Wicked Play: Wicked Problems, Designerly Citizens, Design Games

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Abstract: Design games are playful spaces that invite and require participants to think like designers as they navigate design challenges centered around broken games as objects-to-think-with. We argue design games thematically aligned to real-world wicked problems may help develop players' capacity to engage wicked problems as designerly citizens, citizens who view the world as designs in progress, upon which they can exercise their designerly agency in pursuit of the equitable distribution of social goods.

Introduction

The world is full of wicked problems, problems so rife with complexity and so enmeshed within broader problem-solution ecologies that defining them—to say nothing of solving them—is a challenge of paramount difficulty (Buchanan, 1992; Jordan, Kleinsasser, & Roe, 2014; Rittel & Webber, 1973). At perhaps no other time in human history has the human species faced such wicked problems as it does today. These wicked problems (e.g., the global climate crisis, the assault on the democratic institutions of nations the world over, the systematic marginalization of nondominant communities) are becoming all the more wicked in a world of ever-increasing social and technological complexity. Furthermore, these wicked problems develop, persist, and must be confronted along hitherto inconceivable scales of time and space, making them even more difficult for the human brain to make sense of—to say nothing of addressing them with any level of solidarity or coherence (Kahneman, 2011; Marshall, 2015). Nevertheless, the task of addressing such wicked problems is perhaps more pressing now than ever before.

Some have taken a playful approach to the adaptive problem of organizing for the social change required to confront these wicked problems. Digital games, in particular, have been a favored approach in the learning sciences community for some time. One genre of such games are games for change. Sometimes called serious games, these are games "created not simply to entertain, but to promote positive social change and help solve the thorniest problems in the world" (Burak & Parker, 2017, p. xxi). One such game is *PeaceMaker*, a game for change that situates players as decision-making agents within the Israel-Palestine conflict, in which players make decisions to avoid further conflict and move the contentious parties towards a peaceful resolution of a decades-long conflict fraught with wickedity and complexity.

But while such games leverage constructivist learning principles to bring acute awareness to important issues, they may be overspecialized to particular learning goals and social issues. This is because games designed to facilitate social change in particular arenas are necessarily limited in scope to the specific social issues they seek to address. Though the issues such games take up are indeed often wicked in nature, their wickedity is rarely baked into games' mechanics, which after all, is what determines what a game is truly *about*, and therefore what players learn from them (Hunicke, LeBlanc, & Zubek, 2004; Johnson, 2011). For example, games typically reward players for solving more narrowly defined problem sets along predetermined problem-solution pathways, while wicked problems, by definition, are difficult to frame and elude definitive solution sets. For example, wicked problems by definition have no correct or definitive solution, while games typically reward players for solving more narrowly defined problems in ways determined by the designers. Furthermore, the resource and time constraints associated with making digital games renders making a new game for every social issue altogether impractical.

We take up here a three-pronged proposition. Our overarching purpose is to argue for a form of playful learning—what we call Design Games—specifically designed to situate players as decision-making agents within a context built around confronting wicked problems. Second, we argue such games highlight and facilitate the development of a promising new conception of citizenship anchored by designerly thinking—what we call Designerly Citizenship. Third, we argue designerly citizenship, as an explicit learning goal in P-20+ education, is a promising way forward for attending to the world's wicked problems through the work of professional educators, and that design games, as part of an approach anchored in preparation for future learning (Bransford & Schwartz, 1999; Schwartz & Arena, 2013), may be one tool for forwarding this agenda.

To attend to our proposition, we present data from gameplay sessions we conducted in our research to explore the potential affordances of design games. We begin first by discussing the nature of wicked problems and the role designerly thinking—properly democratized across local, national, and global citizenry—might play

in confronting them. Additionally, we outline our vision of designerly citizenship as one promising way forward in achieving such democratization of designerly ways of thinking, knowing, and doing, and we conclude this introductory section with an explication of design games and how they may fit into the agenda we forward here.

Designerly thinking and wicked problems

There are many definitions of design (Warr & Mishra, 2019). Simon (1969) described design as the process of rational decision making by which endeavors to change a thing from what *is* to what *ought to be* by devising "courses of action aimed at changing existing situations into preferred ones" (p. 111). Cross (2006) contended design is a specific way of thinking with "its own distinct things to know, ways of knowing them, and ways of finding out about them" (p. 1). Schön (1992) also conceptualized design as an epistemology, one based on the union of thought and action. Importantly, we take Cross and Schön's conceptions of design, between their emphasis on distinctive ways of knowing, doing, and being in the world and marriage of action to constitute a *D*iscourse (Gee, 2018).

'Designerly thinking' is typically associated with attempts to describe and theorize the practice of professional designers (Johansson-Sköldberg, Woodilla, & Çetinkaya, 2013). We take up the term not so much for its association with the design profession, *per se*, but rather to align ourselves to the scholarly tradition of seeing design as a complex, flexible, situated, and social process. As Dorst and Cross (2001) point out, accomplished designers quickly assess the affordances and constraints of their design context, move rapidly and reflexively between different ways of thinking about problems and solutions, and remain focused on generating solutions. We acknowledge, too, another body of design literature focused around the term 'design thinking' (Stanford d. school, 2018). This literature focuses on developing design capacity among those not formally trained as designers. In a sense, design thinking then becomes a simplified version of designerly thinking, which others have pointed out may reduce the complex, flexible, situated, and social process of design to a decontextualized 'toolkit.' Nevertheless, we acknowledge what is, in our view, at least one primary benefit of this approach, that this simplified version of design processes more readily lends itself to democratization.

Properly democratized across a citizenry, the unique ways of knowing, doing, and being attributed to the design community may offer promise in confronting the kinds of wicked problems we identified earlier—the global climate crisis, the global assault on democratic institutions the world over, the institutional marginalization of nondominant communities (Bang & Vossoughi, 2016; Gutiérrez, 2018). Rittel and Webber (1973) defined wicked problems as those that elude definitive formulation and have no clear criteria by which to judge their completion. The solutions to wicked problems are neither true nor false, but rather good or bad in a "goodness-of-fit" sense; nor can these solutions be immediately tested or ultimately decided upon with any finality. Every solution to a wicked problem is a "one-shot operation," because every attempt at solving a wicked problem is simultaneously an attempt to (re)define it and counts significantly; that is, there are no soft attempts at solving wicked problems, as every attempt necessarily causes the problem to evolve and take on a new shape and substance (p. 163). Wicked problems cannot be engaged by exhaustively enumerating their possible solutions, as there is no "well-described set of permissible operations that may be incorporated into the plan" (p. 164). Every wicked problem is essentially unique and should furthermore be considered deeply intertwined within a broader ecology of many other problems. Further complicating efforts to address wicked problems is their reflexive nature; the problem itself—its form, how it is understood, and the range of viable solutions that might be applied to it—is wholly dependent on how it is framed. Importantly, the stakes of wicked problems are high; every attempted solution has real consequences for those entwined within and affected by the problem. As Rittel and Webber pointed out, members of the scientific community are not blamed "for postulating hypotheses that are later refuted… In the world of planning and wicked problems no such immunity is tolerated" (p. 167).

Designerly citizenship

We seek in this section to make clear the underlying assumptions guiding our view of designerly citizenship and to provide succinct illustrative examples to make the idea intuitively transparent to readers. We believe a succinct and clear definition will suffice for the purposes of the present work, and we therefore do not explicate in depth here a comprehensive conceptualization of the idea. For us, designerly citizenship is a way of viewing ourselves and others as members of a community of co-citizens. Each member has a seat at the table when decisions about the distribution of social goods are taken up, and together, these members agree to see the world as an historicized artifact—the result of the confluence of (re)designs in progress in constant flux and always in contention. A designerly citizenry shares a civic responsibility to recognize their own and others' designerly agency vis a vis the choose-able options arrayed before them. When we say designerly citizens share a civic responsibility, we mean they have a personal responsibility as part of a collective. Designerly citizens are personally—but not individually—accountable for designing the world that could and ought to be.

Recognition is not enough, however, as designerly citizenship relies on citizens taking real action, exercising their designerly agency to (re)design the world and the tools, materials, and structures within it in pursuit of a shared common future. To this end, designerly citizens view their own and others' choose-able options through a designerly lens; that is, they consider the choices they make as consumers, political activists, and social beings as 'votes,' the accumulation over time of which become bids for the kind of world they envision for themselves and others. As such, designerly citizens recognize their votes and bids as explicitly political acts. By political we mean that the distribution of social goods, those things generally considered by society to be good to have and bad not to have (Gee, 2018), is always at stake when making design choices. Designerly citizens not only recognize this—they embrace the opportunity to design a world that more equitably distributes social goods like dignity, access to clean air and water, and autonomy over one's body and destiny.

Design games

That games and play provide valuable opportunities for situated, consequential learning is by now a time-tested view in the learning sciences community (Gee, 2003; Gresalfi, Barab, & Siyahhan, 2009; Squire, 2011), though designing games for overtly educational purposes is challenging. Gee (2003) offered an early summation of the ways in which good games embed principles of good learning within gameplay, including offering players the opportunity to perform prior to developing competence, embedding interesting problems within gameplay, and supporting a flow state (Czikszentmihalyi, 1990) for learners as they engage interesting, well-sequenced problems. Conceptually integrated games brought games for learning squarely into the fold of the academy, seeking to marry the principles of good learning found in good games with the disciplinary conceptual tools valued within traditional learning environments (Clark & Martinez-Garza, 2012; Sengupta, Krinks, & Clark, 2015).

The idea that games might be used to teach about design, specifically, is also not new (Habraken & Gross, 1988; Iversen & Buur, 2002; Zimmerman, 2008). What *is* new, however, is the view that design games might operate as conceptually integrated games, with designerly thinking processes baked directly into the mechanics, dynamics, and aesthetics (Hunicke et al., 2004) of a game complete with the traditional accoutrement of games—for example, clear goals and competition and/or cooperation in pursuit of win states (c.f., Iversen & Buur, 2002). Such a conceptually integrated design game would situate players within the cognitively and socially contextual work of design around a legitimate design task. In the next section, we outline the task-participant structure (Sandoval, 2014) we used to make this vision of design games a reality.

Mode of inquiry

The present study grew out of a larger one grounded in principles of design-based research (DBR) (Design-Based Research Collective, 2003). The initial project focused on how design thinking capacities might be developed at the intersection of Making and game design. Findings from the first stage of this work included a complication of the linear 'toolkit' model of design thinking as one that is recursive and fluid in nature, insight into the kinds of pedagogical assumptions and 'teacher moves' required to teach design thinking through game design, and how participant talk may represent an undervalued and underutilized means of assessing developing designerly abilities. The second phase of the present research focused on how previous participants' incomplete game-making artifacts, or 'broken games,' may offer unique affordances for learning to think like designers. Broken games are incomplete games—missing or ill-aligned mechanics, lack of clear rules, etc.—which participants must 'fix' as part of a larger task-participant structure: design games. Broken games function within design games as objects-to-think-with (OTTW) (Holbert & Wilensky, 2019); that is, in design games, players take on the role of player-designers, who must (re)design the broken game to align to pre-established learning goals. This shift in the task-participant structure of design games, with broken games at their heart, creates a playful game space in which novices, who are not steeped in professional design discourse and have no intention of becoming professional designers themselves, are immersed in designerly thought and activity as embedded in the gameplay.

Our design games share three characteristics with previous conceptualizations of design games more broadly: (a) collaborative design, (b) interplay between real and imagined designs, and (c) tangible game materials (Vaajakallio, 2012). Nevertheless, as noted above, our design game intentionally adapts the larger participant structure to more closely resemble conventional notions of a game. For example, players' goal is to work together to make the broken game playable by the end of a 45-minute session. Findings from the second phase of the present project clearly indicate the task-participant structure of the design game invites and requires players to practice designerly thinking skills by exercising their designerly agency. In this third phase of the project, however, we focused on the extent to which participants' design talk may align (or not) with our notion of designerly citizenship.

The present work draws on data from a larger corpus gleaned from 18 participants of several design game sessions conducted in our games lab. While each design game session utilized the same task-participant structure

outlined above, multiple broken games were used as the focal OTTW of the sessions. For the purposes of this paper, we draw on data from one game in particular: *Pollutaplop*. *Pollutaplop* is a game about the water systems of a metropolitan area of the American South West designed by a group of high-school students during a summer games design workshop as part of an early stage of this project. Broadly, the game focuses players around two goals—one individual, one cooperative. *Pollutaplop*'s game board (see Figure 1) separates the larger water ecosystem into up to six hexagonal areas. Individually, players win the game by collecting 'pollution,' pink plastic pieces players extract from their individual hexagons. The game cannot end, however, until all the pollution is collected from the game board, which, along with the Action, Event, and Disaster cards, introduces a collective—if not altogether cooperative—element to gameplay. As will be outlined in the Results section, this mechanical ambiguity served a rich source of opportunity for participants to engage in designerly citizenship talk.

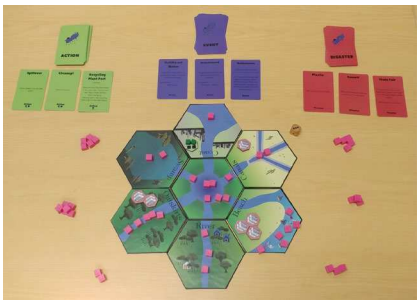

Figure 1. *Pollutaplop*, a game about complex water ecosystems, pollution, and action.

Data collection and analysis

We audio and video recorded participants' gameplay, which was then professionally transcribed. We then coded participants' talk in multiple stages. First, we conducted multiple readthroughs of the transcripts to immerse ourselves in the data (Tesch, 1990). We then leveraged descriptive coding to identify the topics of participants' design talk during gameplay (Miles, Huberman, & Saldaña, 2019). Next, we reorganized the transcripts into like-topic stanzas (Gee, 2018). We then combed through the stanzas to identify utterances that aligned to our conception of designerly citizenship talk. Namely, we looked for talk in which participants made sense of the game and their goal to (re)design mechanics that aligned to a learning goal contextually situated in the real world. In particular, we looked for talk that exemplified one or more of the following elements of designerly citizenship as we currently conceptualize it: (a) personal accountability, as part of (b) a larger sense of the collective responsibility of co-citizens; (c) acknowledging the world as designed by the accumulated confluence of human decisions that shape the social, political, and material world, in which participants possess (d) designerly agency; (e) viewing one's own and others' choose-able options as (f) bids for the world that could and ought to exist.

Results

Due to space, we are limited here to only a handful of exemplar interactions illustrating how participants engaged in what we consider designerly citizen conversations. Nevertheless, the larger findings indicate to us that conceptually integrated design games offer a promising means of preparing future generations as designerly citizens able to contend with wicked problems. We posit here three design elements of design games that may shape this affordance: (a) game mechanics and the (mis)alignment thereof to the learning goal(s) at hand; (b) the dialogical nature of the task-participant structure, as well as that of the complex system of the broken game as OTTW within the design game; and (c) the purposeful selection of the game's theme to reflect a complex, real-world occurrence. Importantly, each of these design elements work together recursively as part of a complex system. Therefore, we present one condensed stanza and discuss each of the above elements in relation to it. Additionally, we offer comments participants made during the post-activity debrief in an effort to offer an additional window into how the design game elicited thinking like designerly citizens. We begin with Table 1, which shows a condensed stanza of participants' talk around the question of the simultaneously competitive and cooperative win states of *Pollutaplop* and how they align (or not) to the real-world wicked problem of confronting pollution in a complex world. Prior to Line 1 of the stanza, the players had taken up the issue of where to place (in the middle of the game board) and how to use the recycling plant the original designers had included in the game. The recycling plant was intended as a cooperative element of the game, one which drove home a core learning goal of the game: recycling is one important means by which to attend to pollution.

Table 1: Thematically condensed stanza: Aligning mechanics to meaning in *Pollutaplop*

Line	Speaker	
1 2	Alex	Yeah, I think it's got to be the middle. But I mean, we're never going to build it at this point, because it doesn't help us.
3 4	Landon	Yeah, that's true. The only thing that helps us is taking stuff from our own, as far as we've determined.
5 6	Melissa	Wouldn't it be better if it was cooperative and we were just trying to clean a game world. But that's fine.
7	Landon	Yeah. It's a weird mix… It's a weird mix of competitive and cooperative.
8	Alex	How would we change that?
9 10	Melissa	So, it's basically all of the cards where—it's us working together to clean everything. So, these event and disaster cards would be more applied to everything.
11	Landon	Instead of just on one. You fight the game.
12 13	Melissa	And maybe suggest that as a change [to the game]. That also is more on theme with pollution. You should be working together.
14 15 16	Alex	Well, but is it, though? With real government agencies. No… I feel like, there almost should be a money-making point of it too. There's no benefit for us to have a factory. Also, none of us have had any factories except you've had one for one turn. The factories are pretty useless.
17 18	Landon	Well, and they don't get added frequently enough for it to be a thing for you to care about. And even if they are just adding more pollution, there's just more points for you to get.

In Lines 1 and 2, Alex is noting how the mere presence of a recycling plant in the game does not on its own mean much to players. He noted none of the players in their gameplay session had thus far put any effort into erecting the plant, because doing so would have reduced the amount of available pollution players could collect (readers will remember the individual win state of *Pollutaplop* is to gather the most pieces of plastic). This realization led the players to note, beginning in Line 3, a drastic misalignment between the game's core mechanics and the social-change goal of the game. In Line 3, Landon notes how the game's mechanics focus players on individual—rather than collective—action. We view this revelation as important for developing notions of designerly citizenship, as it gives players practice viewing the world in terms of designed interactions that afford and constrain some kinds of thinking, being, and doing over others, a crucial element of designerly citizenship.

In Line 5, Melissa points out mechanics that encouraged cooperative play would make more sense and align more tightly to the real-world wicked problem represented in the game, a sentiment she comes back to in Line 12. We view this as an example of the players going beyond merely pointing out logical misalignments between the game's mechanics and the real-world solutions to the wicked problems represented therein, to actually imagining a new state of affairs that *would* more accurately reflect reasonable approaches to the solution of real-world wicked problems. Furthermore, Melissa's dialogical work in this part of the stanza highlights how the give-and-take, 'conversational' nature of the design game invited and required Melissa to do such thinking, thereby practicing crucial elements of designerly citizenship.

In Line 8, Alex's framing of a 'how' question (and not, for example, an 'if' question) helps demonstrate the players' sense of their own designerly agency and their ability to take action as player-designers. Landon takes up Alex's point about designerly agency in Line 11 and suggests the mechanics might be modified to reframe the game—rather than fellow players—as the common enemy against which players might fight. Here, the design game's purposeful use of a real-world wicked problem—addressing pollution—is crucial to how players come to think about the task on the table, which we hope will in turn come to shape how players think about real-world wicked problems outside the design game space.

We now transition to using participants' talk during the post-game debrief as another source of data highlighting how the design game invited and required players to think like designerly citizens. First, when asked whether they recognized in their own lived gameplay experience the elements of designerly thinking we sought to elicit through the larger design game activity, participants were quite explicit in their agreement they had thought like designers:

> I think 'define' really came out in our game process. We were working through it, and we would come up with frustrations with the game and then we would try and figure out how we could change 'this' or improve 'that.' So, the 'define-into-ideation' process was really helpful.

Another participant added to the identification of definition and ideation, noting, "I feel like we also focused on empathizing a lot."

Additionally, participants made clear their view that the activity had positioned them to think in terms of matching the structural workings of the game to the goal of attending to the wicked problem of pollution. Echoing their in-game talk, the participants returned to the question of *Pollutaplop*'s mechanics and the meaning those mechanics communicated about how best to address the wicked problem on the table:

> If the game is about [addressing pollution]—which is the overall story—are we trying to make the world not polluted? Or are we trying to pollute other people and not us? If you were trying to make a game that teachers people how to fix pollution, the end goal should be everyone fixes pollution cooperatively—or something like that.

Importantly, participants also spoke about the wickedity baked into the mechanics of the larger design game:

> I think that we encountered all [the elements of designerly thinking]—the one we have not mentioned is the brainstorming of different ideas. We were trying to figure out how to make it more challenging, or how to make it fair—how can we get to the end goal, but also fully process the game?

This shows how players were not only invited to think about the interconnectedness of problems and solutions, but that they were in fact required to do so in order to move through the design game experience.

Discussion and conclusion

To this point, we have forwarded three propositions. First, we argued for our conceptualization of design games as playful practice spaces for designerly thinking. Second, we suggested such design games may be promising tools for developing what we call designerly citizens. Third, we argued designerly citizenship ought to be considered as an explicit goal of P-20+ education in a world confronted with wicked problems. We believe the kind of conceptually integrated design game we have presented here holds promise for preparing future generations of citizens for future learning about wicked problems. In particular, we view the aim of developing designerly citizens as an important one which warrants additional theorizing and empirical research—particularly in the context of design games built to invite and require the kinds of dispositions for designerly citizenship we outlined herein. In particular, future research might address further development of the design game concept and purposeful measurement of design game players' preparation to learn about and contend with wicked problems.

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