TEACHERS AS COACHES: A TEACHER'S PERCEPTIONS AND ACTIONS IN A GAME-BASED VIRTUAL LEARNING ENVIRONMENT

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ABSTRACT

Identification of how a teacher can facilitate learning within virtual environments is critical if use is to become a valued student learning experience. Through an ethnographic case study, a teacher's perception of her role and her actions in classrooms and the virtual world along with attributes used to facilitate inquiry were described. Comparisons were also made to determine if transfer of pedagogical techniques from traditional to virtual environments were possible. Understanding how game-based complex virtual worlds work and where knowledge that the student is to acquire exists, as well teacher's value of virtual environments, were key for facilitation and teacher buy-in.

INTRODUCTION

This study examined a teacher's perception of her role in a game-based virtual learning environment, Quest Atlantis (QA). In order to understand how the affordances of a virtual learning environment can foster learner-centered properties, such as students' critical thinking, problem solving, and collaboration, it is important to study the teacher's description, interpretation, enactment and critical self-reflection of her/his teaching world through ethnographic inquiry. This study focused on an in-depth study of one teacher who facilitated students' activities in QA. Teachers play a major role in technology integration. A teacher's understanding and realization of her role in a student centered learning environment and how technology, in this case, complex game-based virtual learning environments, can help students to develop new literacies, is critical for successful technology integration. Therefore the research questions that specifically interested me are:

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1. What are the teacher's perceptions of her role in a student-centered online virtual learning environment, such as QA?
2. Can teachers' preference of pedagogical techniques in regular classroom settings be enacted in student-centered game-based virtual learning environments?

Data analysis revealed that the teacher perceived herself as becoming a facilitator upon the condition of her understanding how virtual learning environments work and her possession of the knowledge that the student was to acquire. Such a view informed me that the participating teacher began to adopt her role to what may emerge from a unidirectional relationship to a bi-directional coach-student relationship. Duffy and Cunningham (1996) demonstrated a unidirectional relationship in which the student observed and mimicked or followed the instructions of the coach. The coach, in turn, modeled the behavior or provided the answers. This pedagogical belief might hinder teachers' pick up of the affordances of student centered virtual learning environments, the design and function of which is non-linear, resulting in a bi-directional coach student relationship. Using ecological psychological framework (Gibson, 1979) to guide analysis of the teacher's perception of and action in QA provided new insights on how to prepare teachers in adopting and implementing learner-centered technologies in school settings.

CONCEPTUAL FRAMEWORK

Student-centered learning environments have been the main focus of design, development and implementation in the constructivist instructional design paradigm. Instructional technology design and development is in its prime stage of development with the availability of high-end information and communication technology. Web-based instructions and virtual worlds (e.g., Quest Atlantis, Second Life, HiPiHi) are emerging and broadening the concepts of student-centered classrooms. In technology-supported student centered learning environments, students are required to set their own goal for learning and solve problems to a central question that are relevant, engaging and interesting (Jonassen, 2000; Pedersen & Liu, 2003). In teacher-directed classrooms, students work to meet the objectives set by teachers. Pedersen and Liu (2003) depicted that in teacher directed instruction, the teacher set learning objectives, and then planned a set of activities designed to help learners meet those objectives. Because learners were not

assumed to be able to determine a process to meet these objectives, it was the responsibility of the teacher to guide or direct students through a step-by-step process and to make sure that any difficulties they encountered during this process were resolved. In student-centered learning, however, Pedersen and Liu argued that the teacher presented the central question (issue, case, problem), then worked as a facilitator as students determined the nature of the response they would develop, and then formulated and carried out a process to develop that response. Teachers helped students to work through the difficulties they encountered by questioning them and helping them to identify alternative paths and resources, but they did not resolve these difficulties for the students.

Literature has demonstrated that implementation of technology-enhanced student-centered learning environments was double-layered (Ertmer, 1999). It required a teacher's conceptual change of her/his teaching philosophy to embrace constructivist teaching. Teachers tend to teach the way they were taught; therefore conceptual changes are never an easy task. It also requires teachers to be technology proficient in order to take full advantage of constructivist computer enhanced learning environments.

From the Ecological Psychology perspective, learning occurs when the person is able to detect information in the environment if she/he has the ability, tools, and knowledge. Duffy and Cunningham (1996) emphasized affordances of a learning environment as zones of proximal development and scaffolding. Young, Barab, and Garrett (2000) claimed interactions were codetermined, in that an affordance was not an inherent property of the environment, rather its relationship to a specific agent, with specific goals and effectivities, on a specific occasion. Effectivities are "the abilities of an individual to take actions" (Young, Barab, & Garrett, 2002). The door knob metaphor has been used ubiquitously to scaffold the understanding of the co-determination of affordances and effectivities in that the door knob only has affordances for people who can reach and be able to turn/push/pull it.

In this study, the affordances were defined as potentiality within an information field (e.g., problem-space) that enabled a teacher, like Tiani (pseudonym for the participant), to take action based on specific intentions (Young, Barab, & Garrett, 2000). Affordances that I expected Tiani to detect were the special affordances in the QA environment, such as, the avatars and point systems that allow students gain more points by doing quests, co-quests, and other QA job duties, More points would empower questers accessing higher status, such as to build, to buy

things, and also other privileges. In addition, I expected Tiani to realize how QA can foster skills in the new illiteracies for the 21st century (Coiro, Knobel, Lankshear, & Leu, 2008). I, the participant observer, was also considered to be an affordance in the larger context, the QA extended day.

RESEARCH DESIGN

Participants

The teacher who was in charge of the QA extended day program was of both self-selection and recommendation from the technology coordinator (Victoria, the pseudonym for the technology coordinator). This selection was an internal administrative decision which was not in the scheme of this qualitative study; however, the school wide plan for teacher technology professional development that year was to have the technology coordinator reach each individual teacher and assist integrating technology at a personal level. Thus, QA implementation into the extended day became Tiani's goal for her own professional development.

Tiani is an African-American female in her late twenties. She had a warm smile when interacting with students both in her regular class and extended day. She loves reading and writing, and was active in aerobics in a city gym. She worked in another older school district for 4 years before coming to Connected School in 2002.

Tiani and I together went through about six hours of getting to know and becoming familiar with QA including downloading, registration of users, navigation through the virtual worlds using the "teleport" and "join" functions, assigning quests to students, and so forth. A teacher manual was provided to Tiani, in which learning theory orientations and administrative functions of QA were introduced. During these training sessions, pedagogical techniques were not discussed explicitly, given this study was designed to look at the teacher's perceptions of her role and actions in this virtual learning environment. I had the assumption that Tiani would be self-directed in pursuing her professional development goal in learning about QA and how QA would be best presented as a fun and engaging learning environment.

Material

Quest Atlantis is a learning and teaching program that makes use of 3D Multi-user Virtual Environments (MUVEs) to immerse children, ages 9-13, in educational tasks. QA allows users to travel to virtual lands where they select educational activities (known as Quests), talk with other users and mentors, and build virtual personae (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005). QA is different from other 3D virtual worlds in that it is designed for children and educational quests are integrated within the environment.

Such design engaged children in a fun environment to explore different virtual worlds, as well as solving authentic complex global problems by themselves and/or by collaborating with their peers from different cultures (Barab et al, 2005). By solving problems together, children exchanged ideas and information, proposed solutions from their own cultural experiences, and negotiated appropriate tools to use. In this way they broadened their view of the world to a conscious level for comparison (Duffy & Cunningham, 1996). Virtual worlds offered the possibility for multiple perspectives and cultures to collaborate on a problem, task, or scenario (Dickey, 1999, Zheng, Young, Wagner, & Brewer, in press). This active process not only fostered children to embrace multiple perspectives, but also was effective in building communities of learners across distance (Dede, L'Bahy, & Whitehouse, 2002). Through QA, children, teachers and the Council internationally formed a virtual learning community, in which a student (a new comer), through legitimate peripheral participation and affordances of the environment, began to assume greater responsibility in that community of practice (Duffy & Cunningham, 1996; Lave & Wenger, 1991). It is worth to note that The Council is actually a group of researchers, teachers, and QA-players who “secretively” play the roles of wise elders of Atlantis to evaluate and provide feedback on children’s work in forms of quests and missions. The cultural context, artifacts as well as experts (teachers and old-timers), afforded the learner support (scaffold). Hence the children gradually constructed knowledge, and developed effective behavior and therefore were able to “speak the voice of that community” (Duffy & Cunningham, 1996).

Data Sources and Procedures

Interviews. Tiani was interviewed twice face to face, each of which was unstructured and lasted about one hour. The first interview was about Tiani's beliefs and perception of her role as a regular classroom teacher and her foreseeing of her role in QA virtual environment. The second interview was conducted under special circumstances. An interview should have been conducted after QA Extended Day, according to the proposed data collection timelines. From prior email communications with Tiani and Victoria, I perceived that Tiani was resisting participating in the interview. This perception turned out to be true. In one of the emails to me and Victoria she perceived that QA Extended Day required the students and her to do more work than other extended day programs. She also expressed her concerns about her role in QA Extended Day. She thought she was a co-teacher and a facilitator. I was concerned about Tiani's frustration and wanted to find out the reason for her attitude change from cooperation with QA implementation to alienation from participation. Therefore the second interview included questions related to her understanding of QA and her knowledge about her role in the QA environment, as well as questions which emerged from the first interview.

Observations. *During the* 14 weeks of QA implementation in fall 2003, once every week, I spent at least 2 hours at Connected School. Four hours of this time were dedicated classroom observations of Tiani in her language arts teaching setting. The purpose of this observation was to learn Tiani's role in regular classroom practices and her using technology for instruction. Because the laptops were not ready for six graders at the time, I could only observe her using SmartBoard in combination with Word and the Internet. During QA, Extended Day started in October, I spent 1.5 hours every week for 4 weeks observing Tiani in the QA environment and her role as a facilitator in the QA Extended Day context, except for one week, when I was not on site. For this special day I provided online help and was able to conduct minimal online observation. Based on the needs of Tiani, for the rest of the 3 QA extended days, I became more involved in not only planning, but also guiding and coaching. My role as a participant observer had faded and changed to more of co-teacher.

This study is considered to be an ethnography case study. Ethnographers often focus closely on the face-to-face and virtual interactions of members of a cultural group. They are interested in how interactions shape meaning in particular settings and environments (Erickson, 1986;

Hutchins, 1995; Rossman & Rallis, 2003). As an ethnographer, I therefore studied the intact cultural group and the community that Tiani was in, both face-to-face and in QA world, through ethnographic observation entailing long-term immersion.

The unit of analysis. Rather than focus on the individual as the unit of analysis, ecological psychology extends the unit of analysis to include the dynamic system that accounts for the totality of the teacher-environment interaction (Kulikowich & Young, 2001).

QA Extended Day took place in the environment of Tiani's own classroom. Observations of Tiani in her regular language arts teaching setting and QA extended day took place in this room also. Tiani thought it was a strange shape classroom but she likes it because it afforded her to be creative. The room was pentagon shaped. The desks were trapezoids which could be flexiblely arranged to circles and other shapes. If I stood by the door, on my left was a straight wall (Wall1) with boards and Smart Board. On my right, the wall was 45 degrees extended to northwest (Wall2). There were multiple copies of books and stationary items on the long folding table along this wall. The wall then turned 90 degrees to the northwest (Wall3). There were two wide windows on Wall 3 next to the corner of Wall 2 and 3. At the end of Wall 3, the wall turned 135 degrees to the west (Wall4) and met Wall1. There were two big windows next to each other on Wall3 and Wall4. Tiani's desk sat right in front of the corner where the two big windows meet. Looking out of the window, I saw both of the rivers hidden in the trees and bushes and wondered if students were engaging in activities that would require them to go beyond the books, laptops, and SmartBoard. There is another stand-alone bookshelf along the side of Wall 4. At the corner of Wall 4 and Wall 1, the moveable computer control center sat, which looked like a complicated system.

In addition to the interaction of Tiani and her classroom environment, QA was the virtual environment in which Tiani interacted. In this virtual environment, Tiani could choose her own persona (avatar), which represents her as she travels through different virtual worlds within Quest Atlantis, such as Otak Hub, Culture, Story Inn, Ocean, and so forth. Her avatar could express feelings, such as happiness, sadness, excitement, and so forth thorough pre-programmed actions. She could also jump, turn around, fly, and swim. Her persona also allowed her to make interaction with students more realistic and more individualized (see *Figure 1*. for a screen shot of interaction in QA).

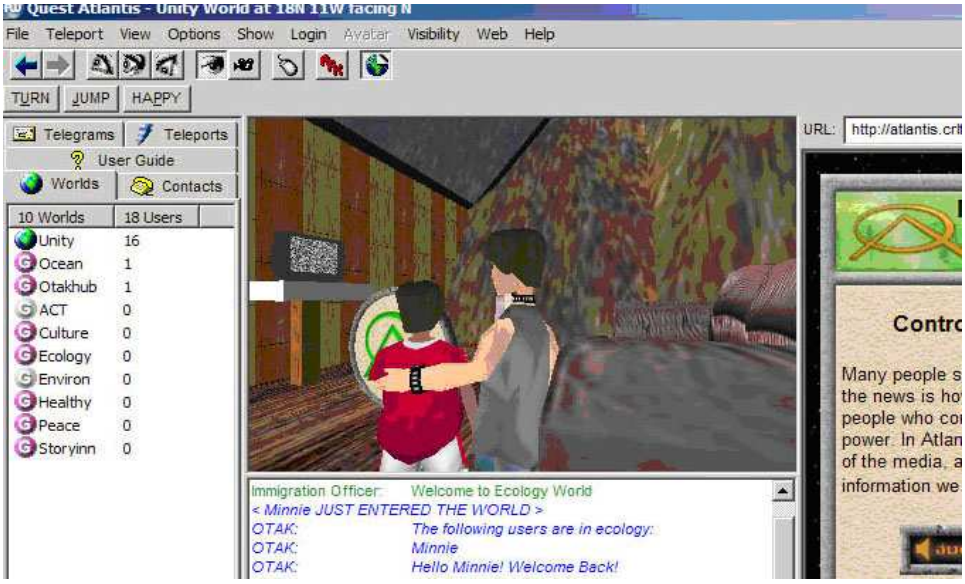

Figure 1: Students interacting in QA Unity virtual world

MUVEs provide users a unique opportunity to interact with others through sight (visual orientations and text communication) and sound (Maher & Corbit, 2002). While still maintaining the capabilities of older technologies – text-based chats and web pages – virtual environments have added the capability to visualize the surroundings and to see virtual representations (avatars) of the people with whom one interacts (Maher & Corbit, 2002). "Avatar" is a surrogate persona in the virtual world (Dede, 1995). 3D virtual worlds are inhabited places, social, experienced and dynamic space (Jensen, 1999). It is in this social space (culture), a user-in-avatar moves, follows his own project and intentions, uses tools and artifacts to solve problems in the space, and thus transform his participation in such culture, and in turn, change that culture.

I as an ethnographer focused closely on the face-to-face interactions of Tiani with her students in the QA Extended Day setting (her room) and in the virtual learning environment. I was interested in how interactions shape who she was as a coach and facilitator in QA Extended Day and the virtual settings. As a participant observer, my role as a researcher was not transparent.

Trustworthiness

Credibility and rigor. The participatory nature of this study required me to immerse on site for a total of more than 40 hours. These hours were spent on training, planning, meeting, co-

teaching, observing, interviewing. To establish credibility and rigor, multiple sources of data were collected for data analysis including field notes, observation scripts, interview transcriptions, and email communications. Reviewing the conceptual framework and interpretations of data with a critical friend also helped me gain another layer of rigor to my study. Sharing "emerging ideas, tentative hypotheses and half-based ideas" with an expert in the community of practice was engaged throughout the study; such activities enhanced the credibility of research design, the questions being investigated and study findings (Rossman & Rallis, 2003).

DESCRIPTION AND ANALYSIS OF DATA

I am Facilitating, I Want to Be a Facilitator

During the first part of our conversation at the first interview, we focused on the activities of the first day QA implementation. There were things that would not happen if this were not the first day. There were times the room was somewhat chaotic because the students could not download the QA software with their own logins of the school network. The alternative plan was to use Tiani's login and password for all 15 students. Here was when I turned myself into a participant. We went through every laptop and logged students in and helped them download the QA software and register into the QA 3D interface.

When Tiani shared her reflections of her regular classroom teaching experience, she appeared to talk more and to give explicit examples while talking about her experience, and that she loved to learn from her students. In order to learn from one's students, one has to give up control, give up the common perception that teacher has to know everything. At the same time, a teacher has to be willing to listen and respect children's choices and willing to spend time to find their interests.

> "I would like to see myself facilitating what they do, and not so much leading. Not saying you need to do this. Really let them figure their way around a little bit more. I mean I do have the control saying this is the quest I assign to you. So there is a teacher part there. But as far as when they are there and when they do the quest, I really don't want to give them hints. I'd rather have them chat with one another."

> "I think in the facilitator position there is less you have to do in this situation, which kids always respond better, especially adolescents. They like having freedom, they like feeling they have a choice. If you can get them learning without them realizing. Then all the better."

Tiani perceived herself as a facilitator, which she defined as having students control more in the situation, and having the freedom to choose what they want to learn. Learners should know best what they need, and so learning will be more efficient if they are in control (Duffy & Cunningham, 1996).

The "affordances of the environment" (Duffy & Cunningham, 1996) that scaffold knowledge construction and metacognitive reflection are important attributes of constructivist learning. However, for this project, the focus was on teachers' role in such environments. Virtual environments are good places for students to construct knowledge (Dede, 1995). Winn (1997) also acknowledged this fact, but at the same time he pointed out that simply turning students loose in a virtual environment with the task of constructing understanding was not likely to succeed. Duffy and Cunningham (1996) suggested teachers be coaches; the coach-learner relationship is bi-directional. "The skills and knowledge of both coach and learner are attended to and honored" (p. 16). In this relationship, both mentor and protégé are seeking to understand the other's view. Instead of learners replicating coach's behavior or following coach's view, mentor and learner come to an agreement even if it is an agreement to disagree. Duffy and Cunningham's vision of teachers as coaches was of a radical constructivist shift in Von Glasersfeld's term (Duffy & Cunningham, 1996). In MUVEs, such as QA, coach-learner bi-directional relationships are more possible to develop than in traditional classroom environments. Teachers' cognitive load is reduced when students engage in questing on their own or with peers. The role of coaching is realized when individual's requests are supported with questions and dialogs.

Tiani's role appeared to be a coach in her language arts class and her relationship with students was bi-directional:

> "The kids love it. They love seeing me sitting there writing with them.
> They write their own and I write mine. And we will be able to share in-group." <B117>

> "It keeps me on my toes. It makes me continue learning, which is what I want to do anyway.
> I wouldn't want to say that I am a teacher, I know everything, I want to pass my knowledge

> to you. I want to know more. Even in my classroom, when I do use the Internet, I really want to show the kids how exciting it is. For example the vocabulary lesson, we looked up Fair and Fare. … I heard of these things (definition) before, but if you set a work sheet in front of me and said, "What does fair mean?" I would give a definition like "it is equal" I might come up with some other definitions like "Light skin". There is so much out there." <B259>

> "Having kids that were here for the whole year, I like to ask them, ok, teach me how to use the SmartBoard, my computer is not letting me login, what's the problem? And it was simple like clicking the button. So I do learn from them. I think that adults in this world need to understand. The kids are a lot better in Technology. I wouldn't say they are better. But I think they spent a lot more time on it." <B279>

I Want to Be a Facilitator but I Want to Know the Outcome

In Vygotsky's view of coaching, which is in alignment with the concept of scaffolding, he proposed each child has a Zone of Proximal Development, where with the assistance of a more mature partner (a teacher or a more advanced student) the child can accomplish more, solve more advanced problems than she/he could alone (Cunningham, 1992). Even though the teacher has been moved from a sage on the stage to a guide on the side, the guide is still the fount of knowledge. He or she still possesses the knowledge the student is to acquire. The coach provides the scaffold for the learner. It is not so much that the teacher is seen as less important, rather the role of the teacher changes so that the focus is on aiding or providing the scaffolding for the learners rather than telling the learner (Duffy & Cunningham, 1996).

The phenomenon that Tiani perceived her role as a coach fits both the radical constructivist and traditional Vygotsky perspectives. Her willingness to learn from students in technology-oriented tasks categorized her as a coach in the coach-student bi-directional relationship. Her coaching role in the traditional Vygotsky perspective of coaching was revealed in the student-centered technology-supported virtual learning environment in QA Extended Day. When asked if she would be more teacher-directed to cope with such situation, she described:

> "It was hard having them all over the place, like they were all in different worlds and if I'm typing into one screen I am only talking to those people who are in that one world. I can't get all of them, which is really hard."

Her response was “No. I don’t want to be teacher directed. I want to be much more at the same level, learning at the same time with them.”

However, Tiani expressed a need to have teacher-directed knowledge, when I asked her to confirm if she perceived her role the same as in the classroom at the second interview.

> A: So, I see there is a theme emerging, I labeled it “Teacher as Coach” in your regular classroom. And by Teacher as Coach I mean from my understanding in the literature, the learner-coach relationship is bi- directional; you know they learn from each other. The knowledge of the coach and learner are both honored, you said you learned together, there is agreement, even though the agreement is disagreement, the directional leadership is equal. So do you think this relationship is the same as in QA Extended Day? <C220>
>
> B: I think it should be but at the moment it’s not. I’m certainly not learning anything from them at the moment, except for frustration. And I don’t think I know enough about it to show them, there is nothing for me to model, and say, “This is what you can do.”<C228>

During my observation of this particular QA Extended Day, and from reviewing the quests students submitted that day, there were many things going on. Two groups of students were engaging in co-quests; one student immersed himself in doing the quests and he ended up completing three quests. Such student interaction and deep involvement with a task were what we wanted to happen in this virtual learning environment. Students themselves initiated this interaction and such self-governance is inline with the collaborative learning literature (Pedersen & Liu, 2003). When students engage in collaborative learning, they have to make decisions about with whom they work, and how. As students negotiate their relationship with each other, they must articulate their ideas, and engage in a disciplined social process of inquiry (Pedersen & Liu, 2003).

Did Tiani see what students were doing and turn her learning motivation on and learn from her students? This is an interesting phenomenon that I want to explore in my future research: under what circumstances can a teacher learn from students? Tiani affirmed that she wanted to

see herself as a facilitator not giving teacher-directed knowledge: “No. I don’t want to be teacher directed. I want to be much more at the same level, learning at the same time with them.” However, the following needs expressed from Tiani demonstrated that Tiani needed teacher-directed knowledge to feel in control in QA virtual learning environment.

> “I cannot do anything more than they can do. I don’t have any more rights than they do. As a teacher, I can assign quests. That’s all I can do. And I think, right now I have 2 points. So the only way to experience with what they are experiencing is to go in to do the quests and have others rate them, which again, it is a lot more work than I should have to do. As a teacher, I should already have clearance, to be higher than where they are.” <C189>

> “Yeah, that would certainly be the way even when they double click on us, they’re seeing we’ve done something, and we have more points.” <C204>

> “I want to know the outcome. Like when I have teacher directed classes, I have outcome I know the kids are going to get to. And if they don’t get to them, I know how to guide them to get there. But this one, with Quest Atlantis, I don’t know so much where they’re going, so I don’t have that teacher directed knowledge, I’m really a facilitator, I’m really co-learning with them. It’s not like, here I am, with all the knowledge, here you guys are, try to reach it. That’s just not how it is.” <C440>

> “I would like to see them have more direction. Have someone who knows more than I know. And so, maybe, when I do those quests and I see more points and I see that I can do more things, that will help.” <C458>

Her concept of being a coach was more like the Vygotsky definition; she wanted to possess the knowledge the student was to acquire. According to Duffy and Cunningham (1996), this was a unidirectional relationship in which the student observed and mimicked or followed the instructions of the coach. The coach, in turn, modeled the behavior or provided the answers. The coach gave the learner his/her knowledge, which was to be replicated.

> “That was modeling, like really trying to be with them and not be this person in the front of the classroom that knows everything because I certainly don’t. What I wanted to do was get

> online and interact with them online. It didn't work, you know. They are still talking, they still not interested and I found it really hard that their code names, I don't know who they really are. By the time I start double clicking to find out who is who, you find yourself talking, 'Who's this one?'"<C241>
>
> So what I was trying to do was put myself on their level and have them see, "This is what you should be doing." Your earphones should be on, you should be in your world, trying to figure things out." <C251>

Pederson and Liu (2003) drew conclusions from their research on the implementation of new technology enhanced student-centered learning environments. They concluded that successful implementation required that most teachers make substantial changes in their classroom practices if these programs were to be used in accordance with the designers' intentions. The Vygotsky perspective of teachers' role in scaffolding was not much different from the traditional view of learning, in that knowledge was still this entity to be transmitted from coach to learner, which was a new instructional method, but the same view of learning and knowledge (Duffy & Cunningham, 1996).

Tiani's perception of herself in the regular classroom exhibited discrepancy from what she viewed herself in the online virtual learning environment in the after school context (QA Extended Day). From the observations and the conceptual ecological psychological framework of realizing and picking up affordances coupled by her effectivites, the transfer of her student-centered facilitator role in classrooms to the complex game-based virtual environments cannot be automatic. She expressed, "I still do not understand what people are supposed to be doing and how I am supposed to get them to do it." One of the purposes of creating a virtual learning environment is that students can learn in an authentic context and teachers can reach the goal of individualized teaching. However, Tiani was overwhelmed with the complication of the worlds and by the amount of time that she had to set aside for learning the worlds on her own. There were different worlds in QA where students could freely explore, for example, Cultural World, Story Inn, and Ocean World. However, she became less engaged in taking advantage of these affordances through which she could individually reach each child.

> "It was hard having them all over the place, like they were all in different worlds and if I'm typing into one screen I am only talking to those people who are in that one world. I can't get all of them, which is really hard." <C120>

> Cause I think what I was getting bogged down on was going to all these quests, opening them and reading them and judging which is a good one, which is a bad one, especially when you assign 2 and kids sometimes finish 2 and say "Next one!" You know, there are` a thousand quests, what should I assign you? <C374>

CONCLUSIONS AND IMPLICATIONS

This study took place in a magnet school which has a theme of science and technology. This middle level school which I named Connected School is a wireless laptop school. Connected School was founded in 2002 and there were approximately 600 students enrolled in 6th, 7th and 8th grades by Fall 2003. Each student was equipped with a laptop computer which could be used both at school and home.

Studies have shown that there are two orders of barriers common in technology implementation in schools: internal barriers (e.g., acquiring technical skills needed to operate a computer) and external barriers (pedagogical challenges) (Ertmer, 1999). The first order barrier was not considered for the scope of this study, given the school is on the cutting-edge to equip teachers with the first order needs. In a different study about teachers pedagogical beliefs in conducting computer-mediated classroom lessons, Lim and Chai (2007) concluded that even when affordances of social-networking and project-based learning were realized by teachers, the actions of inviting students, to engage in a project or an exploration were prohibited by practicalities of keeping up the curriculum, high stake-testing, keeping up with fellow teachers as a team player and a supporter of the school system. In this study, I attempted to study a teacher's perceptions of her role and action in the Quest Atlantis game-based virtual world. Through the lens of the teacher's perceptions of her role and my observations of her action as well as her students actions, I have found two factors that may contribute to the effect of such technology implementation in the after school context.

Tiani considered herself as a facilitator in the QA student-centered learning environment in its early stage of implementation, which had led me to believe that Tiani had fully understood what her role was in QA. The training approach that immersed her in the QA environment was not sufficient to help her to gain effectivities (knowledge and ability) to detect the affordances of the QA environment. A similar misconception occurred in Pederson and Liu's work: teachers have different definitions of the term (facilitator), which may lead to miscommunication and discrepancies. Pederson and Liu recommend an anchored approach in discussing pedagogy in specific examples of facilitation strategies useful within a given program, tying these strategies to a theory of how learning occurs within the environment. My recommendation, which is informed by the ecological psychology perspective, is that training of potential QA facilitators must include extensive goal-oriented exploration of the QA worlds and extensive opportunities to discover the affordances of the QA environment. For example, a newbie teacher can be teamed with a more experienced QA teacher, or a researcher, with whom they can do a co-quest together. This will put the newbie teachers in a student role to detect the functions and information that they may have initially missed. Such activities must explicitly connect to a professional development goal. This way, teachers may be willing to dedicate time and effort to practice in the student-centered environment.

According to McLellan (2004), ecological psychology has been partially influential in laying a theoretical foundation for virtual worlds. Central to the ecological psychological perspective on learning and thinking are dynamic systems, whose properties (affordances and effectivites) are codetermined (Young et al., 2000). Only agents with particular intentions are expected to pick up or detect relevant information on a given occasion (Young et al., 2000). Learners perceive affordances and directly detect the information in the environment. In turn action changes the environment and the learner perceives new affordances. Quest Atlantis is a large-scale complex social dynamical virtual system that is partially designed based on a non-linear model of learning and thinking. Therefore, we need to provide abundant learning opportunities as aforementioned in order for novice teachers who are unfamiliar with a virtual environment to be attuned detectors.

The second factor that may contribute to the teachers' buy-in of new technology innovations is possibly the values they hold for the role of QA type of learning environments as well as the values they hold for the type of outcome that such technology interventions can bring to them

and to the students. Data from this study did not saliently show, but in a different manuscript where I compared teachers' perception and action in QA implementation in China and United States, a sharp contrast was identified in that the teacher in China was adopting learner-centered activities learned from Quest Atlantis to her English classroom practice (Zheng & Young, in preparation). This transformation from appreciation of QA affordances to application to her classroom was quite visible from the teacher's reflecting on the differences between pre-QA teaching to differences during teaching and post-QA teaching. Under the larger context of curriculum reform toward a more student-centered curriculum in China, the teacher has been looking for such kind of technologies to help her to engage her students in authentic language use, such as communication with native English speakers in formal and informal ways. Studies on different interactions between her students and Native English speakers in Quest Atlantis have demonstrated what role she played in the QA implementation. For example Zheng, Young, Wagner and Brewer (in press) studied 2 Chinese-American dyads' negotiations for meaning and actions in the QA quests which allowed Chinese students to engage in language use for real purposes. The intervention resulted in many negotiation and action turns between the dyads and deep perception change and reflective behavior on how to learn English as a foreign language and understanding of American culture. In a quasi-experimental design study by Zheng, Young, Brewer, & Wagner (in press), QA group was rated significantly higher in their ratings on the attitude towards learning English and perception as English language. The afore-mentioned evidences demonstrated the Chinese teacher greatly values what QA can bring to her students and the kind of learning that she had longed for her students to engage in.

I can argue based on my second hypothesis that successful implementation of learner-centered game-based technology, besides helping teachers adopting a new role or transferring their facilitator role to a new and more technologically complex environment, we need to bear in mind the values that the teachers hold for professional development and what kind of learning they truly believe engage students.

In summary, this in-depth study of one teacher's perception and experience during a semester long QA implementation began to help me, and hopefully the field, to understand how emerging net-worked technologies can foster many of the new literacy practices into classrooms and how researchers and instructional designers need to prepare for such implementations. This study suggests that we help teachers to realize the affordances in a similar way that we help novice

teachers to learn a new concept. To begin, provide teachers with great amounts of modeling and scaffolding so that teachers can start to practice what the community normally enacts. Then allow a great amount of goal-directed exploration in order for teachers to pick up the affordances so to move to central participation. In addition, understanding the values that teachers hold for implementing technology and the learning outcomes it can bring is a critical factor because values could have higher ‘organizing principles” than other factors (Hodges, 2007; Hodges & Baron, 1992).

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