Accelerating Online Text-based Discourse via 3D Online Learning Environments

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Abstract: 3D online learning environments, which are an extension of modern massively multiplayer online game concepts with additional collaborative tools integrated into the client for use in education, can be configured such that it provides a low-cost entry into the technology for programs and departments and have impact almost immediately to enhance traditional text-based online course delivery. This paper will discuss research at the University of North Texas in the use of such an environment and how it has positively impacted online discourse in courses between 2003 and 2005.

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 & 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, 2005). This might explain why only 6% of the 316 schools participating in the study indicated that 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 since 2002 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.

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). A 3D environment creates a context or scaffolding for interaction using 3D presentations to engage and/or immerse the student into a situation for learning (situated learning) or entertainment. This type of interface has strong ties to their text-based cousins, dating back to the 1980's (Holmevik & 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, Toh, & Fauzy, 2004; Jones, 2003b). 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 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, 2003a). 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.

Time Required to Develop Online Text-Based Discourse

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, 2005).

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.

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. One solution that is having success are blended or hybrid classes. 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.

The research being presented in this paper examines how effective a 3D online learning environment is at replacing the face-to-face component. The Computer Education and Cognitive Systems program at UNT began using a 3D online learning environment for selected 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 have taught between 2003 and 2004 that used the same pattern of e-mail exchanges for course discussion and student interchanges. These courses were:

CECS 5100 – Educational Programming Languages (taught using 3D online learning environment and E-mail)
This course provides a "hands-on" approach to learning computer programming and scripting. The course focuses on the concept of basic software development, variables, simple and complex data structures, debugging, all geared towards the development of educational software. The instructor chooses the programming language to be used for the course. The course has been taught using Logo, Basic, Pascal, C, C++, and Java. The first course was taught using PERL and HTML and the second course uses PHP and HTML for the purpose of creating programmed dynamic web-based interactions.

CECS 6210 –Theory and Practice of Interactive Multimedia (taught blended with Face to Face and E-mail)
This doctoral seminar course reviews and discusses the theories of interaction, feedback, flow, learning theory, and other elements that impact the design and development of interactive multimedia. Students develop their own theory that is then used in an interactive educational multimedia project.

CECS 5400 – Educational Telecommunications (taught with only a web-based learning management systems)
The course explores foundational issues and currently emerging trends in telecommunications that are becoming integrated into the field of education. The course provides hands-on experience with as many telecommunications systems as possible. Topics include History of Telecommunications and there Societal Impact, Digital Communications, Wireless Communications, Computer Networks, Distance Education, and Advanced Topics on latest technology.

All four courses have similar class sizes of approximately twelve to fifteen students. The two courses of CECS 5100 and CECS 6210 course meet during the fall semester. The CECS 5400 course were held during the summer term, which is why discussion are only listed to the eleventh class week. Since I am the author of all three course content, each course used a similar structure for on-line discussion assignments. Students are assigned discussion postings throughout a course, approximately one each two weeks), and are required to provide two replies to other student's postings. This assures at least some discourse happens during the semester. The topics selected for discussion are appropriate for the course content.

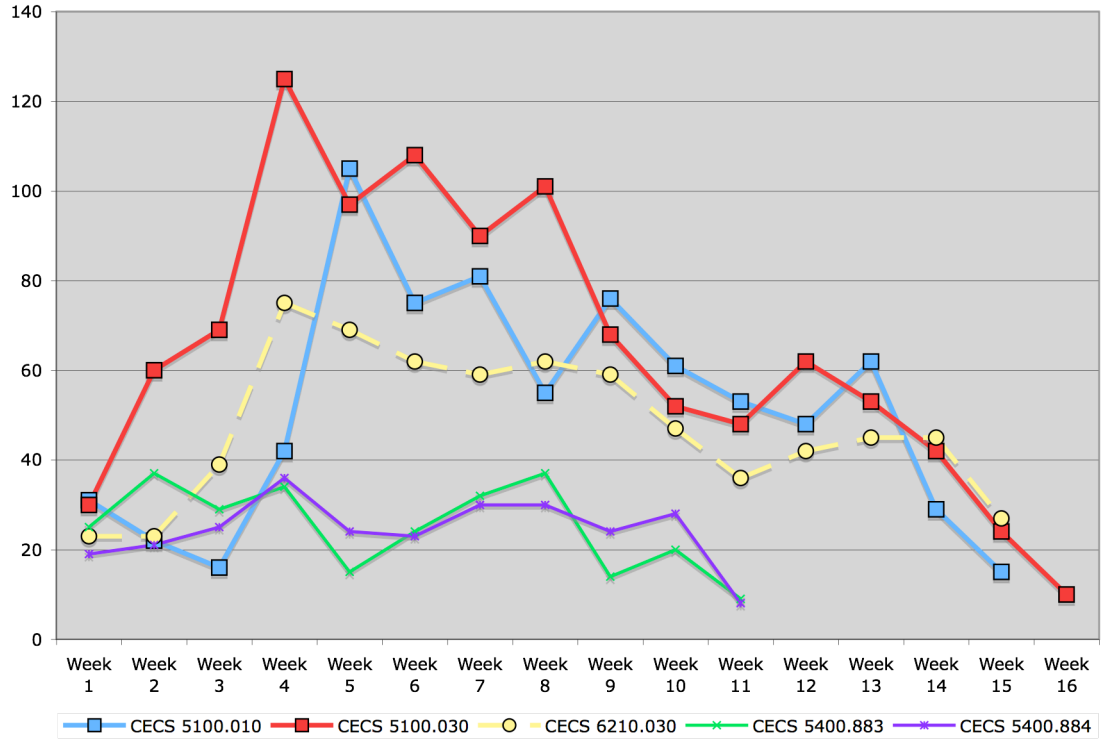

Figure 2 – Comparison of courses

The data, along with the informal interviews conducted with students at the end of each semester, indicates that students have more meaningful and increased online discourse when involved with a blended course because of discourse/cognitive scaffolding. The students using the 3D online learning had the greatest increase and acceleration in online discussion, with more than five times the communications of the web-based only discussions. The results from the fall of 2006 courses that use the 3D online learning environment show equivalent increases.

When students and their instructor have a visual or perceived environment or structure for communication, trust and sharing is more easily accomplished with the results being more frequent exchanges earlier in the semester and that appears to generate higher-order discourse. 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 greatly 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 I 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. The comparison between courses with diverse content during different length semesters is not perfect. I hope to be able in the future to create a more controlled comparison. I am also planning on doing a full discourse analysis on the exchanges to determine the depth and message flow of the discourse in order to build a clearer understanding of the communications (J. Harris & Jones, 1995, April; J. B. Harris & Jones, 1999).

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. I believe that similar systems capable of providing the same types of interactive fidelity to the 3D online learning system (i.e. video, teleconferencing) 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 decent computer, and a 1999 or more recent 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. This research agrees with previous research on this same system that showed important outcomes for student satisfaction and attitudes when taking online courses (Jones, Morales, & Knezek, 2005).

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