of peer knowledge sharing and diffusion in a tween virtual world. *Computer-Supported Collaborative Learning*, 4, 47–68.
Fisher, R. L. (2007). *Making science fair: How can we achieve equal opportunity for men and women in science?* Lanham, Maryland: University Press of America.
Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York, NY: Palgrave Macmillan.
Gee, J. P. (2004). *Situated language and learning: A critique of traditional schooling*. New York, NY: Routledge.
Gee, J. P., & Hayes, E. R. (2009). "No quitting without saving after bad events": Gaming paradigms and learning in the Sims. *International Journal of Learning and Media, 1*(3), 1-17.
Gee, J. P., & Hayes, E. R. (2010-b). *Women and gaming: The Sims and 21st century learning*. New York, NY: Palgrave.
Goode, J. (2010). The digital identity divide: How technology knowledge impacts college students. *New Media & Society*, 12(3), 497-513.
Hayes, E., & King, E. (2009). Not just a dollhouse: What *The Sims 2* can teach us about women's IT learning. *On the Horizon* 17(1), 60-69.
Hayes, E. R., King, E. M., & Johnson, B. Z. (Spring 2012). Research on Gender in Science & Engineering (GSE). National Science Foundation Proposal# 1232403.
Heath, S. B. (1983). *Ways with words: Language, life, and work in communities and classrooms*. Cambridge: Cambridge University Press.
Henwook, F., Kennedy, H., & Miller, N. (2001). *Cyborg lives?: Women's technobiographies*. Raw Nerve Books.
King, E. M. (2011). Exploring the possibilities: Using the Sims2 to simulate possible vocational identities among boys who are chronically disengaged in school settings. *International Journal of Game-Based Learning*, 1(2), 34-51.
King, E. M. (2012-a). Productive play: An examination of workplace skills embedded in massively multiplayer online role playing games. Paper presentation at the 2012 American Educational Research Association Annual Meeting and Exhibition Vancouver, BC, April 13-17.
King, E. M. (2012-b). Productive play in the great indoors: Longitudinal study of the 21st century literacy practices embedded in boys' online and offline affinity spaces. To appear in Duncan, S. C., & Hayes, E. (Eds.). *Videogames, Affinity Spaces, and New Media Literacies*: Peter Lang.
King, E. M. (in-print). *Gaming spaces as models of efficacious CSCL and CSCW practice*. To appear in S. Goggins, I. Jahnke & V. Wulf (Eds.). CSCL at work. New York: Springer.
Lareau, A. (2003). *Unequal childhoods: Class, race, and family life*. Berkeley, CA: University of California Press.
Leander, K. M., & McKim, K. K. (2003). Tracing the everyday 'sitings' of adolescents on the Internet: a strategic adaptation of ethnography across online and offline spaces**.** *Education, Communication & Information***,** 3(2).
Legewie, J., & DiPrete, T. A. (2011). *High school environments, STEM orientations, and the gender gap in science and engineering degrees*. Available: http://www.ssc.wisc.edu/soc/faculty/docs/diprete/paper_pathway_06062011.pdf
Margolis, J., Holme, J. J., Estrella, R., Goode, J., Nao, K., & Stumme, S. (2003). The computer science pipeline in urban schools: Access to what? For whom? *IEEE Technology & Society* 22(3),12-19.
Margolis, J., Estrella, R., Goode, J., Holme, J. J. & Nao, K. (2008). *Stuck in the shallow end: Education, race, and computing*. Cambridge, MA: MIT Press.
Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education*, 74, 5-12.
Mitgutsch, K. (in press). Playful learning experiences meaningful learning patterns in players' biographies**.** *International Journal of Games and Computer-Mediated Simulations.*
Riessman, C. K. (2001). Analysis of personal narratives. In. J. F. Gubrium and J. A. Holstein (Eds.), *Handbook of interviewing*. Newbury Park, CA: Sage Publications.

Squire, K. D. (2006). From content to context: Video games as designed experiences. *Educational Researcher*, 35(8), 19-29.

Squire, K., & Durga, S. (2008). Productive gaming: The case for historiographic game play. In R. Ferdig (Ed.) *Handbook of Research on Effective Electronic Gaming in Education*. Hershey, PA: Information Science Reference.

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA.: Sage.

Steinkuehler, C. (2007). Massively multiplayer online gaming as a constellation of literacy practices. In B. E. Shelton & D. Wiley (Eds.),*The design and use of simulation computer games in education* (pp. 187-214). Rotterdam, The Netherlands: Sense Publishers.

Steinkuehler, C. A. (2008). Cognition and literacy in massively multiplayer online games. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of Research on New Literacies*, (pp. 611-634). Mahwah NJ: Erlbaum.

Steinkuehler, C. Compton-Lilly, C. & King, E. (2010). Reading in the context of online games. In K. Gomez, L. Lyons, J. Radinsky (Eds.) *Learning in the Disciplines: Proceedings of the 9th International Conference of the Learning Sciences* (ICLS 2010) Volume 1, Full Papers (pp. 222-230). International Society of the Learning Sciences: Chicago IL.

Steinkuehler, C., & King, B. (2009). Digital literacies for the disengaged: Creating after school contexts to support boys' game-based literacy skills. *On the Horizon*, *17*(1), 47-59.

Stevens, R. S., Satwicz, T., & McCarthy, L. (2008). In-game, in-room, in-world: Reconnecting video game play to the rest of kids' lives." In K. Salen (Ed.) *The Ecology of Games: Connecting Youth, Games, and Learning*. The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge, MA: The MIT Press, 2008. 41–66.

Taylor, T. L. (2003). Multiple pleasures: women and online gaming. *Convergence*, *9*, 1, 21–46.

Wilson, B.(2002). A study of factors promoting success in computer science including gender differences. *Computer Science Education*, *12* (1, 2), 141-164.