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Flow and cooperative learning in civic game play

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Abstract
Flow theory offers an individualistic explanation of media enjoyment, while cooperative learning theory posits a social explanation for enhanced learning in groups. This classroom-based experimental study examines whether game players can experience *both* conditions and the influence of each on several types of civic knowledge, skills, and dispositions. We find that high quality cooperative learning contributed to acquiring civic knowledge and skills. In contrast, flow was more influential for developing dispositions to empathy and interest in learning more about the game topics. Thus, we conclude that players can experience flow while engaged in cooperative learning, but that these two conditions may support different kinds of civic learning.

Keywords
games, civic education, flow, cooperative learning, empathy, ethics

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Introduction

While empirical research is beginning to provide evidence that games can contribute to learning, we still have much to discover about *what* youth learn from games and *how* they learn it (Egenfeldt-Nielsen, 2007). The psychological theory of flow and the educational theory of cooperative learning offer two explanations for how players learn from digital games. Game flow theory suggests that when players enjoy deep concentration on a game they will be more motivated to play and will learn more (Fu et al., 2009; Kiili, 2005). Cooperative learning theory suggests that positive social interaction during game play is the key to increasing players' motivation and learning (Padilla Zea et al., 2009).

It would be advantageous to reconcile these two theories. Flow theory provides a conceptually rich account of individual media enjoyment, which scholars and designers have used to identify engaging aspects of games, including for learning. Cooperative learning theory offers insights into how games and the contexts in which they are played can best structure social interaction that leads to learning. Yet game flow theory offers an individualistic explanation of media enjoyment, while cooperative learning theory posits an inherently social explanation for enhanced learning in groups. For example, Sweetser and Wyeth's (2005) hypothesis that social engagement during game play may interrupt the individual player's focus on the game has been supported in at least one observational classroom study (Inal and Cagiltay, 2007). Yet it would be helpful to integrate flow and cooperative learning theory to advance our understanding of how to design games that are psychologically compelling and socially engaging, enjoyable and educationally valuable. This is especially urgent as designers and educators seek to take advantage of

the social opportunities offered by online multiplayer games, pervasive games, and games-related social media.

In addition, it would be especially beneficial to know whether flow and social learning can coexist in game play oriented toward *civic* learning, both because of its inherent importance in democratic societies and because digital games and social learning are media that may be especially well-suited to citizenship education. A number of scholars posit that because games provide the kind of enjoyable challenges that induce flow, they are uniquely effective at increasing contemporary youths' motivation to learn about public life by sparking critical thinking about history and politics, exploring controversial issues from multiple perspectives, fostering collaborative knowledge and skills, and developing civic dispositions such as empathy and ethical reflection (Gee, 2003; Jenkins, 2006; Simkins and Steinkuehler, 2008; Squire, 2005). Games can incorporate cooperative learning methods that have been found to be effective in research on civic education in the classroom (Raphael et al., 2010). These techniques include fostering youths' abilities to discuss and express their opinions about current events, practice civic problem-solving and decision-making, and engage in group learning, project-based learning, and simulations of real-world civic events (Niemi and Junn, 1998; Kahne and Westheimer, 2003).[1]

This classroom-based experimental study examines whether flow and cooperative learning can coexist and whether they are equally well-suited to different kinds of civic learning, including issue knowledge, argumentation skills, complex ethical reasoning, and empathy. This study also responds to calls for more research that directly tests the contribution of games to specific learning outcomes, that employs relevant control

conditions, and that examines game play in real-world instructional contexts rather than in a lab setting (Egenfeldt-Nielsen, 2007).

Flow and Games

Mihaly Csikszentmihalyi (1990) first proposed the concept of flow as part of his theory of positive psychology. He described flow as a state of profound enjoyment and focus on a challenging activity. Csikszentmihalyi initially identified eight possible dimensions of flow:

> (a) a clear sense of what has to be done moment by moment; (b) immediate feedback as to how well one is doing; (c) an intense concentration of attention; (d) a balance between opportunities for action (challenges) and capacity to act (skills); (e) exclusion of irrelevant content from consciousness; (f) a sense of control over the activity; (g) a distortion of sense of time—usually hours pass by in minutes; and (h) a feeling that the activity is intrinsically rewarding, or worth doing for its own sake (2000: 381).

The theory predicts that we are most likely to experience flow in an activity presenting challenges that fully engage our skills, without overmatching them. If the challenges are too far beyond our skills, we will be anxious, while if the activity is too easy for our abilities, we will be bored. Over the years, research indicated that flow could be experienced in myriad activities, from consuming and creating art, to engaging in sports, work, schooling, or game play (Csikszentmihalyi et al., 2005). A handful of studies on user interaction with web sites and games have shown that flow can enhance users' sense of control, curiosity, and learning (Hoffman and Novak, 2009).

Flow theory has had a profound influence on digital game design and research

because it offers a multi-dimensional explanation of the intense pleasure that many players find in games and because it offers practical directions for game designers (e.g., to ensure that game goals are clear, offer timely feedback on players' progress, and adjust the level of challenge as players become more skilled). Games that induce flow are assumed to be more enjoyable, to boost players' engagement and motivation to play, and therefore to increase their learning (Fu et al., 2009; Kiili, 2005). Thus, the theory has provided both an explanation and a goal for game-based learning design at each step in its development, including early educational games (Bowman, 1982), commercial edutainment games (Chen, 2007), and contemporary 'serious games' about social issues (Egenfeldt-Nielsen, 2007).

Most theorizing about flow and media has focused exclusively on the relationship of the individual to the medium (Bachen and Raphael, 2011). The flow state is seen as emerging from the individual player-game relationship rather than encompassing enjoyment that stems from the social dynamics of play. This assumption is less plausible than ever before. First, youth often play digital games with friends and family members, not simply alone. A national survey of American adolescents found that 76 percent of teen gamers play with others in the same room or online at least some of the time (Lenhart et al., 2008). Second, social interaction has become integral to newer game genres. In online multi-player games, 'social interaction represents both a vehicle to learn collaboration attitudes and skills, and a powerful *motivator* to engage in educational content' (Garzotto, 2007: 3). Pervasive games integrate play in the virtual and physical worlds, often among groups, making use of 'the social factors and creativity of the players by giving them some overall goal(s) and tools for interaction and then leaving the

field open for the players' (Jegers, 2007: 5).

Cooperative Learning and Games

Several approaches to studying the social aspects of game play suggest the value of integrating flow theory with cooperative learning theory. One line of research has identified socially-oriented motivations for playing online games, including socializing with others, developing long-term relationships, working in teams to accomplish goals, and role-playing with others to create stories (Jeng and Teng, 2008; Yee, 2006). A related line of educational research starts from cooperative learning theory to explain enjoyment and learning through games (e.g., Padilla Zea et al., 2009). This approach is rooted in educational theorists' recognition that collaborative knowledge and skills are increasingly valuable for contemporary work and citizenship. Thus, a 'full understanding of learning requires a combination of individual cognitive analysis and social interactional analysis' (Sawyer, 2006: 574). A third line of thinking emphasizes the value of social learning for developing digital media literacy. In this view, the fundamental knowledge and skills needed in a digital culture include the ability to engage in collective or distributed learning and problem solving through media (e.g., Gee, 2003; Jenkins, 2006). Taken together, these research agendas indicate that cooperative learning theory could contribute to our understanding of why social game play is both pleasurable and educational.

Cooperative learning is defined as 'students working together to maximize their own and each other's learning (i.e., achieve shared learning goals)' (Johnson and Johnson 2008: 404).[2] It can be contrasted with competitive learning, which involves 'students working against each other to achieve an academic goal such as a grade that only one or a

few students can attain' (p. 404), and individualistic learning, which refers to 'students working by themselves to accomplish learning goals unrelated to those of the other students' (p. 404). Johnson and Johnson (2008) identify five dimensions of successful cooperative learning. Learners recognize they that are in a relationship of *positive interdependence*, in which they are part of a group that is pursuing the same outcomes (goals and rewards) using common means (tasks, resources, and roles), so that individual and group success are inextricably linked. Group members also recognize *individual accountability*, in which each member is held responsible for their contributions to the group through assessment of the member's performance. In addition, the group supports each member's learning through *promotive interaction*, as members discuss concepts, explore multiple perspectives, and teach each other in order to solve problems. Such groups foster *interpersonal and small group skills* by strategizing and sharing feedback that advances both taskwork and teamwork abilities. Successful *group processing* allows members to determine whether they are working well together to achieve their goals.

A large body of research has found that well-designed cooperative learning experiences tend to be more enjoyable and effective than competitive or individual learning for fostering higher-order thinking and social competency skills (for recent summaries of the literature, see Johnson and Johnson, 2008; Stevens, 2008). This research also suggests that students have more positive attitudes toward computer-based learning and that they learn to use computer hardware and software better when they do so cooperatively rather than alone.

Like flow theory, cooperative learning theory offers practical guidance to game designers. The importance of positive interdependence and individual accountability has

inspired some designers to make shared learning goals integral and authentic to the gameplay and its educational aims (Barab et al., 2006) and to ensure that social learning games offer a combination of group feedback (such as a team score) and individual feedback (by making each member's contributions identifiable in group play) (Padilla Zea et al., 2009). Cooperative learning theory's emphasis on promotive interaction and group processing dovetails with calls to create vibrant learning communities, such as the online and offline communities that have grown up around some games, in which players share their knowledge (Jenkins, 2006; Barab et al., 2006). This approach has inspired efforts to foster online and face-to-face interaction in game play to develop group skills, such as leadership, consensus-building, negotiation, debate, and abilities to reflect on and evaluate the group's process (Padilla Zea et al., 2009).

Convergence?

Some scholars have begun to incorporate social interaction into their theoretical models and empirical studies of flow and learning. Yet it is by no means clear from the empirical research that the individual experience of flow and the benefits of cooperative learning can coexist, or that they will do so in a way that supports game designers' intended learning outcomes.

Flow and Social Interaction

Some of the research suggests that players can experience individual flow during social play. Surveys of players' motivations and experiences have found significant positive relationships between social interaction and the flow state in several genres of online games, including multi-user dungeons (MUDs), massively multiplayer online role-playing games (MMORPGs), and real-time strategy (RTS) games (Choi and Kim, 2004;

Kim et al., 2005; Voiskounsky et al., 2004). A similar relationship, although not uniform for all players, has been found in a few small-scale classroom and lab studies of game play that employ a mix of observational, survey, and experimental methods (Choi et al., 2007; Garzotto, 2007; Inal and Cagiltay, 2007; Jerome et al., 2006). At least one study finds that flow can contribute to the experience of social presence, which is the illusion of being present together with a mediated person in a virtual environment (Weibel et al., 2007).

However, other scholars have raised concerns that social interaction and the flow state may inhibit one another. For example, while Sweetser and Wyeth (2005) encourage game designers to incorporate online chat features to support social interaction, they caution that social interaction can disrupt immersion in games. This problem was found in an observational classroom study of children who played single-player games in groups, conducted by Inal and Cagiltay (2007). When children entered the flow state they stopped helping their friends play the game and focused instead on their advancement in the game. However, this finding may be an artifact of the study conditions, especially that the games were not designed to require interaction in order to achieve the game goal (unlike many online multiplayer games), the games involved time limits on a player's ability to pass a level (which is less conducive to discussing strategy with others), and the participants were children aged 7 to 9 years (who may be less adept than teens and adults at expanding their attention to include both the game and the group).

Flow and Learning

Another concern is that the experience of flow may inhibit learning about the subject matter of educational games. Pearce (2005) found that players may report

experiencing flow because they are absorbed by the game elements of a simulation, rather than the task (learning objective), especially if the challenge overmatches players' skills. Similarly, Barab et al. (2006) found that some students engaged deeply with the narrative of water pollution in a local park in the game *Quest Atlantis* without learning the underlying scientific concepts that were embedded in the story. Habgood et al. (2005) have suggested that the immersive state of flow may especially inhibit metacognition and therefore may be better suited to practicing and proceduralizing knowledge than acquiring or reflecting on it.

Surprisingly few studies have tested whether flow contributes to game-based learning using objective measures of learning outcomes, rather than self-reports. Of the few such studies conducted, some find that experiencing flow enhances within-game learning as reflected in players' performance (Engeser and Rheinberg, 2008; Keller and Bless, 2008), while others have failed to find such a link (Choi et al., 2007; Li-Chun and Ming-Puu, 2010). However, research on non-game educational contexts offers more support for flow's potential contribution to learning, including other forms of computer-based learning (e.g., Skadberg et al., 2005; Ho and Kuo, 2010).

To summarize, the initial research on flow, social play, and cooperative learning still leaves much to explain about *whether* social interaction might promote flow for educational ends, and, if so, *how*. With few exceptions, these studies do not identify specifically the social game features and play contexts that are most effective at generating flow that leads to learning. Some of the studies use very brief measures, which do not fully capture the many dimensions of flow or cooperative learning. Most importantly, while studies offer conflicting evidence about whether social play is

compatible with flow, none measures whether the quality of players' cooperative learning can help to explain whether they enjoy the game or not. The empirical studies also tell us little about the kinds of learning outcomes to which flow and cooperative learning might be best suited.

Civic Learning

While flow and cooperative learning might be studied in connection with many subjects, we focus on civic learning because of its inherent importance in democratic societies and because many scholars (cited above) have claimed that games are especially well-suited to incorporating some of the most effective pedagogy for citizenship education, such as taking positions on public issues and engaging in political simulations.

In democratic societies, civic education's desired learning outcomes are often identified as a set of knowledge, skills, and dispositions that support effective and responsible participation in civic life. For this study, we selected a game that allowed us to test four learning outcomes that are often included in proposed inventories of civic learning standards. The first learning goal is political issue knowledge, which shapes citizens' ability to interpret political communication and form quality judgments (Colby et al., 2007; Flanagan et al., 2007). Second, many civic educators value skills in constructing and expressing arguments, abilities that are integral to effective political participation (Colby et al., 2007; Levine, 2007). Political knowledge and argumentation skills are also strong predictors of many forms of political participation. Third, a disposition toward complex ethical reasoning, rather than dogmatism, is seen as valuable for questioning one's assumptions, evaluating alternative issue positions, recognizing the trade-offs among them, and forming mature judgments (Dewey, 1916/1966; Simkins and

Steinkuehler, 2008). Fourth, empathy is emerging as an especially significant disposition for global citizenship because it enables learners to perceive the world through others' perspectives, experience the emotions of others, and communicate and act in ways that consider others' views and needs (Colby et al., 2003; Heafner, 2008).

The game chosen for this study was *Global Conflicts: Sweatshops* (Serious Games Interactive, 2009), a first-person game designed for high school and college social studies and global studies courses, in which the player is cast as the owner of a European company who has traveled to Bangladesh to investigate whether child labor is being used in the factory that produces raw leather for his company. The player's goals are to gather information by interviewing characters and examining objects encountered in the game; to use this information to form arguments for improving the conditions of child laborers; and to deploy these arguments to persuade the factory owner to improve conditions for his child workers. In each scene, players interview one or more characters—including a representative of an NGO working on behalf of child laborers, child workers, the parent of a child laborer, and the factory foreman — choosing which of the statements or questions provided by the game will be most likely to win other characters' trust and get them to share information. Eventually, each piece of information must be used to support one of three arguments for improving child laborers' lives, which include making time for them to go to school, reducing the dangers of their work, and respecting their basic human rights. In the final scene, the player meets with the factory owner and must decide how and when to use each argument to best persuade him. The game score is an index of players' performance at gathering critical pieces of information, organizing them into

coherent arguments, and using these arguments to persuade the factory owner to improve conditions.

The game is designed to cultivate multiple learning outcomes (Serious Games Interactive, 2010). First, *Sweatshops* aims to convey knowledge about the issue of child labor and skills of argumentation, including identifying and assessing relevant information and forming persuasive arguments about the issue. Second, given that all characters interviewed are in Bangladesh (and our research was conducted on American students), the game also provides students an opportunity to develop empathy with global others as they learn about child labor from multiple perspectives. Third, the game aims to cultivate a critical approach to ethical reasoning (Dewey, 1916/1966), one that acknowledges that there are multiple legitimate points of view on a complex issue, rather than a single universally-applicable ethical standard that condemns or condones all instances of child labor. Players learn about the issue from the perspectives of interviewees, including the views of a parent and a representative of an educational NGO who contend that the country is not ready to abolish all child labor immediately because the most likely alternatives for children are prostitution and begging, not full-time schooling, given the current economic and educational context in Bangladesh.

We chose *Sweatshops* because of its civic learning outcomes and because it is a game that affords cooperation without being explicitly designed for it. While two or more players can play the game at the same computer, it is designed as a single-player game (i.e., it does not offer players an option to take turns playing as the main character, or to inhabit different characters and interact with each other in the game). In contrast, a multi-player game that required collaboration (such as *World of Warcraft* and other online

multi-player games) would have offered privileged conditions for testing cooperative learning, while a single-player game with features that constrain real-time collaboration (such as time limits on completing tasks) would have offered too daunting conditions for testing cooperative learning.

Our experimental research design allowed us to compare students who played in pairs with a control group of students who played individually, in order to investigate several research questions. To investigate whether flow and cooperative learning are compatible, we asked if play condition (alone or in pairs) influences whether players experience flow (RQ1) and whether flow and the quality of cooperative learning (QCL) among pairs during game play are related (RQ2). The second question is important because cooperative learning theory does not predict that all paired learners will learn more, or enjoy learning more, only those pairs who experience all five dimensions of high quality cooperation. Because of the potential importance of cooperative learning and flow for civic education, we asked how play condition, QCL, and flow influence players' demonstration of issue knowledge and argumentation skills (RQ3), dispositions to empathy (RQ4) and critical ethical orientation (RQ5). To test theoretical claims that both flow and cooperative learning can increase interest in learning, we asked how play condition, QCL and flow relate to interest in learning (RQ 6).

Methods

Participants

Participants were 96 undergraduate students enrolled in four different courses (a first-year course on world history, two sections of introductory communication courses, and an upper-level economics course) at a medium-sized private university in Northern

California. The median age of the participants was 19; 63 students were female and 33 were male.

Procedures

All classes that participated in the study met in the same computer lab and the same professor administered the study to each class. The game was played for course participation credit during regular class meeting times. Students in each class were randomly assigned to play individually (n=44) or in same-sex pairs (n=52), to avoid the problem of males dominating the computer in mixed-sex pairs, which has been found in some prior research (e.g., Schofield, 1995). The study was introduced as a research project on games and learning. Students were told that their participation in the study was completely voluntary, their responses were confidential, and that they could choose an alternative activity (a web search on the same topic) if they did not want to play the game. All potential participants consented to play the game. After filling out the pre-test survey, participants were briefed on how to play. Paired players were asked to work as a team by sharing the mouse and discussing their choices in the game. All players began the game at the same time and as participants finished they were asked to write down their scores and fill out the post-test questionnaire. Paired players were separated so that they could each fill out their individual questionnaires confidentially. On average, it took players about 45 minutes to complete the game.

Advantages for the internal validity of this study, compared with many other classroom studies, were that the location, procedure, and lead administrator of the study were held constant for each class. Advantages for external validity were that the study was integrated into regular course work for credit and it was conducted in a campus

computer lab during a regular class meeting time rather than in a contrived setting.

Measures

A 16-item scale, adapted from the original 42-item scale developed and validated using expert and structural validity analysis by Fu et al. (2009), was used to measure the same eight critical dimensions of flow, including clear goals, feedback, challenge, control, concentration, immersion, altered sense of time, and summary measures of enjoyment. Each item was measured on a six-point scale, ranging from 'strongly agree' to 'strongly disagree.' Reliability (Cronbach's alpha = .83) for our measure was comparable to Fu et al.'s.

Quality of cooperative learning (QCL) was also measured on the post-test. Students who played in pairs answered a 13-item scale adapted from Kern et al.'s (2007) observational study in which the researchers developed a reliable and valid protocol for assessing the dimensions and frequency of cooperative learning behavior. Questions measured all five dimensions of cooperative learning: positive interdependence, individual accountability, promotive interaction, interpersonal skills, and group processing. Respondents rated each aspect of their experience of QCL on the same six-point scale, ranging from 'strongly disagree' to 'strongly agree' (Cronbach's alpha = .85).

Knowledge about the child labor issue and argumentation skills were measured by game score – an index of players' ability to identify important pieces of information, organize them into coherent arguments, and deploy them persuasively. While the game provided separate scores for information finding, argument building, and persuasive ability, we found that in practice one needed both issue knowledge and argumentation skills to earn high scores on all measures. For example, one could not choose the most

persuasive question that would convince an interviewee to share information without understanding their role in the child labor system, and one could not form a coherent argument about child labor without understanding the nuances of the issue. Therefore, we believe that a composite score for knowledge and skills is the most meaningful measure of players' performance in the game. Game scores were generated by the game itself and recorded by each participant. Thus, people playing in pairs had the same score.

Empathy was measured using an 11-item scale adapted from a scale of ethnocultural empathy developed and validated by Wang et al. (2003) that contained four factors related to empathetic feeling and expression, empathetic perspective taking, acceptance of cultural differences, and empathetic awareness. The scale was adapted to reduce the number of items and to translate questions about empathy with racial or ethnic others within one's own country to empathy with people in other countries. The pre-test measure items were phrased to ask about empathy with global others in general, while some of the post-test items were adapted to ask about players' empathy with Bangladeshis featured in the game. Each statement was rated on the same six-point scale reflecting disagreement or agreement used in our other scales (pre-test Cronbach's alpha = .81; post-test Cronbach's alpha=.79). The pre-test form of this scale has been utilized in other research on young people by the authors (Bachen et al., 2012) with comparable reliability and with a finding of criterion-related validity similar to Wang et al. (2003) with respect to gender, finding that females express higher levels of empathy than males.

To measure the game's potential influence on players' orientation toward critical ethical thinking about child labor we developed a scale with four items to assess the rigidity or flexibility of students' beliefs before and after game play (pre-test Cronbach's

alpha = .68; post-test alpha = .65). In addition to the six-point 'strongly agree'-'strongly disagree' scale, participants were given the choice to check 'don't know' if they were uncertain. 'Don't know' responses, which were relatively infrequent, were treated as a neutral response and coded at the mid-point of the scale. A high score on this scale indicates more rigidity of thought (dogmatism), while a low score indicates a critical approach.

Student interest in learning more of the knowledge and skills developed by the game—including understanding issues from the perspectives of others, clarifying one's moral views about global issues, and making arguments about social issues, global poverty and child labor—was measured at pre-test and post-test. The prompt on the post-test specifically asked the students to indicate how interested they were in learning more about these topics in the future. The reliability coefficient for the five-item pre-test scale was .75; the post-test Cronbach's alpha was .87.

Finally, as control factors, we measured students' frequency of prior civic gaming experiences using a set of six questions from Lenhart et al. (2008) (Cronbach's alpha = .73). Sample items included how often students played games in which players help or guide other players, or explored a social issue they care about. Students' gender and frequency of travel outside of the U.S. (ranging from never to more than 4 times) were also measured in the study.

Results

The sample of participants scored quite high on many of the measures, especially quality of cooperative learning, empathy, and interest in learning (see table 1 for the means and standard deviations for all scales). The absolute scores on empathy and

interest did not differ much from pre-test to post-test, but ethical orientation scores reveal a slight decrease in rigidity of thinking. While the absolute scores do not suggest a strong impact of game play on the dependent variables, controlling for pre-test scores helps to illuminate their relationship more clearly.

Our first research question asked whether play condition (alone or in pairs) influenced the experience of flow. We conducted a regression analysis of play condition on flow, controlling for several background factors including player gender, frequency of civic gaming experiences, and frequency of travel outside of the U.S. None of the variables, including play condition, significantly predicted flow ($F(4, 71) = .935$, $p = 0.45$).

Our second research question investigated whether QCL was related to flow for the paired players. Using the same control variables, we regressed QCL on flow. A significant amount of the variance was accounted for in the regression ($R^2 = .28$, $F(4, 37) = 2.87$, $p = .04$), with QCL the only variable to achieve significance (β .34, t (37) = 2.19, p=.04). Thus, while the single and paired players did not differ from one another as *groups* on flow, the paired players who experienced higher QCL experienced greater flow than paired players who had lower QCL.

The next set of analyses (research questions three through six) investigated whether play condition, QCL, and flow influenced the dependent measures of issue knowledge and argumentation skills (game score), empathy, critical ethics, and interest in learning. In order to differentiate the single players from the paired players and factor in the quality of cooperative learning, we divided the sample into three groups: the single

players (n = 45), the paired players who scored below the median (a score of 61) on QCL (n = 26), and the paired players who scored above the median on QCL (n = 26).

For this set of analyses, we conducted a one-way analysis of covariance using the composite QCL/Play Condition measure as our principal independent variable. Gender was used as a control variable because prior research has found that it can influence attitudes toward digital games and empathy (see Bachen et al., 2012). Flow, plus all variables for which a pre-test measure was available, were used as covariates.

We first examined the impact of QCL/Play Condition and flow on game score, a measure of players' demonstration of knowledge and skills (RQ3). Analyses showed that only QCL/Play Condition influenced game score (F (2, 88) = 3.28, p = .04, partial eta squared = .075). Pairs who experienced high QCL scored highest in the game (M = 63.70, SD = 11.33), followed by those who played alone (M = 59.51, SD = 11.84), and finally, those in the low QCL group (M = 52.76, SD = 16.54). Neither flow nor gender was significantly related to game score.

RQ4 examined whether QCL/Play Condition and flow influenced empathy. After controlling for pre-test empathy scores, we found that flow significantly and positively influenced post-test empathy (F (1, 84) = 8.41, p = .005, partial eta squared = .10). In addition, females scored higher (M = 51.91, SD = 5.65) than males (M = 47.30, SD = 8.34) in post-test empathy (F (1, 84) = 5.30, p = .024, partial eta squared = .065). QCL/Play Condition was not significantly related to empathy.

Next, we analyzed the relationship between post-test orientation toward critical ethical thinking, QCL/Play Condition, gender, and flow (RQ5). After controlling for pre-test ethical orientation, no significant relationships emerged for any of the variables.

In RQ6, we examined the relationship of QCL and flow to the level of interest participants showed in learning more about the knowledge and skills fostered by the game. After controlling for pre-test interest scores, we found that both flow (F (1, 88) = 5.19, p = .025, partial eta squared = .061) and gender (F (1, 88) = 6.68, p = .012, partial eta squared = .077) influenced interest in learning more. The relationship between flow and interest in learning more was positive; in addition, females were more interested than males after playing (M = 25.25, SD = 3.24 and M = 22.09, SD = 4.79, respectively). QCL/Play Condition was not a significant factor in interest in further learning.

Discussion

Our findings suggest that cooperative learning and flow can be compatible in game-based civic learning. We found no difference in flow between individual and paired players overall, but the pairs who experienced high quality cooperative learning also experienced higher levels of flow than pairs who cooperated less well. Players' ability to practice good cooperative learning may be the missing variable that explains why some prior research found that the individual state of flow can be achieved in social gaming, while other research found that it could not. In short, the difference between merely playing together and learning well together appears to coincide with how much players achieve the intense state of focused enjoyment characteristic of game flow in a social context. While it may be that players experienced both states by *alternating* between immersion in individual flow and social interaction, our observations of pairs during this study were that they spent much of the game discussing their options and strategies as each looked and pointed at the screen, which suggests that paired players were *simultaneously engaged* in both flow and cooperative learning. This suggests that when

joint information-seeking and discussion are integral to pursuing the game's goal, these kinds of social inquiry need not interrupt flow.

If our findings indicate that the experiences of cooperative learning and flow are compatible, they also suggest that the two may be complementary states that best support different kinds of learning. This study replicated the results of much of the research on cooperative learning and civic education in traditional classrooms, and extended these findings to game-based learning, by finding that high quality cooperative learning contributed to acquiring civic knowledge and skills. Yet we found that flow was more influential than cooperative learning for inspiring empathy and interest in learning more about the game topics and activities. It is plausible to assume that learning to see and feel from the perspective of others is more likely if one is able to immerse oneself in the game world, inhabiting a character and interacting in simulated face-to-face encounters with other characters. Based upon a related study (Bachen et al, 2012), we suspect that empathy is further developed when a player not only takes the perspective of another, but also begins to *identify* with a character, a further step that involves 'temporary alteration of media users' self-concept through adoption of perceived characteristics of a media person' (Klimmt, Hefner, and Vorderer, 2009: 356). The characteristics of the flow state—especially focused concentration on and immersion in the world of the game—seem to lend themselves well to the development of empathy and identification, and to affective learning more broadly.

The complementary values of cooperative learning and flow for game-based learning suggest the need for future research to develop and test a hybrid *concept* for studying players' experience and a hybrid *goal* for educational game designers: social

game flow. For example, whereas prior models of game flow (Sweetser and Wyeth, 2005; Fu et al., 2009) see flow as dependent on the establishment of clear goals in the game, a social game flow model would emphasize the importance of clear goals and rewards that can only be achieved by a group, so that players sense their interdependence. Whereas earlier game flow models see flow as predicated on challenges that match the individual player's skill level, social game flow would focus on the need for challenges that match group members' collective knowledge and skills, including their collaborative abilities. Whereas traditional models of flow expect that players should feel a sense of control over their actions in the game, a social game flow approach would expect that players also feel a sense of control over their groups' strategies and actions within the game, and their group's influence on the gameworld (for a fuller elaboration of social game flow, see Bachen and Raphael, 2011).

Of course, we are not arguing that all games should be designed to foster social game flow, but it would seem to be especially important for civic learning with games, in which social interaction with other learners is often tightly integrated into the games' character roles, rules, and goals, as well as the surrounding instructional context (e.g., through follow-up discussions of the issues treated in the game) (Raphael et al., 2010). Such games echo the social nature of many of the most effective pedagogies for civic learning in the classroom discussed above—including discussion of current events, group simulations of civic activities, and group projects focused on the public sphere.

Conclusion

This study found that players could experience flow at an individual level and be engaged in cooperative learning while playing a civic educational game about child labor.

We also found that cooperative learning and flow made distinct contributions to players' learning. High quality cooperative learning fostered cognitive learning about civic knowledge and skills, while flow inspired affective learning about empathy and interest in learning more about the issues and skills introduced in the game. These results suggest the need for game scholars and designers to be sensitive to the value of flow and cooperative learning as compatible and complementary contributors to civic learning.

It is important to note several limitations in the study. Although we can make greater claims to external validity than if the study had been conducted in a contrived lab setting, it was limited to a single session of game play, so we can only make claims about the short-term effects of playing the game. In addition, *Sweatshops* is a fairly simple game that our participants finished in 45 minutes and the study did not include the accompanying lesson plans suggested by the game developer—such as conducting background research on child labor and writing essays expressing one's ethical views of the issue (Serious Games Interactive, 2010). Furthermore, because participants played for course participation credit, the stakes may have been lower and some students may have been less motivated to play than if their score counted as a graded assignment. Before play, the sample had high initial scores on interest in the game topics, empathy, and critical ethical reasoning. However, the brevity of students' exposure to the game, relatively low stakes for playing it, and likelihood of ceiling effects on participants' ability to move up on several of our scales all seem to work *against* our chances of finding significant differences between players on many of our outcome variables. Therefore, these conditions give us greater confidence in our findings, rather than less.

In future research, it will be important to explore the quality of cooperative learning and flow across a broader range of measures of civic knowledge and skills, as well as affective learning measures, to see if this study's pattern of results is replicated across other domains. Further efforts to validate our scales for game flow and cooperative learning would be useful as each was adapted from previous research. In addition, it would be interesting to measure the dimensions of *social* game flow discussed above, which could help explain what elements of game design and the surrounding educational context foster learning that is both cooperative and pleasurable. Especially for *civic* learning with games, we need to model a state of cooperative flow so that researchers can understand its potential values for learning and game producers can design for it.

Social flow could be studied in social media usage as well—including social networking sites, wikis, blogs, and virtual worlds—in both formal and informal educational contexts. While some social media researchers are incorporating flow into their studies (e.g., Baytiyeh and Pfaffman, 2010; Choi et al. 2007; Franceschi, 2009), this work tends to use the traditional, individualistic concept of flow. We suggest that researchers develop a more social conceptualization of flow, comparable to the social game flow model we suggest above but tailored to the affordances and constraints of each medium. Researchers could test several of our findings, such as whether the quality of cooperative learning influences social media users' experience of flow online, and whether cooperative learning contributes more to knowledge and skill development while flow is better suited to affective learning of dispositions.

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Table 1

Means and Standard Deviations for Scales

	Scale range	Mean	SD
Quality of Cooperative Learning	6-78	61.85	8.20
Flow	16-96	71.12	10.01
Score	0-100	58.84	13.28
Pre-test Empathy	11-66	50.33	7.48
Post-test Empathy	11-66	50.34	6.83
Pre-test Critical Ethics	4-24	13.01	4.09
Post-test Critical Ethics	4-24	11.84	3.83
Pre-test Interest in Learning	5-30	23.79	3.39
Post-test Interest in Learning	5-30	24.06	4.22
Civic Gaming Experience	6-18	8.29	2.14

Notes

[1] Youth who play games that incorporate these kinds of experiences also appear to be more civically engaged offline. For example, a representative study of Americans aged 12-17 found a significant relationship between the frequency of teens' civic gaming experiences (such as playing games that elicit cooperative behavior or that focus on social or moral issues) and players' offline civic engagement (such as expressing interest in politics and raising money for charity) (Kahne, Middagh and Evans, 2008).

[2] While cooperative learning has sometimes been distinguished from collaborative learning, 'the two terms … are increasingly interchangeable and synonymous' (Johnson and Johnson 2008, p. 404) and we treat them as such.