

Education from inside the bunker: Examining the effect of Defcon, a nuclear warfare simulation game, on nuclear attitudes and critical reflection

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Abstract

This mixed-methods study investigates the hypothesis that playing *Defcon*, a nuclear warfare simulation game, can affect attitudes toward nuclear weapons and stimulate critical reflection on this issue. Participants were 141 college students who were randomly assigned to game playing (experimental) and article reading (control) conditions. A multivariate repeated measures factorial analysis revealed statistically significant differences between groups for three pairs of pre-/post-test items. In addition, total pre- and post-test scores showed a significant interaction with group assignment, reported frequency of game play and gender, with women and less frequent gamers exhibiting greater attitude changes. In the second, qualitative phase of the study, 20 additional participants were interviewed to better understand how playing *Defcon* may stimulate critical reflection about nuclear weapons.

Author Keywords

Defcon, video games, simulation, citizenship, nuclear attitudes, nuclear weapons, ethics, violence, critical thinking, critical reflection

Introduction

Since the 1980s, much of the research on gaming has focused on games that are intended to facilitate the learning of sets of curricular competencies, e.g. elementary arithmetic or basic concepts in chemistry. This is not surprising; it is congruent with the orientation of many scholars in the field who wish to mobilize insights about the nature of learning in order to construct effective educational environments in the form of a game (Mayo, 2009). Although a recent meta-analysis has shown that the results of these studies have been mixed (Young et al., 2012), the familiarity and popularity of gaming may well sustain interest in these types of explorations for some time to come.

Recently, however, researchers have broadened their interest in gaming to include a very different set of competencies; namely, skills related to civic life. In “Games for Civic Learning: A Conceptual Framework and Agenda for Research and Design,” Raphael et al. (2010) offer a broad definition of what they call “civic gaming”: “We believe that games foster civic learning when they help players to develop knowledge, skills, and dispositions that players then apply to public matters in the world outside the game” (p. 203). Given this broad definition, a wide variety of games can be put under the umbrella of civic gaming, from purpose-built “serious games” that simulate civic and political processes with high fidelity, to commercial titles like *Civilization V* that include the simulation of political processes as part of the mechanics of the game. Interest in the latter category has been piqued in the wake of a MacArthur Foundation Report, *The Civic Potential of Video Games* (Kahne, Middaugh, & Evans, 2009), which highlighted significant correlations between playing commercial video games with high civic content and both knowledge of and disposition to participate in civic and political processes.

Our research is situated within the broad frame of civic gaming, but it also strikes off in a specific and somewhat uncharted direction. Our central question is derived from a claim made within the context of a philosophical analysis of video games. In “The Banality of Simulated Evil: Designing Ethical Gameplay,” (2009b), philosopher Miguel Sicart suggested that games could be useful tools to promote ethical reflection about important social issues. He also opined that games that had previously been dismissed as excessively violent (e.g. *Manhunt* (2003)) were being unjustly condemned based on a weak ethical analysis of these games, and suggested that ostensibly violent games might actually, in certain cases, promote important reflection on social issues. He identified *Defcon* (2006), a strategy game with a nuclear warfare theme, as a particularly interesting example in this regard. Through its thought-provoking gameplay (which we will highlight in detail in a later section), Sicart argues that *Defcon* (2006) highlights the futile and destructive aspects of nuclear war, potentially prompting reflection on the part of players about this social issue. Sicart notes, “*Defcon* is a political simulator of atomic warfare that makes clear what was implicit: in nuclear war, the winning condition is still a losing condition” (p. 192-193).

Our task in this study was to explore Sicart’s claim in two different ways. First, we examine whether playing *Defcon* would, in fact, affect players’ attitudes toward nuclear weapons and nuclear war. Although attitude changes do not necessarily indicate any kind of deliberate reflection, they are at least a preliminary indication of how players may be responding to the game. A second linked purpose delved somewhat deeper; we wanted to examine whether and

how *Defcon* might prompt critical reflection about nuclear war and weapons. Adapting John Dewey's (1916) definition of reflective experience, we define critical reflection as the deliberate consideration of the potentially problematic links between actions and/or situations (e.g. the existence of nuclear arsenals) and their outcomes (e.g. nuclear war, mass deaths). As we detail below in the methodology section, the study had a mixed methods design with a quantitative component to measure possible player attitude changes about nuclear weapons and a qualitative interview to elicit players' more detailed reflections on the game.

Literature Review and Theoretical Framework

The scholarly work on gaming in education is increasingly diverse and wide-ranging, and it is therefore helpful, for the purposes of situating our work, to focus our overview of the literature on the areas that are particularly relevant to our project. Two broad types of analysis are worthwhile for the purposes of our project: 1. Empirical and conceptual work on civic gaming; 2. Analyses of the possibilities of using games to promote critical reflection. As will be detailed below, the latter (and much smaller) category provides much of the theoretical framework used to frame the experiment.

Empirical and Conceptual Work on Civic Gaming

Turning first toward empirical work on civic gaming, it becomes clear that the literature is still fragmentary, which is not surprising given the fact that the field is in its infancy. In addition to a major Pew Foundation Survey (Lenhart et al., 2008) and the MacArthur report mentioned above (Kahne, Middaugh, & Evans, 2009), there have been a number of studies that have been concerned significantly (although not always primarily) with the link between civic gaming and civic engagement. These studies can be classified into three broad groups: 1. Studies of stand-alone games that simulate civic and political processes; 2. Studies of the civic aspects of multiplayer online gaming environments; 3. Studies of the civic effects of non-commercial virtual learning environments.

This first category of studies (stand-alone games that simulate civic and political processes) tends to focus most on the *SimCity* (1989, 1994, 1999, 2003) and *Civilization* (1991, 1996, 2001, 2005, 2010) series'. The *SimCity* series has accumulated more scholarly interest than any other game of this type. Studies of the various iterations of *SimCity* have analyzed its embedded biases, its potential for classroom use, and its effects on students' perceptions of how municipal authorities operate (Gaber, 2007; Lauwaert, 2007; Lobo, 2007; Nilsson & Jakobsson, 2010; Tanes & Camalcilar, 2010). Although the ideological assumptions (e.g., too much focus on zoning, a technocratic approach to change) of the game have received some criticism, researchers reported that students found the game highly engaging. Important work has also been done on the *Civilization* series of games (Downes, 2005; Lee & Probert, 2010; Squire, Devane, & Durga, 2008), *Europa Universalis II* (Egenfeldt-Nielsen, 2007), and simple flash-based political games (Neys & Jansz, 2010). Squire (2004), in his pioneering work on the *Civilization* series, has found that the game was able to awaken interest in both history and in politics.

The second category of analyses (civic aspects of multiplayer online games) has been burgeoning lately. Most of this literature concerns Massively Multiplayer Online Role-Playing

Games (MMORPGs) like *World of Warcraft* (2004), in which many players inhabit the same virtual world simultaneously. Studies have suggested that these games may provide an important “third place” for civic development (Curry, 2010; Steinkuehler, 2005), and researchers have devoted significant attention to within-game civic life, particularly with reference to cooperation between players, players’ resolution of ethical dilemmas, and communal structures within the games (Andras, Embrick, & Wright, 2010; Bainbridge, 2010; Chen, 2008; Castronova, 2005, 2007; Gee & Hayes, 2010; Gordon & Koo, 2008; Santo, 2012; Schrader & McCreery, 2008; Silverman & Simon, 2009; Simkins & Steinkuehler, 2008; Williams et al., 2006). Some have found that MMORPGs may be effective at scaffolding learning, facilitating collaboration, and developing scientific habits of mind (Steinkuehler, 2005; Steinkuehler & Duncan, 2008; Whitton-Hollins, 2008), while others have shown that participation in MMORPGs may help develop offline leadership skills (Jang & Ryu, 2011). However, study outcomes were not uniformly positive; Williams (2010), in a study of the MMORPG *Asheron’s Call* (1999), found that gameplay did not change players’ attitudes toward social issues appreciably.

The final group of analyses (the civic effects of non-commercial virtual learning environments) is represented most prominently by an educational game environment, *Quest Atlantis*. This game has successfully taught students to examine questions of ecological stewardship and science in the public interest (Anderson, 2010; Barab et al., 2007a; Barab et al., 2007b). Recently, research has also been conducted into two other games, *Citizen Science* (Gaydos & Squire, 2012) and *Urban Science* (Bagley & Shaffer, 2011), which aimed to both help students understand scientific processes and to see themselves as empowered citizens capable of addressing social problems. In another set of studies, researchers (Bers, 2001; Bers & Chau, 2006) had students actually build an educational environment and gave an ethnographic account of the civic discourses the children had while constructing the world. In addition, Susaeta et al. (2010) have researched designing and testing a classroom-based multiplayer role-playing game about ecology that showed promise for promoting the understanding of ecological equilibrium.

These three relatively small groups of studies (which show promising results vis à vis student learning and civic engagement, but which do not always address civic education/critical reflection questions directly) comprise our fragmentary empirical knowledge of civic gaming thus far. Beyond this *immediately* relevant empirical work, however, there has been important conceptual work that is relevant to civic gaming. The most important work in this regard is currently the framework laid out by Raphael et al. (2010) in “Games for Civic Learning.” These authors argue that there are three important axes along which civic games can be analyzed: tight vs. loose integration of gameplay and civic content, ethical vs. expedient gameplay (i.e. the extent to which the game offers players the chance to make more or less ethical choices and the degree to which this influences the outcome of the game), and free/high player agency vs. highly structured gameplay. The first axis, which is thought to be especially crucial, is the degree to which gameplay (e.g. flying a helicopter) and the civic content of the game (e.g. helping hungry people) are tied together. In a loosely integrated game, the plot or the central conceit of the game is irrelevant or not particularly apparent—as an example, the authors refer to *Food Force* (2005), a game in which one flies around in a helicopter delivering food to needy people. As Raphael et al. point out, as one flies the helicopter trying to drop the packages correctly, it is easy to forget that the game is about addressing world hunger. In other words, gameplay and content become detached, which weakens the power of the civic content substantially.

Raphael et al. suggest that the most effective civic games tie gameplay and civic content together quite closely. In the *SimCity* series, for example, it is difficult to forget that one is dealing with city planning problems that correspond closely to actual problems one would find in a city, and this same tight correspondence holds in *Defcon* as well.

Another major conceptual/empirical landmark in this field is the recent MacArthur Foundation report on civic gaming, *The Civic Potential of Video Games* (2009). Using data from a large-scale survey of American teenagers, the report pointed to an intriguing correlation between positive civic outcomes (e.g., political engagement, volunteerism) and playing games that were high in civic content. The report analyzed this connection from a theoretical standpoint, analyzing how different types of video games (e.g., MMORPGs) might potentially develop the kinds of skills and dispositions (e.g., cooperating with fellow citizens in a common endeavor) that would be conducive for positive citizenship development.

Using Games to Promote Critical Reflection

Work that is specifically devoted to civic gaming is not the only research that is relevant to this project; the work of scholars who discuss the link (or lack thereof) between video games and critical and/or ethical thinking is relevant as well. Over the past 15 years, there has been a substantial amount of work on the kinds of ethical dilemmas that video games generate, with scholars analyzing the question of whether these games are ethically worthwhile, with varying results (Consalvo, 2005; McCormick, 1999; Provenzo, 1991; Reynolds, 2002; Schulzke, 2010; Turkle, 2005; Waddington, 2007; Wonderly, 2008). Some of the most thorough work in this area has been done by philosopher Miguel Sicart—as we will explain below, his concepts form the basis of our theoretical framework for thinking about how *Defcon* might promote critical reflection about nuclear weapons.

There has also been a great deal of conceptual work directed at the question of the values and tacit assumptions embedded in video games. Some of this work has focused on the warlike and imperialist assumptions of video games (Bowers, 2000; Chan, 2010; Crogan, 2011; Dyer-Witthford & de Peuter, 2009; King & Leonard, 2010), while others have analyzed the consumerist, technocratic, and hyper-modernist discourses allegedly embedded in these games (Crogan, 2011; Wark, 2007). There has also been scholarship focusing upon the emergent Foucauldian disciplinary elements of MMORPG gaming (Silverman & Simon, 2009). Feminist scholars have pointed out some significant challenges regarding sexism in games (Jenkins & Cassell, 2008; Laurel, 2001), and other scholars have highlighted some of the racist discourses that have emerged in online environments (Gray, 2012; Higgin, 2009; Kafai, Cook, & Fields, 2010; Thomas, 2008).

Although the majority of work on the embedded values of video games tends to be negative, there are some analyses that are substantially more nuanced in terms of the conclusions drawn (e.g., Wark, 2007). Recently, however, a movement within video gaming has emerged that has highlighted the potential of using video games as instruments for social change and the promotion of critical thinking. These games vary substantially in terms of the type of social change they attempt to promote—the game *Urgent: Evoke* (2010), for example, was designed by

Jane McGonigal in order to propagate neo-liberal values ('Let's foster a culture of social entrepreneurship in Africa!') around the world (Waddington, 2013). Meanwhile, the radical game studio Molleindustria has chosen a different path. In *The McDonald's Game* (2006), Molleindustria highlights McDonalds' participation in deforestation, poor treatment of animals, and exploitation of workers. Other game studios have chosen a more moderate path; Red Redemption's *Fate of the World* (2011), a climate change simulation, offers scenarios that cater both to climate change orthodoxy and to climate denialists.

Unfortunately, although the number of "games for change" is increasing rapidly, the literature on using games as tools for change is still somewhat limited. Some early work was done by Chris Crawford, whose *Balance of Power* (1985)—a game that was meant to point up the destructiveness of the Cold War arms race—was one of the first and most commercially successful games for change (Crawford, 2003). Developer Brenda Laurel also did some path breaking work in this area—in *Utopian Entrepreneur* (2001), she details how her *Rockett* (1997) series of CD-ROMs, released in the late 1990s, offered children a more feminist, empowered version of girlhood that made for a stark contrast with the Barbie-esque CD-ROMs that were available at the time. More recently, Suzanne de Castell and Jennifer Jenson (2003) have suggested that effective educational gaming might take a page from the book of commercial gaming by building more exploratory, immersive environments, and Negin Dahya (2009) has detailed the persuasive techniques of several different 'serious' games that were built to raise awareness of social problems.

Three scholars who have been especially prominent in writing about and developing games for change are Gonzalo Frasca, Ian Bogost, and Mary Flanagan. Frasca began his work in this area with his MA thesis, *Videogames of the Oppressed: Videogames as a Means for Critical Thinking and Debate* (Frasca, 2001a), which argued that games could be built on a model of Augusto Boal's *Theatre of the Oppressed*, a style of theatre in which audience members observed an initial problematic situation and then intervened to alter it. Since this time, Frasca has gone on to publish a number of articles fleshing out and refining this argument (Frasca, 2001b) and has also created *September 12th*, a landmark game critical of the "war on terror" (Thompson, 2006).

Ian Bogost, for his part, is perhaps the most prominent and prolific academic member of the games for change movement. Bogost (2007, 2011) has written several substantial works on the power of video games to create social change. In his most recent effort, *How to Do Things with Videogames* (2011), Bogost provides what he calls a "media microecology" of the effects of games on society. The range of purposes that Bogost details is surprisingly large, including outcomes as varied as empathy, reverence, disinterest, and pranks. In addition to his academic work, Bogost has written a number of games that offer social commentary of some type, including *Airport Security* (2006), in which the player has to remove items from passengers' luggage while responding to continuously updated regulations (e.g., "Cameras now banned/snakes now allowed").

Mary Flanagan is situated more on the games-as-art end of the games for change spectrum. In *Critical Play: Radical Game Design* (2009), before Flanagan examines critical computer games, she dedicates several chapters to describing some early critical games, many of which were created by artists. These games come in various types: board games, language games, performative games, and public space-based (locative) games. She also details some of the

contributions that artists have made to the critical computer game movement. Natalie Bookchin's *The Intruder* (1999), a game that conveyed a grim short story by Jean-Luis Borges through a series of short arcade games, is highlighted by Flanagan as an especially important early contribution.

In sum, although the literature on using games as tools for promoting critical reflection about social issues is still fairly limited, a number of scholars have made important contribution in this area and academic interest in using games for this purpose seems to be on the increase. The increasing number of purpose-built games for social change also bodes well for this type of analysis (MIT Game Lab, 2014).

Theoretical Framework

These two key parts of the literature review—namely, the overview of empirical and conceptual work on civic gaming and the outline of work done on using games to promote critical reflection—highlight the fact that there is relatively little empirical work that has been done on using civically oriented video games to promote this kind of thinking. That being said, conceptual work in this area is more abundant, and it is from one particular strand of this conceptual work that we derive our theoretical framework.

Our theoretical framework is derived from video game ethicist Miguel Sicart's model of game interpretation. Sicart (2009a) notes that it a common mistake is to understand video games solely in terms of what he calls the "procedural gradient of abstraction (GoA)" (p. 196). With this term, Sicart points toward the set of inputs and responses in which the user engages while she plays the game. In the case of *Defcon*, these inputs and responses would consist respectively of clicking the mouse to launch weapons and the subsequent flash as a city is annihilated. Sicart (2009a) contends that critics who are limited to the procedural gradient focus on this input/response cycle unduly—he comments, "Common accusations against computer games understand them only within the procedural GoA, and thus with an agent that is not concerned with anything other than providing the right input..." (p. 197). Viewed solely through the lens of the procedural GoA, *Defcon* is an extremely violent game that is simply about killing as much of the enemy's population as is possible.

But it is possible and desirable, Sicart (2009a) argues, to move beyond the procedural gradient to what he calls the "semantic gradient of abstraction (GoA)" (p. 197). Stated very simply, the semantic gradient emphasizes the interactions between the values and experiences of the user and the values embedded in the procedures which make up the game. The user, he argues, is called upon to reflect on these interactions, both in the context of his/her own values and in the context of the wider culture.

If one considers the possible effect of *Defcon* from the perspective of the semantic GoA, its possible use as a tool to promote critical reflection becomes clearer (See *Figure 1*). As we discuss in our subsequent detailed description of the game, *Defcon* places users in a context in which they have no choice but to fight a nuclear war. A menacing soundtrack plays as sound effects of people crying and coughing play in the background. Players are confronted by a stark blue-and-white user interface that evokes the feeling of being deep underground in a nuclear

bunker somewhere, sitting at the control station as the world falls apart. There is good reason to think that this is a promising starting point for thinking about dangers posed by nuclear weapons—as the white flash envelops New York, and the game flashes a message, “10 Million Dead,” it is difficult to avoid the implication that this is a possible future. Sicart comments:

But why is *Defcon* so relevant, so enticing for an ethicist? ...*Defcon* is interesting for the game experience it creates around it: the feeling of isolation, the calculations of megadeaths and victory, the ultimate tension between detachment and attachment to the game world—all these elements configure a ludic experience of enormous relevance. In *Defcon*, players are calculating how to maximize their nuclear strikes to annihilate as much of the enemy population as possible without suffering severe losses in the game’s inevitable outcome. This calculation is part of a process of reflection on the meaning of the game world, and it appeals to players both as subjects in the game, and as ethical citizens.

Once the stark problem *Defcon* presents comes together with the values and cultural experiences of the *Defcon* player, *Defcon*’s potential educational power becomes manifest. The game may have the potential to make people critically reflect upon the danger of nuclear weapons, and in our study, we set out to explore this idea empirically.

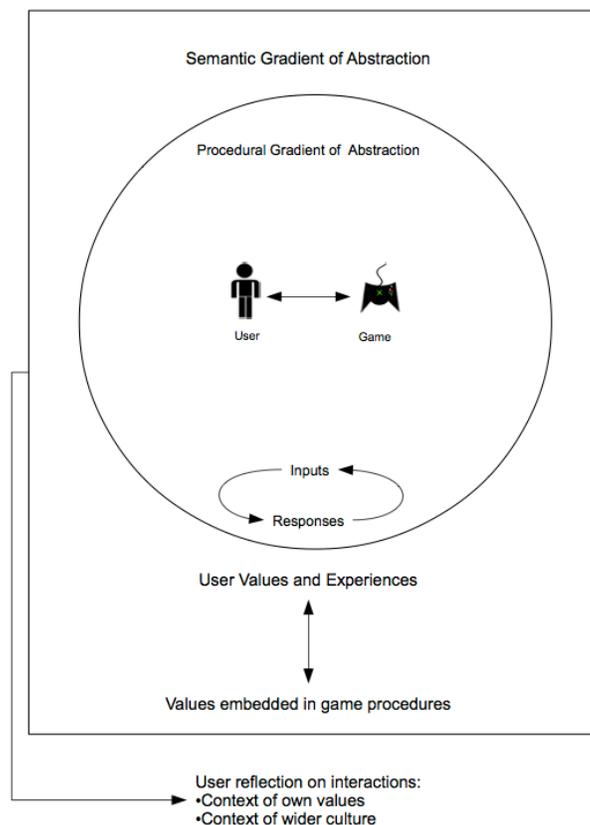


Figure 1--Sicart's (2009a) Model of Game Interpretation

Methodology

What is it like to play Defcon?

Given that *Defcon* is an unusual game, before describing how the data were collected, it is important to spend some time providing a more extensive description of the experimental treatment. As stated earlier, the user interface for *Defcon* is quite simple; it is an outlined world map on a black/blue screen (See Figure 2).



Figure 2. *Defcon* main screen.

Virtually all significant player actions take place on this screen—the location, movements and actions of bombers, missile silos, radar sites, and various ship types are determined by clicking on the units on the map.

As befits its inspiration – the five-stage DEFCON (DEFence CONdition) system used by the American military – the game “counts down” in five stages from DEFCON 5 to DEFCON 1, which is the stage at which nuclear war takes place. At the start of the game (DEFCON 5), the player situates their military elements, which consists of missile silos, radar sites, ships, submarines, and air bases, all of which the player has to locate strategically within their own territory. As the player arranges the elements, the game gradually counts down from DEFCON 5. During the intervening stages (DEFCON 4, 3, 2), the player is able to scout with ships and submarines, engage in ship-to-ship combat, as well as launch bombers against enemy territory. When the game reaches DEFCON 1, players are able to fire nuclear weapons at the enemy state. The pattern of strikes and deaths continues until DEFCON 1 finally comes to an end, whereupon the game assesses a score depending on the number of megadeaths the player managed to inflict upon the enemy.

We indicated earlier that *Defcon* has a unique aesthetic, and it is vital to understand this in order to see how the game might promote critical reflection. The stark and spare map interface is inspired by the control room map from the film *WarGames* (1983) (See Figure 3), which was itself inspired by a 1980 visit to NORAD (North American Aerospace Defence Command) by the film’s producers (Brown, 2008). The interface’s coldness and abstractness operates as a key

persuasive element in *Defcon*, removing the player as much as possible from the “on the ground” reality of nuclear war, while at the same time highlighting the “last person inside the bunker” feeling.



Figure 3. *WarGames* (1983) map

A particular kind of silence and slowness are also vital elements of experience of playing *Defcon*. Unlike most Real-Time Strategy (RTS) games, in which player actions are quick and (literally and figuratively) explosive, *Defcon* unfolds at a deliberate pace. Once missiles are launched, their icons glide gently towards the enemy cities (See Figure 4). When a hit occurs, there is no sound; there is only a gentle white flash around the city and a readout that floats up indicating the millions of dead from the strike (See Figure 5). Even when the game finishes, there is no triumph (visually or sonically) for the winner. There is only a quick display of the winner, followed by a scoreboard of enemy kills, friendly deaths, and respective numbers of survivors.

Perhaps the most important aesthetic element of *Defcon*, however, is its sonic atmosphere. As noted above, *Defcon* is an unusually quiet game in that player actions and critical in-game events are accompanied by minimal effects. This relative silence serves to highlight the game’s award-winning soundtrack and ambient sound effects. In the soundtrack, a variety of dread-inducing atmospheric ambient downtempo tracks feature menacing minor background chords and deep bass drones, distantly muttering voices, wailing electronics and clanking mechanisms, plinking pianos, and a total absence of beat. There is nothing propulsive, exciting, or triumphant about these tracks—all they evoke is futility, death, despair and resignation. Alongside these tracks, the game plays intermittent sound effects of women and men coughing, as well as a crying woman. The overall impact of this soundscape is powerful: as the soundtrack to the end of the world drones away in the background, the crying and coughing remind the player of the suffering outside that corresponds to the neat and clinical destruction unfolding on the blue screen.



Figure 4. Incoming missiles and bombers strike their targets.

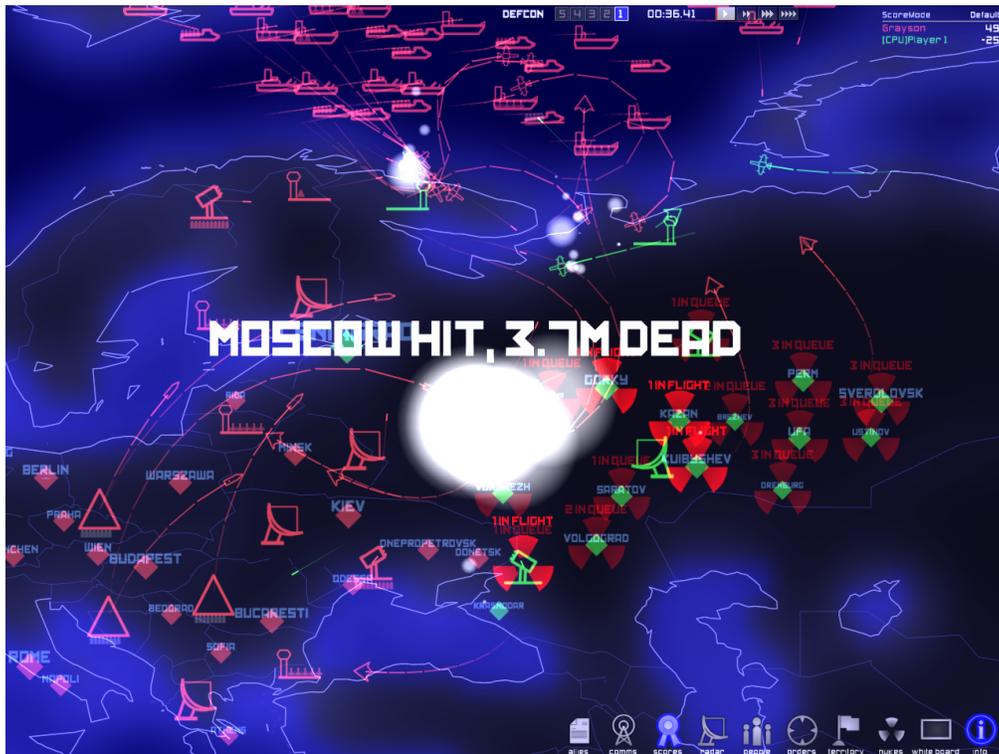


Figure 5. Moscow megadeaths.

Creating an unnerving experience was, in fact, the intention of the game designers. They (Delay et al., 2006) commented,

The intention was always to capture the feeling of senseless Armageddon and the claustrophobia of being buried deep underground, trying to win a war that simply cannot be won. *Defcon* was always meant to be an experiment in the creation of a mood. We wanted to see if we could evoke that vast and terrible detached feeling of genocidal mania. (p. 26)

As will become evident in our results, some of our experimental participants understood this intention and were affected substantially by the game, whereas others did not construct this type of meaning at all.

Data Collection

The first phase of data collection included recruiting a total of 141 students from a large North American university to participate in an experimental study. The purpose of the experimental portion of our study was to measure whether playing *Defcon* would affect participants' attitudes toward nuclear weapons. Volunteers were screened and anyone who reported either having suffered from photosensitive seizures or never having played any video games (steep learning curve) was not permitted to take part in the research project. Volunteers were paid \$15 and told that they were participating in a study about the effects of representations of violence on learning, without revealing details of whether they would be playing video games or not. Each participant was randomly assigned to either the treatment (i.e., video game, $n = 68$) or control (i.e., reading, $n = 73$) condition; those in the treatment condition played *Defcon* for a period of 60 to 75 minutes (the average time taken to complete the tutorial version of the game) while those in the control condition read for 45 minutes from a folder of 15 recent news articles pertaining to nuclear warfare (see *Appendix A* for a list of these articles).

All participants answered both a pre-test and post-test instrument (modified from the Nuclear Attitudes Questionnaire (NAQ) pioneered by Newcomb, 1986) that assessed their attitudes toward nuclear weapons and nuclear technology. The pretest asked participants to gauge their feelings about 12 statements related to nuclear war and technology using a five-point Likert scale of agreement ranging from "strongly agree" to "strongly disagree" (see *Appendix B* for a list of these statements). The posttest consisted of several sections, the first of which consisted of 12 statements measuring attitudes towards nuclear war and technology (equivalent to those in the pretest with an identical Likert scale, but reworded and reordered so as to mitigate for any testing effects). Each of the 12 statements from the pretest was matched to its equivalent statement on the posttest in order to form a combined total of 12 'item pairs'. Subsequent sections of the posttest explored video game and movie-watching habits of the participants. All participants were debriefed at the end of this first phase of data collection to explain that they were purposefully not told about the content of the readings or video game prior to the study so as to avoid any priming effects.

Our second phase of data collection consisted of semi-structured interviews; 20 participants who completed the gaming session were paid an additional \$15 and interviewed about their experiences playing the game. These interviews lasted from 15-45 minutes, and asked participants a variety of questions about their gaming experience, ranging from more general, open-ended questions, e.g., “Describe your overall experience playing *Defcon*” to more specific, e.g., “What do you think of *Defcon*’s soundtrack?” (See *Appendix D* for a list of the semi-structured interview questions). These questions were intended to elicit richer descriptions of participants’ experiences of playing *Defcon* than could be captured by the “snapshot” approach of the nuclear attitudes survey.

Data Screening & Scoring of Questionnaires

Responses to the pre and posttests from two participants were held aside from analysis due to missing data. The final sample included 71 participants in the control condition and 68 participants in the treatment condition. Negatively worded statements in both the pretest and posttest were reverse coded for all analyses so that the higher the score, the more negative the attitude towards nuclear war a participant reported (see *Table 1* for a list of the 12 item pairs from the pre and posttests). All data from Phase One—the experimental component of the study—were entered in the Statistical Package for Social Sciences (SPSS) software.

Results: Phase One (Quantitative)

Descriptive statistics and parametric testing assumptions

Table 1 shows the descriptive statistics associated with each of the 12 item pairs and the total scores for both the treatment and control groups across the attitudinal items on pre and posttests (range of *Ms*: 1.66 to 4.06; *SDs*: 0.76 to 1.39). The Kolmogorov-Smirnov tests of normality for total pre and posttest scores were non-significant, indicating that the data were normally distributed. Cronbach’s Alpha was .670 for all 12 pretest items, and .817 for all 12 posttest items, indicating that participants’ responses across the pre and posttest items were correlated with one another at a moderate and high level of internal consistency, respectively. We therefore used parametric analyses to explore differences in pre and posttest scores since data were normally distributed, could be treated as interval in nature (Likert scales), and could be tested for the assumption of homogeneity of variance in SPSS. Where possible, we conducted multivariate analysis of variance, so as to control the familywise alpha (or Type 1 error rate) at .05. *Table 2* lists the high and low item pair scores for each condition. *Table 3* shows the distribution of participants’ gender and frequency of video game play for each condition.

To investigate the effect of a series of factors on participants’ changes in attitudes towards nuclear war and technology, we conducted a series of repeated measured factorial ANOVAs and MANOVAs using individual item pairs, and total pre and posttest scores as dependent measures, with condition, gender, and self-reported frequency of video game play (high, medium, and low) as independent variables. We report analyses of how attitudes towards nuclear war and technology differed across groups, in combination with demographic factors such as gender and frequency of play.

Table 1. Descriptive statistics for 12 item pairs.

Measure: Question	Condition	N	DV	Mean	SD
Pair 1: I am concerned about how many countries have nuclear weapons.	Control	71	Pre1	3.54	1.12
			Post4	4.00	0.91
	Treatment	68	Pre1	3.37	1.38
			Post4	3.82	1.32
Pair 2: I would feel frightened if I lived within ten miles of a nuclear power plant.	Control	71	Pre2	3.92	1.01
			Post5	4.06	1.09
	Treatment	68	Pre2	3.53	1.31
			Post5	3.74	1.23
Pair 3: It is essential for our protection that Canada and the United States produce as many nuclear weapons as possible.	Control	71	Pre3	1.66	0.76
			Post7	2.07	1.11
	Treatment	68	Pre3	1.90	0.87
			Post7	2.40	1.00
Pair 4: I imagine that there will be a nuclear war in the next 10 years.	Control	71	Pre4	2.92	0.82
			Post1	3.15	1.01
	Treatment	68	Pre4	2.88	0.97
			Post1	2.76	0.95
Pair 5: It is not a good idea for Canada to supply other countries with nuclear power plants.	Control	71	Pre5	2.41	1.10
			Post2	3.90	1.17
	Treatment	68	Pre5	2.60	1.04
			Post2	3.44	1.15
Pair 6: I feel frightened when I think of all the nuclear weapons in the world.	Control	71	Pre6	3.42	1.17
			Post10	3.70	1.01
	Treatment	68	Pre6	3.40	1.26
			Post10	3.59	1.05
Pair 7: I don't think that I would survive a nuclear war.	Control	71	Pre7	3.63	0.93
			Post3	3.44	1.00
	Treatment	68	Pre7	3.53	1.20
			Post3	3.62	1.04
Pair 8: I worry a lot about nuclear war.	Control	71	Pre8	3.07	1.21
			Post12	2.51	1.12
	Treatment	68	Pre8	2.99	1.18
			Post12	2.78	1.23
Pair 9: Many people tend to underestimate the threat of nuclear war.	Control	71	Pre9	3.61	1.01
			Post11	3.32	1.07
	Treatment	68	Pre9	3.49	0.95
			Post11	3.25	1.06
Pair 10: There are times I have felt depressed thinking about the possibility of nuclear war.	Control	71	Pre10	2.35	1.33
			Post6	3.00	1.38

Measure: Question	Condition	N	DV	Mean	SD
	Treatment	68	Pre10	2.40	1.31
			Post6	2.91	1.22
Pair 11: The world does not feel like a safe place because of so many nuclear weapons.	Control	71	Pre11	3.01	1.09
			Post9	3.55	1.14
	Treatment	68	Pre11	3.00	1.15
			Post9	3.32	1.17
Pair 12: I have a lot of hesitation about raising a child with the threat of nuclear war.	Control	71	Pre12	2.35	1.16
			Post8	2.90	1.21
	Treatment	68	Pre12	2.68	1.39
			Post8	3.01	1.34

Table 2. High and low item pair scores

High scores	Condition	Mean	SD	Item
Pretest	Control	3.92	1.01	Pre2
	Treatment	3.53	1.31	Pre2 ¹
Posttest	Control	4.06	1.09	Post5
	Treatment	3.82	1.32	Post4
Low scores				
Pretest	Control	1.66	0.76	Pre3
	Treatment	1.90	0.87	Pre3
Posttest	Control	2.07	1.11	Post7
	Treatment	2.40	1.00	Post7

Table 3. Gender and frequency of game play distribution, by condition.

Gender	Frequency of game play	Control (n)	Treatment (n)
Male	High	18	8
	Medium	9	11
	Low	9	16
Female	High	23	4
	Medium	18	10
	Low	4	9

Differential effects of gender, condition, and frequency of game play on attitudes towards nuclear war and technology.

We conducted a repeated measures MANOVA with the 12 item pairs as the dependent measures and condition as the between group measure. This revealed that the control group (article reading) showed significant differences between pre and posttests for 10 item pairs, whereas the treatment group (playing DEFCON) showed such differences for only 6 item pairs (see Table 4). In general, participants in both groups had more negative attitudes towards nuclear war while

completing their posttests; the only exception being the control group's responses to item pairs 4 ("I imagine that there will be a nuclear war in the next 10 years"), 7 ("I don't think I would survive a nuclear war"), 8 ("I worry a lot about nuclear war") and 9 ("Many people tend to underestimate the threat of nuclear war") (see *Table 4*).

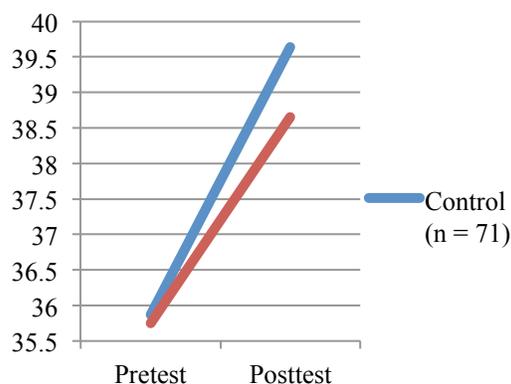
Table 4. Significant differences between control and treatment conditions, across item pairs.

Measure: Question	Cond.	N	DV	Mean	SD	df	F	Sig.	ES
Pair 1: I am concerned about how many countries have nuclear weapons.	C	71	Pre1	3.54	1.12	1, 70	7.37	0.008	0.31
			Post4	4.00	0.91				
	T	68	Pre1	3.37	1.38	1, 67	5.61	0.021	0.03
			Post4	3.82	1.32				
Pair 3: It is essential for our protection that Canada and the United States produce as many nuclear weapons as possible.	C	71	Pre3	1.66	0.76	1, 70	7.89	0.006	0.32
			Post7	2.07	1.11				
	T	68	Pre3	1.90	0.87	1, 67	11.51	0.001	0.38
			Post7	2.40	1.00				
Pair 4: I imagine that there will be a nuclear war in the next 10 years.	C	71	Pre4	2.92	0.82	1, 70	5.01	0.028	0.26
			Post1	3.15	1.01				
Pair 5: It is not a good idea for Canada to supply other countries with nuclear power plants.	C	71	Pre5	2.41	1.10	1, 70	39.60	0.000	0.60
			Post2	3.90	1.17				
	T	68	Pre5	2.60	1.04	1, 67	11.98	0.001	0.39
			Post2	3.44	1.15				
Pair 7: I don't think that I would survive a nuclear war.	C	71	Pre7	3.63	0.93	1, 70	5.48	0.022	0.27
			Post3	3.44	1.00				
Pair 8: I worry a lot about nuclear war.	C	71	Pre8	3.07	1.21	1, 70	17.63	0.000	0.45
			Post12	2.51	1.12				
Pair 9: Many people tend to underestimate the threat of nuclear war.	C	71	Pre9	3.61	1.01	1, 70	4.36	0.040	0.24
			Post11	3.32	1.07				
Pair 10: There are times I have felt depressed thinking about the possibility of nuclear war.	C	71	Pre10	2.35	1.33	1, 70	18.93	0.000	0.46
			Post6	3.00	1.38				
	T	68	Pre10	2.40	1.31	1, 67	9.36	0.003	0.35
			Post6	2.91	1.22				
Pair 11: The world does not feel like a safe place because of so many nuclear weapons.	C	71	Pre11	3.01	1.09	1, 70	17.02	0.000	0.44
			Post9	3.55	1.14				
	T	68	Pre11	3.00	1.15	1, 67	8.38	0.005	0.33
			Post9	3.32	1.17				

Measure: Question	Cond.	N	DV	Mean	SD	df	F	Sig.	ES
Pair 12: I have a lot of hesitation about raising a child with the threat of nuclear war.	C	71	Pre12	2.35	1.16	1, 70	24.35	0.000	0.51
			Post8	2.90	1.21				
	T	68	Pre12	2.68	1.39	1, 67	7.12	0.010	0.31
			Post8	3.01	1.34				

Effect of condition on attitudes towards nuclear war.

Participants in the control condition ($n=71$) showed significantly more negative attitudes at the end of the study (pretest $M=35.87$, $SD=5.89$; posttest $M=39.64$, $SD=7.25$) as opposed to those in the treatment condition ($n=68$; pretest $M=35.75$, $SD=6.70$; posttest $M=38.65$, $SD=8.28$); this was revealed in a repeated measures ANOVA using total pre and posttest scores as dependent measures and condition as factor, $F(1,126)=2.04$, $p=.03$, *Effect Size (ES)*=0.4 (see Figure 5). The effect size of 0.4 signifies an increase from the 50th percentile to the 66th percentile which, given the random assignment to conditions for our experimental study, should be interpreted as a statistically significant effect.



$$F(1, 126)=2.04, p=.03, ES=0.4$$

Figure 6--Differences in pre and posttest scores, by condition

Follow-up analyses with individual item pairs reveal a significant interaction between pre and posttest scores and the condition that participants were exposed to, for two items pairs (see *Figures 6 and 7*). For item pair 4 – “I imagine that there will be a nuclear war in the next 10 years” – participants in the control condition showed a more negative attitude in the posttest, indicating that they felt that war was a higher likelihood (pretest $M=2.92$, $SD=0.82$; posttest $M=3.15$, $SD=1.01$) whereas those in the treatment condition had a less negative attitude in their responses in the posttest, indicating that they felt that war was less likely after the treatment (pretest $M=2.88$, $SD=0.97$; posttest $M=2.76$, $SD=0.95$), $F(1,137)=6.07$, $p=.02$, *ES*=0.2). This effect size represents an increase from the 50th to 58th percentile and a statistically significant interaction effect.

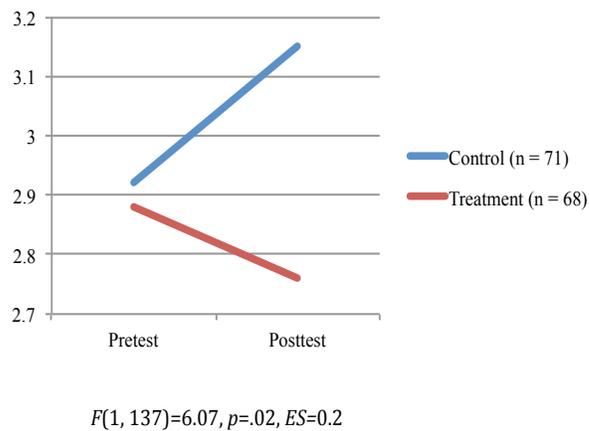


Figure 7--Item Pair 4: *I imagine that there will be a nuclear war in the next 10 years.*

The opposite phenomenon was seen for item pair 7 – “I don’t think that I would survive a nuclear war.” Here, participants in the control condition showed a less negative attitude in the posttest (pretest $M=3.63$, $SD=0.93$; posttest $M=3.44$, $SD=1.00$), indicating that they were less pessimistic about their chances of survival, whereas those in the treatment condition had a more negative attitude after completing the posttest (pretest $M=3.53$, $SD=1.20$; posttest $M=3.62$, $SD=1.04$), $F(1,137)=4.58$, $p=.03$, $ES=0.2$, indicating that they felt more pessimistic about their survival chances; again, this effect size represents an increase from the 50th to 58th percentile and a statistically significant interaction effect.

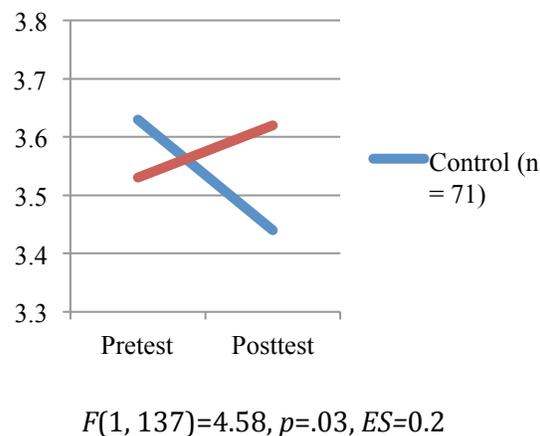


Figure 8--Item pair 7: *I don't think I would survive a nuclear war.*

We conducted a repeated measures factorial ANOVA using condition and frequency of video game play as factors with total pre and posttest scores as dependent variables. A significant interaction was reported between change in total pre and posttest scores, condition, and frequency of game play (see *Table 5* and *Figure 8*), $F(2,127)=5.50$, $p=.005$, $ES=0.3$. The significant interaction and the accompanying effect size of 0.3 (which explains an increase from the 50th to 62nd percentile) can be explained in part by the steep increase in negative attitudes for control group participants ($n=20$) who play video games with medium frequency (pretest $M=35.85$, $SD=7.28$; posttest $M=40.95$, $SD=9.75$) as compared to high-frequency video game players in the treatment.

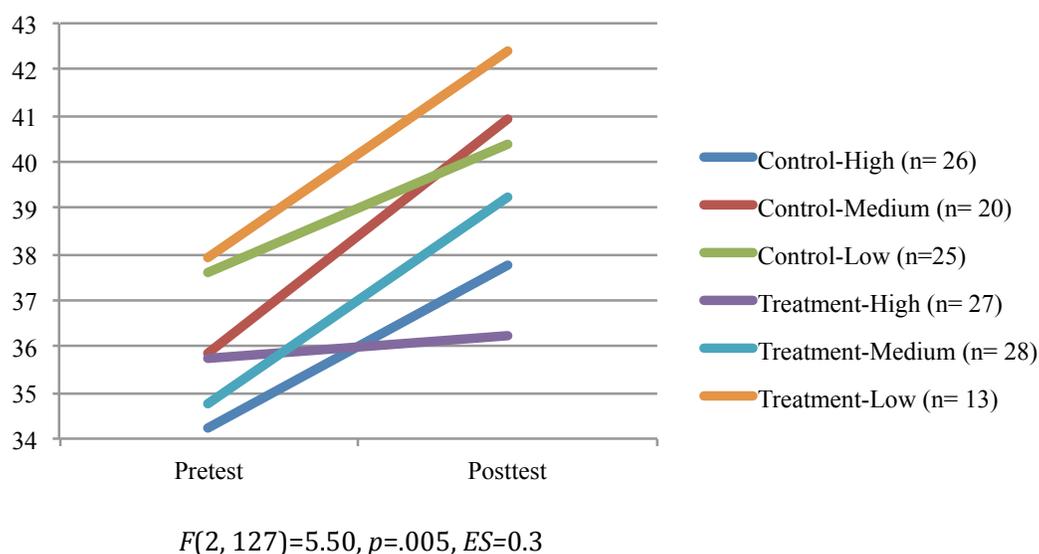


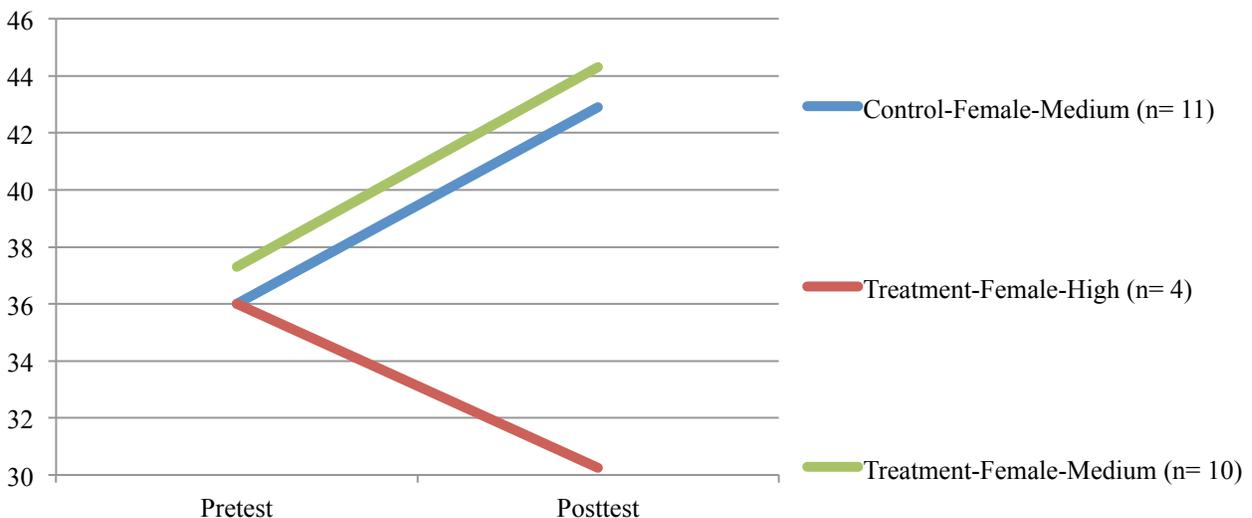
Figure 9. Interaction between pre and posttest scores, condition, and frequency of game play

Table 5. Descriptive statistics for pre and posttest scores, by condition and frequency of gameplay

Condition	Frequency of game play	N	Pretest		Posttest	
			Mean	SD	Mean	SD
Control	High	26	34.23	4.74	37.77	6.35
	Medium	20	35.85	7.28	40.95	9.75
	Low	25	37.60	5.46	40.36	5.68
Treatment	High	27	35.74	7.92	36.22	8.33
	Medium	28	34.75	6.42	39.25	8.60
	Low	13	37.92	3.77	42.38	6.05

Effect of gender, condition, and frequency of game play on attitudes towards nuclear war and technology

We conducted a repeated measures factorial ANOVA using condition, gender, and frequency of game play as factors with total pre and posttest scores as dependent variables. A significant interaction was reported between changes in total pre and posttest scores, condition, gender, and frequency of game play (see *Table 6* and *Figure 9*), $F(2, 127)=3.06$, $p =.05$, $ES=0.2$. The significant interaction and the accompanying effect size of 0.2 (which explains an increase from the 50th to 58th percentile) can be explained in part by the steep increase in negative attitudes from pre to posttest for female medium-frequency gamers in both the control group ($n=11$; pretest $M=35.00$, $SD=3.86$; posttest $M=42.91$, $SD=7.57$) and the treatment ($n=10$; pretest $M=37.30$, $SD=3.86$; posttest $M=44.30$, $SD=4.80$) group conditions. An additional notable result was a decrease in negative attitudes from pre to posttest among female high-frequency gamers in the treatment condition ($n=4$; pretest $M=36.00$, $SD=7.02$; posttest $M=30.25$, $SD=6.08$).



$$F(2, 127)=3.06, p=.05, ES=0.2$$

Figure 10. Interaction between pre and posttest scores for female medium-frequency game players in the control/treatment conditions, and female high-frequency game players in the treatment condition

Table 6. Descriptive statistics for pre and posttest scores, by condition, gender and frequency of game play

Condition	Gender	Frequency of game play	N	Pretest		Posttest	
				Mean	SD	Mean	SD
Control	Male	High	18	34.50	4.78	37.33	6.58
		Medium	9	35.67	8.05	38.56	11.93
		Low	9	38.67	5.98	40.22	6.40
Control	Female	High	8	33.63	4.90	38.75	6.09
		Medium	11	36.00	3.86	42.91	7.57
		Low	16	37.00	5.25	40.44	5.45
Treatment	Male	High	23	35.70	8.21	37.26	8.33
		Medium	18	33.33	7.19	36.44	9.05
		Low	4	38.25	4.03	40.50	0.58
Treatment	Female	High	4	36.00	7.02	30.25	6.08
		Medium	10	37.30	3.86	44.30	4.80
		Low	9	37.78	3.90	43.22	7.22

Results: Phase Two (Qualitative)

The interview data from Phase Two was initially analyzed by aggregating the verbatim from all twenty participants and searching for themes matching two broad emergent categories: a) aspects of the simulation that users found notable and b) correspondences (or lack thereof) identified by players between the simulation and the real world. These categories were constructed specifically with Sicart's framework in mind—the first category (notable aspects of the simulation) corresponds more to Sicart's procedural gradient of abstraction (i.e., analysis at the level of procedures that are taking place in the game), whereas the second category (correspondences to reality) tends toward implicating the semantic gradient of abstraction (i.e., analysis at the level of the intersection of the game and the user's values and experiences), due to the fact that it includes drawing connections between the game and the "real world." It should be noted, however, that Sicart's analytic scheme does not map perfectly onto the two broad categories, as the semantic GoA is operative in both broad categories. Still, we believed that this broad distinction was useful, as it identified points at which the users were clearly thinking beyond the game world and bringing the game's content to bear on the world outside.

After a first pass of coding with these two broad categories, we created more specific codes within each broad category in order to classify the data more finely (See *Appendix D*), which allowed us to see repeated answer patterns and reach satisfactory saturation level for many concepts such as correspondence with reality, strangeness of the simulation, disturbing aspects of the simulation, possible effects of the simulation on prospective players and detachment and discomfort with the position of the player in the simulation.

Before proceeding to the results, one last explanatory remark is in order. It must be conceded that the interview questions may have shaped participants' reflection to some extent; one could argue

that they would not have reflected as much or as deliberately about the experience of playing *Defcon* if they had they not been asked about it at length in a rather artificial intervention. Still, the fact remains that participants supplied a broad variety of narratives about *Defcon*, which indicates that although the participants may have been influenced by the experimental intervention, they still had their own stories to tell about playing the game.

Correspondence with reality

As noted above, when participants made a remark that was coded as “correspondence,” they identified some sort of link (or lack thereof, which in itself constitutes a comparison of the simulation with reality) between *Defcon* and the reality that they inhabit. These correspondences broke down into four types: 1. Neutral correspondence, which simply indicated a connection between *Defcon* and reality; 2. Correspondences that included the expression of concern about nuclear war; 3. Indications of correspondences between the simulation and reality accompanied by a lack of concern about nuclear war; 4. Denial of correspondence between the simulation and reality.

The first two types of correspondence were most numerous, with 14 and 26 comments identified in the first two categories, neutral correspondence and correspondences that indicated concern. Participants in these two categories appeared to believe that *Defcon* represented either a current reality (in the form of weapons technology) or a possible future (in terms of nuclear annihilation). One participant, indicating a neutral correspondence, commented on “how close, how real it felt. Like I said earlier, you have that idea of some screen that's sort of [in a] silo based somewhere, it was exactly like that.” Other participants went beyond this, indicating that the game worried them in some way: “What stood out the most for me was when you would completely eradicate a city and it would just go white, with the biohazard symbol just fading in and out. It struck me the most...like...wow, I just completely destroyed that. That would be the thing I would take away the most from [the game].”

The other two types of correspondence—those which accepted correspondence but also expressed a lack of concern about nuclear war and those which denied correspondence between *Defcon* and reality—were less numerous, with 4 and 11 comments respectively. In terms of the former category, when participants indicated that there was a correspondence between the simulation and reality and nevertheless expressed lack of concern about nuclear war, this lack of concern was invariably the sentiment that any concern was futile. One participant remarked: “...nuclear war seems like something that’s so far beyond my reach that I’m not worried about it really. Because worrying about it, I would not be able to do anything to stop a nuclear war.” The participants that denied correspondence completely, on the other hand, tended to emphasize the speculative status of the *Defcon* scenario. A representative participant commented, “I find that this is just a game and from the game you cannot make assumptions that nuclear war will be possible.”

Possible effects of the simulation on others

Players also expressed a substantial amount of concern about the possible negative effects of the simulation on other people. Most of the 17 comments of this type expressed concern about the effects of these types of games on children—one participant commented: “But it annoys me to think that they’ve crafted this whole experience and kids who don’t necessarily, it goes under

their radar, pardon the pun, they don't realize what's happening. And then get all excited because of it." Some players disagreed with this view, noting that *Defcon* was "just a game"—7 comments were classified as denying the effects of the simulation. One participant in particular stated her views in this regard quite strongly:

I think we are people with free mind and free will and it's our choice to play or not to play and it doesn't matter what the content [is] of video games or games overall. It's like I can go to the library, I pick up documentary about [a] maniac who raped and killed some girls or I go and pick up a book for kids, it depends what's my choice. It doesn't mean I'm going to kill someone...right away because I read that content.

Although most of the participants appeared to see the possible effects of *Defcon* as negative, there was a marginal minority view (2 comments) that indicated that it might have positive effects on players:

Participant: So, I think that [*Defcon*] does desensitize individuals on a certain level, but it also creates an awareness, as well. So that's at least a benefit of the game.

Researcher: Could you expand a little bit more on what that awareness is?

Participant: How close we might be to a nuclear warfare. How close the world might be to destruction. And how close the countries are in monitoring other states' nuclear capabilities and how we could be right at the tipping point. But no one actually knows about it. So if you actually play a game like this, you'll understand how, to a certain level, how easy it might be to launch an attack without any implications.

Feelings of strangeness and detachment

Two other notable themes that emerged during our analysis of the verbatims were participants' feelings of strangeness or detachment within the simulation (12 comments and 22 comments, respectively). A representative remark: "It was so eerie...I think there was this sobbing sound. As soon as that hit I turned around and I was like "Oh my God!" In that sense it was good in the sense that it evoked emotion, you know? It evoked an emotion that was sort of, eerie and...it definitely is kind of disturbing..."

Other participants went beyond simply identifying strangeness and pointed out that *Defcon* made them experience unpleasant sentiments of detachment. These feelings generally centered on the fact that *Defcon* has an abstract interface; everything is represented symbolically and one never sees any of the millions of virtual deaths directly. One participant made the following comment:

Those other popular games that I mentioned, like *Call of Duty* and *Battlefield*, it seems like your role in them is that you're one of the soldiers or you're one of the people that is really in the thick of it. Whereas this one takes the stance that you're somebody from a position of power and you're

moving pieces around on a board. You're controlling people, but you're not included in it. So it's more different. I guess it's like, it's worse. Because you're controlling other people's lives but you, from wherever you are, you're not at risk. Or you're relatively not at risk, whereas in the other games, you might kill somebody, but you also risk being shot. There's no moment in the game where the screen turns black because your little tower has been destroyed.

Another player expressed similar sentiments: "You see the radar and you see all that but you forget the ground, the earth. The reality on the ground, it sort of distances you from the effects of what you do and gives you sort of an abstraction." This level of detachment appeared to bother some players—one remarked, "I don't think [the game] says something good. I think the numbers [of deaths] [said something good]. But at the same time there wasn't enough violence. For a violent game, I thought there would be more. I think that 1.3 [million dead]...we never think of yourself as [in] the 1.3 million."

Unpleasant elements of the simulation

In keeping with players' sentiments of strangeness and detachment, they also identified numerous elements of the simulation that they found unpleasant. The dark electronica soundtrack was the principal element commented upon by participants (13 comments). A typical response to the soundtrack was as follows: "It wasn't a light soundtrack. It was pretty heavy...It made me feel cold. It made me feel very defenseless." Many participants indicated that the soundtrack made them feel some sort of sadness.

Along with the soundtrack, participants were also bothered by the game's sound effects (13 comments): "There was a woman crying or coughing, in terror. Suffering. But that comes with the game, I guess. It was unnerving, a bit." Some players, however, found the sound effects "fake" and other players thought that both the soundtrack and the effects were excessively manipulative. One participant was especially exasperated by this:

Well it looks like the creator of the game [is] already...putting information into our mind saying that if there was a cry of a woman it is a bad or sad thing or nuclear war is a bad thing. That is why we put crying woman there. Why don't you put jungle jumping music or something else [?]

The numbers, which appear in the game when one successfully annihilates a city were also mentioned frequently by participants (11 comments). One participant noted: "I remember when I launched the strikes on cities and then it said a certain amount of people were killed, I think I heard the sounds come up. It was sad. It wasn't great. It kind of made you pause and think about what's happening in the game. It was the timing."

As for the stark graphical interface offered by *Defcon* (11 comments), participants who commented on this were largely unimpressed; although one player noted that they were "appropriate" because of the "coldness" of nuclear war, other players noted their resemblance to "80s videogames" and indicated that the interface was "kind of plain" and "not very stimulating."

Discussion

Quantitative Results

As noted in the introduction, our purpose in this study was to explore two linked hypotheses: first, the hypothesis that playing *Defcon* would affect players' attitudes toward nuclear weapons; and second, that *Defcon* could prompt some sort of critical reflection on nuclear weapons. The results reveal that these hypotheses have survived the tests we applied to them, but nonetheless point up some important caveats as well as some results that bear further investigation.

Turning first to the quantitative results, we find that, in general, the control group, the members of which were assigned to read articles about the threat of nuclear war, had shifts in attitude that were greater than the shifts exhibited by the experimental group (See *Figure 1*). A reasonable explanation for this is that the treatment given to the control group was a robust one—the members of this group read articles that referred directly to real-world nuclear dangers. In addition, the message offered by the articles was an explicit one (i.e., “Danger from nuclear weapons exists.”), whereas the message conveyed by *Defcon* was implicit rather than explicit. Unlike the news articles, *Defcon* does not explicitly tell the people that play that nuclear weapons are cause for concern.

An alternative explanation, of course, is simply that *Defcon* was ineffective at shifting nuclear attitudes. Both the quantitative and qualitative results seem to contradict this, however. On the quantitative side, both *Defcon* and the article reading conditions resulted in significant shifts in attitude, and on the qualitative side, the fact that *Defcon* had a substantial effect on many of the participants was borne out repeatedly by their responses to our questions. Thus, our explanation for the statistically significant effects in both control and treatment conditions is that both the control and treatment interventions are effective.

Some intriguing data in the quantitative analysis concerned some of the control/treatment differences on some of the questions in the Nuclear Attitudes inventory. In item pair 4 – “I imagine that there will be a nuclear war in the next 10 years” – participants in the control condition showed a more negative attitude in the posttest, whereas those in the treatment condition had a less negative attitude in their responses in the posttest (See *Figure 2*). The explanation for the increase in negativity in the control group is fairly straightforward; the factual information about the danger of nuclear war contained within the readings likely influenced them to feel more concerned about it. The decrease in negativity on the part of the treatment group, however, is more perplexing. One possibility is that *Defcon* actually highlighted precisely how apocalyptic nuclear warfare is, thus making participants feel as though it was actually less likely to occur. If nuclear warfare is, to adapt a phrase from Paul Virilio (2008), the “integral catastrophe,” then one might surmise that governments would work to prevent it.

Notably, this latter interpretation is supported by the results from item pair 7 – “I don't think that I would survive a nuclear war,” in which participants in the control condition showed a less negative attitude in the posttest, while those in the treatment condition had a more negative attitude (See *Figure 3*). The catastrophic scenario offered by *Defcon* may have helped

participants understand that in the event of global thermonuclear conflict, their chances of survival were not especially robust.

Another important finding in the quantitative analysis concerned the inverse correlation between frequency of game play and attitude shifts in both the control and treatment conditions (see *Figure 4*). In general, high-frequency gamers' attitudes were less affected by either the control or treatment interventions, whereas medium and low-frequency gamers' attitudes were affected substantially more than their high-frequency counterparts. In the case of *Defcon*, it is not difficult to imagine an explanation for why the game may have affected high-frequency gamers less. It is plausible that high-frequency gamers would be somewhat more inured to both simulated violence and to the immersive effects of a simulation—in other words, *Defcon* simply has less “shock value” for these players. In the case of the control group participants, plausible explanations for these results do not spring as readily to hand.

An additional element of the explanation to the effect of frequency of game play may come from gender, as *Figure 6* indicates. Female gamers, both among our participants and in the general population, tend to play real-time strategy games like *Defcon* less frequently than male gamers, and the lack of familiarity with this type of gaming environment could explain why medium-frequency female gamers responded especially strongly to both the treatment and control conditions (Laughlin, 2013).¹ Still, the waters are muddied substantially by the fact that high female gamers were made substantially *less* fearful in light of the treatment. Ultimately, it would appear that both prior gaming experiences and gender are important potential elements in understanding the impact of *Defcon*, but further research may be necessary in order to untangle some of the complexities here.

In sum, the quantitative results show that *Defcon* seems to affect nuclear attitudes substantially. However, some of the shifts are unanticipated (i.e., making participants *less* fearful in some respects), and some of the variations according to frequency and gender are worthy of more in-depth investigation.

Qualitative Results

The qualitative results, in general, mesh well with the results of the quantitative portion of our analysis. Many of our participants, both male and female, were affected substantially by *Defcon*, and this was manifested in many different ways in our interviews.

The most important of our categories of analysis was undoubtedly the correspondences between the game and the real world that were identified by participants. Correspondence is a particularly revealing category because it shows clearly that participants were dealing with the game on Sicart's semantic Gradient of Abstraction—they were thinking through how the game related to their own experiences and values, and considering it in the context of both present reality and an uncertain future. For the most part, the participants felt that *Defcon* did correspond to a possible reality, and some of them were unsettled by the possibilities that it represented. These participants were beginning to reflect critically about nuclear weapons and war: they were beginning, albeit in a somewhat inchoate and tentative way, to think about it as a problem.

As the quantitative results indicated, however, *Defcon* clearly did not affect attitudes toward nuclear weapons in all participants. The qualitative interviews also demonstrated that there were a number of participants for whom the *Defcon* experience was either completely or mostly un compelling. These participants often found the game boring, and they often rejected the idea that it could correspond to a possible or actual reality. There were also participants who, though realizing that *Defcon* corresponded to a possible reality, felt that the danger posed by nuclear weapons was either (a) negligible or (b) utterly beyond their control. Yet the fact remains that these latter participants were nevertheless reflecting critically on nuclear weapons, just not in the way in which we initially anticipated.

The responses that were grouped under “Possible effects of the simulation on others” were arguably substantially less interesting, at least as far as critical reflection about nuclear weapons is concerned. A couple of participants saw that *Defcon* might have educational potential, but many more participants offered narratives about the possible danger that *Defcon* might pose for children, despite the fact that children are extremely unlikely to play a game like this. There are, perhaps, two overarching discourses that people tend to choose from when discussing video games—‘Lock up your kids!’ and ‘They’re just games,’—and both standard narratives were amply in evidence.

In terms of players’ responses to specific elements of the simulation, the responses speak for themselves. In general, the aspects that we anticipated that participants might find particularly disturbing and thought-provoking were precisely those of which they took note—namely, the soundtrack, the sound effects, and the numbers of deaths. The one somewhat surprising finding in this area is that participants did not always understand that the stark and somewhat crude graphics of *Defcon* were a deliberate aesthetic choice intended to evoke a Cold War bunker-style environment. But given the youth and limited video gaming experience of some of our participants, we should probably have anticipated this outcome.

The number of responses that we were able to categorize under the “strangeness” and “detachment” themes clearly indicated that some of the design elements of *Defcon* had the desired impact. A significant proportion of the participants were knocked off balance emotionally by *Defcon*, precisely as the game designers intended. In these participants, the game created an alienating, eschatological mood; the feeling of uncanniness as the player rains down megadeaths in the form of little white symbols on a dark blue map. The philosopher Martin Heidegger (1927/1996) wrote about the clarificatory power of a confrontation of the possibility of one’s own death—he writes, “Anticipation discloses to existence that its extreme inmost possibility lies in giving itself up and thus shatters all one’s clinging to whatever existence one has reached” (p. 244). The experience of playing *Defcon* is not quite as substantial or dramatic as the kind of confrontation that Heidegger had in mind, but there is nonetheless a certain analogy here. By producing feelings of strangeness and detachment, *Defcon* can successfully “detach” players from their ‘lostness’ in the everyday humdrum of existence. It forces them to confront the possibility of the worst (so far, at least) integral accident that humanity has made possible. It is this opening for reflection that is the essence of *Defcon*’s educative potential vis à vis critical and engaged citizenship.

Conclusion

In this study, we set out to investigate *Defcon's* ability to provoke attitude changes and critical reflection about nuclear weapons. We have demonstrated that *Defcon* does indeed have the potential to do this.

Nonetheless, further empirical investigation of the educational potential of games like *Defcon* is necessary. One way in which the study could be built upon is to further explore *Defcon's* educational potential in a classroom setting. It is not difficult to imagine *Defcon* as a part of a more comprehensive lesson or set of lessons that combined gaming and more traditional forms of instruction like reading texts. A longer study of this kind would properly take stock of the fact that *Defcon* is but one piece within the larger repertoire belonging to a high school or university instructor. One would not teach a lesson with *Defcon* alone; additional content provided by or through the instructor is nearly inevitable.

In addition to testing *Defcon* and games of its ilk in classroom environments, a great deal can also be accomplished in the laboratory environment. As we noted above, there are a number of results that need to be followed up upon, most notably the especially strong response from medium-frequency female gamers and the anomalous results generated by the high-frequency female gamers. We have some reason to think that women respond differently to *Defcon* than men do, but the question of gender differences in gaming is a fraught one and a careful approach to this question is necessary (Jenson & de Castell, 2008).

Empirical research on social impact games in education is still at an early stage. Yet despite the fact that a great deal of popular derision and suspicion still surrounds gaming, both theory and research is beginning to indicate that some games can be useful tools for developing the kind of critical reflection on key social issues that is necessary for active citizenship. Like literature and film, gaming has the potential to open windows into alternative worlds, both utopian and dystopian. *Defcon*, with its relentless gloom, is certainly in the latter category, but perhaps a dark vision is precisely what is necessary to help us address a major social challenge, the existence of which we would prefer to forget.

References

- Anderson, J. L. (2010). Developing ecological stewardship in elementary school through student participation in virtual worlds. Paper presented at *NARST*, Philadelphia.
- Bagley, E., & Shaffer, D. (2011). When people get in the way: Promoting civic thinking through epistemic gameplay. *International Journal of Gaming and Computer-Mediated Simulations*, 1(1), 36-52.
- Bainbridge, W. S. (2010). *The Warcraft civilization: Social science in a virtual world*. Cambridge, MA: MIT Press.
- Barab, S., Dodge, T., Tuzun, H., Job-Sluder, K., Jackson, C., Arici, A., et al. (2007). The Quest Atlantis project: A socially-responsive play space for learning. In B. E. Shelton, & D. Wiley (Eds.), *The educational design and use of simulation computer games* (pp. 161-188). Rotterdam: Sense Publishers.
- Barab, S., Sadler, T. D., Heiselt, C., Hickey, D., & Zuiker, S. (2007). Relating narrative, inquiry, and inscriptions: Supporting consequential play. *Journal of Science Education and Technology*, 16(1), 59-82.
- Bers, M. U. (2001). Identity construction environments: Developing personal and moral values through the design of a virtual city. *Journal of the Learning Sciences*, 10(4), 365-415.
- Bers, M. U., & Chau, C. (2006). Fostering civic engagement by building a virtual city. *Journal of Computer-Mediated Communication*, 11, 748-770.
- Bogost, I. (2007). *Persuasive games: The expressive power of videogames*. Cambridge, MA: MIT Press.
- Bogost, I. (2011). *How to do things with videogames*. Minneapolis: University of Minnesota Press.
- Bowers, C. A. (2000). *Let them eat data*. Athens, GA: University of Georgia Press.
- Brown, S. (2008, July 21). WarGames: A look back at the film that turned geeks and phreaks into stars. *Wired*. Retrieved from http://www.wired.com/entertainment/hollywood/magazine/16-08/ff_wargames?currentPage=all
- Castronova, E. (2005). *Synthetic worlds*. Chicago: University of Chicago Press.

- Castronova, E. (2007). *Exodus to the virtual world: How online fun is changing reality*. New York: Palgrave-MacMillan.
- Chan, D. (2010). Dead-in-Iraq: The spatial politics of digital game art activism and the in-game protest. In N. B. Huntemann, & M. T. Payne (Eds.), *Joystick soldiers: The politics of play in military video games* (pp. 272-286). New York: Routledge.
- Chen, M. G. (2008). Communication, coordination, and camaraderie in World of Warcraft. *Games and Culture*, 4(1), 47-73.
- Consalvo, M. (2005). Rule sets, cheating, and magic circles: Studying games and ethics. *International Review of Information Ethics*, 4(1), 7-12.
- Crawford, C. (2003). *Chris Crawford on game design*. San Francisco: New Riders Press.
- Crogan, P. (2011). *Gameplay mode: War, simulation, and technoculture*. Minneapolis: University of Minnesota Press.
- Curry, K. (2010). Warcraft and civic education: MMORPGs as participatory cultures and how teachers can use them to improve civic education. *The Social Studies*, 101, 250-253.
- Dahya, N. (2009). Serious learning in playful roles: Socio-political games for education and social change. *Loading*, 3(4).
<http://journals.sfu.ca/loading/index.php/loading/issue/view/5>
- de Castell, S. & Jenson, J. (2003). Serious play. *Journal of Curriculum Studies*, 35(6), 649-665.
- Delay, C., Arundel, V., Arundel, T., Chambers, G., & Knottenbelt, J. (2006). Detonating Introversion's DEFCON. *Game Developer*. December 1, 2006, 26-29.
- Dewey, J. (1916). *Democracy and Education*. New York: Free Press.
- Downes, S. (2005). Places to go: Apolyton. *Innovate*, 1(6).
- Dyer-Witheford, N., & de Peuter, G. (2010). *Games of empire: Global capitalism and video games*. Minneapolis: University of Minnesota Press.
- Egenfeldt-Nielsen, S. (2007). *Educational potential of computer games*. London: Continuum.
- Flanagan, M. (2006). Making games for social change. *Artificial Intelligence and Society*, 20(4), 493-505.
- Flanagan, M. (2009). *Critical play: Radical game design*. Cambridge, MA: MIT Press.
- Frasca, G. (2001). Rethinking agency and immersion: Video games as a means of consciousness-raising. *Digital Creativity*, 12(3), 167-174.

- Frasca, G. (2001). Videogames of the oppressed: Videogames as a means for critical thinking and debate. (Master's thesis). Georgia Institute of Technology, Atlanta.
- Gaber, J. (2007). Simulating planning: SimCity as a pedagogical tool. *Journal of Planning Education and Research*, 27(2), 113-121.
- Gaydos, M. J., & Squire, K. D. (2012). Role playing games for scientific citizenship. *Cultural Studies of Science Education*, 7(1), 821-844.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave-MacMillan.
- Gee, J. P., & Hayes, E. R. (2010). *Women and gaming: The Sims and 21st century learning*. New York: Palgrave-MacMillan.
- Goldberg, L. (Producer), & Badham, J. (Director). (1983). *Wargames* [Motion picture]. United States: United Artists.
- Gordon, E., & Koo, G. (2008). Placeworlds: Using virtual worlds to foster civic engagement. *Space and Culture*, 11(3), 204-221.
- Gray, K. L. (2012). Deviant bodies, stigmatized identities, and racist acts: Examining the experiences of African-American gamers in Xbox Live. *New Review of Hypermedia and Multimedia*, 18(4), 261-276.
- Heidegger, M. (1927/1996). *Being and time* (J. Stambaugh Trans.). Stony Brook: SUNY Press.
- Jang, Y., & Ryu, S. (2010). Exploring game experiences and game leadership in massively multiplayer online role-playing games. *British Journal of Educational Technology*, 42(4), 616-623.
- Jenkins, H., & Cassell, J. (2008). From Quake Grrls to Desperate Housewives: A decade of gender and computer games. In Y. B. Kafai, C. Heeter, J. Denner & J. Y. Sun (Eds.), *Beyond Barbie & mortal kombat* (pp. 5-20). Cambridge, MA: MIT Press.
- Jenson, J. & de Castell, S. (2008) Theorizing gender and digital gameplay: Oversights, accidents and surprises. *Eludamos: Journal for Computer Game Culture*, 2(1), 15-25.
- Kahne, J., Middaugh, E., & Evans, C. (2009). *The civic potential of video games*. Cambridge, MA: MIT Press.
- King, C. R., & Leonard, D. J. (2010). Wargames as a new frontier: Securing American empire in virtual space. *Joystick soldiers: The politics of play in military video games* (pp. 91-105). London: Routledge.

- Laughlin, D. (2013, December 13). The gamification of mobile games. [Blog post.] Retrieved from <http://blog.flurry.com/bid/92377/The-Gamification-of-Mobile-Games>
- Laurel, B. (2001). *Utopian entrepreneur*. Cambridge, MA: MIT Press.
- Lauwaert, M. (2007). Challenge everything? Construction play in Will Wright's Simcity. *Games and Culture*, 2(3), 194-212.
- Lee, J. K., & Probert, J. (2010). Civilization III and whole-class play in high school social studies. *The Journal of Social Studies Research*, 34(1), 1-21.
- Lenhart, A., Kahne, J., Middaugh, E., Rankin-Macgill, A., & Evans, C. (2008). *Teens, video games, and civics*. Washington, D.C.: Pew Internet & American Life Project.
- Lobo, D. G. (2007). Playing with urban life: How SimCity influences planning culture. *Space/Time/Play*, 2, 206-209.
- Luacks, A., Embrick, D. G., & Wright, T. (2010). The managed hearthstone: Labor and emotional work in the online community of World of Warcraft. *Lecture Notes of the ICSSITE*, 33(5), 165-177.
- Mayo, M. Video games: A route to large-scale STEM education? *Science*, 323(1), 79-82.
- McCormick, M. (2001). Is it wrong to play violent video games? *Ethics and Information Technology*, 3(3), 277-287.
- MIT Game Lab. (2014). *Purposeful games for social change*. Retrieved February 2, 2014, from <http://purposefulgames.info/>
- Newcomb, M. D. (1986). Nuclear attitudes and reactions: Associations with depression, drug use and quality of life. *Journal of Personality and Social Psychology*, 50(5), 906-920.
- Neys, J., & Jansz, J. (2010). Political Internet games: Engaging an audience. *European Journal of Communication*, 25(3), 227-241.
- Nilsson, E. M., & Jakobsson, A. (2010). Simulated sustainable societies: Students' reflections on creating future cities in computer games. *Journal of Science Education and Technology*, 20 (1), 33-50.
- Raphael, C., Bachen, C., Lynn, K. M., Baldwin-Philippi, J., & McKee, K. A. (2010). Games for civic learning: A conceptual framework and agenda for research and design. *Games and Culture*, 5(2), 199-235.
- Reynolds, R. (2002). Playing a "good" game: A philosophical approach to understanding the morality of games. *International Game Developer's Association Conference Proceedings*, San Francisco.

- Santo, R. (2012). *Playing a mage, becoming an advocate: Games as civic learning spaces*. Phoenix: Center for Games and Impact.
- Schrader, P. G., & McCreery, M. (2008). The acquisition of skill and expertise in massively multiplayer online games. *Educational Technology Research and Development*, 56(4), 557-574.
- Schulzke, M. (2010). Defending the morality of violent video games. *Ethics and Information Technology*, 12(1), 127-138.
- Sicart, M. (2009a). The banality of simulated evil: Designing ethical gameplay. *Ethics and Information Technology*, 11(3), 191-202.
- Sicart, M. (2009b). *The ethics of computer games*. Cambridge, MA: MIT Press.
- Silverman, M., & Simon, B. (2009). Discipline and dragon kill points in the online power game. *Games and Culture*, 4(4), 353-378.
- Simkins, D. W., & Steinkuehler, C. (2008, July). Critical ethical reasoning and role-play. *Games and Culture*, 3, 333-355.
- Squire, K. (2004). *Replaying history: Learning world history through playing civilization III*. (Ph.D. dissertation). Indiana University, Indianapolis.
- Squire, K., Devane, B., & Durga, S. (2008). Designing centers of expertise for academic learning through video games. *Theory into Practice*, 47(3), 240-251.
- Steinkuehler, C. (2005). *Cognition and learning in massively multiplayer online games: A critical approach*. (Ph.D. dissertation). University of Wisconsin, Madison.
- Steinkuehler, C., & Duncan, S. (2008). Scientific habits of mind in virtual worlds. *Journal of Science Education and Technology*, 17(4), 530-543.
- Susaeta, H., Jimenez, F., Nussbaum, M., Gajardo, I., Andreu, J. J., & Villalta, M. (2010). From MMORPG to a classroom multiplayer presential role playing game. *Educational Technology and Society*, 13(3), 257-269.
- Tanes, Z., & Cemalcilar, Z. (2010). Learning from SimCity: An empirical study of Turkish adolescents. *Journal of Adolescence*, 33, 731-739.
- Thompson, C. (2006, July 23, 2006). Saving the world, one video game at a time. *The New York Times*.
- Turkle, S. (2005). *The second self: Computers and the human spirit*. Cambridge: MIT Press.

- Virilio, P., & Lotringer, S. (2008). *Pure war* (M. Politzotti, B. O'Keeffe Trans.). Los Angeles: Semiotext(e).
- Waddington, D. I. (2007). Locating the wrongness in ultra-violent video games. *Ethics and Information Technology*, 9(2), 121-128.
- Waddington, D. I. (2013). A parallel world for the World Bank: A case study of Urgent: Evoke, an educational alternate reality game. *International Journal of Technologies in Higher Education*, 10(3), 42-56.
- Wark, M. (2007). *Gamer theory*. Cambridge, MA: Harvard University Press.
- Whitton, N., & Hollins, P. (2008). Collaborative virtual gaming worlds in higher education. *ALT-J, Research in Learning Technology*, 16(3), 221-229.
- Williams, D. (2010). Groups and goblins: The social and civic impact of an online game. *Journal of Broadcast & Electronic Media*, 50(4), 651-670.
- Williams, D., Ducheneaut, N., Xiong, L., Zhang, Y., Yee, N., & Nickell, E. (2006). From tree house to barracks: The social life of guilds in World of Warcraft. *Games and Culture*, 1(4), 338-361.
- Wonderly, M. (2008). A humane approach to assessing the moral significance of ultra-violent video games. *Ethics and Information Technology*, 10(1), 1-10.
- Young, M. F., Slota, S., Cutter, A. B., Jalette, G., Mullin, G., Lai, B., et al. (2012). Our princess is in another castle: A review of trends in serious gaming for education. *Review of Educational Research*, 82(1), 62-89.

Games Cited

- Airport Security*. (2006). [Online Flash game]. San Francisco: Addicting Games.
- Asheron's Call*. (1999). [PC game]. Redmond, WA: Microsoft.
- Balance of Power*. (1985). [Mac game]. Northbrook, IL: Mindscape.
- Civilization I*. (1991). [PC game]. Alameda, CA: Microprose.
- Civilization II*. (1996). [PC game]. Alameda, CA: Microprose.
- Civilization III*. (2001). [PC game]. Paris: Infogrames.
- Civilization IV*. (2005). [PC game]. Novato: 2K Games.

- Civilization V*. (2010). [PC game]. Novato: 2K Games.
- Defcon*. (2006). [PC game]. London: Introversion Software.
- Food Force*. (2005). [PC game]. New York: United Nations World Food Program.
- The Intruder*. (1999). [Online Shockwave game]. Nadia Bookchin.
- Manhunt*. (2003). [Playstation 2 game]. New York: Rockstar Games.
- The McDonald's Game*. (2006). [Online Flash game]. Rome: La Molleindustria.
- Rockett's New School*. (1997). [PC game]. Mountain View, CA: Purple Moon Software.
- SimCity* (1989). [PC game]. Redwood City, CA: Electronic Arts.
- SimCity 2000*. (1994). [PC game]. Redwood City, CA: Electronic Arts.
- SimCity 3000*. (1999). [PC game]. Redwood City, CA: Electronic Arts.
- SimCity 4*. (2003). [PC game]. Redwood City, CA: Electronic Arts.
- Urgent: Evoke*. (2010). [Online game.] New York: World Bank.
- World of Warcraft*. (2004). [PC game]. Irvine, CA: Blizzard Entertainment.

Appendix A—List of Articles Used in Control Condition

- Associated Press. (2011, February 28). South Korean war games prompt threats from North Korea. *The Guardian*. Retrieved from <http://www.theguardian.co.uk>
- Borger, J. (2011, June 9). Syria referred to UN security council over suspected nuclear programme. *The Guardian*. Retrieved from <http://www.theguardian.co.uk>
- Broad, W. (2011, May 30). Inspectors pierce Iran's cloak of nuclear secrecy. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Broad, W. (2011, June 27). Iran unveils missile silos as it begins war games. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Broad, W. (2011, August 20). Laser advances in nuclear fuel stir terror fear. *The New York Times*. Retrieved from <http://www.nytimes.com>

- Bumiller, E., & Sanger, D. (2011, January 11). Gates warns of North Korea missile threat to U.S. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Gladstone, R. (2011, September 28). Iran mass-produces new missile and rejects 'hot line' idea with America. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Kramer, A. (2011, June 29). Arrests in Moldova over possible uranium smuggling. *The New York Times*. Retrieved from <http://www.nytimes.com>
- McDonald, M. (2011, March 24). North Korea suggests Libya should have kept nuclear program. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Sanger, D. (2011, September 1). Iran moves to shelter its nuclear fuel program. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Sanger, D. (2011, July 7). Pakistani army linked, in letter, to nuclear sale. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Storing up trouble: Pakistan's nuclear bombs [Editorial]. (2011, February 3). *The Guardian*. Retrieved from <http://www.theguardian.co.uk>
- Reuters. (2011, February 18). China to block UN report on North Korean nuclear capability. *The Guardian*. Retrieved from <http://www.theguardian.co.uk>
- Tehran's ambitions [Editorial]. (2011, September 16). *The New York Times*. Retrieved from <http://www.nytimes.com>
- Watts, J. (2010, December 23). North Korea threatens nuclear 'holy war' with South. *The Guardian*. Retrieved from <http://www.theguardian.co.uk>

Appendix B—Nuclear Weapons/Technology Survey Items (adapted from Newcomb, 1986)

1. I am quite concerned about how many countries have nuclear weapons.
2. I would feel frightened if I lived within ten miles of a nuclear power plant.
3. It is essential for our protection that Canada and the United States produce as many nuclear weapons as possible.
4. I imagine there will be a nuclear war in the next 10 years.
5. It is a good idea for Canada to supply other countries with nuclear power plants.

6. I feel frightened when I think of all the nuclear weapons in the world.
7. I imagine I would survive a nuclear war.
8. I have never really worried about nuclear war.
9. Many people tend to overreact about the threat of nuclear war.
10. There are times I have felt depressed thinking about the possibility of nuclear war.
11. The world feels like a very dangerous place because of so many nuclear weapons.
12. I have no hesitancy about raising a child with the threat of nuclear war.

Appendix C—Interview Questions

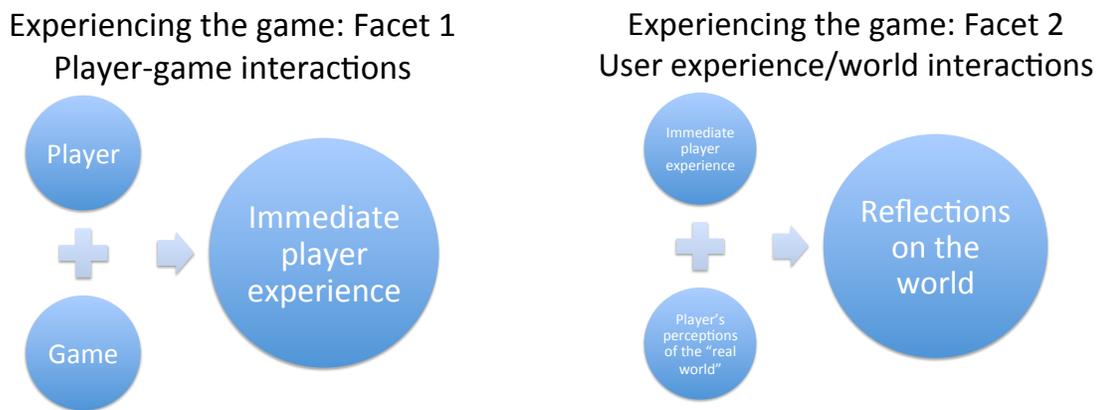
1. Describe your overall experience playing Defcon.
2. Did you enjoy your experience playing Defcon?
3. Do you think that there will be a nuclear war in the next few years?
4. Does playing Defcon make you more worried about the possibility of nuclear war?
5. Does the game make you think differently about nuclear war?
6. Do you think that there's anything morally or ethically wrong with playing a game like Defcon?
7. What did you think of the user interface?
8. Were there any aspects of the game that bothered you?
9. Do you feel that Defcon is an accurate representation of a possible reality?
10. What did you think of the soundtrack?
11. Do you think of Defcon as being different from typical video games?
12. Can a nuclear conflict be won?

13. What do you think your chances of survival would be in the event of a nuclear conflict?
14. At the end of the experience of playing Defcon, what "hit home" the most?
15. Is there anything else that you'd like to share with me?

Appendix D—Interview Coding Scheme

Explanatory Note

The following constitute the list of codes developed which emerged after the qualitative coding did an initial review of the data that resulted from the project. The development of the code list was guided by two fundamental questions which lie at the heart of the DEFCON project: "How did participants experience the simulation?" "How does the game affect the way participants see the world?" The following rough model of how these factors interact determined the way in which we constructed these categories as well as the way in which we classified the participants' statements within them. Facet 2 (see below) tends to line up with codes classified as correspondence with reality (1a, 1b, 1c, 1d) while Facet 1 is brought out more by the remaining codes. Still, given the nature of human experience, these two facets are somewhat present in all experiences reported by the users.



Code List

1. Correspondence with reality—the participant indicates (explicitly or implicitly) varying degrees of connection between the game and the world outside the game.

(a) Correspondence (Neutral)—the participant indicates that there is a correspondence between the game and the real world, but does not say anything that specifically indicates concern about nuclear war or lack thereof.

(b) Correspondence (Concern about nuclear war)—the participant indicates a connection between the game and the real world and expresses some concern about nuclear war.

(c) Correspondence (Lack of concern about nuclear war)—the participant indicates that there is a connection between the game and the real world, but specifically denies that this connection is cause for concern.

(d) Denial of correspondence—the participant indicates that the game does not correspond with reality.

2. Strangeness or uncanniness of the simulation—the participant indicates that they find the simulation weird or odd in some way.

3. Disturbing/unpleasant aspect of the simulation—the participant identifies an aspect of the simulation that bothered, irritated or disturbed them.

(a) Soundtrack

(b) Death numbers

(c) Starkness of the simulation/interface—participants indicate that they find the spare nature of the interface disturbing or unsettling.

(d) Human sounds

(e) Visual effects—participants identify the simulation's visual response to their actions as worrisome.

(f) Scoreboard

(g) Lack of reward--participants indicate frustration with the fact that the game does not reinforce the player's actions.

4. Possible effects of the simulation on other prospective players--participants identify possible consequences (or lack thereof) of gameplay on possible future players of various types.

(a) Concern about possible effects on other players--participants raise the possibility that playing the game may be somehow harmful to others.

(b) Denial of game's possible effects on others--participants indicate that the game will have little or no effect on other players.

(c) Possible positive effects on others--participants indicate that playing the game may be salutary in some way.

5. Detachment--the participant indicates feelings of detachment, either within the "reality" of the simulation itself or from the "real world."

6. Discomfort with the position of the player in the simulation--participants indicate that they feel uncomfortable with the particular role that the game is forcing them to play.

(a) God role--participants indicate that the amount of power that they are given in the simulation bothers them

(b) Lack of freedom--participants indicate discomfort at the lack of agency in their role.

7. Positive aspects of the simulation--participants identify aspects of the simulation that they liked or enjoyed.

8. Comparison with other games--participant notes similarities and differences between DEFCON and other game(s).

ⁱ Within our sample, 43.4% (n=36) of males indicated playing RTS games, whereas only 9.4% (n=6) of females indicated playing the same type of game. Within our sample, 51.8% (n=43) of males reported being "high frequency" gamers, whereas, 21.9% (n=14) of females reported the same. 67.4% (n=29) of high frequency males reported playing RTS games, whereas only 28.6% (n=4) of high frequency females reported the same.