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Understanding Habits of Participatory Civics in High School Students' Crafting and Coding of Collaborative Game Controllers

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Abstract

The civic world is rapidly changing in response to the affordances of the digital age, which ushered the rise of participatory civics: interactive peer-based modes of civic action. In the spirit of Dewey's vision of civic education as participation in a community, video games have been presented as a potential site for practicing civic interactions. We expand this approach, contending that collaborative game making can serve as a uniquely ripe setting for youth to develop habits characteristic of participatory modes of civic action. In a pilot study, high school students designed and build in small groups collaborative controllers for Scratch games. Our analyses reveal how collaborative game making potentially cultivates habits attuned to the challenges of participatory civics: engaging youth in interactive, peer-based and open-ended design processes, while demanding they reflect on the needs, perceptions and behaviors of diverse others.

Background

The civic world is rapidly changing in response to the affordances of the digital age, which ushered the rise of participatory civics: interactive, loosely structured and collaborative modes of civic action (Benkler et al, 2015; Bennett & Segerberg, 2012; Zuckerman, 2014). Coupled with a decline in traditional measures of civic participation such as voting and membership in political parties, these shifts have led researchers and educators to seek novel forms of civic education which will increase its effectiveness and prepare students for the evolving civic sphere (Kahne, Hodgin, & Eidman-Aadahl, 2016). Though still a nascent field, video games have been presented as a ripe setting to offering students an engaging, situated and participatory form of civic education (Bachen et al, 2015; Lenhart et al., 2008).

Broadly defined, research on the civic contributions of video games has focused on two central educational mechanisms: games that present *content* relevant to the civic sphere, and games that facilitate civic *interactions*.[1] Civic content games – both educational (e.g., People Power) and commercial (e.g., SimCity) – offer players opportunities to engage with civic issues from social

1. These categories are in no way mutually exclusive; "civic content games" can simultaneously facilitate civic interactions. Yet, in practice, games that combine the two are rare.

inequalities to global warming in a situated and complex manner (Waddington et al, 2014). Civic interaction games, most notably MMORPG (e.g., World of Warcraft*)*, are not characterized by civic content matter but rather offer players settings in which they engage in simulative civic interactions (Steinkuehler, & Williams, 2006; Curry, 2010). Therefore, we contend that civic interaction games offer a digital version of Dewey's (2001) vision of democratic education as a process in which children develop "habits of democracy" through participation in a community (Stitzlein, 2014).

However, existing research has largely concentrated on examining civics in game playing, leaving out game making.[2] The academic advantages of game making are well documented: introducing youth to programming, integrating academic content matter, developing design skills and nurturing system thinking (Kafai & Burke, 2015; Hayes & Games, 2008). We propose that game making can concurrently function as a site for cultivating habits of democracy. While game playing allows overcoming the often passive nature of classroom instruction, collaborative game making endorses learning that is not part of a carefully designed space, situating youth as shapers of their (physical and virtual) environments, much like citizens in a democracy. Therefore, game making is particularly suited for cultivating habits attuned to the emerging forms of *participatory civics*, defined as "interactive, peer-based acts through which individuals and groups seek to exert both voice and influence on issues of public concern" (Kahne et al., 2016, p. 2).

In this paper, we offer a conceptual analysis of the unique attributes of collaborative game making as a context for developing habits of participatory civics, and illustrate our arguments using case studies from a game making workshop.[3] We conducted a pilot study with 13 high school freshmen who in small groups designed collaborative controllers for simple games using Scratch, a youth-oriented programming platform and MaKey-MaKey, a small USB device that connects to conductive materials and transforms them into touch-sensitive buttons (Silver, Rosenbaum, & Shaw, 2012). Our analyses focused on the unique aspects of participatory civics identified above by Kahne et al. (2016). Accordingly, the research questions guiding this inquiry are: (1) To what extent can the interactions characteristic of collaborative game making cultivate the habit of participation in interactive peer-based acts? (2) How can the other-oriented design demanded in game making contribute to participation in civic action towards issues of public concerns?

Theoretical Framework

The rising prominence of participatory civics has led to renewed interest in Dewey's (2001) conceptualization of civic education as cultivating democratic habits by "immersing individuals in practices of shared living where those habits serve their needs well" (Stitzlein, 2014, p. 68). Dewey (1922) emphasizes that democratic habits can only be developed if schools structure educational environments in which practicing such habits is an integral part of achieving students' aims. Distinguishing between mechanical and dynamic habits, Dewey argued that the former are a form of repetition, usually unconscious, and can be achieved through training while the latter are accompanied by critical reflection, which means they are reconstructed according to accumulated experience, and their cultivation is the essence of education (Hansen & James, 2016). We wish to concretize and contextualize

2. Marina Bers' (2012) research is an exception to this norm; however, Bers is interested in the civic interactions within the virtual realm, while we focus on the civic potential of the process of game making itself.

3. While we focus on the making aspect of our workshops, the distinction between making and playing should not be overstated. Commercial games have been blurring this distinction by offering players more opportunities to actively design parts of the games they play in (Kafai & Burke, 2015).

this framework by outlining how the cultivation of contemporary forms of civic action – *habits of participatory civics* – can be pursued in a specific setting – collaborative game making.

This inquiry is rooted in the fact that the constructionist approach to learning is in essence civic – defined by an emphasis on social participation in creating public artifacts (Kafai, 2006; Papert, 1980). The common thread in the various approaches to learning through crafting and design is the emphasis on the three complimentary components of this activity: defining the ends of the design process, formulating potential solutions, and critically (and iteratively) carrying out the practical steps necessary to achieve these solutions (Horn, Crouser & Bers, 2012; Kolodner, 2002; Roth, 1996). A similar set of challenges faces citizens in today's civic sphere: identifying the problems they think are worth tackling, coming up with possible solutions, and implementing the required means. More specifically, the modes of experimentation and failure characteristic of game making are particularly attuned to the emerging forms of participatory civics: a collaborative, self-directed, open-ended and nonlinear process in which both the goals and the methods utilized to achieve them are largely determined by participants (Ratto & Boler, 2014; Stokes, 2012). Moreover, game making facilitates opportunities for practicing civic interactions in the virtual realm. Several game making platforms are structured around online communities of users who share, remix and comment on projects (Kafai & Burke, 2015). These communities are crucial as an increasing portion of participatory civics is pursued online (Kahne at al., 2016).

Finally, games are public artifacts – created with the intent of being used by others. Therefore, game making develops the foundation for public thinking: collaborating on projects which are created in light of the needs and desires of others. As famously noted by Piaget (1997), games are central spaces for children's moral development. In games, children encounter rule-systems under a relative lack of adult supervision and develop the capacity to comply, interpret and negotiate these rules. In this vein, we contend that establishing an interactive rule system which governs the social interactions within the game space demands a complex form of perspective taking: reflecting on the perceptions, motivations and behaviors of future players as they develop over time across a host of possible choice sets (Flanagan & Nissenbaum, 2014; Salen & Zimmerman, 2003). Most importantly, in game making reflection is endogenous to the decision making characteristic of the attempt to make a successful game, rather than an external element added in retrospect (Kafai & Peppler, 2014). Assessing the perspective of others, and planning projects accordingly, is an invaluable step towards cultivating the habit of effective participation in issues of public concern (Ben-Porath, 2012; Mutz, 2006).

Context

Participants

We designed and conducted a "collaborative controllers" workshop for 13 high school freshman (five girls, eight boys ages 14-15 years) situated in a metropolitan city in US northeastern state. This workshop was the second of a series of workshops intended to explore the potential of game making to nurture habits of participatory civics. Students participated in this workshop as part of a partnership their school has with a local science museum. One instructor led workshop activities, while another assisted with data collection. Participants reflect the demographic makeup of the school: 46% African American, 33% White, 10% Latino, 9% Asian/Pacific Islander, and 2% other; 49% of students were eligible for free or reduced lunch.

Workshop Activities

The workshop ran for a total of 16 hours over eight weeks. Utilizing the Makey-Makey's ability to connect to the computer and transform conductive materials into touch-sensitive buttons, teams created physical controllers which demanded collaboration among players in order to close an electric circuit and control the game on-screen. The choice to require participants to design collaborative controllers was intended to elicit reflection on the game mechanics by deviating from the standard individual and competitive model of controller use. Teams started by designing controllers for the classic video game Pong. For later projects, students were taught the basics of Scratch programming, remixed video games of their choice and created collaborative controllers. Teams presented their final projects in an arcade in their school, offering their peers outside of the workshop an opportunity to play with the games they created and provide feedback.

Data Sources and Analyses

Group interactions were documented in observational field notes (taken by a second instructor) and via video recordings focused on group work. These observations were supplemented by students' weekly reflections, emergent interview opportunities, and semi-structured debriefing focus groups. Finally, we conducted a descriptive review of participants' games relying on groups' Scratch code, videos recording their progress, play-testing sessions and set-up of final projects. Using these data sources, we developed two case studies that best illustrated the relevance of game making to the cultivation of habits of participatory civics. We focus on the final projects of two of the three groups, which were prepared over three sessions and then presented at an arcade in the school.

Case Studies of Participatory Civics in Game Making

We present two cases to illustrate how collaborative game making can potentially cultivate one of two habits of participatory civics: interactive peer-based participation and pursuit of issues of public concern.

Blaze It – Interactive Peer-based Participation

The Blaze It group consisted of six participants (three boys and three girls) from diverse backgrounds, which were largely not familiar from earlier contexts in the school. This lack of familiarity and a foundation of shared interests proved particularly challenging in identifying and setting the goals the team wished to pursue. In contrast to three earlier shorter projects, in the final project participants were not offered any limitations beyond the need to create collaborative controllers. As a diverse and unfamiliar group, this group struggled with setting their own goals. This was particularly notable at the brainstorming stage in which members were dumbfounded to even begin, and seemed openly frustrated. Maria (all names are pseudonyms) later summarized:

> "When we were first getting started, we were all pretty, I don't know, we didn't have a lot of ideas, and um, it took a while to come up with something that we all wanted to do… we spent a whole class time I think just kind of sitting in silence."

The challenges characteristic of a collaborative, nonlinear and open-ended process was a constant theme in the team's work. Blaze It's struggles in creating their controllers illustrates this point. The group's choice of controllers based on tilting water (see table 1) was creative yet technically challenging, and the group encountered a consistent problem of lagging controllers. The group engaged in an iterative trial and error process, tinkering and improving the controllers, as Natasha notes:

> "With the trial and error… we did see so many ways that it could go wrong and we found so many ways to improve it, and um, like, with each trial we saw, um, I don't know, like, things we could take from it… I think it made our design better at the end."

The cyclical and collaborative process of tinkering and play-testing was very insightful from a civic perspective – offering a glimpse into the challenges characterizing a peer-based and self-directed process of production. Maria later stressed the communal aspect of these struggles: "I learned by seeing what other people were thinking". Jennifer elaborated on what this process had taught her:

> "For me, it was like, I am not good at thinking ahead… if I do something it's like, yeah, that's it… I finally thought ahead during the actual arcade… it was thinking in the future, I know it's just a basic human thing, but I don't have it all the time."

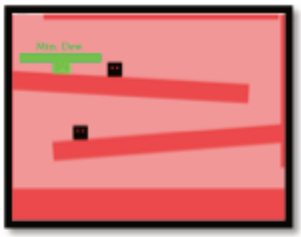
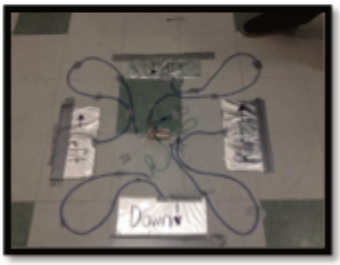
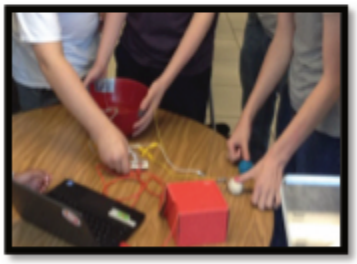
	Potato Hunt	Blaze It
Video game design		
	Remixed the Scratch "monkey game": designed new characters and recorded original sound effects, changed the code in order to allow improved control, added a timer and instructions.	Remixed an existing Scratch side scrolling game: adapted the game's difficulty, changed the game's aesthetics and sound effects according to the game's new "drug dealer" theme, and added instructions.
Collaborative controller design		
	Created a "ring around the rosy" themed controller: players had to run in a circle around the controller while holding hands, and step on the conductive pads indicating the direction they wished the character to move (one player was connected to the Makey-Makey in order to close a circuit).	One player controlled character movement by tilting a water filled bowl in the desired direction; allowing the water to touch conductive wire and close a circuit. A second player was in charge of shooting by simultaneously touching two Play-Doh balls and closing a circuit.

Table 1. Teams' final projects: video game and collaborative controller design.

Potato Hunt – Issues of Public Concern

The challenges encountered by the Potato Hunt group illustrate another civic aspect of game making: nurturing participants' habit of acknowledging diverse perspectives and partaking in public projects in light of these. In contrast to Blaze It, Potato Hunt members (two boys and two girls) were all friends prior to the workshop, which was reflected in high levels of collaboration and creativity in projects related to their shared everyday interests. Where other teams tended to work until the game reached the required levels of functionality, Potato Hunt constantly tinkered with their game in an attempt to improve it. Sarah, a group member, describes:

> "We worked really well as a team together… we kicked around ideas and no one idea's was really like disregarded, or like, that's stupid… we always built upon them and we just worked well."

While their game was highly successful in internal playtesting sessions, boasting unique game mechanics, advanced coding and polished visual and audio effects, their experience in the arcade in their school were drastically different. The group only recruited players for 10 minutes of play in contrast to Blaze It which drew a steady crowd of players for the entire 45 minutes. When reflecting on this state of affairs group members (accurately) acknowledged the game's high barriers for participation which included taking off shoes and holding other players' hands:

> Emily: "The game was a good idea, it just might have been a little too active because it was a bit hard and a lot of people weren't comfortable with what they had to do."
>
> Sarah: "The other games seemed popular because they didn't require as much physical activity and also you had to take off your shoes for the game we created."

When explaining why they might have not considered these barriers beforehand, they state:

> Sarah: "Because we were all pretty comfortable with it, because we were all, um, awesome."
>
> Emily: "I also probably think it's their fault because they suck."

This failure exposes how game making potentially creates a tension between the designers' needs and desires and those of future players. In the process of creating a successful game, designers are demanded to consider and analyze the game's rule system from the perspective of diverse future players, which might be different and even contradictory to their own. In the case of the Potato Hunt group, the feedback from the arcade allowed them to assess aspects of their game they were unable to think of during the initial design and playtesting. We now turn to explore what the experiences of the two groups illuminate concerning the potential of game making as an activity that cultivates habits of participatory civics.

Discussion

This study offered an exploration into the potential of game making as a site for developing habits of participatory civics while concurrently pursuing academic ends (in this case – computer programming and design thinking). As stated, the emergence of participatory civic demands citizens to take part in loosely-structured and collaborative action geared towards public, rather than private, ends. From a Deweyan perspective, this requires schools to offer youth comparable environments in which they can practice and cultivate such habits. Moreover, for the practice of such habits to have enduring effects, they

cannot be limited to explicit civic lessons and must characterize the school environment more broadly (Dewey, 1909). Consequently, it is important to explore other academic settings in which such habits can be nurtured.

Two aspects of game making seemed particularly conducive to habits of participatory civics. First, the ill-structured, non-linear, collaborative and iterative nature of game design is reflective of the challenges of the evolving peer-based and loosely structured sphere of participatory civics (Stokes, 2012). While Gee (2010) argues that games are "pleasantly frustrating", striking the balance between challenge and "doability", game making offers a crucial form of frustration characteristic of participatory civics – that of collaboratively tackling a self-guided process which lacks external structure that ensures success, as Ben succinctly stated during Blaze It's brainstorming: "UGH! This is so painful." However, these struggles are vital if students are to cultivate the habits of setting their own goals and striving to pursue them. A whole session in which participants tentatively brainstorm (as described above) might be perceived as a waste of time when viewed from the perspective of progress towards manufacturing a final product. However, from the perspective of cultivating habits of participatory civics, this is exactly the sort of experience lacking from many educational projects in which the teacher, or the game designer, guide the broader aspects of the project. The failures and iterations in the process of solving the controller problems, had vital contributions ("thinking in the future") that are compromised when students are offered a structured solution to the problem, or when educators take the lead in an attempt to save time or ensure a better final product.

Second, the reflection demanded to make a well-designed game encourages elaborate and sophisticated forms of perspective taking: analyzing the game's rule system according to the motivations and behaviors of future players (Flanagan & Nissenbaum, 2014). Whereas game playing can situate players in roles and interactions characteristic of the civic sphere (Curry, 2010), we suggest that game making can add another layer to the simulative civic role of games: providing students with the expectations and roles characteristic of active citizens working collaboratively to shape social environments. In this respect, game making can serve as a first (and intrinsically motivated) step towards developing public thinking: examining one's actions from diverse perspectives. While due to the workshop's length, members of Potato Hunt did not have an opportunity to implement the lessons they learned from their failure, their experiences explicate the unique perspective taking afforded in games. In contrast to most educational projects that are evaluated by a teacher, or by their ability to fulfill a certain function (e.g., programming a functional script), games are an other-oriented project which are assessed according to the reactions of diverse peers. Practicing the habit of viewing their projects from multiple perspectives, and designing it accordingly is not an intellectual exercise divorced from the activity, it is at the heart of learning to make well-designed games. Importantly, when accompanied by opportunities for play-testing, game making offers experiential and real time feedback concerning the projects' weaknesses and strength, one that is likely to have a more lasting effect than after-the-fact comments offered by an instructor. Therefore, game making does not only facilitate opportunities for perspective taking, it also increases the motivation to do so.

In summary, this workshop allows identifying two vital characteristics of game making as a context for practicing habits of participatory civics. To begin with, it is important to structure game making as a collaborative and self-directed activity. Students need to be offered the time and freedom to set their own goals, and to struggle with the iterative process of making their vision a reality. While this often results in stretches of time in which students do not demonstrate any visible progress, and might jeopardize the quality of their products, it offers challenges and experiences vital for participation in

today's civic sphere. In addition, designers should be offered meaningful playtesting opportunities. One of the important civic aspects of game making is that it affords youth opportunities to create work intended for the use of others. Students are not attempting to fulfill a predetermined goal set by a teacher, but rather to appeal to a diverse set of interests, perceptions and motivations. This can only come into play if students experience firsthand the ways in which players interact with the games they have created.

While this inquiry is still at an early stage, it points out avenues for future research. First, one of the central advantages of game making in nurturing collaboration is the opportunity to offer students opportunities to collaborate not only with their classmates, but also with members of the virtual Scratch community (Kafai & Burke, 2015). Future research could explore how game making may concurrently nurture larger networks of collaboration; in line with the increasing importance of online collaboration in the civic sphere (Bennett & Segerberg, 2012). Second, as implied by their name, habits of participatory civics require a prolonged process in order to develop into ingrained modes of behavior. Hence, future research could also explore how such habits develop over an extended period of time, while simultaneously considering the learning gains of this activity. In this respect, we see this paper as a small step in the journey towards better realizing the civic potential of game making.

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