

Narratizing Disciplines and Disciplinizing Narratives: Games as 21st Century Curriculum

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ABSTRACT

Education is about revealing possibility and exciting passions, empowering learners with the disciplinary expertise to meaningfully act on problematic contexts in which applying disciplinary knowledge is important. Toward this end, we have been using gaming methodologies and technologies to design curricular dramas that position students as active change agents who use knowledge to inquire into particular circumstances and, through their actions, transform the problematic situation into a known. Unlike more traditional text-books designed to transmit facts or micro-stories, our focus is on building interactive experiences in which understanding core concepts, such as erosion or the idea of metaphor, and seeing oneself as a person who uses these to address personally meaningful and socially significant problems is valued. It is the explicit goal of this manuscript to communicate this power of educational videogames, as well as the design steps that we have been using to make this happen.

Keywords: Contextual Learning, Engagement, New Media, *Quest Atlantis*, Transformational Play, Video Games, Virtual Worlds

INTRODUCTION

In many American classrooms, students have opportunities to remember and record decontextualized disciplinary information in ways that all too often contribute to inert understandings. Such positioning of disciplinary content often undermines student appreciation of the potential value of academic content for solving person-

ally meaningful and situationally significant problems. Theoretically, we are arguing for the need to reconnect disciplinary understandings with contexts in which such understandings are useful, specifically by *narratizing disciplines* and, at the same time, to empower youth to *disciplinize narratives*. In realizing this vision, a central goal in our design is to develop play spaces in which the learner has a goal or intention and makes choices in a dynamic environment/storyline that change in relation to these

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choices. From a design focus, our interest is in (1) legitimizing the key disciplinary content to be learned; (2) positioning the person as an individual with an intention to transform the content; and (3) designing the learning environment as a context in which actions are consequential. The challenge underlying our work is how to use videogames to connect disciplinary content with those situations in which it has personal and functional value.

Toward this end, and as part of our design of a multiuser virtual environment called Quest Atlantis (see <http://QuestAtlantis.Org>), we have developed a theory around the power of *transformational play*. Playing transformationally involves taking on the role of a protagonist who must employ conceptual understandings to understand and, ultimately, make choices that have the potential to transform a problematic context. For example, in one of our extensively researched designed worlds, a student becomes a scientist, examining the water quality of the green, murky water in a virtual river (Barab, Sadler, Heiselt, Hickey, & Zuiker, 2007; Barab, Zuiker, et al., 2007). In another context, a student becomes a statistician using measures of center to analyze various choices and help a mayor make the best choices (Gresalfi, Barab, Siyahhan, & Christensen, 2009). In still another context, the player becomes an investigative reporter, assembling evidence by talking to game characters to build a persuasive argument for the town newspaper (Barab et al., 2009).

Elsewhere, we have discussed the role of transformational play in supporting learning and, in particular, how our designs support transformational play (Barab, Gresalfi, & Ingram-Goble, 2009; Barab, Gresalfi, & Arici, in press). Here, we focus more specifically on how educational games can be disciplinary worlds, and game play can become a way of *disciplinizing* the world (cf. Roth, 1994; Hoyles, Noss, & Pozzi, 1999)—using disciplinary content as a tool to understand and take actions on problems in the world. The goal of this manuscript is to elaborate on this theoretical stance and to share design strategies that have usefully guided the worlds we have created

and have been used in hundreds of 4th-8th grade classrooms worldwide.

THEORETICAL FRAMING

Games as Disciplinary Worlds (Narratizing Disciplines)

Our work entails the use of videogame technologies to establish prototypical situations as exemplars, which serve as the referent that, for the learner, makes visible and valuable the to-be-learned concept. Such work has resonance with simulations and other work designed to *situate* academic concepts (Cognition and Technology Group at Vanderbilt, 1991), but extends further in that we are concerned with situating contexts such that they are responsive to learner actions. In other words, while some have argued for the importance of the framing context in co-determining the meaning of particular content, games allows us to additionally situate the person as the central protagonist who makes key decisions. To elaborate, while in some of our work one can perceptually see a disciplinary concept (e.g., witnessing an algae bloom by examining the green, murky water in a particular location in a virtual river), we are primarily interested in the learner having the experience of *being in* a scenario wherein applying one's understanding of a disciplinary concept has impact on the (virtual) situation—a situation in which the learner has a significant role and which is semantically revealing, thereby helping learners appreciate the meaningfulness of the concept (its use value) for transforming problematic situations (Barab, Zuiker, et al., 2007).

In this manner, our work involves allowing the meaning of concepts to come from their functional value in the world, with the design goal being to create a virtual environment that enables learners to use disciplinary concepts to meaningfully act on this fictional scenario. To further clarify the goal, Gee (2003) has discussed the example of trying to read a game manual without playing the game—a task one

finds tedious, uninteresting, and conceptually challenging. However, once one engages the game itself, the manual content becomes clear, interesting to the player, and even valuable for improving one's performance in the game. Extending this thinking to educational settings, it might be argued that schools too often provide learners with the manual and rarely engage them in playing the game. But more than making the concepts meaningful, our goal is to support learners in perceiving themselves as people who can use the content toward meaningful ends with the expectation of allowing them to try on new ways of being in the world. Said another way, in our games, one is not simply playing the game, but playing out the self, as they are stretched into another world and another self (Gadamer, 1989).

So, for example, usefully applying one's understanding of algae blooms to identify a particular cause and generate a solution has the potential of changing one's understanding of self as an individual who uses science to improve the world. Importantly, the disciplinary worlds in which our game play is situated are fictional, allowing such an opportunity for players who might otherwise never see themselves as able to take on such an identity and meaningfully use disciplinary content. The fictional and sometimes fantastical nature of the stories, we argue, is in part what makes it possible for the player to leave the "real" world and meaningfully enter the virtual one—a world in which they can become a scientist, a historian, a reporter—and in this role of an evolving expert, they address problems that are personally engaging and situationally important. Lastly, a disciplinary world involves more than a framing of possible uses of content, but actually establishes a world in which the only way to succeed is to meaningfully leverage disciplinary content to interpret and to make meaningful game play choices. Just as the storyline *narratizes* the to-be-learned content, the relationship among conditions, actions, and outcomes—the anatomy of player choices—ensures that our designed game play involves *disciplinizing* the narrative; that is, to make useful game play decisions the player

must leverage disciplinary understandings to make meaningful play choices.

Game play as disciplinizing a world (disciplinizing narratives). Vygotsky (1933, 1978), a renowned developmental psychologist, argued that "the influence of play on a child's development is enormous ... [allowing him or her to act] a head above himself" (pp. 94–95). Through play the child is able to engage in forms of communication, in rule structures, in understandings, and even in identities that are unreachable in more explicit contexts (Barab & Jackson, 2006). It is through play that a child can take on identities and experiment with actions even before she appreciates the meanings associated with these actions. For philosopher Hans-Georg Gadamer (1975), play is serious, structured, and involves the suspension of belief versus pretense, reality versus unreality. We play games again and again, experiencing new paths with a palpable set of constraints. We play with ideas, piecing together seemingly useless sets of understanding, sometimes weaving our way into creative contributions. We play roles not to step into the life of some imagined Other but to stretch ourselves into another being (character) that can act with that Other. And in the games we design, we design storylines that require one to step into the role of a scientist, a historian, a reporter, a statistician—one who learns not only about disciplinary content but also about themselves as individuals who use content and about which contexts benefit from the application of content understandings.

We understand play as both a kind of activity and a kind of freedom within constraints, that is, a quality embodied to greater or lesser degrees in an immediate environment (i.e., a virtual world). The challenge is in building a virtual world that is not overburdened by rules but that affords opportunities for the player-character to apply disciplinary understandings to make sense of and, ultimately, transform the virtual world in productive ways. In our work, disciplinary concepts come to define the boundaries for what actions are reasonable and which actions fail to meaningfully impact the virtual world—and it is these types of constraints

that determine the value of different player actions in a conceptual play space. More than a simple narrative cover-story, the play spaces we design afford intense interactivity, allowing the player to test conjectures, act upon them, and witness the consequences within the context of that narrative. Accordingly, a player can bring about a particular chemical reaction or even act as a fictional newspaper editor who approves a particular story and then witnesses the effects of that decision. This sort of consequential engagement is very difficult to accomplish in schools and even in non-interactive media. Teachers can describe a situation, share a book, or even show a movie but not establish a proxy character and setting that the learner can enlist and act upon.

Game designers, on the other hand, can embed a learner within a story, not simply as an observer but as a first-person protagonist who experiences *intentionality*, *legitimacy*, and *consequentiality* (see Figure 1) (Barab, Gresalfi, & Ingram-Goble, 2009). Said another way, we view games as spaces for positioning the person with intentionality, for positioning content with legitimacy, and for positioning context with consequentiality. Some might argue that the ability to test the water quality in a virtual world and even examine the outcome of different choices remains simply a simulation, conceptually powerful but not personally transformational. However, we argue that a well-designed digital game offers something beyond the traditional simulation: it creates a potential for a player to leverage their understanding a concept (*content*) to actually transform a storyline (*context*), thus creating opportunities for one to reflect on one's in-game identity (*person*) as the type of person who uses content to change contexts. In other words, as game play unfolds, the narrative *context* evolves and changes based on the player's efforts and decisions. At the same time, the *player* herself also evolves, because she is treated differently by other in-game characters and real-world players based on her accomplishments and decisions. Finally, her actual tasks in the game require increasingly sophisticated

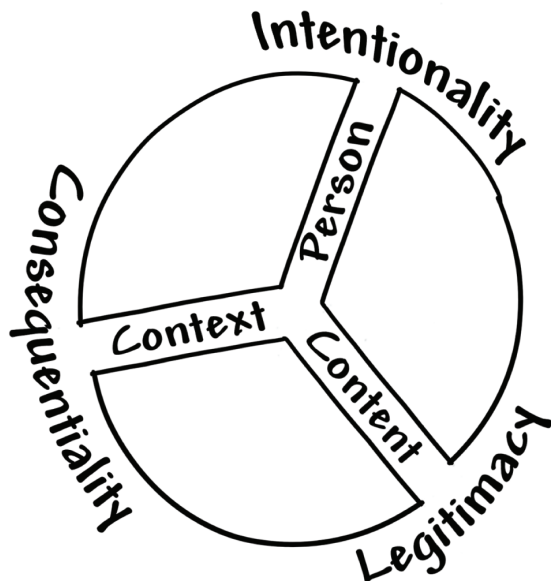
content usage, as the game-world dilemmas become more complex over time.

The idea is that through participation one becomes bound up as part of a context in which he or she experiences the consequences of particular understandings, resulting actions, and environmental consequences. Dewey and Bentley (1949) introduced the transactional perspective to characterize the inseparable and mutually constitutive nature of subject and object. Transaction, according to the Merriam-Webster dictionary, is "a communicative action or activity involving two parties or things that reciprocally affect or influence each other." It is the adoption of an intention that is tightly coupled to, and helps to knowledgeably act upon, the environment or situation that allows for the dynamic (transactional) unity of individual, concept, and the environment (Barab, Cherkes-Julkowski, Swenson, Garrett, Shaw, & Young, 1999). The goal from a curricular design perspective is to establish a context upon which the learner can perform knowledgeable actions that, if properly understood, result in productive world changes. Such a positioning, one in which the learner enters a situation and as a virtual character applies disciplinary content in useful ways, has the potential to transform the textbook as we know it.

Designing Transformational Play Spaces

Beyond a theoretical argument, we have been translating these ideas into dozens of games nested in the Quest Atlantis (QA) learning and teaching project. QA is an international learning and teaching project that uses a 3D multi-user environment to immerse children, ages 9–15, in educational tasks (see Figure 2); currently we have over 20,000 members distributed across the world on four continents. QA combines strategies used in the commercial gaming environment with lessons from educational research on learning and motivation. The core elements of QA are (1) a 3D multi-user virtual environment, (2) a scripting engine for creating interactive stories and objects, (3) inquiry

Figure 1. Elements of transformational play

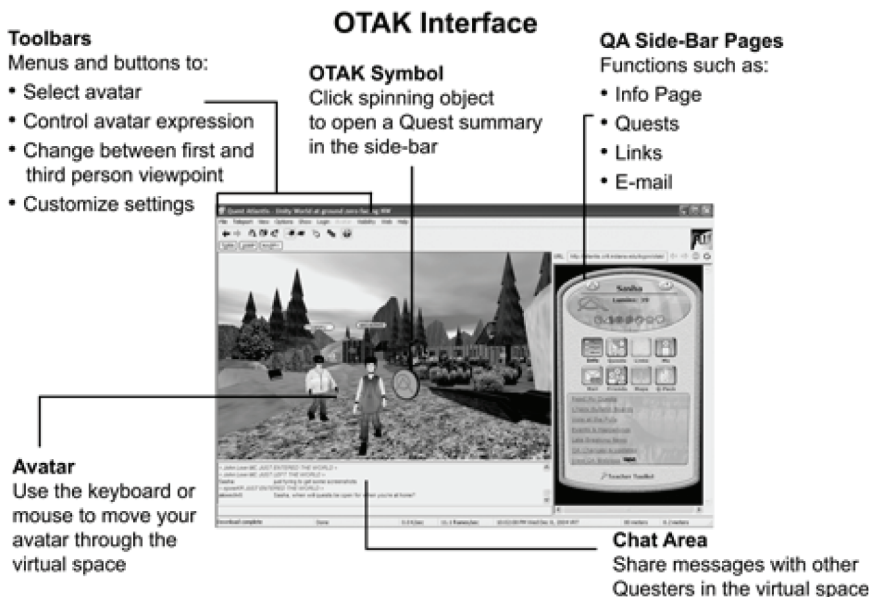


learning Quests, assessments, and missions, (4) a meta-storyline as well as nested storylines associated with various game worlds, (5) a teacher toolkit for managing students and their work, and (6) a globally-distributed community of participants (Barab, Arici, & Jackson, 2005; Barab, Thomas, Dodge, Squire, & Newell, 2004). QA was designed to foster inter-subjective experiences through structuring interactions, toward helping children to realize that there are issues in the world upon which they can take action. Through QA, players can travel to virtual places to perform various educational activities, talk with other users and mentors, and build virtual personae.

The QA virtual environment, storyline, associated structures, explicit social commitments, and social policies constitute what is referred to as a meta-game context, a genre of play in which an overarching structure lends form, cohesion, and meaning to a collection of nested activities, each with its own identifiable rules and challenges (Salen & Zimmerman, 2004). As students complete these various ac-

tivities, their game character visibly “luminates” on core social commitments (e.g., environmental awareness, diversity affirmation, etc.), representing an increased functionality (i.e., their game character can perform previously inaccessible behaviors) and characterizing participation in terms of the foundational storyline (Barab, Dodge, Tuzun, et al., 2007). Further, within constraints assigned by one’s teacher, each player can evolve her character based on personal interests and priorities such that after two months of participation, players rarely have similar game experiences and character profiles. Also, because of the program’s multi-user nature, finding players with particular profiles becomes a useful means for completing collaborative activities and advancing the unfolding narrative. Within this meta-game context, we have developed numerous worlds, and through research we revise these designs in response to classroom implementations, allowing us to evolve theoretical claims in terms of teaching and learning and the possible value of games for supporting this process.

Figure 2. Screenshot of the Quest Atlantis gaming project



While there are numerous worlds, each with its own narrative frame and targeted to support particular conceptual understandings, all designs have been informed by the design assumptions and the transformational play theory discussed here. When designing for the experience of transformational play, we have found it necessary to weave together particular design threads to form what we refer to as substantive, immersive, impactful, and reflexive participation (see Table 1). Briefly, substantive participation involves students enlisting target concepts in the service of solving a particular task. Immersive participation involves situating tasks in the context of a larger dramatic storyline that creates a legitimate reason and context for disciplinary engagement. Impactful participation occurs when a player's actions affect a situation and, at the same time, reflexively impact the actor, positioning the self in terms of the virtual world. Finally, reflexive participation involves examining how one's own participation changed the environment and then using this understanding to interrogate the

dynamics of the environment as well as their role in influencing such dynamics.

Collectively, when properly integrated, these design braids form a curricular drama in which the disciplinary content is narratized, while simultaneously requiring the player to use academic content to productively discipline and transform the narrative. Whereas the former illuminates why academic content is important, the latter illuminates what is the academic content, and when experienced as part of transformational play, they establish the player as someone who knows how to use academic content to achieve useful ends. Specifically, the substantive and immersive braids constitute the disciplinary and narrative content with which students engage, while the impactful and reflexive braids create the rules and structures that support such forms of engagement. While narratizing or contextualizing content is consistent with many other project-based design efforts, the latter two braids capture the transactive nature of the experience, in which during transformational play the game world itself changes based on player choices, thereby

Table 1. Braids of transformational play

Transactive States	States	Structures	Description		
	Substantive Participation	Target Concepts	Core understandings and practices that students are expected to learn		
		Legitimate Tasks	Increasingly complex real-world and fantastical challenges with nested goals		
		Embedded Scaffolds	The availability of appropriate tools, resources, and lessons for understanding and accomplishing tasks		
	Immersive Participation	Dramatic Storyline	A story that has engaging tensions and characters who have motives that affect the plot line		
		Role Play	Opportunities and identities that players enlist as they transform the story and tasks		
		Contested Space	A physical or perceptual environment within which player actions and the storyline takes place		
	Impactive Participation	Interactive Rules	Logical and accumulative structures that respond to and dictate player actions		
		Leveling Trajectories	Progressive realization of the story and nested goals as well as the player's position and potentialities		
		Critical Decision Points	Significant junctions in the storyline dependent on the player's choices and actions		
	Reflexive Participation	Feedback Episodes	Game structures that provide feedback to the player of their choices and submissions		
		Character Evolutions	Stages in which understandings, commitments, and achievements become reified in the player character		
		Transfer Challenges	Opportunities to engage emergent abilities and understandings to transform other related contexts		
				Narrating Disciplines	Game Structures
				Disciplinizing Narratives	

having the potential to change the player's appreciation of themselves as someone who can used (and has used) disciplinary content to bring about desired ends.

Substantive Participation

Substantive participation refers to one's potential to usefully engage in meaningful tasks. It begins with being immersed in a particular context that frames meaningful challenges that require students to engage in problem solving and inquiry (Savery & Duffy, 1998). The types of challenges that interest us require students to make choices about how disciplinary information relates to real-world contexts, thus illuminating more than one meaning for con-

ceptual understandings. For example, instead of teaching students about water quality to pass a science test, we are interested in engaging children in scenarios (Barab et al., in press) that require *leveraging* what they know about water quality to better understand a problem and pose a solution. These scenarios have either participatory authenticity, in that they occur in a real-world context, or simulatory authenticity, in that they involve solving authentic activities but in fictional scenarios (Barab, Squire, & Dueber, 2000). It is in this way that learner actions bear legitimacy. The contextualized challenges are designed such that, in order to solve them, the participant must locate and employ tools and resources—pedagogical scaffolds that they

access through their participation in the transformative play space.

Immersive Participation

Once the designer has identified targeted core concepts and those contexts in which they find functional value, the next step is to establish an overarching immersive framework—usually one that involves a narrative. More than a simple context, an overarching framework creates a tension which involves a balance among particulars, including setting, characters, and plot. More elaborately, Bruner (2002) describes Burke's (1945) dramatic Pentad, or narrative grammar, as consisting of "an Agent who performs an Action to achieve a Goal in a recognizable Setting by the use of certain Means" (p. 34; cf. Aristotle, 1992). This conflict involves some sort of story complication to which there is also a turning point, reversal of the problematic situation, and ultimately a resolution of balance. Whereas a particular narrative affords engagement, perspective taking, and projective identification with plotlines that potentially resonate with other situations (cf. Bruner's 1992 notion of "metaphorical loft"), videogames additionally reposition the audience such that they experience a sense of agency and consequentiality with respect to their engagement with the narrative (Gee, 2003). The aspects of our designs which support these active forms of engagement are described in the two design braids described below.

Impactive Participation

In our designs, we work not to simply narrate a story but to position learners within the story so that their actions affect its progress (Sheldon, 2004). This involves not only establishing a context in which the learner finds an important role but, further, building an environment in which this role has consequence for the unfolding of the story. That is, as the player makes choices and interacts with different game features, her achievements affect the ongoing narrative, and underlying tensions and possible resolutions

are progressively revealed. The design of the learning space affords this sense of interactivity through sets of logical rules and networks of narrative trajectories that position the player as a protagonist who determines, within designed parameters, how the story will unfold. As such, properly designed conceptual play spaces position the player as protagonist in a *contested space* in which one finds a spatially-bound problem that changes over time, based on player decisions as one navigates the game environment (Lee, Park, & Jin, 2006; Squire & Jan, 2007). Experiencing the drama, then, means not simply witnessing but participating in its realization in a transactional relation diffusing the conventional distinction between subject and object (Dewey & Bentley, 1949). That is, no drama—indeed, no content, not even domain-related concepts—exists per se apart from the player's activity; it is occasioned by the interplay between the user and the system as the former navigates and negotiates the branches and decision points that bear critical consequence on the narrative that ensues.

Reflexive Participation

Just as a game narrative is shaped only through the virtual actions of one's game character, a player's identity is also formed through the actions she takes. To begin, over time the actions a player performs serve to evolve the functionality and talents of the in-game character. More than a merely symbolic act, the evolution of the game character changes possibilities for in-game actions, as the player can engage in activities unavailable to lower-level players or players who have evolved with different profiles. Moreover, one's actions and choices contribute to one's sense of self. In our designs, such reflexive participation is supported by allowing students to evolve their avatars in ways that are reflective of the decisions they have made in the game. The opportunities that players realize and the challenges they successfully resolve represent not simply accomplishments but advancements of themselves, as one increasingly identifies with the world of those

practices. Thus, as players make choices that demonstrate their commitment to and understanding of the environment, for example, their character develops, and the interactions they have with other players and non-player characters change and respond to their new status and accomplishments. Importantly, there are three areas in which we work to facilitate reflexive relations to one's play: reflecting on how content understanding is what allowed them to transform the context in productive ways, what their particular choices say about them and their potential to meaningfully use academic content, and what features of the content lend themselves to transformational acts.

Design Braids in Practice

The unit *Saving the Black Rhino*, as one example of an environment designed to support transformational play, consists of both a series of standards-based curricular activities and a virtual environment resembling a factual game reserve located in the East African country of Tanzania. Specifically, the unit plan, which takes from six to ten class periods to complete, contains seven learning components targeted to engage students in developing an appreciation of endangered species, ecotourism, relative scale, and multiple perspectives. Students are asked to help determine how to best manage the game reserve, and the unit is designed to support their understanding of ecology, geography, politics, medicine, and economics, all of which they leverage to address the problem. The unit was designed to establish the design braids advanced in this manuscript (see Table 2). Indeed, because of its factual grounding in the people, places, and issues relating to the game reserve, the unit weaves together the four braids in an elegant and engaging result.

To support substantive participation, the activities progress from a general introduction to the topic of extinction, to a detailed investigation of issues relating to maintaining the game reserve, to addressing the balance of social and environmental priorities through ecotourism, and finally to examining similar

issues in students' own communities. Toward understanding these issues, students have to learn about the biology of animals and how different ecological niches can best support the needs of particular animals. They also learn history as they evaluate the appropriateness of government land in Tanzania being managed by a foreigner, an issue that brings with it a host of tensions related to imperialism and the relations between Africa and other nations. Lastly, players struggle with economics as they determine how to financially support the reserve and must understand concepts of relative scale as they relate the virtual locations to their design of a physical map. They then use this map to measure distances and provide recommendations of tour routes that, depending on their accuracy, result in low or high game scores and feedback from virtual tourists. Importantly, more than simply conceptual struggling with the academic content, they must also engage their personal values as they make decisions based on moral judgment that have economic, political, and imperialistic consequences.

In order to support immersive participation, the *Black Rhino* unit takes place in a virtual world that becomes a contested space for experience and learning and involves multiple nested storylines, each one framed as a different mission. However, more than just a fictional storyline, this unit is based on actual people, places, and issues. This real-world connection has proven to be of compelling interest to students who have completed the unit: one student explained, "I actually feel like I'm halfway around the world," and another added, "I think it is cool that all these people are real and actually living in Africa right now, talking about these issues."

To support impactful participation, as students move through the experience, the interactive links change such that the same people over time provide new information, depending upon which trajectory students choose to pursue. For example, as students initially work to discover people's opinions and earn the trust of the park's population, most of the information is relatively informal. However, as it becomes known that

Table 2. Alignment between the design braids and the Saving the Black Rhino curricular unit

<i>Braid</i>	<i>Description</i>
Substantive Participation	The academic content involves a cluster of related topics, including extinction and endangered species (target concepts). Students investigate the park in order to develop a recommendation of how the land should be used (legitimate tasks). Students are given planning documents from game characters to learn about ecotourism and historical problems that prevent simple solutions from working (pedagogical scaffolds).
Immersive Participation	The unit centers on a representation of a factual game reserve in Tanzania and involves students in the perspectives of the various stakeholders (dramatic storyline). Students freely wander through the virtual game reserve, interviewing characters in order to develop their own perspectives on the situation (participation roles). Students interact with people, animals, and natural and man-made structures in order to develop a viable ecotourism scenario (contested space).
Impactive Participation	The virtual environment functions interactively: for example, characters present text pages stating their understandings of the situation, and these statements change based on student experiences and choices (interactive rules). Students progressively negotiate the different perspectives to develop their own informed and supported opinions relating to the game reserve (leveling trajectories). Arriving at individual conclusions involves adopting various perspectives and committing to difficult choices (critical decision points).
Reflexive Participation	As students receive feedback from teaches and from the game itself in terms of consequences to their actions, they are able to develop increasingly sophisticated conceptual understandings and make more informed decisions (feedback structures). More than simply understanding content, they are also positioned differently as players who have different levels of expertise and subsequent choices (character evolution). Students are also asked to apply what they are learning to different contexts, both in the Rhino world and as they engage in side missions and on other storylines (transfer challenges).

students are engaged in a different trajectory, namely building a scientific-economic report, the characters begin to provide richer information that requires deeper inquiry on the part of the students and that may even be integrated into their final reports. Further, depending on student choices, the information they receive varies so that different students end up with slightly different stories—with the information changing more drastically at critical decision points where students align themselves with particular views.

Finally, reflexive participation can be seen through the actions that students took as they worked through the unit to understand contrasting points of view, effectively adopting the concerns, values, and opinions of a variety of stakeholders and ultimately developing an ecotourism scenario to balance and improve conditions for both the animals and humans of the area. That is, because the students are involved in real-world dilemmas and informed

by factual details, their efforts bear value and consequence. Significantly, the students reflect on this impact with clarity: one noted, “I think this unit was important so we could learn to save an environment in a virtual world, so we would know how to do it in the real world.” And another, “I feel proud of the work I have done.... This unit changed me because now I look at things in a different way, and now I have more perspectives.”

Through affording a more richly contextualized experience, the designed space creates opportunities for engaged and meaningful learning. Indeed, teachers continually commented how useful they found it to take this “virtual fieldtrip,” thereby situating children in the Tanzanian context. One California teacher stated,

It was a shining example of what great things can come from students if you engage them in learn-

ing not just curriculum ... because the students really cared about the Black Rhino, the Maasai Tribe, or the farmers. They were motivated to really understand these perspectives in order to discuss and debate the perspectives of the poachers and government officials.

As example of the types of changes occurring over the duration of the unit, the following shows a sixth grader's movement from a superficial description to one of more depth on the transfer scenario tasks.

Pre-test response: The trade of illegal drugs is an important issue. Poor farming families know they can make money off of selling illegal substances. Drug usage is dangerous and this is an important issue.

Post-test Response: In many countries, rainforest logging is a major issue. People from wealthy countries such as our own might protest it because it kills so much of our beautiful environment, but in a country where fine rainforest wood is a major industry and especially if the countries economy is weak, it's not really fair to say they can't do it anymore. This is a very controversial issue, because we are basically weighing human life and animal life, two things that depend on each other.

While the pre-test response shows an attempt to address a factual issue, it lacks the depth and complexity of that of the post-test, which demonstrates multiple perspectives, considers economic and societal issues, and weighs contradicting factors. More generally, we examined student learning in four classrooms, and in all four classrooms, we found significant learning gains from pre-test to post-test: the New York site (PreM = 12.14, PostM = 18.74; $t(27) = 12.17, p < .01$), the Indiana site (PreM = 6.82, PostM = 13.65; $t(16) = 9.23, p < .01$), the California site (PreM = 2.66, PostM = 11.27; $t(29) = 12.66, p < .01$), and the Indiana after-school site (PreM = 6.12, PostM = 11.38; $t(7) = 10.45, p < .05$).

The design process involved understanding the perspectives of the various stakeholders, collecting authentic resources such as histori-

cal documents, and developing an immersive, interactive virtual space. All of this also had to be considered in terms of the utility it would bring to the lessons as well as the appeal it would bear for the children. In the end, the designed space served to provide an engaging context for students to experience the curriculum. Specifically, it was clear that students were able to *narratize* the content of the unit by understanding formalisms in the context of the storyline. Likewise, students were able to *discipline* their narrative experience by looking for and leveraging disciplinary ideas to make sense of and change the storyline of the game.

CONCLUSION

We began this manuscript with the premise that all too often classroom learning overemphasizes disciplinary content (universals) and underrepresents the contexts (particulars) for which this content has value. In highlighting this problem, we return to Gee's (2003) example of reading a game manual without playing the game: removed from its context and purpose, the manual seems uninteresting, but in relation to the game itself, its content becomes meaningful, even valuable. Likewise, learning in classroom contexts is often removed from its contexts of practice. Such learning can be both conceptually impoverished and also motivationally monotonous; degrading disciplinary knowledge from a useful tool to a set of facts or disembodied rules to be memorized. Therefore, curriculum designers might benefit from an examination of how gaming methodologies and technologies situatively embody the player and the to-be-learned content in rich participation structures. In particular, the digital age has established entirely new possibilities and even extended identities that challenge traditional ontological conceptions of what is self, what is real, what is valued, and what is knowing.

Capitalizing on this affordance of videogame technologies, we have advanced a transactive perspective that involves positioning concepts and learners within rich, interactive

contexts that elevate concepts from abstracted facts to conceptual tools that operate and transform those very same narratives that imbued the concepts with worth—simultaneously *narrativizing disciplinary content* at the same time learners use their conceptual understandings to usefully *disciplinize narrative contexts*. Transformational play, as a goal for designing curriculum, offers much in terms of curing the crises of meaning that many youth are experiencing when it comes to academic content. To restate, our interest is not simply in making the abstract concrete (that is, providing a perceptual instantiation of an academic concept) but making the abstract consequential as one uses it to make sense of and transform particular storylines. By bounding up disciplinary context within interactive narrative contexts, we have the potential to not only change learners' understanding of the use value of the content and also offer the opportunity for learners to see themselves as capable of meaningfully applying disciplinary content. Many commercial games, and especially the transformational play spaces that we have been designing, provide learners with a sense of legitimacy, intentionality, and consequentiality in ways that are different to achieve in many school-based lessons.

Our hope for the future is that school curriculum can focus more on engaging students in the game (narrative particulars) and less on providing them the manual (disembodied universals). This is not to argue against there being a place for lectures or explicit content presentation. Certainly, for those who already have an appreciation of the real and problematic situations that disciplinary content can help address, listening to well-organized presentation of information can be very informative. Their intentions have been established; they arrive at a situation with an appreciation of its use; for them, the content is already situated. This

situation is not usually the case for most young learners, especially those being left behind by our school system—and we don't see increasing accountability measures as the solution. Our interest is to ensure that all children understand and care about big ideas, and to supporting teachers in making classrooms places that excite interest and passion for learning. Specifically, we have argued that the transformational potential of videogames creates opportunities for children to play scientists, historians, lawyers, accountants, doctors, etc. who use domain knowledge to address personally engaging and situationally important problems. It is for this reason that we regard games as offering a new pedagogy for the 21st century, one that has the potential to not merely fill individual minds, but empower whole persons, and to transform learning from a rote acquisitional process to a transactive one in which conceptual understandings have transformational significance.

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REFERENCES

- Aristotle. (1992). *Poetics* (S. H. Butcher, Trans.). In H. Adams (Ed.), *Critical theory since Plato* (pp. 49-66). Fort Worth, TX: Harcourt Brace Jovanovich College Publishers.

- Barab, S., Dodge, T., Tuzun, H., Job-Sluder, K., Jackson, C., Arici, A., et al. (2007). The Quest Atlantis Project: A socially-responsive play space for learning. In B. E. Shelton & D. A. Wiley (Eds.), *The educational design and use of simulation computer games* (pp. 159-186). Rotterdam, The Netherlands: Sense Publishers.
- Barab, S., & Jackson, C. (2006). From Plato's Republic to Quest Atlantis: The role of the philosopher-king. *Technology, Humanities, Education, Narrative [THEN] Journal*, 2.
- Barab, S., Sadler, T., Heiselt, C., Hickey, D., & Zuiker, S. (2007). Relating Narrative, Inquiry, and Inscriptions: A Framework for Socio-Scientific Inquiry. *Journal of Science Education and Technology*, 16(1), 59–82. doi:10.1007/s10956-006-9033-3
- Barab, S., Thomas, M., Dodge, T., Carteaux, R., & Tuzun, H. (2005). Making learning fun: Quest Atlantis, a game without guns. *Educational Technology Research and Development*, 53(1), 86–108. doi:10.1007/BF02504859
- Barab, S., Thomas, M., Dodge, T., Squire, K., & Newell, M. (2004). Critical design ethnography: Designing for change. *Anthropology & Education Quarterly*, 35(2), 254–268. doi:10.1525/aeq.2004.35.2.254
- Barab, S., Zuiker, S., Warren, S., Hickey, D., Ingram-Goble, A., & Kwon, E.-J. (2007). Situationally embodied curriculum: Relating formalisms and contexts. *Science Education*, 91(5), 750–782. doi:10.1002/sce.20217
- Barab, S. A., Arici, A., & Jackson, C. (2005). Eat your vegetables and do your homework: A design-based investigation of enjoyment and meaning in learning. *Educational Technology*, 65(1), 15–21.
- Barab, S. A., Cherkes-Julkowski, M., Swenson, R., Garrett, S., Shaw, R. E., & Young, M. (1999). Principles of self-organization: Ecologizing the learner-facilitator system. *Journal of the Learning Sciences*, 8(3-4), 349–390. doi:10.1207/s15327809jls0803&4_2
- Barab, S. A., Dodge, T., Ingram-Goble, A., Volk, C., & Peppler, K. (2009). *Pedagogical dramas and transformational play: Narratively-rich games for learning*. Manuscript submitted for publication.
- Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.
- Bruner, J. (2002). *Making stories: Law, literature, life*. New York: Farrar, Straus and Giroux.
- Dewey, J., & Bentley, A. F. (1949). *Knowing and the known*. Boston: Beacon.
- Gee, J. P. (2003). *What video games have to teach us about learning*. New York: Palgrave.
- Gresalfi, M., Barab, S. A., Siyahhan, S., & Christensen, T. (2009). Virtual worlds, conceptual understanding, and me: Designing for consequential engagement. *Horizon*, 17(1), 21–34. doi:10.1108/10748120910936126
- Lee, K. M., Park, N., & Jin, S.-A. (2006). Narrative and interactivity in computer games. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 259-274). Mahwah, NJ: Lawrence Erlbaum Associates.
- Rosenblatt, L. M. (1995). *Literature as exploration* (5th ed.). New York: Modern Language Association of America.
- Ryan, M.-L. (2001). *Narrative as virtual reality: Immersion and interactivity in literature and electronic media*. Baltimore: Johns Hopkins University Press.
- Salen, K., & Zimmerman, E. (2004). *Rules of play*. Cambridge, MA: MIT Press.
- Sheldon, L. (2004). *Character development and storytelling for games*. Boston: Thomson Course Technology.
- Squire, K. D., & Jan, M. (2007). Mad City Mystery: Developing scientific argumentation skills with a place-based augmented reality game on handheld computers. *Journal of Science Education and Technology*, 16(1), 5–29. doi:10.1007/s10956-006-9037-z
- Tamborini, R., & Skalski, P. (2006). The role of presence in the experience of electronic games. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 225-240). Mahwah, NJ: Lawrence Erlbaum Associates.

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