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A Virtual World for Collaboration: The AETZone

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Abstract

Participation in learning communities, and the construction of knowledge in communities of practice, are important considerations in the use of 3D immersive worlds. This article describes the creation of this type of learning environment in AETZone, an immersive virtual environment in use within graduate programs at Appalachian State University since 2000. Both student and faculty perceptions of elements such as presence, co-presence, and the forging of active community are presented, along with examples of formal and informal activities which serve as the base for teaching and learning in the Zone.

Why a virtual world for collaboration?

Collaborative learning involves three key elements: learner sharing, learner interdependence, and active involvement of learners in activities (Yang, Wang, Shen, & Hang, 2007). This type of collaboration, in which learners not only work closely with instructors or experts but also with each other, is at the heart of social constructivist philosophy. A primary tenet of the theory of social constructivism is that learning is a social activity and that knowledge is constructed in communities of practice (Vygotsky, 1978). Participating in this level of sharing, interdependence and involvement can be a challenge for students who are separated by distance. Web pages, chat and other tools can help, but a virtual world affords students and faculty the opportunity to see each other (as avatars), participate in serendipitous interactions, observe or infer activity, and to share in a sense of presence that goes well beyond a simple name on a screen. In other words, they can participate more completely in a community.

Studies abound that suggest the importance of student involvement, learning through participation and engagement in the learning process. Astin's (1985) theory of student involvement is based on the foundation of actively involving students in their

own learning process. Such involvement leads to such outcomes as persistence, satisfaction, and academic achievement (Astin, 1985, 1993; Goodsell, Maher & Tinto, 1992; Kuh & Vesper, 1997; Pascarella & Terenzini, 2005). Participation in learning communities is positively correlated to student engagement, outcomes and overall satisfaction (Zhao & Kuh, 2004).

As we move into online environments for teaching and learning, new computer technologies provide significant challenges as we consider new options for fostering student engagement and the creation of learning communities. What tools and pedagogies are needed to develop and to provide for the kinds of student engagements that we see in the literature? Clearly, the traditional classroom model of teaching and learning cannot be moved directly to online instruction. Flat web pages can provide information to the reader; email can move research papers back and forth between student and instructor. However, the rich engagement of small peer group research, discussions and communication - the very essence of that described above as requisite - is not possible. Three dimensional (3D) immersive virtual worlds provide possibilities to enhance online student engagement in new and profound ways.

Importance of building community

The characteristics of learning communities are defined in varying ways in the literature. Wilson and Ryder (1996) state: "… one of the lessons of postmodernism and situated cognition is that learning cannot be separated from action. We are learning every day, in everything we do. We add the qualifying term to our definition to suggest a community sharing a consensual goal to support each other in learning." Jonassen (1997) cites the following necessary components for a learning community: active, constructive, collaborative, intentional, complex, contextual, conversational and reflective.

Wilson and Ryder (1996) added the term *dynamic* to the notion of learning community. They define a Dynamic Learning Community as one characterized by distribution of control, commitment to generation and sharing of new knowledge, flexible and negotiated learning activities, autonomous community members, high levels of interaction, and shared goals and projects.

Wilson (2001) provides a list of supports which can foster a sense of community in online environments. These include:

- Meaningful and authentic exercises and requirements
- Extended opportunities for collaboration
- User-friendly communication tools which move beyond alphanumeric exchange such as email and threaded discussion

- Tools for organizing, evaluating and publishing knowledge which are available to all group members
- Effective means for making group decisions
- Respect for individual members, including flexible accommodation of multiple goals, foci, and learning needs, and room for private exchanges.

How then can these characteristics be an inherent part of an online experience? The importance of promoting sense of community and learner engagement in online learning environments is a growing topic of discussion. Shea, Li, Swan, and Pickett (2002) cite agreement with a growing body of researchers that a sense of shared purpose, trust, support, and collaboration –that is, a sense of community - is an essential element in the development of quality online learning environments, and that online learning community may be established through effective instructional design and organization, the facilitation of productive discourse, and helpful direct instruction, all components of teaching presence.

A study by Liu, Magjuka, Bonk, and Lee (2007) suggests significant relationships between sense of community and perceived learning engagement, perceived learning, and student satisfaction with online learning experiences. Positive relationships were also noted between feeling of belonging to the community and social presence in the online courses. Sense of belonging to a social community was also positively linked to instructor presence and facilitation.

Another study of online course work by Lee, Carter-Wells, Glaesser, Ivers, and Street (2006) suggests that students cite community-centered approaches to learning and establishment of a constructivist learning environment as essential for building community during the course experience. Lee also cites interaction among all members of the community as an important factor.

Goodfellow (2005) notes that membership of an online community is not just a matter of belonging to an organization, having a title or having personal relationships with some people, but also involves patterns of participation and non-participation in practice. Virtual community therefore resides in both the subjective experience and in observable patterns of practice in online interaction. Wilson and Ryder characterize dynamic learning communities as "…groups of people who form a learning community with the following attributes: distributed control; commitment to the generation and sharing of new knowledge; flexible and negotiated learning activities; autonomous community members; high levels of dialogue, interaction, and collaboration; and a shared goal, problem, or project that brings a common focus and incentive to work together" (Wilson & Ryder, 1996).

Inadequacies of webpage-based tools

As we explored distance-based alternatives for the Instructional Technology program at Appalachian State University, many types of resources were considered. A variety of widely accepted web-based tools and course management systems for higher education were available at the time, including WebCT. It became evident that tools such as these lacked the capabilities and structure to provide for the types of meaningful interactions we hoped to provide our students – the ability to provide an environment conducive to the building of community. Wilson and Ryder (1996) support this conclusion, noting that while both instructional design and dynamic learning communities can lead to learning, open systems are preferred because they address more fundamental learning outcomes, for example, self-directed inquiry, learning how to learn, and metacognition, and are more closely situated within natural performance environments. See a comparison between attributes of webpage-based tools and 3D learning environments in Figure 1.

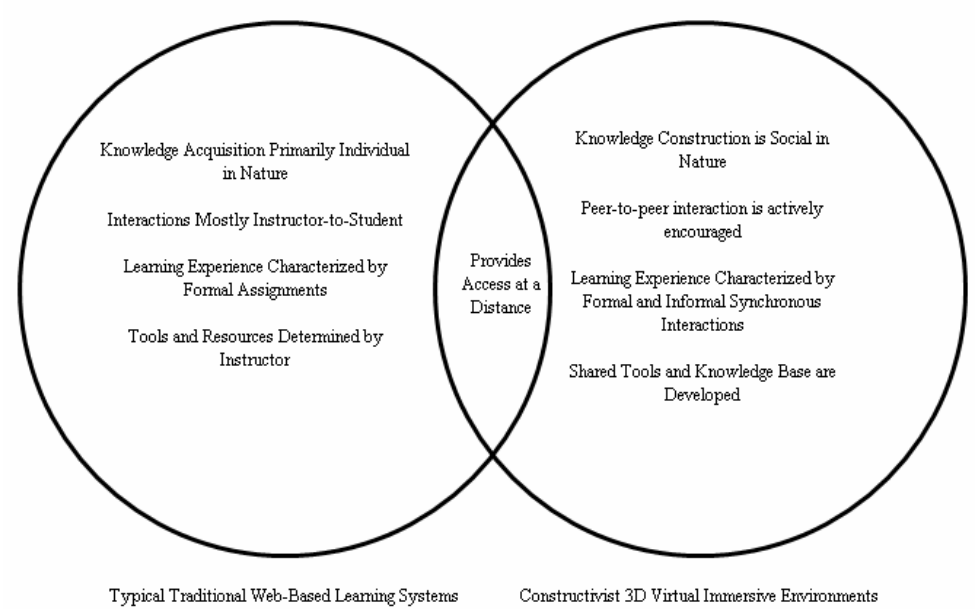

Figure 1. Comparison of Webpage-Based Tools to 3D Immersive Learning Environments.

Initial efforts

Our first effort to explore a 3D environment as part of the Instructional Technology program environment was initiated by Richard Riedl in the spring of 2000. He recruited three graduate students to help him think through how a 3D interface might be used to teach a course. The course selected was called Integrating Computer

Technology into Education, to be offered in the fall 2000 semester. It was a small class that semester and the students agreed to be part of the experiment, including completing surveys and conducting interviews.

The tool chosen was Active Worlds (http://www.activeworlds.com), which at the time offered educators a free world on their server and a limited number of citizenships. This server included a large resource of objects that could be used to build, text chat and whisper, the ability to open web pages by clicking on objects, and a selections of avatars from which to choose.

Initial goals for this effort were modest. Part of this experiment was to explore how students and the instructor would interact when given such a tool, and to determine if a 3D environment could break the rather linear, step by step aspects of most web-based courses.

The course syllabus was studied carefully and components were built in a world called Appedtec on the Active Worlds server. The course area had a central space and three areas branching off of it. The central area hosted links to the course syllabus and schedule as well as places to post thoughts and ideas from questions that were posed in the course, including a link to the main class discussion board.

One of the three areas of the course that branched off of the central area was a path through a garden that had key questions the students needed to ponder. Another was a chessboard with avatar-sized chess pieces. Each chess piece was linked to an article the students were to read. The third area was a café in which different tables represented links to tools that could be used when integrating computer technologies into instruction.

Students were given a schedule that included tasks and there were dates, but efforts were made not to require a preset order for visiting particular areas or reading particular articles. Students could choose to go to the café first, leave comments, reactions, or summaries on a resource in the central area, or go to the chessboard and select one of the chess pieces and share a reflection on the discussion board in the central area, and then go to the garden and leave their thoughts about each of the questions in the central area. The central area was designed to serve as the repository for their shared reflections, summaries and responses to questions in such a way that they could interact with each other without stringent requirements that certain things be done at certain times.

In follow-up surveys and interviews, there was ample evidence to suggest the course was successful, but, as is the case with such experiments, there was much that needed to be explored and improved upon. That a 3D environment could help break out of a perceived or real linearity when desired was evident. But the aspect of this experiment that provided the greatest insight was the very clear evidence that a different sense of presence had emerged among the participants.

Students and the instructor reported a very powerful sense of meeting each other; of having the experience of running into each other as they explored the 3D space, discussing the course but also chatting about the weather or how their day had gone; in other words, interacting as if they had run into each other on campus. The students reported a sense of closeness that was, in some ways, more significant than that which they would normally develop when meeting face-to-face in a classroom once a week. There was the suggestion this 3D presence was a very important component of the course experience.

Taking the plunge

The faculty of the Instructional Technology program had been developing a significant web presence for use in their courses and was discussing moving more of the program online. Two things were of primary importance in their discussions. One was a sense that it was an error to assume that learning only happened in a classroom. Students whose only interaction with the university is through course content put into a learning management system were being deprived of a richness that students who live and learn on a campus took for granted.

The other resulted from a simple question. How often are two or more students exploring content or a question on a web page at the same time, and yet unaware that each is puzzled by the same thing? What would happen if they knew of each other at that time and they began talking to each other?

The experience with the class on the ActiveWorlds server, combined with the conversations that resulted, prompted more activity in a 3D setting. The faculty purchased their own ActiveWorlds, single world server, costing just under $1,900. This decision was made primarily because they did not want to pass citizenship costs on to their students and they wanted to provide an environment in which it was guaranteed that those who participated in this environment were there for the common purpose of pursuing a graduate degree. A first course was developed and the learning process for the faculty began. Each semester, a new course was added - until all of the courses within the program were in the virtual world. At some point during the third semester of courses in the 3D setting, a critical mass of learners was reached and much that the faculty hoped began to happen: students and faculty were meeting and interacting in ways that are just not possible through either web page interfaces or traditional classroom-based environments. There was a very real sense of presence and co-presence.

Critical mass

Reaching the point of critical mass was essential in the creation of our online community. Interactions between a small number of students in a single class were dra-

matically different than those with more users: with more involvement, the community evolved, grew and became self-sustaining with the types of rich interactions all had envisioned. This magic number of critical mass is difficult to quantify. But prior to it developing, participants often found themselves wandering around in isolation, their only interactions being with the course web pages linked to objects within the virtual world.

When the critical mass was reached, however, not only did the discussion boards become richer, but also the social environment became more comfortable – people could expect to find others online and would talk with them about any number of topics, both related to coursework and not. Many even began arranging their schedules to be online when they knew they could find others there, outside of any assignments or activities that were set up to create opportunities for groups to meet and to work together. Moreover, students from other program areas outside of the Instructional Technology program began to appear in the world, increasing the number of students present at any given time. More important, it helped to move this critical mass from one based solely on the number of students in the AETZone to a critical mass that also consisted of a diversity of perspectives, backgrounds, and academic disciplines.

In hindsight, reaching critical mass was essential for the creation of a sustainable, rich environment for learning. Once a sustainable critical mass exists, entry into the community becomes easier for new members, as they have experienced users to greet and to guide them. Asking new participants to seek out experienced users to ask for tips and asking experienced participants to help a "newbie" have proved to be important steps in the rapid integration of new students into the learning community, and also in the retention of more experienced students within the ever-changing virtual world.

Presence and co-presence

What differentiates an immersive learning environment such as this from a more traditional social constructivist setting? Perhaps the most notable difference is the sense of presence, both of instructors and peers in the learning community. Certainly, there is presence in a traditional classroom, but this is often limited to the hours and physical spaces of class meetings. Although this can be extended via supplementary methods or course management systems by the addition of asynchronous tools such as discussion boards, often even the supplements are limited by section, class, course, or term, or time.

In an article discussing the difference between interaction and true presence, Garrison and Cleveland-Innes (2005) argue that the natural and appropriate inclination is first to direct interaction efforts to establishing social presence and creating interrelationships, but that this is only a precondition for a purposeful and worthwhile

learning experience. The authors propose that presence is important for the creation and sustainability of a community of inquiry focused on the exploration, integration, and testing of concepts and solutions. Their study indicates that teaching presence contributes to the adoption of a deep approach to learning. A study by Shea et al. (2002) supports the hypothesis that perceived presence is associated with students' sense of learning community.

Our experience based on feedback, observation and survey results suggests that 3D virtual worlds support deep learning, help learners make meaning, and facilitate the development of a true learning community. Virtual worlds such as AETZone offer participants a sense of presence, immediacy, movement, and access to artifacts and communications unavailable within traditional web-based learning environments. Our own experiences with teaching in this type of immersive learning environment supports studies on social presence by Rovai (2002) and Tu (2002), which suggest that this sense of presence and co-presence is a critical factor in the creation of online communities. Tashner et al. note how this occurs in AETZone:

"As an immersive 3D environment, AETZone allows participants to 'see' the other participants (represented by avatars) present. Each participant is able to move through the 3D world by keyboard action. As one moves, one's perspective changes, as does what is seen. This change in perspective as one moves, creates a sense of 'presence'. A participant has the perception of being somewhere else. In addition, as one observes others in the environment, one has a feeling of being somewhere else with someone else or 'co-presence'. These concepts lead one to experience a connected presence or mutual awareness of others. As the mutual awareness increases, so does the desire for and feeling of heightened engagement in the world and in the activities conducted within the world. Emerging from the analysis was a strong theme of the importance of both presence and co-presence in developing learning communities. Participants indicated that the feeling of isolation and working alone diminished as they become accustomed to working in the environment. As participants gain more of a sense of being somewhere and with somebody else, communication and collaboration is dramatically enhanced. Combining communication and collaboration tools with a sense of presence and co-presence provides opportunities for developing authentic learning environments" (2007).

Our virtual world has helped us to interact more naturally and fluidly with our students. We can offer more opportunities for our students to take their own paths through resources and activities together, in groups and at times that make more sense to them. Structure and guidance are still provided, and a class within the virtual world may be as linear as any. However, we are more open to providing choices for the students within the 3D world, and the ability to help students construct individual paths through the virtual environment is an essential element in that process.

What we have done

As the use of AETZone has grown for both formal coursework and informal interaction between members of the community, several important changes have taken place. Along with the ActiveWorlds server which serves as a base, it has become evident that a variety of other communications tools are necessary to encourage and to facilitate meaningful interaction. A threaded discussion board was the first tool added for this purpose; a Voice over IP utility called Talking Communities (http://www.talkingcommunities.com), which allows for collaborative activities such as Whiteboard and Desktop Sharing, was another. Wikis and blogs have been added in recent years to further help build our community and to increase the capacity for sharing within the environment.

Because nearly all of our students are physically located at a distance from our campus, they typically are unable to access the resources of our University Library. In response to this need, instructors worked closely with Library staff to create the Information Commons, a space in AETZone where our students can both access the numerous resources the Library makes available, but also can interact directly with Library staff members, who work in the Zone almost every evening. This has created a way for our students to access resources for reading and research, and provided a connection with the University community which is unique and significant.

Perhaps one of the most important changes in AETZone was the creation of the Commons area, which now serves as the point of entry for all who enter the environment. This area is not specific to any academic program; instead, it was designed to house common tools and resources for any of our citizens, as well as provide a place for interactions between graduate students and faculty in a variety of academic areas. Here, Instructional Technology meets Library Science meets School Administration - and all discuss a variety of topics of common interest.

Formal activities

Activities around coursework in AETZone require careful planning to facilitate the types of interaction for which we hope. As such, courses have strong elements of teamwork and project-based learning activities. Small and large groups frequently meet in the Zone to discuss projects and other course activities. Students are asked not only to work with members of their own cohorts, but also to complete projects with those in other geographic areas as they progress through programs.

An example of these formal activities can be found in the first course of the Instructional Technology program: Computers in Educational Settings. As students begin to work in AETZone, they are asked to find three 'veterans' in the environment and get tips from them, either on the program itself or working in the 3D worlds. Next, they report interesting things they have learned on the class discussion board. One new

student in the spring of 2008 wrote: “Every time I log into the "zone" I am amazed at all the information that is so readily available. I haven't had a chance to play around with all the fun stuff but seeing what is available is amazing- instead of having to go to the internet and search for things. I have met very helpful people- it seems that I keep running into people from our class but I have run into a few others, a professor of library science- Nita- she suggested the best way to find out information is to just ask; which is so much easier in a virtual world than in a classroom- there are no expectations- even though I don't consider myself shy, I find it hard in a regular classroom setting to ask a lot of questions.”

In the Library Science program, communities across cohorts are created in the course Critical Evaluation of Library Media for Children. In this course, graduate level library science students participate in online literature circle discussions with each other and with K-8 schools. The library science students collaboratively select children’s literature to read and then determine a calendar and method of ‘discussion’- for example, discussion board or audio chat. As a springboard for their literature circle discussions the students use a blog to record their thoughts and ideas as they are reading. The community is extended by bringing in students from K-8 classrooms across the state to participate in discussions with the library science students. See an example of students working in a formal class setting in Figure 2.

Figure 2. Faculty and students working in the Computers in Educational Settings Course Scene.

Another example of design of formal activities in AETZone is the Case Study Conference Center. While not specific to one program, it serves as a more formalized attempt to design a space to foster cross-program dialogue about real problems and issues affecting all educators. Several cases are housed in the conference center, one specifically designed to engage students in a scholarly conversation about ‘future forces’ expected to impact teaching and learning in the 21st century, and how these forces might be addressed through the development of a comprehensive plan to overhaul K-16 education in North Carolina. Students participating in this case inter-

act with others across various disciplines and work collaboratively to design a response informed by and responsive to each of their respective communities of practice.

Along with some spaces designed for specific functions, asynchronous tools such as discussion boards, blogs and wikis are important elements of the formal element of courses in this environment. It is significant to note, however, that unlike some applications of these types of tools, there is an important and ongoing element of student-to-student interaction, facilitated by guiding questions on the part of faculty and an expectation of consistent involvement throughout a given course. Presence on these discussion boards, for example, is not measured by number of posts; rather, we both model and seek deep discussion and questioning.

Informal activities

A key characteristic which differentiates 3D virtual learning environments from others online is the notion of serendipitous presence: unplanned, spontaneous conversations and interactions between students and other students as well as between students and faculty. Through these informal meetings, students gain a sense of belonging, gain help and assistance in a timely fashion, and increase their own learning through conversation with fellow practitioners about issues pertinent at the time.

The Commons area was designed specifically to facilitate this kind of informal interaction between citizens. All courses in the Master of Library Science (MLS) program are "taught" in the Commons. Tools and resources are distributed throughout the Commons, providing students in all MLS courses access points to what they need for online, offline, and in class assignments and activities. MLS students come into the world throughout the day and week to access discussion boards, blogs, wikis, podcasts, and other digital resources for learning. In doing so, invariably they meet with other students in their class, students in other MLS courses, and students in other departments altogether. These informal, serendipitous meetings are common and serve as an important contributing factor in the creation of learning communities in AETZone. We encourage our students to go out of their way to interact with others while in the Commons; to introduce themselves to one another and to extend opportunities to share ideas and experiences in education with and among each other.

Formal and informal experiences sometimes do blend in AETZone. Recently, Library Science students were meeting with an invited guest expert in the Glass Classroom in the Commons. They were discussing collection development in the 21st century. Many other students entering through the commons noticed the mass of avatars, and were intrigued. They decided to join the class. These students from other disciplines actively participated in the discussion, broadening the perspectives by sharing insights related to their respective disciplines. The ‘drop-in’ class members also requested copies of the resources prepared by the guest.

One important element which has developed as a result of informal interactions is a sense among the participating faculty that all students are 'my' students, and among the students that all instructors are available no matter what course is being taught; the lines between courses are blurred so that students can interact and learn together no matter where they may fall within the programs offered.

Students are aware of the presence of their instructors and peers when logged into AETZone - through the use of avatars, each can 'see' the other. Students can approach other students and - using both audio and text - they may talk to one another not only about course assignments, but also about life, work, or world events. Through these interactions students create knowledge together. They talk about the work they are doing in class; they share ideas, processes, and resources with one another; and they contribute to the base of knowledge that exists within their field. Throughout this process, each moves from novice to expert, not only in terms of knowledge and skills, but also in terms of their abilities to work collaboratively within a virtual learning environment using tools previously unknown to them. Their beliefs about teaching and learning are challenged, refined, and shaped by the process of learning together in an authentic social world of dialogue and discovery (Sanders & McKeown, 2007). A visual example of students interacting informally is found in Figure 3.

Figure 3. Students Gather to Work in the Information Gardens, AETZone's Branch of the University Library.

What we have seen

As AETZone has grown to a community of over 1700 citizens, including faculty, students, guests, and experts in content areas, we have been able to see the development of the types of community described above. Through both formal and informal interactions, activities both planned and unplanned, the 3D immersive environment has allowed students and faculty to interact in continuous, collaborative fashion.

Results of survey

In the spring of 2007, present students and program alumni in the Instructional Technology program were asked to complete a survey regarding their experiences in AETZone. Many of the questions revolved around themes of community and presence, and the results verify faculty perceptions of the creation of a community in AETZone.

Table 1. As a student in the Instructional Technology program, I feel that I am part of an effective and supportive learning community.

	Percentage (%)
Strongly Agree	71.9
Agree	21.5
Disagree	2.5
Strongly Disagree	4.1

The result in Table 1 makes evident the strong sense of community felt by a great majority of students participating in AETZone. One student wrote, "I can confidently say that I feel I am a part of an effective and supportive learning community BECAUSE of the IT program. The conversations and collaboration between me and others in the program has grown, even after I graduated".

Table 2. The Instructional Technology program promotes continuous, collaborative and active learning.

	Percentage (%)
Strongly Agree	81.8
Agree	11.6
Disagree	0.8
Strongly Disagree	5.0

Not only does this environment promote a sense of community, but as shown in Table 2, it also provides our students with a sense of continuous engagement in a collaborative approach. As another student writes:

"THE AETZONE is not called an active world just because of the software...it is an ACTIVE WORLD with people discussing issues, projects, and ideas about everything from classroom lessons to technical hardware problems. I have never been so involved in my own education as I am in this program choosing the topics I want to learn and the ways in which I want to use technology. Instructional technology professors facilitate, teach by example, and stimulate thinking to take students to their "individual next" level. Collaborative projects are not only encouraged, but required

and every assignment, project, and class builds upon the last. I have learned software that enhances my class instruction. I also have accessed hundreds of websites full of teacher ideas, student-friendly project makers, and much needed educational issue forums. I am so impressed that ASU is on the cutting edge of technology with a virtual class room that is virtually filled with interactive learning opportunities".

Reflections of faculty

Ongoing faculty assessment is a crucial component of the effective use of a 3D immersive learning environment such as this – and the success of helping facilitate the creation of a learning community is one of the most important concerns. Many lessons have been learned in the eight years that AETZone has been used.

The definition of this kind of community is one which is constantly revisited and revised as we grow. Communities, especially online communities, depend on common purposes, goals, issues or problems. They also depend on some sort of formal or informal set of rules or guidelines to keep the community focused on its reason for being. Historically, online communities have been ephemeral, starting quickly and often ending quickly. Early listserv communities are an example where the list begins by being very useful and popular. But, as new members join who were not part of the original reason for forming the community or who do not agree to the guidelines formed by the initial community, the original reasons for forming the community disappear or members leave because the community is changing in a way they do not like.

It is important to note that the community in the virtual world is brought together by common purposes and goals, and is defined both by the programs involved as well as the students within them.

Goals and purposes of graduate programs may initially bring students into AETZone, but what makes them want to come back? It is perhaps the sense of belonging – of presence and co-presence – which cements this community of learners and helps each member continue to learn from one another.

But presence is much more than simply being aware of another's avatar. Presence is manifest in myriad ways throughout the world. It is found in the resources faculty and students share. It is evident in the syllabi faculty create, in the metaphors each chooses for the course spaces and scenes, as well as in the synchronous and asynchronous instruction that occurs in the world. Over time, students have suggested that they appreciate this multiple manifestation of presence, and that the ability to both contribute to and benefit from it is invaluable to their own development. Faculty involved suggest each appreciates the facility this manifestation of presence provides when sparking discussions by challenging students to move out of their comfort zone, so that they can explore ideas new to them, or to reconsider ideas that are a

part of their current environment. Indeed, discussion boards lend themselves well to this. However, faculty note the importance of "being seen" in the 3D world at regular intervals, and appreciate the value of both planned and serendipitous interactions with those who are also present within the world. In part, there is clear instructional value in being visibly present to assist students as needed. But there is also significant pedagogical worth in making explicit to all students that each is not actually on his or her own. Instead, no matter which program, nor what time, nor where one lives, there are instructors available to support them. To this end, it is important to use all the tools and methods available to engage students with faculty, as well as with each other.

The co-presence issue is also manifest in the opportunities for students to work together in small and large groups. Each sees representations of others and often carries their own personal persona into the 3D world. Others may dare to be very different. In either case, they obtain a sense of being somewhere else with someone else. They work collectively and discuss various components of tasks to be completed. They know they can obtain assistance and support from others who are there. As a result, instructors are challenged to create assignments that require students to interact with one another in meaningful and different ways.

The future

Of all lessons learned during the implementation of a 3D immersive virtual learning environment, perhaps the most important is this: while the technology tools provide devices for communication and collaboration, the truly important elements are the changes in pedagogy and development of student engagement which are enabled by these interactions. As we progress, we will continue to explore the most effective and accessible ways to foster the development of communities of learners. What do we do to help facilitate and to encourage these types of communities? What behaviors and activities do we model? How do formal, planned activities contribute, and which do not work as well? These and other questions will guide both the pedagogical and technical elements of continued development of AETZone.

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