Provost Learning Innovations Grant for Faculty Projects

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Project Title: A Client-Server Platform to Support Web-based Teaching, Tutoring, and Presentation

Project Summary
The project goal is to create a platform capable of supporting remote teaching, tutoring, and presentation, assembling it from custom written or modified public domain server-client modules.

The server side of the platform may be installed on anyone's desktop PC, turning it into a basic Web server capable of providing Web-based collaboration and communications services. Client software will enable students to access those services from any PC connected to the Internet. All client server modules will collectively form the platform. This platform will deliver the functionality teachers need to work with remote learners on the Web, using pedagogical processes loosely modeled after classroom teaching, individual tutoring, and auditorium presentation.

Special Project Notes
The project idea grew out of my 1999 Provost Productivity project, *Web Tools to Facilitate Creation of Interactive Web Sites to Support Instruction at NTID*. One of the tools was being used to create, administer, and grade online quizzes and assignments. A few faculty members asked for a forum where teacher and student could discuss a quiz or assignment by displaying it in the Web browser and discussing the quiz or assignment using a tool similar to ICQ, AIM or MSN Messenger. Both teacher and student should be able to synchronize the two browsers to ensure both are displaying the same information during a session, with the teacher having ultimate control. Whiteboard and annotation tools would also be needed to highlight information or make margin notes on the fly.

This was the impetus behind my original intent to create a client-server platform as a solution for remote teaching and tutoring. However, at the request of the grant committee, I (and my department head, Jorge Samper) met with Richard Fasse in the Educational Technology Center. We discussed how my solution could fit into existing efforts in Distance Learning and First-In-Class initiatives at RIT. Richard suggested that I broaden my proposal to include support for using the platform to broadcast PowerPoint and streaming media presentations to large Web audiences.

Richard’s suggestion was compatible with my objective of creating a visually oriented solution for teaching deaf learners. My final project title thus reflects his input, by indicating that the proposed platform would support Web-based presentation in addition to remote teaching and tutoring. I also added applications sharing and streaming media capabilities to my platform functionality. There are technical issues related to how well RIT networks can support these technologies. I plan to consult Richard on these issues if my final proposal is accepted.

Project Description
The Virtual Classroom/Auditorium platform will utilize Web-based collaboration and communications tools to create a solution for remote teaching, tutoring and presentation. The platform will deliver the functionality teachers need to work with remote learners, using pedagogical processes loosely modeled after classroom teaching, individual tutoring, and auditorium presentation.

The server platform will consist of software that will turn any desktop PC into a basic Web server capable of providing Web-based collaboration and communications services. These services will include as many in the following list as resources would allow me to implement: Web Tours, Instant Messaging, File Transfer, Whiteboard, Annotation, Applications Sharing, Web Broadcasting, and Streaming Media.
All server tools will be lightweight, i.e., barebones, modules delivering only Web services essential to support remote collaboration and communications. Participation will be limited to small groups. Non-essential services will be eliminated. The stripped-down thin server architecture means it will be possible to implement the platform on most current-generation desktop PCs, making it unnecessary to purchase an expensive central server. This also means the proposed solution will be broadly scaleable since one only has to install the server modules on another PC to convert it into a Virtual Classroom/Auditorium platform to serve another group of learners.

The client platform will consist of software running on the machines of both teacher and students. The software will allow teacher and students to access Web services hosted on the teacher’s PC so that together they can take part in Web-mediated learning processes. The client software will include a Web Browser, File Transfer Program, Chat Client, and other programs. Other than the fact that these programs will be seamlessly integrated to support platform functionality, they are no different than any other garden-variety programs serving similar functions. Thus, most students already own, or have access to, hardware needed to make use of the client tools in the proposed platform. The exception is videoconferencing. In many cases, videoconferencing will not be a viable option for off-campus students until high-speed broadband Internet access is widely available to consumers.

Client-server communications will be affected through HTTP and other Internet protocols, supported by newer Web standards where applicable. Most communications services will use old-fashioned but reliable text-based chat. I’ll try to support Voice over IP (VoIP) and videoconferencing. Realistically, however, current Internet bandwidths still are not fast enough to handle video and voice reliably, but technology holds promise that broadband Internet will become more ubiquitous in the near future.

- **Targeted learners**
  
  The primary targeted learners are the deaf students at NTID. The secondary targeted learners are deaf adults in the workplace who cannot attend classes at NTID due to family or job commitments. Traditionally, it is very difficult for these deaf adults to seek continuing education for career advancement. Access to NTID classes via distance learning would be a boon for them.

  But, as I have explained, Richard Fasse in the Educational Technology Center urged me to broaden my project to support PowerPoint and streaming media presentations. This makes the proposed platform a viable teaching and training solution for any group of learners for whom Web-based distance learning is the preferred option, whether by choice or necessity.

- **Anticipated Impact on Teaching and/or Learning**
  
  The impact of the proposed platform on teaching and learning are suggested by, but not limited to, the following scenarios:

  **Remote Tutoring:** For remote one-on-one tutoring, the teacher can display an electronically submitted quiz or assignment in the Web browser. The teacher can also control and synchronize browser display on the computers of both teacher and student. Control can be passed to the student when the student needs to scroll to a different area to raise a point for discussion. A chat window will allow teacher and student to discuss the assignment in real-time using text-based chat. Streaming audio and video will be possible options if the network is fast enough. Both teacher and student can supplement text-based communications with simple graphics and annotations created using the whiteboard and annotation tools. One-on-one tutoring needs not be limited to quizzes and assignments. Any materials (HTML documents, PDF files, photos, graphics) that can be displayed in the Web browser can form the basis of a tutorial topic.

  **Remote Teaching:** For remote classroom teaching, the teacher can display lesson agendas and Web-based lesson materials in the Web browser. The teacher can control and synchronize the browser display on the computers of all students. Control can be passed to individual students who wish to scroll to a different area to raise a point for discussion. A group chat window will allow teacher and students to carry on normal classroom discussions in real-time using text-based chat. Students can ask a question and get immediate clarification, while interest is fresh, increasing cognitive efficiency. Text-based communications can be supplemented with simple graphics and annotations using the whiteboard and annotation tools. Students will see the same Web content under the teacher’s control. The Web display will in effect be fulfilling the role of traditional classroom overheads but in a virtual context, with virtual classroom discussions mediated by chat and supplemented by whiteboard graphics, annotations, even streaming audio and video if the network is fast enough.
The teacher, who is able to control the browsers of the students, may take students along on Web tours, visiting Web sites with information germane to a lesson. A list of bookmarks will provide quick access to the most useful Web sites. The teacher can also pass control to individual students during a tour. This gives students the ability to scroll to a different area to raise a point for discussion, or take classmates to Web sites they have discovered to contain useful information about the current topic. All the while, teacher and students can make comments or share insights using text-based chat, even streaming audio and video if the network is fast enough.

The teacher can create learning materials, including word processing documents, PDF files, photos, graphics, low-bandwidth animated Shockwave demos, and PowerPoint presentations. The files can be saved in lesson folders on the teacher’s hard disk, to be used as classroom resources when needed. These resources will be within easy reach whenever the teacher activates the platform. By dragging a file to the Web browser, file contents can be displayed simultaneously on the browsers of all students.

Before a virtual classroom session, teaching resources needed to support the lesson can be moved to a special folder ready for use. Other resources on the hard disk will also be readily accessible to the teacher. This affords the maximum flexibility in creating and using teaching resources. The teacher can prepare for a lesson following a lesson plan, and yet be responsive in unanticipated situations. If a student asks an unexpected question, the teacher will be able to make use of any available resources on the hard disk to develop a full response to the question on the fly. This is unlike making an ad lib response in a real-world classroom, where the teacher would not be able to make use of resources that he or she did not take to class.

File transfer capability will allow the teacher to drag a word processing, scanned, or a PDF file, and send the file to all students as classroom handouts or project assignments. A project assignment can be displayed on the screen. Students can use the chat tool to ask questions about the project or work collaboratively on the assignment. The file transfer capability will also allow students to submit completed projects and assignments to the teacher’s computer. Additional readings and graded assignments can be dragged to a virtual drop box, where student can pick them up remotely.

The teacher can display a quiz question and poll the students for an immediate answer. The collective student response will be displayed in real time, and will help the teacher determine whether students have mastered the learning objective. If confusion exists and instructions need to be repeated, the teacher can access and repeat old lessons or presentations on the hard disk.

Remote Presentations: A presenter can broadcast a PowerPoint or streaming media presentation, allowing the presenter to reach Web audiences in many different locations. Applications sharing will allow the presenter to demonstrate software for training purposes. The presentation can be auditorium style, under the control of the presenter, who can poll the audience using multiple choice and true/false questions. The presentation can also be in a round-table format, where the presenter can allow audience members by turn to take over temporary control of the presentation.

Gcoographically separated audience members can ask questions or share insights using group chat and even streaming audio and video if the network is fast enough. If the network is fast enough, the presenter can also make use of canned audio narration and video to support the presentation.

- Rationale for Project
This project is a substantial undertaking, requiring considerable human and financial resources. It is also experimental; even Web-based collaboration and communications client-server applications are common business tools. the bundling of these business tools to create a Web-based teaching platform has never been tested in an educational enterprise. My department, center, and college only allocate funds for production projects, and not for development projects of an experimental nature. Even the Educational Technology Center does not have money to undertake development projects, experimental or otherwise. The project is thus a logical candidate for a Provost Learning Innovations Grant, and I hope the grant committee will give it due consideration.

Measuring Impact/Reporting Findings. Success in achieving intended platform functionality will be measured by the number of Web-based collaboration and communications services implemented in the final platform, and by the number of teachers and students who are able to use the platform as a solution for teaching and learning. Project impact on the intended audience will be measured by the success rates of students taught using the platform, and by the number of teachers and students who chose to continue using the platform after initial tryout.
During project development, I will make presentations to demonstrate the platform to interested members of the RIT/NTID community, and to collect feedback data for refining the platform. I will conduct training workshops for interested individuals; in particular the NTID teachers who asked for a forum to discuss quiz results and assignments on the Web with their students (their request led me to propose this project). I will work with these faculty members to collect data on student success rates when taught using the platform. I will report the findings at a presentation to the RIT/NTID community when the time is appropriate.

Relevance to NTID and Deaf Learners. The TTY is a text-based real-time communications device that is the "telephone" of deaf people. Deaf people use it everyday and text-based conversations are to deaf people as home calls are to hearing people, unremarkable but indispensable. Deaf students at NTID are one of the earliest adopters of chat or instant messaging technology. In addition, there is anecdotal evidence indicating many deaf people subscribe to AOL so that they can "socialize" with other deaf people in AOL chat rooms.

Thus, it is reasonable to believe that deaf learners will readily accept the Virtual Classroom/Auditorium platform as a solution for interacting with and learning from their teachers. Not only that, but a platform that offers a visual learning environment has logic on its side as a solution for teaching learners who depend on sign language and visual communications. The platform has the potential to be a tool useful to NTID faculty members.

Relevance to RIT and Mainstream Learners. By all accounts, mainstream, i.e., hearing, students are equally adept and avid users of instant messaging and the World Wide Web. Thus, it is also reasonable to assume that a teaching platform using shared browsing and text-based chat will appeal equally to mainstream students, particularly when combined with streaming audio and video where network speeds make these options viable.

Web-based teaching and training is in the early stages of development at RIT/NTID. Faculty members in the institute need tools that will support them in efforts to explore and experiment with using the Web for remote teaching and learning. My project, by creating one such tool, can support their efforts.

Credentials: Simon Ting. The project director is Simon Ting, who is deaf. He is an Instructional Developer (EDF) working in the NTID Department of Instructional Development and Evaluation. He graduated from Gallaudet University in fall, 1992, after earning an MS in Educational Technology (Special Education/Deafness). He started working at RIT soon after and has been working here since.

The focus of his work is developing instructional solutions catering to the need of many deaf learners for visually oriented instruction. Over the past 4 years he has created a number cutting-edge Web sites that incorporate rich media, such as Shockwave animation and Web video, with online functionality implemented using CGI and ASP technologies. These Web sites are being used at NTID to teach courses in diverse content areas, including Web design, C++ programming, Visual Basic programming, Astronomy, Meteorology, Social Studies, Reading, and English Composition.

His current interest is to create Web tools for Web-based instructional development and evaluation. He is also interested in the Web as a medium for distance learning. He was awarded a 1999 RIT Provost Productivity Grant to develop a rapid development tool for building Web courses. He is using this productivity tool to speed up his Web-based instructional development projects. He is also looking into the possibility of making the tools generally available to other RIT/NTID faculty members.

- **Project Development Timetable**

  - **Summer 2000**: Design specifications; Building/evaluating prototype components
  - **Fall, Winter 2000**: Developing/testing components; Integrating platform
  - **Spring 2001**: Platform testing; Project previews/colllecting feedback; Refining platform