

Expanding Assessment Practices with Educational Videogames

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Abstract: Many approaches to instructional design engage users in imagining possibilities for themselves and a community's view of the world in addition to showing or explaining that world to them. As a case in point, many videogames exemplify the idea that learning how to "be" a kind of person, or professional (e.g., soldier, doctor, thief), accompanies how to "do" the range of skillful practices associated with a particular discipline. However, whether and how these novel design affordances inform the study and practice of instructional design remains an open question. This essay explores specific opportunities for expanding assessment practices, particularly for formative purposes as players transition between and beyond educational videogame experiences. To this end, it considers information, evidence, and assessment with respect to educational videogames, attendant arguments for expanding assessment practices, one design that embodies these arguments, and implications of the work for instructional design.

Keywords: *assessment, video games, multimedia instruction*

*"[O]ur knowledge about how to conduct inquiry hangs on the same thread
from which dangle our best guesses about how the world is" (Laudan, 1996, p. 141).*

Introduction

Many approaches to instructional design engage users in imagining possibilities for themselves and a community's view of the world in addition to showing or explaining that world to them (Thomas & Brown, 2011); such approaches reflect the idea that "learning is a way of being in a social world, not a way of coming to know about it" (Hanks, 1991, p. 24). As a case in point, many videogames exemplify the idea that learning how to "be" a kind of person, or professional (e.g., soldier, doctor, thief), accompanies how to "do" the range of skillful practices associated with a particular discipline (Gee, 2005). Such videogames invite players to engage but, moreover, they often recruit deeper involvement and concern.

An open question revolving around educational videogames, however, is whether and how these novel design affordances inform the study and practice of

instructional design. As the empirical and conceptual adequacy of game-based and game-infused instructional models evolve, this essay explores one set of emerging opportunities to expand formative assessment practices, particularly as players transition between and beyond educational videogames experiences. The following sections therefore consider information, evidence, and assessment with respect to educational videogames, attendant arguments for expanding assessment practices, one design that embodies these arguments, and implications of the work for instructional design.

Information, Evidence, and Assessment

Instructional designs increasingly generate rich information but whether and how these data are enlisted as evidence of learning and measures of knowing remain open challenges. Addressing this challenge, a widely adopted assessment strategy called evidence-centered design (Mislevy & Riconscente, 2006)

underscores the importance of specifying conceptions of the very nature of knowledge in the targeted domain of an assessment. These conceptions are critical, in part, because philosophical, educational, and scientific traditions typically characterize the purpose and structure of knowledge differently and therefore locate evidence differently too. Moreover, conceptual distinctions likewise proliferate within any of these traditions. For example, research in education often characterizes three grand theories of knowledge (e.g., Case, 1996; Greeno, Collins, & Resnick, 1996). To ground this essay, I locate my exploration of the role of game-based assessment practices and the evidence it generates with respect to socio-cultural theory in education and its conceptions of the nature of knowledge.

There are several reasons why a socio-cultural perspective is a valuable resource for understanding and enlisting new assessment practices in instructional design. Socio-cultural views of the nature of knowledge strongly resonate with the approaches to learning and literacies that underlie the design of many commercial videogames (Gee, 2003). Both typically account for not only the nature of knowledge that is central to evidence-centered design but also the nature of being (e.g., Packer & Goicoechea, 2000). That is, knowing is an integral part of participation because it emerges through, and inevitably relates to, how and why one is involved (Lave & Wenger, 1991). Through this complementarity, socio-cultural views are also valuable because they expand what counts as assessment (Moss, Pullin, Gee, & Haertel, 2006). Taken together, the theoretical resonance and complementary approaches to design among videogames and socio-cultural theories open new possibilities for researching and practicing instructional design.

Of course, assessing knowledge discretely is already complex and beset with challenges. Assessing it relative to the variable ways that educational videogames organize participation and the equally variable ways that individuals participate in and around educational videogames immediately runs the risk of simply complicating matters further. However, an assumption underlying new possibilities at the intersections of videogames and socio-cultural theory suggests the opposite. That is, the affordances of immersive environments, such as multi-user environments like *SecondLife*, videogames like *World of Warcraft*, and other forms of interactive digital media, not only enable instructional designers to address both the nature of knowledge and the nature of being, but, moreover, good instructional designs enlisting these technologies and perspectives arguably demand it (Gee, 2003). Said differently, these learning and teaching systems cannot engage players in learning

and knowing unless they are also successful at involving them in the kinds of situations through which such knowledge has become and remains genuinely relevant.

With respect to evidence and assessment, videogames may also begin to productively advance intractable debates among scientific and philosophical traditions and between cognitive and socio-cultural grand theories in education. Such incompatibility has arguably plagued a science of learning since Thorndike's psychology of learning eclipsed Dewey's philosophy of learning (Lagemann, 2002, p. xi), and remains manifest in century-old research on knowledge transfer. The combination of videogames and socio-cultural theory provides new possibilities for rigorously examining not only a cognitive orientation towards what is in the head but also a socio-cultural orientation towards what the head is in (cf. Cole, 1996). With respect to assessment, one implication of these possibilities is a more robust consideration of how people transition from one situation to another rather than how knowledge transfers from one task into another. By re-solving how learning serves learners, educational videogames may serve a mutual re-alignment between particular assessment practices, general principles about information and evidence, and enduring theoretical tensions in instructional design. The following two sections develop and then embody an argument for expanded assessment practices, illustrating how designing for both the nature of knowledge and being can address, if not redress, the open challenges reviewed above.

Crafting an Argument for Expanding Assessment

Videogames often focus as much on learning how "to be" a particular kind of professional as they do on learning how "to do" the practices of a profession. They create opportunities to succeed (and sometimes fail) at what Gee (2005, ¶9) characterizes as "distributed authentic professionalism," providing distributed experiences through which players engage the authentic skills of professionals. However, players are not only engaged, they can also be, in a sense, involved or concerned. In this way, playing is increasingly similar to participation with the authentic value systems and identities of professionals as well as their attendant modes of subjectivity (Wenger, 1998). These epistemological and ontological entailments enable true professionals to actually create their professions and not merely enact established routines. Nevertheless, efforts to advance inspiring educational videogames in these ways less often strategize complementary assessment designs. Historically, validity arguments about the broader class of performance assessments reflected in this essay emphasize interplay among evidence and consequences. Messick (1994), for

example, underscores the importance of not only the knowledge, but also the forms of participation that reveal knowledge, as well as the kinds of situations that elicit it. Educational videogames offer powerful new affordances for relating performances and situations to knowledge and skills, and thereby supporting players in formatively understanding a profession. Therefore, the assessment argument is that educational videogames afford designers the ability to construct, embed, and integrate compelling transitions that illuminate how people link and separate participation across situations, both of which underlie opportunities to learn in and through game play. The twin qualities of doing science and being scientific, for example, require complementary and seamless design elements in order to assess players. To this end, the next section describes one science education environment in which knowing not only what students know about science but also what kinds of scientists they are becoming underlies assessment practices through considerations of people transitioning rather than knowledge transferring.

Embodying an Assessment Argument

In order to embody an assessment of distributed authentic professionalism, design must emphasize the performances that demonstrate

understanding, the situations through which they emerged, and, importantly, transitions that illuminate how player enlist new situations to navigate subsequent performances. To this end, an educational videogame that serves as a science education curriculum incorporated assessment practices that embody these three inter-related emphases. The videogame-based unit is called *The Taiga Fishkill Project*. It is a three-dimensional immersive environment organized around an elaborate narrative involving interactions with non-player characters that inhabit the fictive world. Taiga recruits players into a story about its riverscape and the ecological problems occurring there (see Figure 1).

Students assume the role of field investigators for whom various science concepts like erosion become key tools for exploring problems and developing solutions. Specifically, each student works to determine the cause of a declining fish population and then, through a process of socio-scientific inquiry (Barb, Sadler, Heislit, Hickey, & Zuiker, 2007), to enlist principles and practices related to healthy water quality in order to broker a satisfactory resolution. They must recognize the competing interests of a logging company, a farming community, and a sport fishing camp as they develop recommendations that can

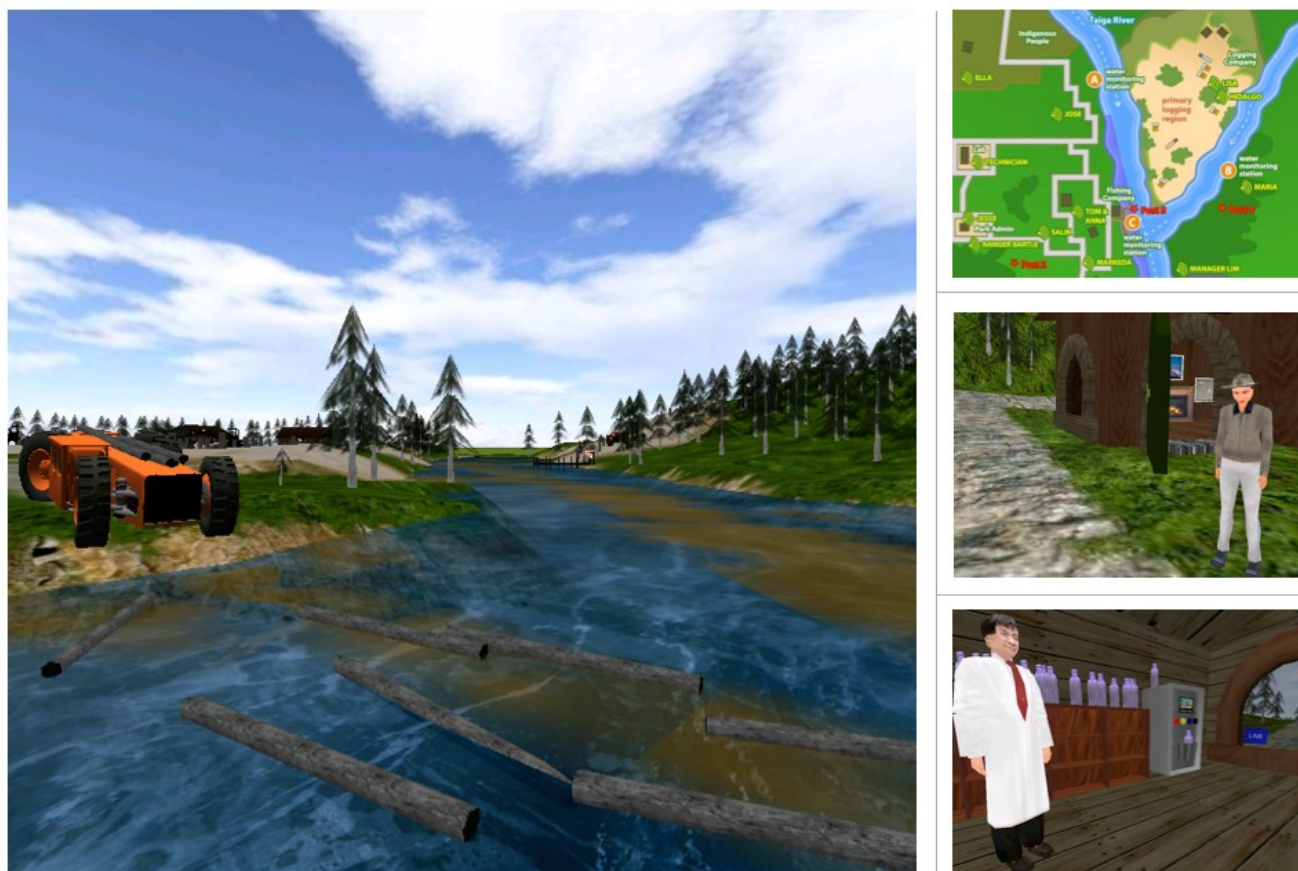


Figure 1. Screenshots of The Taiga Fishkill Project educational videogame

balance the interdependent processes of aquatic habitats and various human activities connected to them (Barab et al., 2007). Specifically, a park ranger recruits players to investigate the problem; players then hike through the park in order to conduct and synthesize stakeholder interviews; next they intern with a lab technician in order to collect and analyze their own water samples; finally they return to the park ranger in order to share their results and recommendations. Together, these and other design elements of the Taiga curriculum enable students to do science and be scientific along a trajectory of participation that begins to approximate the idea of distributed authentic professionalism in commercial videogames.

With respect to expanding assessment practices, Taiga also serves as a videogame design space for embodying the socio-cultural assessment argument for transitions. The assessment design leverages player progress from interviews and analysis to recommendations. Across the game, players encounter a series of transitions that organize complementary situations beyond Taiga. In these situations, doing science unfolds elsewhere but still in relation to the player's involvement in the Taiga narrative. For example, a non-player character associated with the narrative reveals to the player that he is working to resolve water pollution in a riverside city. The situation organizes "doing" science with respect to contrasting cases (i.e., urban versus forested riverscapes). At the same time, the character justifies the revelation in terms of how the player is "being" scientific, citing the player's choices and achievements in the game. This dual framing (i.e., doing and being) frames participation more expansively (cf. Engle, 2006) and induces presuppositions both about and beyond the Taiga problem. In other words, an instructional designer can frame these situational transitions with respect to how "being" a particular kind of professional informs ongoing efforts to "do" science beyond Taiga. In this way, transitions challenge players to transform practices as they also extend participation into new situations.

These transitions organize productive assessment practices for multiple reasons. First, transitions generate useful feedback in relation to deeply situated forms of participation. Second, transitions remain embedded in a trajectory of participation that makes them not only useful but used because they support a concrete, particular, and ongoing inquiry experience. Moreover, the expansive framing is also formative because it engages players in imagining new possibilities for themselves and a professional view of the world in addition to providing feedback that explains that world to them. In contrast, simply taking a player out of a videogame and dropping him or her into an assessment context is not only uncommon but

problematic for thinking "both beyond and about an immediate situation in more general terms" (Lave, 1993, p. 13). As a first study of expanding assessment practices with educational videogames, the Taiga design enabled me to juxtapose conventional assessment practices with the new possibilities afforded by videogames.

In a preliminary study of transitions, I considered how transitions that extend participation in the service of assessment compare to conventional quizzes that discretely bound learning and teaching practices from assessment practices (Zuiker, 2007). In this quasi-experimental study I specifically considered the same assessment questions enlisted in the service of contrasting assessment practices: transitions woven into Taiga game play and paper-and-pencil formative quizzes interleaving game play. In this way, the design enabled a discrete consideration of the relationship between the nature of knowing and being central to educational videogames and socio-cultural theory.

The results of this comparison were promising, but counterintuitive. To begin, I conducted a customary analysis of variance. It revealed no statistically significant differences, but this is not surprising given that the intervention in this study was modest. That is, the contrasting assessment practices in each condition constituted 20 minutes of a 600-minute curriculum, or about 3% of instructional time. Given these relative proportions, statistically significant gains would probably justify critique of the broader curriculum, rather than support for a relatively small intervention. At the same time, the nature of assessment suggests that the intervention should never amount to more than a relatively small proportion of instructional design. Research on the formative and summative purposes of assessment suggests that, while assessment matters, how assessment is enlisted matters more. This point characterizes a paradox attendant to the assessment argument presented above. That is, relatively small interventions such as transitions can reasonably be assumed to generate a cumulative effect over time; given this assumption, their ongoing use in instructional designs amounts to a cumulative process that would, over longer periods of accumulating influence, produce statistically significant results, which might not be detected over shorter periods. Abelson (1985) framed this problem as the variance explanation paradox and notes that it is the processes under which variables operate in the real world that matter, precisely the processes that videogames enable researchers and practitioners to design for.

In order to navigate the variation explanation paradox, Abelson (1985) recommends examining effect sizes. As I report (Zuiker, 2007), the relative effect size between conditions consistently favored transitions

embedded in game play over paper-and-pencil quizzes for three different separate learning measures. Taken together, the findings from this study are counterintuitive because a customary analysis of variance that initially appears conclusive may actually obscure more than it reveals, and promising because the relative effect sizes support the hypothesis that transitions constitute a cumulative process that, over time, yields statistically significant results.

Conclusion

This essay is not intended to be a conclusive argument, but rather suggestive of the broader opportunities at the intersections of assessment, videogames, and instructional design. The study presented above provides a means of supporting productive participation beyond the deeply situated contexts in which meaning emerges during education videogames. However, an enduring challenge for the study and practice of instructional design is to communicate both the explanatory value and the practical force of designs such as the idea of transitions, and to do so regardless of the technologies, media or even the theoretical framework. With respect to explanatory value, without meaningful evidence, productive communication among stakeholders may not be possible, underscoring mutual interest in expanding assessment practices that account for increasingly complex and robust learning and teaching systems such as videogames. With respect to its practical force, productive instruction must challenge learners to expand beyond one level of activity by including more than one level of understanding, which transitions organize as part of ongoing game play. For these two reasons, the idea of assessment transitions engineered through the design of educational videogames can contribute to a more coherent and equitable system of opportunities to learn and serve a systemic agenda to understand and improve education.

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