Eat Your Vegetables and Do Your Homework: A Design-Based Investigation of Enjoyment and Meaning in Learning

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Design-based research is a collection of innovative methodological approaches that involve the building of theoretically-inspired designs to systematically generate and test theory in naturalistic settings. Design-based research is especially powerful with respect to supporting and systematically examining innovation. In part, this is due to the fact that conducting design-based research involves more than examining *what is*. It also involves designing possibilities and then evolving theories within real-world contexts. In this article we share the historical development of three outcomes of our design-based work on the Quest Atlantis project, an interactive narrative designed for children ages 9–12 that includes a 3-D environment and various resources, with the goal of understanding the value of play spaces for learning.

Learning is one of the most natural acts in which a child can engage. Developmentally, young children are born with a propensity to decipher the world around them, make sense of sights and sounds, and learn complex language skills (Vygotsky, 1978). As children progress to more formal skills, such as recognizing letters and reading, they typically do not view learning these arbitrary symbols as work, but rather approach it as play. In elementary school, a different attitude towards learning regularly emerges; school-based learning is often something that must be done before a child is allowed to go out and play—an activity distinct from play and explicitly labeled 'work' (schoolwork, homework). Much like eating one's vegetables before getting dessert, schoolwork becomes a chore rather than reward. What causes this shift? How does school learning become tinged with a negative connotation? What occurs to shift the perspective from 'learning as play' to 'learning as work'? Is it possible to reconnect the two and do so even in the context of schools? More specifically, what if we were to combine the framework of gaming, with the content and inquiry-based pedagogy of schools, reuniting the early childhood experience of learning and play? While schools are struggling to achieve mandatory participation, the entertainment industry is proving wildly (and sometimes problematically) capable when it comes to capturing the attention and passion of kids. Is it possible to harness the best potential of entertainment as a foray into more meaningful and engaged learning?

It is in response to these types of questions, and towards the goal of advancing theoretical work that integrates education, entertainment, and social commitments, that our work on the Quest Atlantis project has been targeted. On the surface, Quest Atlantis might be viewed as a three-dimensional (3-D), multi-user virtual environment, or game. However, this game was designed to serve a much deeper purpose; to provide a meaningful context for significant learning and pedagogy. At its core, Quest Atlantis (QA) involves creating and understanding a relationship among learning, playing, and helping. The process by which we have been building these understandings is referred to as design-based research. In design-based research "the design is conceived not just to meet local needs [e.g., supporting learning], but to advance a theoretical agenda, to uncover, explore, and confirm theoretical

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relationships" (Barab & Squire, 2004, p. 5). In our case, design work, while meaningful in its own right, reflexively evolves with our theoretical work, providing a deeper understanding of the psychological concepts involved.

The Quest Atlantis project has provided a fertile context for generating, testing, refining, and evolving theories of participation that work to preserve the joy and meaning in the processes of learning. In this overview of our recent work, we begin with the basic Quest Atlantis context, highlighting our shift in thinking about QA as a designed, packaged space to viewing it as a socially-responsive context of participation. We have come to think of QA more as a "brand" than a particular piece of technology. Stepping beyond the simplistic idea of *product*, a *brand* refers to a larger aesthetic. It including the multiple facets and attributes, both tangible and intangible, that communicate a certain type of experience and create profound relationships between the players and the experience. For example, when playing the card game *Magic: The Gathering*, players collect cards and follow the prescribed rules of gameplay (product/technology), but the 50 novels, rich backstory descriptions on the cards and manuals, the graphic design of the cards, and the resulting culture of participation and fantasy surrounding them all create the *Magic: The Gathering* "brand."

Following our discussion of evolving a Quest Atlantis brand, we highlight how this work and our research around its implementation led to a new theoretical framework we call Learning Engagement Theory. This framework is based on a simple premise: If we treat school activity in terms of *learning, playing,* and *helping,* then we can more thoroughly engage children in the learning process. We then share how this project provided a rich context from which to evolve our thinking with respect to the construct of motivation.

Quest Atlantis as an Example of Design-Based Research

QA is an immersive context with the potential to engage children in a form of socially-responsible dramatic play that has both fictional and non-fictional realities, and whose storyline inspires in children a disposition towards social action *(http://questatlantis.org)*. QA, as an interactive narrative, includes a 3-D environment, a storyline, novels, comics, Quests, social commitments, a mythical Council, a globally-distributed community, etc., as well as an inter-subjective experience to help kids realize that there are issues within the world upon which they can take action. At the core of QA is narrative about a world in trouble. Participation in QA entails a personal and social engagement with that narrative, as kids are asked to contribute experiences, ideas, and information to the activists of Atlantis. As such, QA is more than an open-and-close narrative storyline; it is an immersive context for the combination of dramatic play and real-world inquiry. The narrative backstory further establishes continuity among the QA elements, and helps bridge the fictional world of Atlantis with the real world of Earth as interpreted by each individual child.

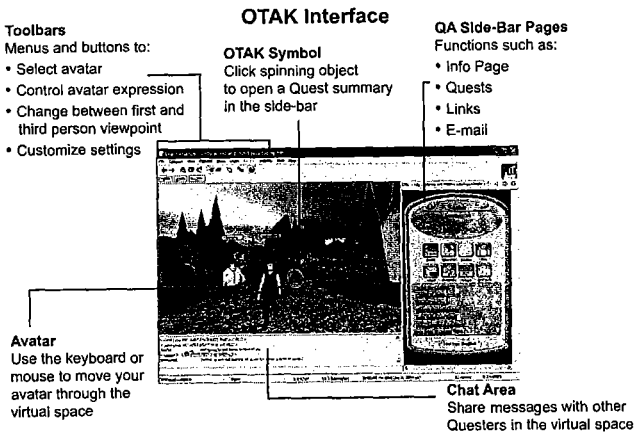

Figure 1. A screenshot from Quest Atlantis, showing a scene from a village on the left and the homepage for a student on the right.

The 3-D software allows users to travel to virtual places to perform educational activities (known as Quests), talk with other users and mentors, and build virtual personae. Each child is given an online persona with which he or she can respond to Quests (developmentally appropriate activities that include a task description, specific goals, and useful resources) so as to help the Council of Atlantis restore lost knowledge. Upon entering the virtual environment (see Figure 1), Questers can then travel to virtual worlds where they learn about the theme of that world; complete various Quests; chat with other children and with mentors live, from around the world; and build their virtual persona—this last feature has been shown to be a powerful motivator for engaging participation in online worlds (Turkle, 1995). Moreover, these personae contribute to their formative identities or sense of self.

Aspects of the design, both form and content, reflect our prioritization of multiple perspectives. The Quests, though connected to academic standards, are rooted in our social commitments and are framed by the types of issues and interests that children themselves have expressed. For example, as children complete Quests, they can work to understand their own lives in terms of the movies, music, and magazines that they view as exciting. More important, rather than simply work with content introduced by textbook or software publishers, Questers are invited to use stories from their personal

experiences, families, and cultures, as legitimate material for reflection.

By design, the Quest Atlantis community consists of both the virtual space and the face-to-face Quest Atlantis Centers. In order to participate, children must be associated with a particular Center (participating elementary schools, Boys and Girls Clubs, children's museums, local libraries) and must register on the Website. Once Questers are registered, they may participate at a Center or from any location with Internet access. Specifically, the virtual space is divided into worlds, and each world is divided into three related villages, each holding up to 25 Quests. Each village has a theme—for example, community power, all about us, global issues, water, sound of music, habitat, and understanding numbers—reflected in an associated series of Quests. The themes were designed to embrace all areas of knowledge and feature something for almost everyone without explicitly mirroring traditional academic categories. Each village houses a spectrum of Quests, ranging from simulation to application problems of varying levels of complexity. Quests are also combined in thematic units.

We have tried to incorporate the insights gained during the ethnography stage of our work into our evolving design (Barab, Thomas, Dodge, Squire, & Newell, 2004). For example, children and especially boys liked (indeed, many were obsessed with) trading cards of all kinds: They enjoyed collecting them, talking about them, and trading them. As such, we developed our own trading cards with the expectation that, as students completed Quests, they could trade in points earned for cards. Our trading cards represent real people who have made important contributions to Earth (e.g., Goodall, Ghandi, Da'Vinci). Each person is described in terms of their positive contributions to the world, and each card highlights the admirable characteristics of kindness, creativity, personality, strength, and wisdom. Further, we have supported many female Questers' interests in story, plot, and character with videos, comics, and novellas. While our plot was quite dramatic, we found that the children were accustomed to wry, self-reflective wit. Thusly, we watched popular children's television shows and used the banter common in these shows to inform our understanding of how to interact with the children.

The Design Evolves

In the initial conception and the first year of the project, we described QA as a "3-D multi-user environment designed to immerse children, ages 9–12, in educational tasks." At that point, our focus was on the technical challenges of designing a multi-user virtual environment. Following a year-long ethnography at a local Boys and Girls Club and another year of design and development, we had a usable product that, in the context of the classroom, was innovative and engaging. However, as we interviewed children both within and outside of schools, it became clear that, compared to the more popular multi-user online role-playing games, QA seemed, in one child's words, "somewhat of a hack." It is interesting to note that this is the same student who, after the second day of using Quest Atlantis, said that it was the "...the coolest thing I'd ever seen." As we probed more deeply, we learned that, by "hack," he meant that our "backstory" was fairly trivial and that the ways in which it was communicated did not leverage the multiple avenues being used in the commercial sectors. "Backstory" refers to the larger narrative/cultural framing within which many play and learning experiences take on meaning. As such, in the entertainment and gaming industries, backstory is often a critical piece of a brand's life. For instance, the Pokemon card game line leverages comic books, novellas, and a television show, in addition to related video games and even a doll line. In the U.S., it was not until American television imported the Pokemon television show that kids really bought into the card game. Apparently, the decontextualized cards and rules were relatively unengaging.

Unlike existing successful games, we had developed a technology, but not a brand. We lacked a backstory of real depth, the defined practices of community members, and the attributes that create a product identity and culture. The word "brand" rightfully has negative connotations within academic or pro-social circles, especially if used in inappropriate means to lock users into a particular service and value system regardless of its competitive merits. Instead, our goal was to create a brand and nested activities and structures to support children in developing their own senses of purpose as individuals, in seeing themselves as legitimate members of their communities, and in becoming knowledgeable citizens of the world. While we have created the various resources of QA to provide a holistic, unified immersive experience, we have certainly faced challenges in implementing our goals in such a diverse and complex socio-technical context. A central recognition of our ideology of design is the reality that we cannot guarantee, nor would we hope to overly establish, a particularly uniform QA experience. This has resulted in some implementations that largely focus on either the academic learning or on the playing aspects of the space, rather than leveraging both.

As a context for conducting design-based research, QA has now been adopted by teachers and after-school centers in the United States, Australia, Singapore, Denmark, and Sweden without any external incentives. Distributed across these countries, QA has been available for less than a year and has over 3,000 registered Questers, 49% of which are female. While only about half of these can be considered active

users—kids who have logged in more than once and customized their avatars—these active Questers have undertaken over 5,500 Quests, with 47% having been initiated by female Questers. Of those Quests, over 2,500 went through a period of revision in which the reviewer required the student to resubmit their work in response to a particular critique. Further, in addition to the thousands of Quests assigned by teachers, children in both school and after-school settings have voluntarily completed hundreds of educational Quests without any mandated requirement. Other data shows that girls have sent over 15,000 e-mails (58%), while boys have sent 11,000, and that girls have sent over twice as many unique e-mails (to one particular Quester as opposed to mass e-mails to groups) than have boys. Lastly, with respect to descriptive data, girls have currently posted over 85,000 lines of chat (55%) compared to boys, who total approximately 70,000.

In a series of studies evaluating the impact of QA on learning, we found that, when responding to personal narratives, students participating in QA offered character insights that were either deeper or better supported than did students in equivalent conditions ($t(14) = 2.62$, $p < .05$). Additionally, elementary students who participated in a three-Quest unit plan on plant and animal cells demonstrated significant learning over time (Pre$M$ = 10.6, Post$M$ = 47.1) ($t(79) = 38.62$, $p < .01$), with respect to their conceptual understanding of cells. Similarly, students learning world history in the context of QA went from almost no appreciation for how this content related to their own lives (Pre$M$ = 10.30) to a deep appreciation for its relevance to their life worlds and showed the ability to take multiple perspectives in the international arena (Post$M$ =47.45) $t(19)=10.28$, $p <.01$). Less related to content, we have also found that students participating in QA showed significant increases over time in their academic efficacy ($t(115) = 2.07$, $p < .05$). We have also interviewed dozens of children and have logged hundreds of hours of observation at QA sites. While these numbers are gratifying, as a design-based research project it is just as important that we also are leveraging this participation to advance theory. Below, we begin to describe the evolving theoretical framework through which we hope to communicate and test our design commitments.

Learning Engagement Theory

By the end of our second year, we began using the designed context as a means for understanding the potential relations of learning, playing, and helping as potentially intertwined dimensions of activity (Barab, Thomas, Dodge, Carteaux, & Tuzun, in press). We conducted dozens of interviews with teachers and children in an attempt to better understand how they perceived Quest Atlantis. Our analysis of these comments, coupled with our observations and evolving pedagogical commitments, resulted in the simple premise that underlies our Learning Engagement Theory. We have found that the important elements of any activity designed to support learning in the context of schools can be usefully examined in terms of the extent that these elements integrate aspects of learning, playing, and helping (see Figure 2). Clearly, as evidenced above, students involved in QA are learning academic content. However, we argue that our learning context is unique. QA situates this "academic" learning in the context of important social issues and aesthetically-rich dramatic play—establishing both a use and entertainment value for the learning activities.

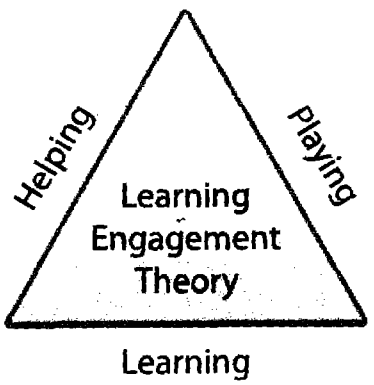

Figure 2. Learning Engagement Theory: A framework for developing engaging curricular contexts.

Using a five-point scale ("1" = none, "5" = a whole lot), we surveyed 153 fourth and fifth graders and interviewed a number of them with respect to how they rate the activities in their life (school, Quest Atlantis, playing with friends, doing house chores, watching television, etc...) with respect to the degree to which they involve learning, playing, and helping (Barab *et al.*, in press). They also rated the degree to which they enjoyed the particular activity. Some activities were rated as higher on one of the three components. For example, boys scored videogames higher on play than school. However, with respect to a composite score across the three dimensions, both boys and girls rated Quest Atlantis higher than any other activity in their lives, suggesting that participants do experience the design in terms of each of these three dimensions. In fact, we found no activity in the lives of children that scored above 3.0 ("I agree") on all three dimensions, other than Quest Atlantis. Additionally, children "liked" Quest Atlantis significantly more than they did school, but did not rate school as significantly higher on the learning dimension than Quest Atlantis. In other words, while kids generally claim to like QA more than school at large, no negative correlation was found between the perception of significant levels of helping and playing

and the perception of significant levels of learning. The fact that we found statistically significant learning gains with respect to science, social studies, language arts, and metacognitive skills does indeed suggest that academic learning was occurring alongside of or in the process of the experience of playing and helping.

Certainly, these ideas are not new to the thousands of teachers and administrators who regularly work to bring playing and helping dimensions to their classroom activities. However, these dimensions are too often undervalued in the way we conceive of curricular paths. Why should *playing* and *helping* be afterthoughts when they might inform the very conception and design of learning tools and activities? While we are advocating for the importance of learning being fun, there are clearly times when learning is just plain work. Our goal is not to rid the educative experience of hard work or even traditional learning practices. However, we believe that hard work should and can occur in the context of an activity to which the student is already engaged. A chore like taking out the trash takes on meaning in the context being a contributing part of a family and home. Learning about political systems is more engaging when kids get the chance to become active participants in real or simulated political actions. Continuous and complex learning activities are more engaging and meaningful when they strike a balance that reaches beyond the compartmentalization of learning, playing, and helping. Here, we are advocating for curricular activities that have joy and meaning as integral elements of how they are framed. It is at the intersection of these three activities that motivation for using Quest Atlantis is situated. While previous research provided insights into the motivational elements of games, as a design-research team we wanted to better understand which aspects of Quest Atlantis seemed to motivate participation and establish engagement.

Motivation as a Complex Process

Over three decades ago, a classic experiment regarding motivation was conducted in which children were randomly assigned one of three conditions in which they completed a drawing activity: (1) expected-award condition (children were shown an award that they would receive for playing with markers), (2) unexpected-award condition (were not shown an award, but received one after playing with markers), and (3) no-award condition (received no award after playing with markers) (see Lepper, Sethi, Dialdin, & Drake, 1996 for a summary). When these children were then covertly observed in their regular classroom, the intrinsic motivation of students in the expected-reward condition (as measured by amount of time playing with the markers) was significantly lower than children assigned the other two conditions. This study along with a number of other convergent studies produced some consensus regarding the belief that superfluous extrinsic incentives(rewards) will undermine preexisting intrinsic motivation.

A decade later, Harter (1981) developed a motivation instrument to measure intrinsic motivation and found that students' intrinsic motivations for school steadily declined at statistically significant levels from grades 3 through 9 (see Figure 3). Consistent with the early research assumptions, Harter's work was based on the belief in a perfect negative correlation between intrinsic and extrinsic motivation. This resulted in the assumption that the decline in intrinsic motivation of children in school was in part due to an increase in extrinsic reinforcers (grades, pleasing the teacher, etc.). However, almost two decades later, Lepper *et al.* (1996) showed that extrinsic and intrinsic motivation may not be perfectly negatively correlated and that in fact both intrinsic and extrinsic motivation for school steadily declined over grades 3 through 9. This is not a good sign. One might hope that, even in the face decreasing intrinsic academic motivation, there might remain a meaningfully motivating extrinsic framework. This does not seem to be the case.

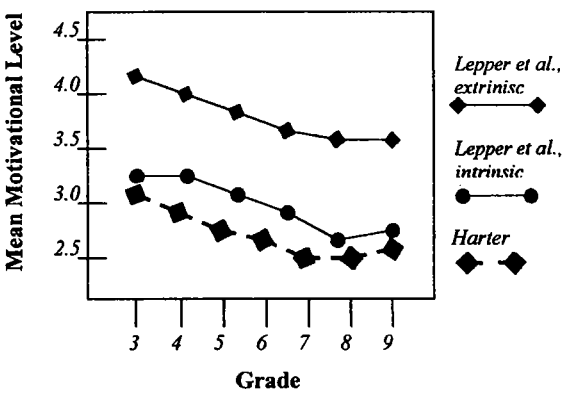

Figure 3. Intrinsic and extrinsic motivation scores from Harter (1981) and Lepper *et al.* (1996).

In terms of Quest Atlantis, our designed space includes motivational elements that might be considered intrinsic and extrinsic, with the larger goal of establishing an engaging cultural ethos through which academic content takes on meaning. In general, we believe that policy-makers have over-theorized and over-valued content, knowledge acquisition, mandatory participation, and the value of assigned grades or scores. Alternatively, the role of context, student participation, student engagement (voluntary participation), student goals and intentions, and the use value of information have been under-theorized and under-valued. *By over-theorizing and over-valuing product and under-valuing the rich processes of*

learning, the joy, fun, challenge, and meaning have, in part, been stripped out of educational activity. Learning is reduced to work, to academics, or becomes simply the activity of being a student. Our research on what motivates children to participate in Quest Atlantis has provided us with a host of potential motivational elements to which children are attracted in Quest Atlantis and that could be leveraged by other projects.

Malone and Lepper (1987) developed a taxonomy of intrinsic motivations for learning based on four factors they observed motivating children while playing videogames: game challenge, stimulating curiosity, a sense of control, and the fantasy of the game. These findings might be incredibly valuable and quite powerful, especially if used to inform the design of textbooks or other school curricula. However, the research was based primarily on single-person games, as has much of the educational research on videogames since then. With respect to the multi-user virtual environment of Quest Atlantis, Tuzun (2004) found support for these established factors, plus evidence for additional motivators at work. Tuzun studied the perspective and motivations of children using Quest Atlantis in an after-school context. Data were collected on 22 children using ethnographic methods, including interviews, observations, and document analysis. Interviews were analyzed using grounded theory and resulted in the identification of the original four elements plus ten additional motivational elements: *identity presentation, social relations, playing, learning, achievement, helping, rewards, immersion, uniqueness,* and *creativity.*

These new elements were able to arise, in part, due to the unusual context for learning. For example, *identity presentation* was accessible as a motivator due to the affordance of being able to build, customize, and evolve an online persona. Unlike the previous research, this list, in addition to expanding the number of intrinsic motivators, includes items that could be considered both intrinsic and extrinsic. These additional ten motivational elements emerged in part due to the unique social and technical structures that make up Quest Atlantis, shedding light on the importance of context in producing theory. One's notion of possibilities are very much constrained by actual particulars; and, while Malone and Lepper's (1987) categories were useful in terms of the games they were examining, educators need to acknowledge the delimiting effects of particular contexts and to consider how the particulars of a situation constrain possibilities for learning as well as theory development. An important part of design-based research is not simply to examine what is, but to design possibilities and then evolve theories within real-world contexts—a type of research that not only allows for, but takes advantage of real-world complexity. Similarly, we need to understand how laboratory contexts bring with them a host of constraints that necessarily influence the types of theories that evolve.

Conclusions

Quest Atlantis is a design-based research project that has the dual goal of supporting research and service, treating these as interdependent activities that are reflexively informing and informed by the other. As a designed context, Quest Atlantis is a play space that supports the learning of academic content within a context that is engaging and meaningful. The challenge has been to develop an adaptive entity that is not simply about playing, yet remains engaging; is not a lesson, yet fosters learning; and is not evangelical, yet still promotes a social agenda. As a design-based research project, our work involves interacting with the developed play space, in both its material and social forms, to understand and advance specific research questions and particular theoretical claims. Our research focuses on understanding the pedagogical and motivational impact of the medium, differences among genders, the relationship between playing, helping, and learning, the challenges in maintaining and participating in a globally-distributed online community, and how different design features of the project impact children's participation.

In this article, we focus on three outcomes of our work: (1) our current thinking of Quest Atlantis as a socially-responsive context of participation (a brand); (2) our belief in the value of academic activities having elements of learning, playing, and helping; and (3) our understanding of motivation as multi-dimensional and complex. From a practical perspective, we believe that policy-makers have spent too much time thinking about standards, grades, and outcome measures and too little time focused on developing contexts that will truly engage children. In contrast, we have used Quest Atlantis as a design platform to provide a different example of what curriculum could look like in schools. As a design-based research project, we have used this platform to enrich our appreciation for the challenges and possibilities of conducting such work. From a methodological perspective, we have come to value design-based research and the importance of using design possibilities and conducting research in the context of naturalistic (not laboratory-based) environments for evolving and advancing rich theory. It is our belief that theory developed in the context of actual use not only has ecological validity with respect to real-world practice, but also has the potential to bridge divides that have previously separated universities and practitioners and, thereby, lessened the potential impact and value of educational research. □

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