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TEACHING VIRTUAL REALITY COURSES ONLINE

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Summary

Virtual Reality courses at East Carolina University have been taught online since 1998. Online delivery has been found to be an effective method of teaching with multiple links to World Wide Web sites ensuring that each student has access to an abundant, in-depth array of virtual-reality resources, the quantity and depth of which could not be matched if only printed materials were used.

Careful course planning and an adequate infrastructure are essential to successful online teaching. While each course is fully scripted before the beginning of the term, keeping the Internet links up-to-date is a necessary, continuous and time-consuming process.

Instructor-student and student-student interaction can be supported electronically with email, chatrooms, and discussion boards. Our preference is for asynchronous interaction, allowing the instructor and students to participate at times that best suit their schedules and preferences.

Teaching VR courses online, like all other forms of teaching, has its strengths and weaknesses. Among the strengths are accessibility from remote sites, elimination of the need for commuting, and the opportunity for self-paced study. Among the weaknesses are the lack of hands-on experience with VR hardware and software, the lack of face-to-face personal contact, and the potentially large quantities of email that can be a burden to both the instructor and the students.

Introduction

The authors co-founded the Virtual Reality and Education Laboratory (www.soe.ecu.edu/vr/vrel.htm) in 1992 primarily for workshops, presentations and visits by educators and students of all ages as the major activities. It gradually became clear that a more formal instructional system was needed and since 1995, a number of courses on VR at the undergraduate and graduate levels have been offered, first as face-to-face classes, then as web-based courses. Today, all of our VR courses are web-based except for the Directed Independent Study and an Internship.

Implementing Online Instruction

When we made the decision to offer our virtual reality (VR) courses via distance delivery, we considered all the possible methods available to us. We chose web pages as the primary format, capitalizing on the many opportunities for interaction and audio and visual information delivery in an asynchronous environment. The web-based courses are augmented with online conference facilities, listservs and email.

The first issue we faced was "How does one teach a graphics-intensive course online?" While graphics can be incorporated into web-based instruction, excessive use will slow down the loading of web pages and frustrate students. We compromised, relying on linked web pages for most of the graphic content. In the process, it quickly became apparent that using online resources offered our students a richer, more current, and more extensive range of resources than would be possible with even several printed textbooks.

The planning of an online, virtual reality course is essentially the same as the planning for any type of course. However, an online VR course must be fully and carefully scripted in advance, a process much like writing a textbook, complete with exercises, projects, papers, other homework and examinations.

In effect, the course is being published, albeit electronically and for a specific audience.

Features of Online Instruction

Incorporating interactive features is important so that students do not feel isolated from the instructor and other students. It's also important to provide the instructor with the means to get a sense of how the course is progressing. While it would be nice to meet each student face to face and to get to know her or him personally, this will not happen when online students live in several communities, states, or even different countries. We use email, listservs, chatrooms, and discussion boards to provide opportunities for communication one-to-one and one-to-many, both synchronously and asynchronously. Our choice of which forms to use depends on a combination of how widely the class is dispersed geographically and student work schedules.

The traditional classroom presentation tends to be linear, progressing through the course from beginning to end, more or less in a straight line. In an online environment, the presentation can be linear, random, or a combination. Some of our students tell us that they much prefer linear presentations. Certainly, managing a linear presentation is much easier.

The most obvious difference in a fast-changing subject area like Virtual Reality and other online courses is the continual need to keep links up to date, and to locate and incorporate new links to new virtual reality-related and relevant websites as they appear. Less obvious, but no less important, are such issues as how to provide students with the opportunity to experience VR from a distance and how to make VR hardware and software accessible at a distance.

It is difficult to imagine a VR class that does not include the experience of being in virtual space. Lacking equipment (for example, a head-mounted display unit), the online student is limited to flat-screen walk-throughs, most likely enabled with a VR web-based program such as Virtual Reality Modeling Language (VRML), or the quasi-VR program, QuickTimeVR. While flat-screen displays do not usually offer views that respond to head and body movements, they can provide convincing views, representing the basics of virtual reality and the feelings of presence and immersion. Other VR delivery formats may be available if the student can gain access to local laboratories, simulators, or other installations.

The dynamics of working with disabled students changes in any online, virtual reality course. Disabilities that are highly visible in a face-to-face class (for example, a spoken language problem arising from a hearing impairment or a speech impediment) may disappear in an online course where the communication is by email, and assignments and projects are mainly in textual format.

On the other hand, problems arising from impaired vision may be heightened in an online, virtual reality course. Computer-generated, graphic images are the foundation of graphics-based, virtual reality. Experiencing and understanding this type of VR depends a great deal on the visual impact. While well-written, verbal descriptions can alleviate this problem to a limited degree, they require attention to an area and degree of detail that might, otherwise, be ignored. We have had a totally blind student take several of our online VR courses. Working with him, we have learned how to make our courses more accessible to the sight impaired.

Quality control is at least as important in online, VR classes as it is in face-to-face classes. Formative or interim evaluations of course materials help us decide how best to use online delivery and interaction methods available to us. For example, based on the results of student recommendations in evaluations, email is now used less and other forms of delivery and interaction, particularly online conference facilities (discussion boards), are used more.

Assessment of Online Instruction

Our assessment of instructional quality relies on the same criteria regardless of delivery mode:

- is the content rich in detail, well organized and presented;
- are the expectations of what the students are to do clearly and concisely presented; and
- are the factors for grading explicit?

In addition to generic forms of student evaluation, we ask our students to respond to evaluative questions that are specific to the particular course. We have found that some of the strengths of an online, virtual reality course are:

- the ability to be up to date, using hyperlinks, drawing directly on the tremendous resources of the World Wide Web;

- accessibility, allowing the student to study and participate within his or her own personal time schedule;
- elimination of the expense and inconvenience of commuting to a physical location, such as a college campus;
- the possibility of students to often go through a course at their own pace, within the dates set by the beginning and ending of the course;
- the potential for abundant personal interaction with the instructor and with fellow students electronically, monitoring student progress by using frequent assignments; and
- the ability for students to take courses on virtual reality that are not offered in their local college or university, wherever in the world they may be located.

The primary weaknesses of an online, virtual reality course include the following:

- the lack of hands-on, guided experience with VR hardware and software;
- technical restrictions on the use of media such as videos, films, and CD-ROMS;
- the lack of face-to-face personal contact;
- the need for the student to be self motivated to complete a course in a cutting edge technology new to the academic curriculum, without previous courses to build on;
- a total dependence on an adequate electronic infrastructure. The student must have access to a computer and an Internet connection, as well as the ability to download complicated software and view graphics-intensive webpages;
- the need for the student to be able to use a computer to take a course. Students who do not have some level of computer literacy will have a difficult time at first;
- the potentially large quantities of email that can be a burden to both the instructor and the students;
- technical problems related to the delivery of the course via the Internet, including downloading graphics-intensive webpages and software; and
- time consuming work of keeping the class going. The instructor may feel overwhelmed by email, with class work, technical problems and with one-on-one instruction on how to use VR software.

Some solutions to problems, in our experience, include:

- adequate support staff familiar with VR hardware and software to help coach students one on one, so that instructors are able to concentrate on teaching the online VR classes;
- a good help desk to answer technical, Internet-related problems of the instructor and the student, which makes a course go much more smoothly;
- good course design, with clear instructions at every step of the course to help reduce student questions to a minimum;
- a well-planned infrastructure to meet online VR course needs, assure quality control, and maintain standards and
- acknowledgement by administrators, instructors, and students that online courses take a different type of motivation and support system than regular classroom-based courses.

We are exploring using collaborative virtual environments (CVE) that enable individuals and/or groups in different places to work together in virtual environments,. One such application is Active Worlds (www.activeworlds.com). With a CVE, we could meet all our students in a web-based, simulated classroom, and the students could meet in small virtual groups, in virtual environments of their own design, to work on class projects.

We are considering assembling a pictorial record of VR projects and equipment to be added to our VREL web site (www.soe.ecu.edu/vr/vrel.htm) for student use. This would provide important support to remote users, with less than state-of-the-art computers and connections.

Of course, our long-term goal is to use the ultimate teaching tool, a StarTrek-like virtual classroom based on the Holodeck™.

Conclusion

We have had very positive experiences teaching virtual reality online. The online platforms we have used have been successful, according to student feedback and evaluations. We plan to continue to use this method of distance learning to teach our virtual reality courses. As new technology becomes available to us and to our students, we will need to modify the courses. By using online delivery, we are able to offer our courses worldwide. Based on our experience since 1998, we have found online teaching of virtual reality courses to be effective and exciting.