Accelerating Online Discourse via 3D Online Learning Environments

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1 Introduction

Over the last few years the technical entry barriers for students to use 3D online learning environments (Internet, Computer Performance, and Graphics Adapter) have been removed to the extent that deployment now makes economical and instructional sense [Jones 2004b]. However, wide scale deployment of such virtual teaching spaces face new barriers. One of the most profound is the perception that 3D belongs to the world of online gaming [Lombardi and McCahill 2004]. Additional barriers include cost of content development, content migration to new systems in the future, and establishing new paradigms for course delivery that allow for both behaviorist and constructivists pedagogy [Jones 2004a].

For those of us writing various papers about 3D online learning environments and it potential in education, we can envision a future that contains large-scale environments, where thousands if not hundreds of thousands of students create their own content and participate in social and learning groups. The problem is that today few universities and schools are ready or prepared to change from their current educational approaches to a massively interactive online approach. Schools are interested in this technology, but are looking for something that is smaller in scope, less-expensive to install and maintain, holds little risk during early trials, and is used initially in a supplemental role with their existing investments in web-based course systems. In research conducted between 2002 and 2004 that examined the issues and concerns of directors of post-secondary distributed learning programs concerning online methods and technologies the directors indicated that speed of adoption was slow for new technologies because of issues related to how to integrate new technology with existing deployments and the cost of content migration for already invested materials [Jones in press]. This might explain why only 6% of the 316 schools participating in the study indicated that a the institutional level they used some type of text-based MOO/MUD. At the time of the study, none of the participating schools used a more modern 3D interface. Early adopters of 3D online approaches are not found at the institutional level, but at the department and program levels.

With these issues in mind, this paper will discuss the use of a 3D online learning environment being used at the University of North Texas and how it is extending and enhancing established web-based and blended courses. The most notable fact is that web-based courses that use the 3D online system tend to have accelerated and prolonged discourse over the semester. The research presented in this paper is part of a larger research work focused on discourse and cognitive scaffolding for online interactions.

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2 3D Online Learning Environments

3D online learning environments provide a way to create Internet resources that are stimulating, appealing, easy to use, and educationally sound, without the need to develop highly elaborate technical skills [University of Sheffield 2004]. These environments are commonly seen implemented in computer games where they are called MMOGs (Massively Multiplayer Online Game), MMOPWs, or MMORPGs [Kent 2003]. In education they are termed 3D MOOs (Multiser Object Orientated), MUVEs (Multiuser Virtual Environments), or 3D online learning environments. The commonality between all these approaches is they create a context/scaffolding for interaction using 3D presentations to engage and/or immerse the student into a situation for learning (situated learning) or entertainment. These new interfaces have strong ties to their text-based cousins, dating back to the 1980's [Holmevik and Haynes 2000], but now provide highly collaborative, immersive environments that promote interactions among students and with the instructor. As computer performance on low-cost personal computers increases, these types of systems allow teachers to provide students with unique online collaborative learning opportunities in the areas of language, science, computer graphics, and other fields [Chen et al. 2004; Jones 2003]. An online 3D virtual environment supporting text, audio, and overheads allows for immersive environments to be created so that the students and instructors can interact as if they were at the University. Figure 1 shows a captured screen image of the environment we are using at the University of North Texas.

Figure 1 - Example of a University Environment.

Students at remote sites assume control of a representation of themselves, also called an avatar, in a shared created environment such as a school building, park, or any other space. The virtual-space is segmented into conversation areas (portals) so that learners can easily move their avatars to areas for small group or private discussions.

Students and teachers, when interacting with each other within the 3D online learning environment, frequently comment that they feel more engaged. The engagement in the environment is a natural outcome from the user interface. The student has to take control in order to interact and move in the environment. This interaction leads to immersion in the environment [Jenson 2002]. The MUVEES Project found that students using 3D environments had high levels of motivation, increased interactions, and improved academic efficacy [MUVEES Project 2003]. The spontaneous exploration feature of the 3D online learning environment can be harnessed to better implement underutilized forms of pedagogical practice and perhaps to create new forms of teaching/learning. Research conducted at the University of North Texas in 2003 showed that students had the same satisfaction and attitudes towards using the 3D online learning environment as compared to the same course taught in a traditional face-to-face manner [Jones et al. in press].

The modes available in the system that University of North Texas uses are text, audio, overheads, whiteboard, etc. Students and instructors use different modes depending on their needs. Students who are uncomfortable speaking, can use the text-based chat for voicing their questions in a course. The instructor can use the audio chat mode in order to provide more information than they can easily type in. Multi-modal interactions allow the system to utilize more than one mode over time to ensure that students with different learning styles are effectively reached.

A 3D rendered environment is highly bandwidth efficient and can provide communications to the lowest speed users (dialup). This is possible, because the learning environment is rendered and not retransmitted, the initial bandwidth is minimum and can easily support those without access to faster Internet connection as discussed earlier. Fast performance over thin-client Internet connection is ensured by small file sizes, delivery of just-in-time information, and incremental rendering that only request and then renders active visible areas on the user's screen [Jones et al. 2002]. This is a very important issue for those facing the digital divide in rural and urban settings [Benton Foundation n.d.]. A majority of homes and users in the United States today still do not have access to broadband Internet, with these types of connections (i.e. cable modem or DSL) either hard to get or cost-prohibitive for many rural and inner-city students [FCC 2003; Jones 2001]. By supporting dial-up Internet users, the 3D system supports the same target bandwidth group that web-based course approaches aim to provide for.

3 Time Required to Develop Online Text-Based Discourse

Numerous research papers have been written concerning the use of e-mail and message boards to support course delivery and community building. Comparisons between free form, mediated, structured, facilitated, and other types of discourses approaches have been written about. The focus of many of these studies has been to examine how text-based discourse can be improved. While video conferencing and other forms of high-bandwidth technology have widened the palette of communications options for distributed learning, text-based tools remain the lowest common denominator for a diversely Internet connected student population. This is seen by the fact that over 90% of post-secondary institutions that participated in a research study between 2002 and 2004 reported that e-mail was their primary course communications method, followed closely behind with web pages and web-based message boards at over 80%. High bandwidth systems like video conferencing were only reported being used by 62% of the responding schools [Jones in press].

The one pattern of interest that has emerged from the various studies is that the more message exchanges that can happen over a prolonged period of time by the participants, the better chance the participants have of attaining meaningful discourse. The author, in his dissertation research found that participants in a facilitated message process focused on a curricula topic took between 10 and 18 weeks to reach a sustained, high level discourse when using text-based e-mail. The participants only communicated via e-mail and never used alternate communications, like telephone, face-to-face meetings, and the like. Even with facilitation and structuring the initial discussion to help form successful discourse, only teams that maintained prolonged communication over ten weeks reached meaningful discourse [Jones 2001]. Ten weeks is the better part of most school's long semesters.

4 Accelerated Discourse via Scaffolding

The question becomes, how can we accelerate the discourse such that students taking online courses with text-based communications as the primary mode of interaction reach meaningful discourse in the first month of a class. The answer can be seen in the increasing number of blended or hybrid classes being offered. The term blended learning describes a course in which a mixture of face-to-face and online instruction is used [University of North Texas Center for Distributed Learning 2005]. The purpose of these face-to-face meetings is to allow denser communications initially in the face-to-face meetings that give the students and instructors the opportunity to build discourse and cognitive scaffolding, with the results being accelerated discourse.

I began using a 3D online learning environment at UNT for course delivery during the fall of 2003. Since then I have taught courses using our university web-based course delivery system, blended courses with face-to-face classroom time, and blended courses using the 3D online learning environment.

Figure 2 compares the e-mail exchange rate by week between five Computer Education and Cognitive Systems courses I taught between 2003 and 2004 that used the same pattern of e-mail exchanges for course discussion and student interchanges. CECS 5100.010 was taught during the fall semester of 2004. CECS 5100.030 was taught during the fall semester of 2003. Both courses used text-based communications (e-mail) along with approximately bi-weekly meetings using the 3D online learning environment. The course is a master class focused on programming for educators. CECS 6210.030 was a doctoral course during the fall of 2003 covering theories of interactive multimedia and was taught as a blended course with a face-to-face meeting every other week. CECS 5400.883 and CECS 5400.884 were masters courses on educational telecommunications that were delivered only on the campus web-based course delivery system during 2004.

What we are surmising from this data is that students have more meaningful online discourse when involved with a blended course because of discourse/cognitive scaffolding. When students and their instructor have a visual or perceived environment or

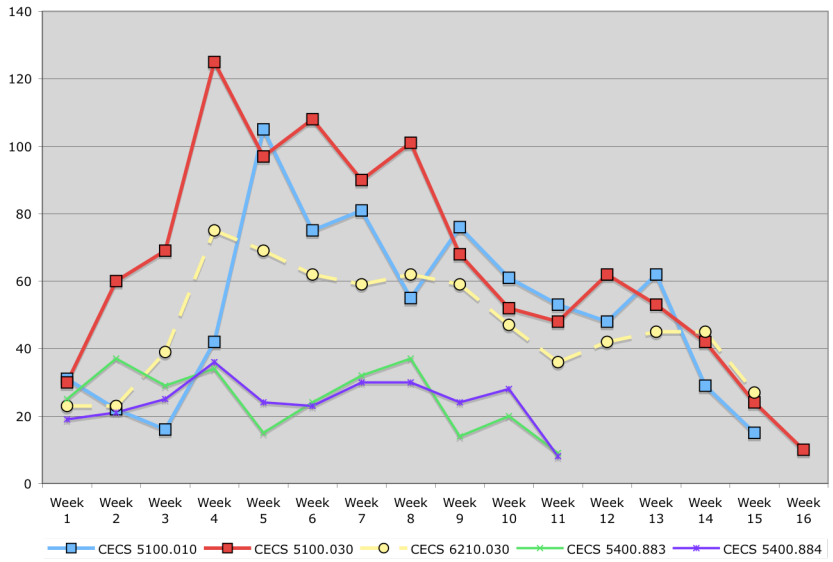

Figure 2 - email exchanges between courses by week

structure for communication, trust and sharing is more easily accomplished that results in more frequent exchanges earlier in the semester and that appears to generate higher-order discourse. We are looking at doing discourse analysis [Harris and Jones 1995, April; Harris and Jones 1999] on this data to determine the depth and message flow of the discourse in order to build a clearer understanding of the communications .

As was discussed earlier, e-mail only communications requires prolonged and frequent exchanges before the participants feel that they have reached a high level of discourse. Blended courses are providing more feedback and structure that then allows discourse to grow in a faster manner.

As can be seen, the courses that used the 3D online learning environment (5100.010 and .030) had accelerated discourse within the first month as compared to the web-based non-blended courses. The course that meet every other week had improved discourse, but we believe it was not as significant as the courses using the 3D online software because of the more frequent face-to-face meetings being used for high-level discussion.

5 Conclusion

The patterns of accelerated exchanges among students when using a 3D online learning system is very promising. The 3D online learning environment for the two courses showed that students tended to communicate more frequently early in the semester using e-mail as compared to the face-to-face or web-based courses. We believe that similar systems capable of providing the same types of interactive fidelity to the 3D online learning system (i.e. video) will produce the similar results. The reason for using the 3D online learning environment over other approaches is bandwidth considerations (support dialup and broadband user a like) and the ability to scale into every home that has an Internet connection, a half-decent computer, and a 1999 or older graphics adapter.

As discussed in the introduction, this study shows a use case that most schools using web-based course delivery could benefit from today. The system being implemented for the blended courses using a 3D online learning environment cost less than $5000 to get operational (software and hardware) and used a single environmental space that a graduate student built over two days. This research shows that a small implementation can produce important outcomes for student discourse and previous research on this same system has shown important outcomes for student satisfaction and attitudes when taking online courses [Jones et al. 2004]

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