In *Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Computer Games*, Y.B. Kafia, J. Denner, C. Heeter, and J. Sun (eds.) Cambridge: MIT Press, 2008, 265-279.

17 Design Heuristics for Activist Games

Mary Flanagan and Helen Nissenbaum

Computer games are more profitable and popular than ever and have become a major cultural medium across a wide range of social, economic, age, and gender categories. Indeed, from casual games played on the Internet to *The Sims, Metal Gear,* and *Grand Theft Auto* series, the popularity of computer games suggests a revolution measurable in terms of financial, social, and cultural impact. Annual retail sales of video games in the United States in 2007 exceeded $9 billion, not including hardware, peripherals, and related products.

Games are also a cultural medium, carrying embedded beliefs within their representation systems and structures, whether the designers intend them or not. In media effects research, this is referred to as "incidental learning" from media messages. For example, *The Sims* is said to teach consumer consumption, one of the values of capitalism: it encourages players to earn money so they can spend it and acquire goods. The *Grand Theft Auto* series was not created as an educational game, but nonetheless, it portrays its world as a violent place, rewards criminal behavior, and reinforces racial and sex stereotypes. Many scholars, makers, and consumers observe that games can embody antagonistic and antisocial themes—violence and gore, genocide, crime, cruelty, problematic representations of bodies in terms of sex and race, and even viciously competitive game interaction and game goals (see Anderson 2004; Johnston 1999; Media Education 2001; Melillo 1999). While of course this is not the case for all games, these issues arise in a notable number of popular games. Our goal is not to denigrate these games but offer alternatives. How can a game designer intentionally "break the mold," especially when designing for "new" or underserved players such as girls?

Building upon the significant insights of those engaged in the study of ethics, science and technology, and design disciplines (e.g., Akrich 1992; Brey 1997; Hughes 1987; Latour 1992; Lessig 1999; MacKenzie and Wajcman

1985; Mumford and Henshall 1978; Nissenbaum 2004; Winner 1980), we believe that it is not enough to stop at the point of recognizing that human principles (negative and positive) could be embodied in design—we must set forth particular principles as a design aspiration. As this book attests, there is a will, not only among concerned observers but also among those who play and create games, that existing games be changed, or rather, that games should at least be developed in a way, that they could include ethical ideals—or *human values*. Accordingly, our work urges designers and producers to include values in the criteria by which the quality of a given technology is judged, to strive actively for a world whose technologies not only are effective, efficient, safe, attractive, easy to use, and so forth but also promote the values to which the surrounding societies and cultures subscribe.

Research on sex differences in IT, game, and computer interests helped trigger the development of the framework presented here. Our team believes that the lack of values-oriented software environments or environments that embody the ideals of values such as creativity, security, and equity contributes to the large number of females who lose interest in IT fields overall (AAUW 2000; Bruner 1997; Flanagan 2006; Inkpen et. al. 1995; Varma 2003). We believe the Values at Play (V.A.P.) framework will be of use to educators and systems designers in the IT field considering game structures. This research will also be of significant value to scholars interested in the study of technology, society, and humanity (Lee 2003). Throughout this chapter, we draw examples from *RAPUNSEL*, a game that teaches girls basic programming skills with the underlying motivation to include girls' perspectives in software design. *RAPUNSEL* was designed to embody a suite of activist social values within the overarching goal of increasing girls' technological competence.

What is the best way to influence existing game paradigms? By now there is a tradition in technology studies that has stressed a relationship between design and values, and has made some progress in how to structure design practices (see Friedman, Kahn, and Borning 2002). We have developed a specialized version of this inquiry in relation to computer games, which we hope to promulgate in both industry settings as well as educational institutions. To develop a design approach (or best practices) for taking values systematically into account, we generated several key questions: How can values be consistently and systematically integrated into the design of software systems? How close can one get to making values investigations in the context of technical

design scientifically rigorous? Is it possible to construct a viable set of general software design principles that could lead to the integration of values across a variety of design tasks, and in particular, games?

The Method

We have developed a methodological framework, Values at Play, to foster values integration into the science of design through the creation of a tool kit to go along with this framework. The V.A.P. framework has been further developed through work with *RAPUNSEL*, a dance game to teach girls programming. The V.A.P. framework is not intended to replace other well-established design approaches or methodologies such as participatory design (e.g., Cross 1971; Druin1999; Grudin, Ehn, and Schmidt 1988; Mumford and Henshall 1978), value sensitive design (e.g., Borning, Friedman, and Kahn 2004), reflective practice (e.g., Schön 1983), and critical technical practice (e.g., Agre 1997; Dourish et al. 2004; Mateas 2000). We rather intend to supplement them, to augment software design philosophies that currently only target, for example, reliability, usability, functional efficiency, good game play, et cetera. Although our core concern is how to design systems that meet the constraints suggested by important social values, we must also meet traditional software and game design criteria as well.

The V.A.P. methodology can be used to create games specifically intended to be activist games. But it can also be applied to the design of more mainstream commercial and educational games. When using V.A.P. to embed values into the mainstream game design process, values will be one of many competing game design requirements. Intentionally embedding values, however, stands a better chance of creating socially conscious games than ignoring the topic and thus leaving embedded values to chance. Why forego the opportunity to at least consider making a more socially conscious game?

Development of the Values at Play Approach

The preliminary approach [sketched out and applied to a case study in Flanagan, Howe, and Nissenbaum (2005)] comprises three constitutive and iterative activities: (1) *discovery* in which designers discover and identify values relevant to their project, (2) *translation* in which designers translate value

considerations into architecture and features, and (3) *verification* in which designers verify that the values outcomes they sought have been realized in the system. Designers do not undertake these activities in serial order but in parallel, as outputs from each are expected to feed back into the other two, which, in turn build upon these outputs in iterative steps.

1. **Discovery** The goal of this activity is to identify values that might be relevant to a given design project. Although the explicit output of discovery—a set of values—will vary radically from project to project, the steps we suggest designers follow remain stable across projects. The steps emerge from the overall need to answer the question "What values?" To start a values discussion, it is useful to start with a list—while the following list of values is far from exhaustive, it is offered to help designers start thinking broadly about social values in games: liberty, justice, inclusion, equality, privacy, security/safety, creativity, freedom of expression, trust, cooperation, sharing, diversity, fair representation, personal autonomy, improved IT participation for females, self-esteem, self-efficacy, and authorship. By adding to, deleting from, and ultimately creating their own lists, project designers can initiate an inquiry into the sources of values in a given project, and prioritize them in the design process.

Values may be expressed in the very definition of a project. For example, a company that wishes to make the next commercial-shooter-game smash hit might define the project within the first-person-shooter genre; this alone brings about embedded values in terms of competition, creativity, potential violence, and goals. The National Science Foundation has supported numerous game projects to increase girls' interest in science, technology, engineering, and math (STEM) topics (see Hughes this volume; Kelleher this volume). Designing games for girls is particularly challenging because doing so intersects with larger assumptions about what girls like and how to market to them as a group, running the risk of reinforcing antitechnology stereotypes in ways that might not match a designer's intention to empower girls. Even the general question "What do girls like?" is in itself rife with assumptions proffered through marketing, media, and cultural assumptions; the question itself must be reconsidered with more nuance to become useful. Designing to accommodate a variety of player styles rather than a generic "girl" player could, in this example, be far more useful.

Values may emerge in specification of game mechanics. Examples of game mechanics range from the reward structure to the point of view in the game. For example, a particular design enables cooperation—such as collective inventories, rewards for sharing, how much players are able to communicate and work together, or even the point of view in the game. The point here is not to say that competition is inherently bad, but there might be different forms of competitions girls express an interest in. Therefore, we designed several kinds of reward systems in *RAPUNSEL* to satisfy different competitive and cooperative urges. Players can seek rewards based on their creativity and know-how in designing clothes and dances; players can share and earn points, gaining status; and players can actively challenge each other to dance-based competitions. Players have the important option of turning down competitions if they are noncompetitive players. This approach accommodates diverse play styles. Another very different example lies in game-play perspective, and here too we can see how values are affected in the very game engine design. For example, a "god's-eye" controlling point of view and the ability to manipulate large scale events and characters in games implies different values from, say, collaborating with characters to produce a desired result—complete control over events, weather, or human or nonhuman characters in god's-eye mode may foster a player's sense of autonomy, authorship, security, and self-esteem, but the god's-eye control may not necessarily cultivate sharing, cooperation, equality, or diversity.

Stakeholders' values set up preliminary expectations that frame any given project. Stakeholders can be clients, nonprofit groups, publishers—anyone with investment in the success of the project. Many game designers, for example, design for clients who bring to the project concerns about markets and distribution as well as already successful titles that affect the design process and its outcomes. One issue in particular in designing "games for girls" are the goals of the stakeholders in relationship to assumptions about female and male play styles and interests—are these assumptions well researched and is intention deep? Is success defined in terms of market share, or in terms of principles such as self-esteem, self-efficacy, self-autonomy, creativity, et cetera? Can both commercial and social values be equally important?

Design team backgrounds mold the creative process. Designers themselves are shaped by their expectations, goals, education, culture, and economic

and social contexts. Recognizing ones' own values is a first step. Assessing where the team is coming from is a difficult but necessary part of the reflection on the values held among those in the creative environment.

Presumptive social and political values, and sometimes legislation, generate background constraints. For example, how much privacy a log-in system offers, what is shared publicly, what is freely exchanged—these are all affected by larger cultural and social norms and have implications for the values embedded in a game.

The acts of discovery for a given activist design project are thus far-ranging and represent significant challenges to designers. This initial values discovery checklist can launch consideration of social values to embed in a game. For *RAPUNSEL*, the list of project values after the discovery phases included cooperation, sharing, diversity, and fair representation.

2. **Translation** This is the activity of embodying or expressing values in systems design. It comprises three subactivities: operationalization, implementation, and resolving value conflicts.

Operationalization. This involves defining value concepts, which, like privacy, equity, social justice, access, autonomy, and sociality, are often understood only in abstract and general terms.

Particular game features are tied to values. The idea is to express values definitions in operationally accessible, concrete forms so they may be rendered as design features. Creating the design for a game, then, involves making meaningful play happen through the incorporation of these values. *Cooperation,* for example, is a value that the team must not only identify but also design for—as a guiding factor, principle, or constraint. studies show teenage girls are deeply engaged in instant messaging and chat as a means toward higher levels of computer use (Grinter and Palen 2002). *RAPUNSEL*'s chat system was identified as a feature to facilitate cooperation and contribute to increasing female participation in IT and computer science.

Operationalizing values requires a leap from concept *to* feature. The process of designing project values into the fabric of the game interaction (the rules by which players interact inside a game, also known as the game mechanic) for any one world is not always straightforward. If the value is to be meaningful in the game, it must be integral to the game-play mechanic, but the leap between the ideal value and the feature could sometimes seem like

a leap of faith. In order to implement the value of cooperation in a game, for example, one might create tasks that can be completed only by two or more players cooperating. Or, one might design a game that rewards large coordinated group efforts over those undertaken by an individual alone (figure 17.1). Whether this feature, after implementation, in fact leads to cooperation or unfriendly competition remains to be seen and must be verified (a later stage).

Implementation is, in some sense, the essense of design, wherein the central concern is transforming, or translating ideas, intentions, requirements, and concepts into concrete design specifications and then, even more concretely, to lines of code in a program. Similarly, this is true in the case of values, except that the concepts in question are operationalized values.

Implementation involves translating, testing, and iteration. Even if the design has incorporated the translated value into a cohesive design, a designer never actually knows if the design is successful unless players and testers are involved and feedback incorporated into a revised design.

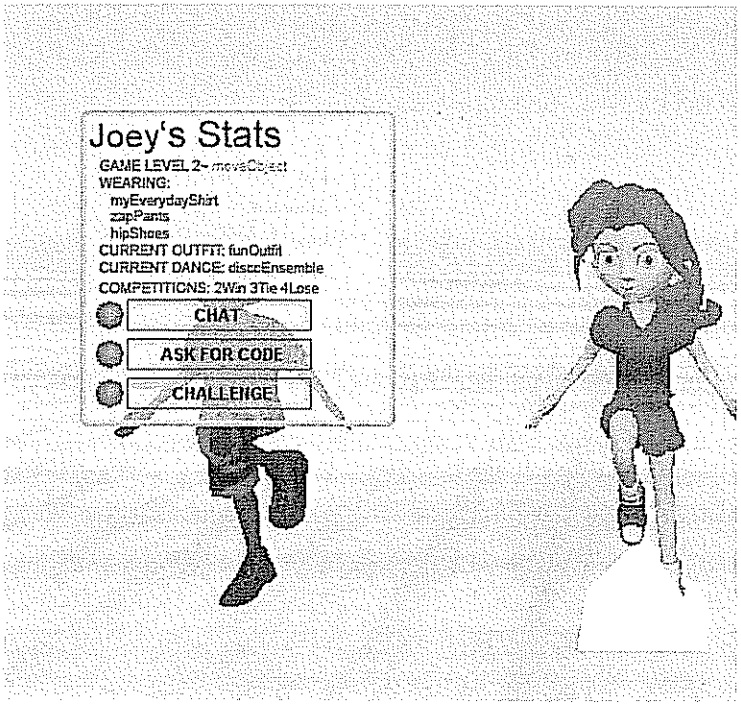

Figure 17.1 Designing for cooperation: in *RAPUNSEL*, players can choose to chat or use chat interaction to swap bits of computer code for points and recognition (see color plate)

Continuous review of values during implementation safeguards important design features. Values must be reviewed and re-reviewed throughout the implementation process. Even if values are expressed and operationalized into the design document, the features or aspects that embody values are often the first to be cut due to constraints of time, energy, and funding. The problem is more severe with larger teams. In our work on *RAPUNSEL* we discovered that features omitted in a particular game build, such as a missing graphic or audio feedback for mouse movements, or more complex features, such as a map in a game, might irrevocably alienate girl players unaccustomed to playing games. Rather than increasing girls' interest in programming, a prototype missing a few small key features drove them away from technology.

Disagreements are natural. Great team arguments may ensue regarding values decisions. Explicit, common values goals for the project, and reviewing the values on a regular basis (in our case, weekly) provides opportunities to discuss disagreements and may keep features prioritized in implementation that supports values without going overboard. A disagreement on the *RAPUNSEL* team focused on how much to scaffold the options available to players to help them learn to program. One perspective advocated giving the players nothing to alter but a parameter, such as shoe color. Then the game would allow for more and more changes, introducing more aspects of code. This approach was favored by some team members and not others: many self-taught programmers favored allowing players to look at actual code and hack away at it to see what changing the code does.

Values must be reviewed and re-reviewed for "feature creep." Because game design is a highly iterative process, values must be cyclically reassessed. Inspiration and a particular round of player testing can lead to the adoption of new design decisions, some of which may actually improve embedded values but could also be detrimental or conflict with the values aspects of the project.

Resolution of value conflicts. This is an ever-present need in design. In many cases these conflicts may not even rise to the decision-making level because they appear obvious, such as when one of the values is clearly dominant, or a design option is overwhelmingly costly or simply trivial. But experience with software design has shown that certain conflicts are recurrent and difficult—for example, security versus ease of use, privacy versus accountability—because the science of assessing values is still developing, nuances in the definition of

values may vary from team member to team member, or the team's relative commitment to the values in conflict is unclear. Our preliminary work has revealed two key strategies that we have called "dissolving conflict" and "values trade-off."

Dissolving values conflict means redesign. Here, in the case where two values conflict, designers find ways through creative redesign to satisfy both values simultaneously. Examples from real-life design in projects created for girls abound, especially given that the initial design questions are likely to hold conflicting values. Designers of "games for girls" tend to want to create fair representation of female characters—the characters in the *Team Up!* game, by Girls, Inc., for example, are simple, diverse-looking in terms of ethnicity, and cartoonishly plump. Players used to toys, cartoons, and fashion advertising, however, can tend to prefer overtly sexualized female characters. Various approaches can work to dissolve this conflict: character redesign to stay somewhere in the middle, or avoidance of human characters for animal or abstract characters, et cetera. Another example would be violent interaction. While the design team may wish to offer an alternative to violent games as a possible option, players may fervently wish for violence in games, or expect violence as part of any computer game. Here, the decisions are complex, but solutions can include providing several ways of competing or substituting intense body action (running, jumping, kicking) in favor of hand-to-hand combat.

Values trade-offs favor one design choice over another to support a particular value. Sometimes one value can take priority over another, and do so at the expense of a second. In this example, perhaps offering sexualized characters to attract the players to an educational game would be more preferable to their not playing the game at all. This would be opportunity for significant team discussion of the values in the project. In cases such as these, usually a middle ground is sought, but at times designers will reach a values impasse and will need to make difficult decisions. Resolving values in games is, in general, a fiercely difficult problem.

3. **Verification** This activity covers the appraisal of whether and to what extent designers have successfully embedded target values in a given system. Verifying attitudes and beliefs need not be an entire research project on its own, but rather this process can be embedded in the playtesting and user research that is already being conducted in the course of development.

Sociological methods for verifying attitudes and beliefs can be used to a project's benefit. Verification strategies for values are likely to resemble those used in the design of more conventional attributes such as functional efficiency and usability, which include critical reflection and analysis, comparison with historical precedent, playtesting within the design team as well as with third parties, user studies in controlled settings, formal and informal interviews, surveys, and so forth. Verifying the inclusion of values adds a layer to this process, but in practice, the values merely become another item on the observer's or researcher's list of what to look for and ask about. How to gauge whether a game promotes sharing and diversity and so forth can become a part of the process.

Pre- and post-attitudinal surveys, control groups, playtesting, and other methods may be used to get at the heart of a player's experiences in a game. Here, enlisting the aid of a trained social scientist is extremely beneficial to the project so that the questions are phrased correctly and data can be gathered reliably. Pairing with graduate students interested in researching games would be a step in the right direction for commercial developers on a budget. In *RAPUNSEL,* which was funded as both a design and research project, we collected data in-game from mouse clicks, code complexity generated by the player, kinds and amounts of items authored, interaction habits, and time on task. We also used online surveys to see how players felt before and after using the game. Preliminary survey results in a study involving more than one hundred middle-school-age players, for example, showed a significant change in general self-efficacy and confidence level about programming knowledge among female players, but not among male players (see Plass et al. 2007).

Embedding values within technological systems, and verifying that such systems actually reflect those values, has rarely been attempted with computer games outside the work of small developers (see Frasca 2004; Laurel 2001). Games provide tricky values cases, and the games developed with alternate values in mind are up against several factors, not the least of which are the expectations produced by existing games. In the recent assessment sessions for *RAPUNSEL,* players expressed a desire to kill the characters and enemies discovered in the game. One student asked in near agony, "Why won't she die??" In the best of all possible worlds, designers

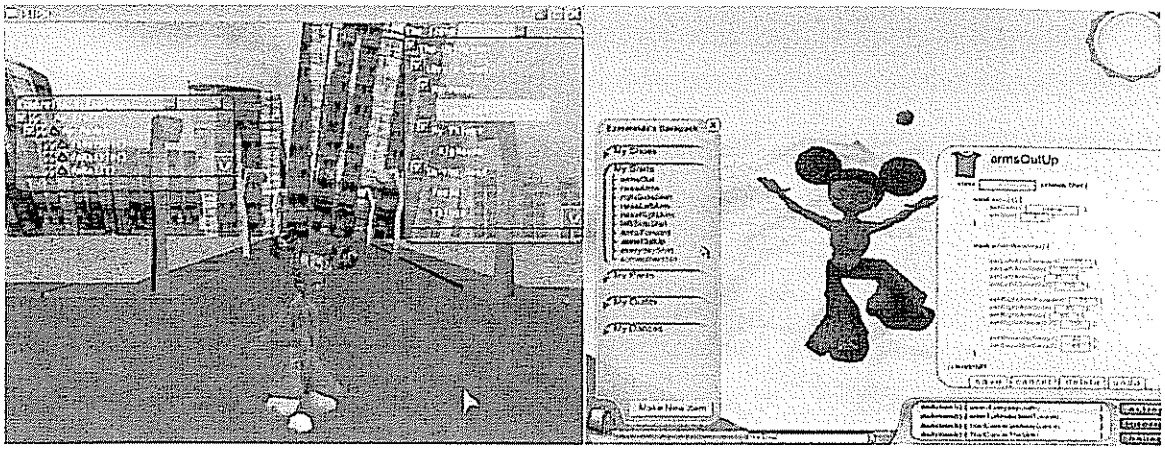

Figure 17.2 Iterations of the *RAPUNSEL* interface (see color plate).

may rely on prior work and compare this work to verify consistent attitudes and beliefs generated from, or fostered with, the project.

Iterative review of values throughout the project may yield more consistent results. Values work is of utmost importance as computer technologies and games affect larger society. In earlier work, we suggest that verification by means of prototypes is promising, and hold forth that small, focused prototypes are key to measuring values in the designs embedded in games. In *RAPUNSEL* (figure 17.2) adding a backpack icon in which players could find their programmed clothes and dances, adding icons to the organizational and code-editing windows, and limiting the number of items hierarchically represented in the backpack not only made good design sense but also enhanced project values of self-efficacy and creativity among players in the design partner sessions. Long-term results of values integration will be more difficult to verify but are a next step in the evaluation process. What are the immediate and long-term impacts of the V.A.P. method on players' attitudes, knowledge, and behavior? Do sex, gender identity, prior knowledge, design experience, or other variables influence this impact?

Conclusions

In our work, increasing female participation in computer science and IT is the overall principle that takes a priority among others and informs and sustains our practical design endeavors. Many of the points made in this chapter about

design to increase female participation in computer science and IT, however, also apply to social inclusion at large, and the V.A.P design process could be adopted for these concerns as well. Our goal in terms of game design is to create enjoyable games that support values—and to offer a well-crafted approach to embedding particular values in a given design. While we have lofty goals, we are tempered with a good dose of realism: we are not going to make sweeping changes in the nature of all computer games, but we are striving to put social and political values, where relevant, on the design agenda at a grassroots level. Initiatives such as Values-in-Design, the NSF-PORTIA project at Stanford ("Sensitive Information in a Wired World"), and others (e.g., the many "privacy-preserving" projects) already constitute a lively arena of bottom-up attempts to create better IT systems. Because of the popularity of computer games, universities throughout the United States and other parts of the world are creating games-focused course work and degrees (Fullerton et al. this volume). These programs have become a training site for IT professionals, not all of whom will go into game design as a profession. In 2005 there were more than fifteen degree programs (BS, MS, and PhD levels) established in the United States focusing on the development of computer games, and more in the works (e.g., Georgia Tech, University of Southern California, Carnegie Mellon, Univeristy of Pennsylvania, University of Denver, and Rochester Institute of Technology). The proliferation of computer game–focused course work translates to an opportunity to educate systems designers about values in design before they are employed in the industry. Ultimately, such educated designers will alter the industry from the inside.

Other chapters in this book discuss activist approaches to game design and play (see Taylor this volume; Hughes this volume; Kelleher this volume), demonstrating that the idea of activist game design and play is part of a larger, growing movement. The contribution our project makes to the next decade of game design is a rigorous, systematic means to meet the goal of taking values into consideration in design at many levels of generality. We do not mean to pit "concerned citizens" against "creators," because many creators themselves *are* conscientious. We see computer games as a compelling entry point and test-bed for integrating values into technology design from the beginning of the process. The arena is particularly challenging as we are still at the beginning of an effort to integrate values into the sphere of technology design, especially in the complex field of game design, where even conscientious designers

who support the principle of integrating values into systems are likely to have trouble applying standard design methodologies to the unfamiliar terrain of values. Experienced designers will recall the not-too-distant past when user interface and usability were similarly neglected features of software design.

Acknowledgments

We would like to thank the *RAPUNSEL* team. *RAPUNSEL* was funded under grant HRD-0332898 from the Gender in Science and Engineering Program (GSE) of the National Science Foundation. The CREATE lab at NYU was instrumental in assessment of the game. The V.A.P. research was funded by the National Science Foundation Science of Design program in 2006, with co-PI Sophia Catsambis, of Queens College.

References

AAUW (2000). *Tech-Savvy: Educating Girls in the New Computer Age*. New York: American Association of University Women Education Foundation.

Agre, P. (1997). Toward a critical technical practice: Lessons learned in trying to reform AI. In G. C. Bowker, S. L. Star, W. Turner, and L. Gasser (eds.), *Social Science, Technical Systems and Cooperative Work: Beyond the Great Divide*. Hillsdale, N.J.: Erlbaum.

Akrich, M. (1992). The de-scription of technical objects. In W. Bijker and J. Law (eds.), *Shaping Technology/Building Society*, 205–224. Cambridge, Mass.: The MIT Press.

Anderson, C. A. (2004). An update on the effects of playing violent video games. *Journal of Adolescence*, 27, 113–122.

Borning, A., B. Friedman, and P. Kahn (2004). Designing for human values in an urban simulation system: Value sensitive design and participatory design. In *Proceedings From the Eighth Biennial Participatory Design Conference*. Toronto, Canada. July.

Brey, P. (1997). Philosophy of technology meets social constructivism. *Techne: Journal for the Society for Philosophy and Technology*, 2, 3–4.

Brunner, C. (1997). Opening technology to girls: The approach computer-using teachers take may make the difference. *Electronic Learning*, 16(4), 55.

Cross, N. (1971). *Design Participation: Proceedings of the Design Research Society's Conference*. Manchester, UK.

Dourish, P., J. Finlay, P. Sengers, and P. Wright (2004). Reflective HCI: Towards a critical technical practice. Extended abstract in *Proceedings of CHI 2004*, 1727–1728.

Druin, A. (1999). Cooperative inquiry: Developing new technologies for children with children. In *Proceedings of CHI 1999,* 592–599. ACM Press.

Flanagan, M. (2006). Making games for social change. *AI & Society: The Journal of Human-Centered Systems,* 20(1), 493–505.

Flanagan, M., D. C. Howe, and H. Nissenbaum (2005). Values at play: Design tradeoffs in socially oriented game design. In *Proceedings of CHI 2005: Portland Oregon.* New York: ACM Press, 751–760.

Frasca, E. (2004). Videogames of the oppressed. In *Electronic Book Review* 3, http://www.electronicbookreview.com/v3.

Frasca, G. (2004). Videogames of the oppressed: Critical thinking, education, tolerance, and other trivial issues. In P. Harrington and N. Wardrip-Fruin (eds.), *First Person: New Media as Story, Performance, and Game.* Cambridge, Mass.: The MIT Press.

Friedman, B., P. Kahn, and A. Borning (2002). *Value Sensitive Design: Theory and Methods* Technical Report 02-12-01, Comp. Sci. & E., University of Washington, Seattle.

Grinter, R., and L. Palen (2002). Instant messaging in teen life. In *Proceedings of the 2002 Computer Supported Cooperative Work* (CSCW '02), New Orleans, La., 21–30.

Grudin, J., P. Ehn, and K. Schmidt (1988). Computer supported cooperative work. In *Proceedings of the 1988 ACM Conference on Computer-supported Cooperative Work,* 377–394. Portland, Ore.

Hughes, T. (1987). The evolution of large technological systems. In W. Bijker, T. Hughes, and T. Pinch (eds.), *The Social Construction of Technological Systems,* 51–82. Cambridge, Mass.: The MIT Press.

IGDA (2005). Game developer demographics report. International Game Developers Association. http://www.igda.org/diversity/report.php.

Inkpen, K., K. S. Booth, M. Klawe, and R. Upitis (1995). Playing together beats playing apart, especially for girls. In *Proceedings of Computer Support for Collaborative Learning,* 177–181 (CSCL '95). Bloomington, Ind.

Johnston, C. (1999). Doom made me do it. *Electronic Gaming Monthly,* July, 26.

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W. Bijker and J. Law (eds.), *Shaping Technology/Building Society,* 225–258. Cambridge, Mass.: The MIT Press.

Laurel, B. (2001). *The Utopian Entrepreneur.* Cambridge: The MIT Press.

Lee, S. S. (2003). "I lose, therefore I think": A search for contemplation amid wars of push-button glare. *Game Studies: The International Journal of Computer Game Research* 3(2).

Lessig, L. (1999). *Code and Other Laws of Cyberspace*. New York: Basic Books.

Mateas, M. (2000). Expressive AI. In *Proceedings of SIGGRAPH 2000: SIGGRAPH Art and Culture Papers*. CD-ROM, 23–28 July. New Orleans, La., New York: ACM Press.

MacKenzie, D., and J. Wajcman (eds.) (1985). *The Social Shaping of Technology*. Berkshire, UK: Open University Press.

Media Education Foundation (2001). *Game Over: Gender, Race & Violence in Video Games*. DVD.

Melillo, W. (1999). Video-game group creates ads to deflect criticism. *Adweek Eastern Edition*, November 15, 5.

Mumford, E., and D. Henshall (1978). *Participative Approach to Computer Systems Design: A Case Study of the Introduction of a New Computer System*. New York: Halstead Press.

Nissenbaum, H. (2004). Will security enhance trust online, or supplant it? In P. Kramer and K. Cook (eds.), *Trust and Distrust Within Organizations: Emerging Perspectives, Enduring Questions*, 155–188. New York: Russell Sage Publications.

Plass, J. L., R. Goldman, M. Flanagan, J. Diamond, C. Dong, S. Looui, H. Song, C. Rosalia, and K. Perlin (2007). RAPUNSEL: How a computer game designed based on educational theory can improve girls' self-efficacy and self-esteem. In *Proceedings of the American Educational Research Association*. Chicago. April.

Schön, D. (1983). *The Reflective Practitioner*. New York: Basic Books.

Varma, R. (ed.) (2003). Technology and society: Diversifying computing, special issue on women and minorities in information technology. *IEEE Technology and Society Magazine*, 22(3), 1–48.

Winner, L. (1980). Do artifacts have politics? *Daedalus* 109(1), 121–36.