What Videogame Making Can Teach Us About Literacy and Learning: Alternative Pathways into Participatory Culture

Kylie A. Peppler
University of California, Los Angeles
2331 Moore Hall 2128
Los Angeles, CA 90095-1521
kpeppler@ucla.edu

Yasmin B. Kafai
University of California, Los Angeles
2331 Moore Hall 951521
Los Angeles, CA 90095-1521
kafai@gseis.ucla.edu

ABSTRACT
In this paper we articulate an alternative approach to look at video games and learning to become a creator and contributor in the digital culture. Previous discussions have focused mostly on playing games and learning. Here, we discuss game making approaches and their benefits for illuminating game preferences and learning both software design and other academic content. We report on an ongoing ethnographic study that documents youth producing video games in a community design studio. We illustrate how video game making can provide a context for addressing issues of participation, transparency and ethics.

Author Keywords
Education, Video Game Making, Learning, Literacy Practices, Media Education, Urban Youth

INTRODUCTION

The publication of Jim Gee's "What videogames teach us about learning and literacy" [8] has jumpstarted a long overdue discussion about video games and learning in the academic and public arena. In this book, Gee articulated a collection of learning principles involved in playing video games and becoming part of the gaming community. Other researchers have demonstrated how participation in game communities involves apprenticeship and how games, such as Civilization™, can be used in classrooms to examine how the understanding of history is fostered [33, 34, 36]. On the public side, movements such as the Serious Games initiative have highlighted role-playing games for learning in military, health and other professional contexts [9].

Noticeably absent from all these discussions is another promising context – the making of games for learning [16]. From this perspective, game players program their own games and learn about software and interface design. Some efforts have integrated the learning of subject matter, such as mathematics and science, within game making activities [13]. Most current commercial games have customization features that allow the player to tailor their characters and edit new levels for games. But in our view, this kind of scripting does not touch the backbones of game design – all modifications are within prescribed parameters.

For this paper, we want to bring back the approach of making games for learning, but situate its contribution within the current debates of the participatory culture [12]. In Jenkins' view, video game play is part of the larger digital culture and the majority of youth are already contributors and producers of media when looking at social networking and blogging sites [27]. He articulated three issues that policymakers and educators face as they attempt to bridge the gap between those that contribute and those that don't: the participation gap, the transparency problem, and the ethics challenge. These three issues encompass the need to ensure that every young person has access to the skills and experience needed to become a full participant, can articulate their understanding of how media shapes perception, and is knowledgeable of emerging ethical standards that shape their practices as media makers and participants in online communities [12]. We agree with these challenges, but want to expand on media production as an alternative and complementary pathway for learning and participation in today's media culture. We will use these challenges as our framework to examine the production of game making practices for learning that took place in a Computer Clubhouse, an informal, after-school program.

BACKGROUND

We see our approach as part of a larger group of work concerned with the educational value of video games. Most prominent within this field are approaches that examine educational computer game play for learning specific subject matter. There are many notable examples of successful educational computer games, such as SimCity™, Civilization™, Where in the World is Carmen Sandiego?™ and the Zoombinis™, even though empirical evaluations of their educational effectiveness have been rare. The more recent discussions have examined existing commercial video games and what players have to invest to understand these complex environments, what kind of collaborations they have to develop to become knowledgeable, and the motivation and persistence they have to display in mastering them. All this has led researchers like Gee [8] and others to use video game play as an example for a

Situated Play, Proceedings of DiGRA 2007 Conference

compelling learning environment that provides players with many of the skills needed in today's digital culture.

As a contrasting approach, efforts to examine making games for learning have leveraged game design for learning programming [13, 21], academic subject matter [15], and to better understand the game preferences of girls and boys [14, 6, 11, 26]. There are also several efforts to design environments that make it easy for young game players to program their own games [2, 7]. Here we want to focus on those approaches that have been concerned with making games for learning programming and expand upon these efforts using the challenges set out by Jenkins for participatory culture.

To address the challenge of the participation gap, youth need to be able to move beyond participation via game playing to game making that involves more than just a handful of pre-selected choices of graphics, aesthetics, and characters. While Jenkins *et al.* views the participation gap as the unequal access to the opportunities, experiences, skills, and knowledge necessary to prepare youth for full participation in a digital culture [12], we would like to expand upon this notion and apply it specifically to video game making, a field which has been dominated by white males. This has been problematic for many reasons, including the lack of representation of women and minority avatars in video games, the reduction of these groups to exaggerated stereotypes, and the overabundance of games marketed towards white males. Our hope is that by providing opportunities for underrepresented youth to participate in designing video games, they can be a vehicle of change as both critical consumers and designers in an industry that has an increasing importance for schools and society at large. Our study focuses on urban youth that are oftentimes seen as consumers of new media and are rarely positioned as designers, especially of video games.

This leads us to Jenkins' *et al.* second challenge: The transparency problem, described as "the challenges young people face in learning to see clearly the ways that media shape perceptions of the world" [12]. We are concerned with the way in which video games form these perceptions. While youth are already discriminating readers of the genre, youth are not as proficient at articulating what makes a particular video game or software application "good." Asking youth to design video games challenges them to make these assumptions explicit and asks them to build upon this knowledge to make informed suggestions for change. Through this type of conversation, we envision that youth will learn about, question, and rewrite power structures found in dominant commercial texts. Although the classroom may be more well-suited for stimulating these types of discussions, informal learning environments offer promising opportunities for how youths' media practices can be used to support expanded views of literacy, learning and expression, which are more open to new technologies, respond to new media, and extend the typical classroom. The texts or products that the youth in this study have created can be seen and read to counter dominant discourses about urban youth.

Finally, we see making games for learning as a way to provide an authentic context for the ethics challenge, described by Jenkins *et al.* as the "breakdown of traditional forms of professional training and socialization that might prepare young people for their increasingly public roles as media makers and community participants" [12]. While many youth are already contributing to digital media, most of these contributions or creations are produced via cutting and pasting. There is little sense of what is involved in creating digital products. We see game making as one of the privileged avenues that gets youth involved in the big and small design decisions that make a video game and thus generate a sense of ownership that understands the value of contributions.

In order to support the type of video game production that we propose, there needs to be a well-articulated theory of learning and subsequent pedagogy behind it, particularly one that emphasizes the expression of ideas, values and genres. A pedagogy with such a design orientation can be found in constructionism, as opposed to constructivism, which places learners in designer roles and ties together the importance of designing artifacts that are of relevance to a larger community [25, 17]. While constructionism places importance on the individual learner, it also places equal importance on the role of social participation. Here the individual, the artifact, and collaborative input of the community shape learning, participation, and sharing. In the case of video game production today, the community could be described as both the distributed online and offline community. Sociocultural constructionists further argue that the individual and the community develop reciprocally through "shared constructive activity that is resonant with both the social setting that encompasses a community of learners, as well as the cultural identity of the learners themselves" [28]. Accordingly, a tool that will promote the developmental relationship between the individual and the community will enable youth to express their cultural heritage, have a broad communicative value, and allow for an information and resource exchange [28]. We propose that Scratch, a media-rich programming environment, offers just such an opportunity and that design flexibility is particularly important as we struggle to be inclusive of individuals with diverse backgrounds.

CONTEXTS, PARTICIPANTS, AND TOOLS

For the past two years, we have been engaged in ethnographic work at a Computer Clubhouse in South Central Los Angeles, California, seeking to better understand youths' video game making practices. The studio is situated at a storefront location in one of the city's poorest areas and serves over 1000 high-poverty African American and Hispanic youth. The Computer Clubhouse is not a stand-alone center. Not only is it part of a local community organization, it's also part of world-wide

network of over 100 design centers designed to embody constructionist principles that acknowledge that people learn best when they are actively engaged in design activities [29].

At this particular Clubhouse, youth have access to an impressive variety of software, including Microsoft Office, Bryce 5, Painter 7, RPG Maker™, in addition to video, photography, and sound editing software. All of the computers are networked to a central server, where youth have a personal folder that serves as an image archive and repository for finished work. Youth work individually and in small groups, and range from 8-18 years of age but most are between the ages of 10-14.

Notably, there is one media-rich programming environment, Scratch, which was specifically designed for the Clubhouse environment to facilitate video game production [22, 30]. Scratch differs from other visual programming environments [10] by using a familiar building block command structure [22, 30], eliminating thorny debugging processes and the risk of syntax errors (see figure 1). Programming objects can be any imported two-dimensional graphic image, hand-drawn or chosen from a personal archive. We propose that two-dimensional game design holds several advantages for youth wanting to make their own video games. For example, two-dimensional programming enables easy incorporation of third party images, and is not as difficult as three-dimensional programming.

THE STUDY

This study draws on observation, interview and video game artifact data that were collected as part of a larger research project funded by the National Science Foundation [30]. The youths' video games were collected on a weekly basis and entered into an archive for further analyses. We used a simple quantitative approach to analyzing archival data, in addition to detailed profiles of participants, involving interviews, videotaped observations, extensive ethnographic field notes [5], and other artifacts. The analyses and case study presented here illustrate different access points used by youth to engage with video game making and highlight what we consider to be significant events and practices surrounding video game making--defined as the written texts, software programs, media images, oral discussion about video games. Field notes were open and axial-coded for themes derived from the theoretical framing.

Our case study was selected from over 30 other participants based on the prototypical nature of his work and his persistent interest over a period of multiple weeks in using computer programming for video game making. In the following section, we introduce the community and the case study and give examples from the field notes and interviews where they describe literacy events and practices, with an emphasis on those involving video game making. These excerpts provide a perspective on youths' attempts to create video games and how urban youths' informal video game making culture and practices can be used to support alternative pathways toward new literacies and learning. Here we concentrate on work done in Scratch, but we consider Scratch to be just one computational tool among potentially many others that has enough flexibility for meeting the three challenges of a participatory culture.

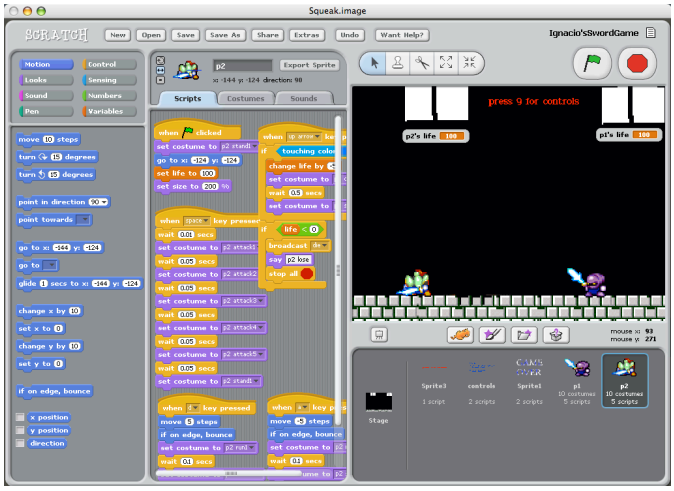

Figure 1: Screenshot of the Scratch User Interface.

DEVELOPMENT OF A GAME MAKING COMMUNITY: ARCHIVAL ANALYSES

Over the course of two years, we tracked Scratch development and collected all projects created by Clubhouse members. The work stored on the central server creates a representation of game design community development. Based on an analysis of all files saved on the central server during the first 24 months of introducing Scratch (n = 11,926), we discovered that Scratch was the most popular design software used during this period (5.3% of the files saved, n = 643). The only activity that was more popular was the saving of images found on the web (> 75% of the files saved, n = 8944). Other popular design software included *Microsoft Word* (3.5% files saved, n = 461), *Bryce5* (2% of the files saved, n = 270), and *Kai's SuperGoo* (1.1% of the files saved, n = 143). Notably absent from the list of most popular software is RPG Maker game files (n = 43), despite it's presence in the community for a number of years prior to the introduction of Scratch. While there are a number of reasons that could explain this finding, we think that Scratch's popularity was due in large part to its ease of use and flexibility that allowed for a greater variety of game genres and aesthetics.

The total number of Scratch projects paints a picture of an active video game culture, but what exactly are youth creating in Scratch? Because Scratch was designed to flexibly promote video game design, youth have appropriated the software in a number of ways. Games were

reliably coded for 19 types of different game genres (see table 1) and inter-rater reliability was 85-92%.

Table 1: Table of game genre types found in the archive.

Game Genre	Years One & Two (%) n = 643
Action-adventure games	9.9%
Shooter games	7.1%
Fighting games	8.0%
Role-playing games	0.0%
Platform games	3.5%
Simulation games	0.3%
Sports games	9.0%
Racing games	4.3%
Classic arcade games	2.2%
Artillery games	0.3%
Educational games	0.3%
Music games	1.1%
Puzzle games	1.1%
Interactive movies	5.1%
Mazes	0.7%
Design/ Fashion games	2.7%
Mixed genre games	12.7%
Undeveloped, graphics-only	14.0%
Other/ Unknown	17.7%
TOTAL	100%

We found that 14% of projects were graphics-only files without any computer programming; 12.7% of projects fell into mixed genre game categories; 9.9% were action-adventure projects; 8.0% focused on fighting; 7.1% were shooter games; and the remaining 30.6% were distributed among the other games categories. 17.7% of projects escaped a clear categorization because they did not provide enough detail. This indicates that there were several subcultures of game makers. From the field notes, we observed that members of these groups tended to cluster together to share ideas and provide support for each other's designs.

We know that a number of projects have been created within the design culture, but what can we say about the creators themselves? Overall, the Clubhouse services over 1000 youth, 250 of whom have created an individual folder on the central server. This is one of the first initiation practices of becoming a member of the design studio. Based on the Computer Clubhouse's estimate, this would indicate that about one quarter of the youth have been introduced by peers, mentors, or coordinators to creating a folder and saving work (n = 252). Of this group, over 80 youth have saved a Scratch project to the server, roughly 8% of all Clubhouse youth. Overall, 40% of the Scratch archive was created by male members, 29% by female members, 9% were created by small groups, and 22% have unknown authors.

In the second year of the project, we saw that some new aspects of a video game making culture emerged. For example, video game production was a high status marker, local and global game design experts emerged, and work in Scratch established membership within the community. In addition, we began to see peer-to-peer mentoring in video game design for the first time and there was increased appropriation of Scratch as a video game design tool. As a result, new types of hybrid genres emerged and individuals worked together in groups with increased frequency, with some youth specializing in aspects of game design akin to more professional settings.

One of the questions that interests us is whether there was any evidence that the community had become more knowledgeable in game design as a whole. In order to better understand this, we turned to the artistic and programming content of the projects. Although analyses are still underway [1], there are some preliminary indicators that the community on average had become more knowledgeable during the second year of implementation. The programming of the games became more complex, as indicated by the increased number of stacks, sprites, sounds, and costumes. When we looked more closely at a random selection of projects from the first and second year, we saw that there were other indicators that the community became more sophisticated in its video game design practices. This leads us to the following case study of how an individual navigated this landscape.

CASE STUDY OF A VIDEO GAME DESIGNER

In the following case study, we illustrate how youth integrate computation and the arts into video game design practices, express personal interests, and shift participation over time within the video game design culture. This case serves as an example of how youth engage in video game practices as they learn visual programming.

Jorge: Metal Slug Hell Zone X

"Metal Slug Hell Zone X" was created by a 15-year-old Latino male software designer named Jorge,[1] who modeled the piece after a similarly-titled popular videogame. The original Metal Slug game is a futuristic "run and gun video game" widely known for its fluid animation and fast-paced, two-player action. At home, Jorge has a passion for video

gaming, and spends the majority of his time at the Clubhouse working on Scratch projects. Metal Slug Hell Zone X is his second Scratch project. When the viewer presses a start button in Metal Slug Hell Zone X, a title screen prompts the player to choose one of four avatars. The selected avatar then appears on the screen, behind which lays a barren purple desert landscape with moving clouds overhead. Players use the arrow keys to move forward, backward, crouch, jump, and fire a gun (see figure 2).

Jorge used a full range of design software to make his project. Using the paint editor within Scratch, Jorge paid meticulous attention to realistically animating his avatars. Jorge made sketches based on playing the videogame, downloaded sample avatars from Internet fan sites, and refined each frame of the movement in the paint editor for smooth stop-action animation. Jorge has used design conventions such as programming the character to respond to each arrow key and created special responses if the avatar is told to do something (such as shoot) while crouching or jumping. In order to do this, all of these scripts correspond to carefully crafted costumes for his avatar.

Jorge's video game production provides insight into how the goals of media education apply to game making. In this project, Jorge learned about game design through imitation of a familiar game and as Buckingham points out, "imitation is an indispensable aspect of learning" in media education [3]. He learned how to design for interactive play and redesigned his program several times, discovering that it can be friendlier to the user if his game responded to standard key strokes (e.g., right and left arrow keys) rather than random ones. Jorge also learned how to participate in the distributed online culture specific to designing and making video games. Jorge's work in Scratch facilitated his understanding of how games are made by professional production specialists and also networked with other fans, like himself, that wanted to create amateur productions. Evidence of this is found in his online web-surfing activities and over 300 downloadable sheets of sprites found in Jorge's folder at the Clubhouse. He gained an appreciation for what's difficult and easy to design in video gaming, and in the process, he now actively participates in the gaming community, checking occasionally online to see what others had created and asking others to play his game to gain feedback.

Beyond Jorge's attention to interface conventions, he has explored and in some senses reformulated genre conventions of shooter games. The title denotes that it is in the same series as other *Metal Slug* games, yet there seems to be a parodic edge to the title (*Hell Zone X*) because, while he has conformed to most of the trademarks of the series, Jorge's recreation has an almost Zen-like impact on the viewer/player. Jorge's game lacks the loud sound effects of the original, and with animated clouds floating overhead and the rolling terrain beneath, the resounding quality of this game is one of tranquility and solitude. Jorge has created no antagonists to shoot, no violence, no blood, and no chaos that we might otherwise expect in the "Hell Zone," and instead has focused on creating smoothly animated protagonist and a space for this character to dwell. This seems to be a play on the genre itself (simultaneously a violation and a creative act). While Jorge doesn't articulate this, we interpret Jorge's conscientious programming decisions to suggest the impact that violence can have on the environment. Jorge tells us that one of the reasons for coming to the Clubhouse includes the sense of focus and calm that he gets when he works on his projects. In this sense, the game serves as a metaphor for Jorge's everyday experiences and encapsulates the sense of relief that Jorge feels at the Clubhouse when he's engaged in his work. We feel that his working for over a year on this piece and his knowing (as demonstrated by his earlier game, Mortal Kombat, which did have violent combat between characters) that this was a purposeful move on Jorge's part.

Figure 2: Partial screenshots of Jorge's *Metal Slug Hell Zone X* video game.

We see Jorge's participation changing on two levels. First, Jorge's participation in Scratch has changed over a period of a year and a half to the point that he is now exploring the upper limits of Scratch. Second, beyond Jorge's development in computer programming, Jorge's expert status has forged new bonds amongst his peers and with the Clubhouse staff. For the first time in the summer 2006, Jorge was seen mentoring his peers in Scratch. In the following two field note excerpts, Jorge shifts from wanting to work alone and needing help from others to being willing to help and advise others in video game design:

> *I met Jorge today. I went over to introduce myself to him because he was sitting in the corner of the room by himself. Jorge is very quiet…I tried to talk to him about his Scratch work but he didn't seem to want to talk about it… While I was working with John, Jorge came over and asked me for help in Scratch [February, 2005].*
>
> *I was working with Yessica in Scratch today… We were having trouble with the Broadcast commands because I had never used them before. Jorge was sitting next to us and he offered to help…He made it seem very easy. It was more like he was the mentor and I was the member [June, 2006].*

We see this as a dramatic shift in Jorge's participation. In the beginning, Jorge was seen as being unsocial. Jorge is now widely accepted by his peers, mostly facilitated by his impressive work in Scratch. The involvement in the design process has awakened new possible career opportunities for some of the youth – notably the teenage boys. As Jorge puts it, "…it teaches how to play games and make games and it helps us figure out our future." Jorge would now like to be a professional video game designer, to attend college at M.I.T., and perhaps someday design a program like Scratch. It's clear that experiences like the ones at the Computer Clubhouse can have a considerable impact on the outlook and career aspirations of young people.

Jorge is not only becoming more fluent in technology, he is also learning to participate in an increasingly more mediated society. By playing and making games, Jorge's knowledge of games and gaming has increased – what some might call "games literacy." He is also now connecting to a distributed online community with similar interests. Although these types of new literacies are often seen outside the canon and scope of the aims of traditional types of literacies, we can assume, given Jorge's goal of becoming a game designer, that he will be well-served by cultivating these new types of literacies.

DISCUSSION

In our discussion, we want to return to the issues faced in a participatory culture – participation, transparency, and ethics – and examine how game making for learning has addressed them. We used our research at a Computer Clubhouse as a context for game design activities. We should note upfront that many other design activities took place concurrently that would well qualify the clubhouse participants to be members of a participatory culture, including youths' creations in Photoshop, 3D graphics in Bryce, etc. But for us, the most important aspect relates to who is participating in the game design culture. We know that the game industry is not a welcoming place for women and minorities [4]. Here, we have seen urban youth and English language learners engaged in game design activities and become participants in gaming communities. Through the general scope of Clubhouse game production and the extent of Jorge's game designs, we can find evidence that game-making activities can provide a pathway into participation.

We also see the transparency issue addressed in game-making activities. Jorge's games dealt with a host of complex interface design issues that reveal the underpinnings of software interactions. Such understandings are crucial for today's citizenship, as more aspects of life have moved into the digital domain. Interfaces also happen to be one of the most difficult artifacts to design, as many assumptions about human interaction are built in, assumptions that most people are not aware of unless faced with designing them. Jorge became acutely aware of these issues, and his game afforded him the opportunities to examine them with others outside of the clubhouse. In today's media culture, we lack a history of educating students about interface design, as most school activities are concerned with using rather than producing technologies. But we argue that the transparency challenge should be equally concerned with opening the black box of digital technologies, particularly games, as about media ownership and control issues. In reviewing Jorge's case, we have pushed the transparency issue to a new level that involved the participation and manipulation of media bits on multiple fronts and created opportunities to learn how to do this.

The final issue concerns the ethics problem prominent in digital culture, as violation of copyright can be just one mouse click away. We argue that game-making activities offer a promising avenue for young people to develop ownership of media and a sense of appreciation what goes into creating them. In the Computer Clubhouse, there is an emphasis on repurposing media akin to a professional context. But there is also a sense of transgression if other members were to copy someone else's work without explicit acknowledgment. Jorge's Metal Slug variations are a good example of how the modifications within a genre can be minimal but still reference its originator.

CONCLUSION

We want to conclude our paper with a possible answer to the question "What can video game making tell us about learning and literacy?" It is clear from our analyses that video game making can provide a rich context for learning programming, how to collaborate with others, becoming a member of an affinity group, developing sustained engagement, and more. We see the approach of making games for learning as an appropriate and healthy counterpoint to a culture of consumption. While the boundaries between media consumers and producers are perhaps not as distinct as they used to be, there is still a large rift between those who own and control media and those that have the possibilities of creating them. To be a full member in today's participatory culture should mean much more than knowing how to point and click; it should also mean knowing what goes into creating a pointing device – be it a cursor or another object of your imagination.

ACKNOWLEDGMENTS

The research cited in this paper was supported by a Dissertation Year Fellowship from the Spencer Foundation to the first author and a grant from the National Science Foundation (NSF-0325828) awarded to the second author.

REFERENCES

1. Peppler, K. (2007). Creative Bytes: Literacy and Learning in the Media Arts Practices of Urban Youth. Unpublished Doctoral Dissertation, University of California, Los Angeles.
2. Brunner, C. "Games and Technological Desire: Another Decade," in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.). *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, 2006), MIT Press.
3. Buckingham, D. *Media Education: Literacy, learning and contemporary culture*. Polity Press, Cambridge UK, 2003.
4. Consalvo, M. "Game Over? A Preliminary Study of Women Game Developers and Factors Influencing Career Success and Failure," in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.), *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, 2006), MIT Press.
5. Creswell, J. W. *Research Design: Qualitative, Quantitative, and Mixed Methods*. Sage Publications, Inc., Thousand Oaks CA, 2003.
6. Denner, J. & Comb, S. "What do Girls Want? What Games Made By Girls Can Tell Us," in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.), *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, 2006), MIT Press.
7. Flanagan, M. "Design Heuristics for Activist Games," in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.), *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, 2006), MIT Press.
8. Gee, J. P. *What video games have to teach us about learning and literacy*? Palgrave Macmillan, New York NY, 2003.
9. Glazer, S. "Video Games: Do they have educational value?" in *Congressional Quarterly Researcher*, 16(40), (2006), pp. 937-960.
10. Guzdial, M. *Programming Environments for Novices*. Unpublished manuscript, Atlanta GA, 2003.
11. Heeter, C. & Winn, B. "Gender, Play Style, and Learning," in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.). *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, 2006), MIT Press.
12. Jenkins, H. Clinton, K., Purushotma, R., Robison, A., & Weigel, M. (2006). "Confronting the challenges of participation culture: Media education for the 21st century." White Paper. Chicago, IL: The John D. and Catherine T. MacArthur Foundation
13. Kafai, Y.B. *Minds in play: Computer game design as a context for children's learning.* Lawrence Erlbaum Associates, Hillsdale, NJ, 1995.
14. Kafai, Y.B. "Gender differences in children's constructions of video games," in Patricia M. Greenfield & Rodney R. Cocking (Eds.). *Interacting with video*. (Norwood NJ, 1996), Ablex Publishing Corporation, pp. 39–66.
15. Kafai, Y.B., Franke, M., Ching, C., & Shih, J. "Games as interactive learning environments fostering teachers' and students' mathematical thinking," in *International Journal of Computers for Mathematical Learning*, vol. 3, no. 2 (1998), pp.149–193.
16. Kafai, Y.B. "Playing and making games for learning: Instructionist and constructionist perspectives for game studies," in *Games and Culture*, vol. 1, no. 1 (2006), pp. 34-40.
17. Kafai, Y.B. "Constructionism," in K. Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences*, Cambridge University Press, Cambridge MA, 2006.
18. Kafai, Y.B. (in press). "Synthetic Play: Teen Gaming Together and Apart in Virtual Worlds," in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.). *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, 2006), MIT Press.
19. Kafai, Y.B. & Giang, M. T. "New Virtual Playgrounds: Children's Multi-User Virtual Environments for Playing and Learning with Science," in T. Willoughby and E. Wood (Eds), *Children's Learning in a Digital World*. Blackwell Publishing, Oxford UK, in press.

20. Kafai, Y.B., Cook, M. S., & Fields, D. A. "Blacks deserve bodies too! Design and discussion about diversity and race in a teen online world," paper submitted to the Digital Games Research Association International Conference, to be held in Tokyo, Japan. 2007.

21. Kelleher, C. "Motivating Middle School Girls: Using Computer Programming as a Means to the End of Storytelling via 3D Animated Movies," in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.). *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, 2006), MIT Press.

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

23. Marcia, J. E. "Identity in Adolescence," in J. Adelson (Ed.), *Handbook of Adolescent Psychology*, 1980.

24. Miller, H., & Arnold, J. Self in web home pages: Gender, identity and power in cyberspace. In G. Riva & C. Galimberti (Eds.). *Towards cyberpsychology: mind, cognitions and society in the Internet age* (Amsterdam: IOS Press, 2001) 73-94.

25. Papert, S. *Mindstorms: Children, Computers, and Powerful Ideas*. New York: Basic Books, 1980.

26. Pelletier, C. "Producing difference in studying and making computer games: How students construct games as gendered in order to construct themselves as gendered**,"** in Y. B. Kafai, C. Heeter, J. Denner, & J. Sun (Eds.). *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Games* (Cambridge MA, in press), MIT Press.

27. Pew Foundation. Teen Content Creators and Consumers. Washington, DC: Pew Internet & American Life Project (2005, November).

28. Pinkett, R. D. *Bridging the Digital Divide: Sociocultural Constructionism and an Asset-Based Approach to Community Technology and Community Building.* Paper presented at the 81st Annual Meeting of the American Educational Research Association (AERA), New Orleans, LA, 2000.

29. Resnick, M., Rusk, N., & Cooke, S. The Computer Clubhouse: Technological Fluency in the Inner City. In D. Schon, B. Sanyal & W. Mitchell (Eds.). *High Technology and Low-Income Communities*. Cambridge, MA: MIT Press, 1998.

30. Resnick, M., Kafai, Y., & Maeda, J. ITR: A Networked, Media-Rich Programming Environment to Enhance Technological Fluency at After-School Centers in Economically Disadvantaged Communities: Proposal submitted to National Science Foundation, 2003.

31. Schroeder, R. (Ed.) The social life of avatars: Presence and interaction in shared virtual environments. Great Britain: Springer-Verlag London Limited, 2002.

32. Schroeder, R. & Axelsson, A.-S. (Eds.) Avatars at work and play: Collaboration and interaction in shared virtual environments. London, Springer, 2006.

33. Shaffer, D. W. How computer games help children learn. New York, Palgrave Macmillan, 2007.

34. Steinkuehler, C. A. Learning in massively multiplayer online games. In Y. B. Kafai, W. A. Sandoval, N. Enyedy, A. S. Nixon & F. Herrera (Eds.), Proceedings of the Sixth International Conference of the Learning Sciences (pp. 521-528). Mahwah, NJ: Lawrence Erlbaum, 2004.

35. Steinkuehler, C. A. Cognition and literacy in massively multiplayer online games. In D. Leu, J. Coiro, C. Lankshear, & K. Knobel (Eds.). *Handbook of Research on New Literacies.* Mahwah, NJ, Erlbaum, in press.

36. Squire, K.D. "Sid Meier's Civilization III," in *Simulations and Gaming*, 35(1), (2004), 135-140.