Addendum to the Updated Cooperative Learning Computer Lab Proposal

David I. Schwartz (Department of Computer Science), Tammy L. Shapiro (College of Engineering)

June 4, 2002

Abstract

This addendum addresses issues of use, flexibility, and governance of the cooperative learning computer lab that has been proposed to both Campus Life and the Academic Technology Center (ATC). Given the format of the ATC proposal which required a more technological focus, we hope to clarify these issues for the proposed lab.

Project History

In 2001, Campus Life had contacted the Department of Computer Science (CS) about constructing a computer lab for the North Campus Residential Initiative. Both the College of Engineering and CS had already been interested in incorporating computers with the cooperative-learning component of the Academic Excellence Workshop (AEW) program, which serves students from all colleges that are enrolled in many introductory science and technology classes. So, we began to explore the idea of designing a new lab that would assist with the cooperative-learning aspect of the AEW courses. During the initial development of the lab, Cornell's Academic Technology Center (ATC) sponsored the *Faculty Innovation in Teaching Grants Program* to encourage faculty to propose exciting and challenging ideas in education technology. Given the relevance of ATC's program to our endeavor, we decided to combine the ideas and goals of Campus Life, ATC, and the AEW program to expand the scope of the initial lab concept. As a result, the CS department was awarded a Faculty Innovation Grant to design a computer-mediated cooperative learning lab to provide a unique learning setting that would serve the entire Cornell community.

Cooperative- and Computer-Mediated Learning

Cooperative environments enhance learning through social interaction, whereby students share insights, perspectives, and problem-solving strategies with each other. Typical cooperative learning places students in groups that work together to solve problems and help each other learn during the solution process. An extensive amount of literature documents the successes of cooperative learning, and as a result, many academic and industrial environments have incorporated various themes of the cooperative model.

The premise of computer-mediated learning is that appropriately designed computer tools can enhance learning by helping a student to visualize a system, manipulate objects, and seek access to distant resources. Although any computer can provide such abilities, traditional computer labs force students to sit in rows, facing individual computer screens. Such arrangements discourage cooperative work because students are prevented from forming groups in a comfortable fashion. Few spaces exist on campus that enable computer-mediated *co-located*, or face-to-face, group learning. The challenge is to create a physical learning space that allows students to benefit from both computer tools and cooperative learning, simultaneously.

We achieve co-located learning with specially designed tables, which orient groups of two to four students towards working together around a single computer. The curved furniture and deliberate "shortage" of computers, as depicted in the ATC proposal, replace an individual's focus on a single computer with group interaction. The human arrangement is at least as important, if not more so, than the computer layout. So, in creating such a learning setting, we enable students to do the following:

- Share ideas to solve complex problems that are structured around computer simulations.
- Create objects or texts collectively, using various computer applications.
- Use the Internet and communication tools to engage with local and distant persons or groups to learn, problem-solve, or seek information.

Usage

Although the lab was originally inspired by cooperative learning in the engineering curriculum, we realized early on the great potential in creating a learning space that merges cooperative- and computer-mediated learning. Such convergence occurs in courses, training, and project work.

Diverse courses could integrate co-located learning into their content to provide their students with the benefits of computer mediation and cooperation. Examples of such integration enabled by the design of the lab include the following applications:

- Graphical visualizations of fundamental mathematical and scientific concepts that groups of students can manipulate and use in cooperative problem-solving.
- Annotation tools that enable groups to engage around texts and visual representations and then share those annotations with others. Some writing workshops teach editing skills through similar applications (e.g., San Francisco State University) and many art collections are now available online with annotation features.

- Enhanced team-based design and creation with CAD (computer-aided design) tools, as with architecture, city & regional planning, art, and computer science classes.
- Large-scale databases, such as the Internet, which the students need for collaborative projects or problem-solving.
- Experiential- and discovery-based learning, whereby students can perform research and learn basic principles of communication, behavioral science, and microsociology through participation in online communities and collaboratively documenting and analyzing interactions.

In addition to course work, staff and instructor training would greatly benefit from a cooperative workspace with computers. Throughout the year, staff and instructors strive to improve their software skills, and a cooperative-based environment would help to alleviate their fears in learning new technologies. We could schedule such training sessions for time slots that are unavailable and unpopular for student instruction.

Moreover, the same environment that helps for training would also address pressing student concerns. Campus Life and CIT report that students continually request cooperative computer laboratory facilities. Thus, we would allocate blocks of time for students to work in groups independently of a course structure, which serves the original intent of improving the learning environment at Cornell, especially in the residential areas.

Flexibility

Throughout the design, we have made flexibility one of the main specifications, which means allowing for adaptable chair and table arrangements, providing space for groups to collaborate, using off-the-shelf technology, and considering future uses of the space. The proposed lab features curved tables as the major component to induce cooperative learning and provide flexibility. Placing people around circular arcs “bends” the individuals towards working together and induces cooperative work unlike a traditional setting of fixed/individual seats or rectangular rows. In fact, most of the original work in the proposal focuses on the furniture and software to help students work together. The majority of the technology, such as the desktop computers and wireless network, can be off-the-shelf equipment, including some of the software.

An appropriately sized space would allow various academic programs to experiment with computer-mediated cooperative learning, as the above ideas suggest. Even courses that require little to no computer content would find such a space useful because of the cooperative structure. This flexibility not only provides a useful environment, but offers the Cornell community an opportunity for experimentation to improve models of classroom and lab design. Given sufficient space, we could experiment with the effects of room arrangement on cooperative learning with the variety of programs that use the space. Such experiments would assist Cornell in building future co-located spaces and advertise our advancement in learning technologies to academic and industrial communities.

Governance

As more fields incorporate computer technology, such a space might have high demand. Throughout the design process, we have strongly endorsed support for shared control of the space. Though we have no specific plan in place yet, representatives from CIT, ATC, the College of Engineering, Campus Life, and CS have worked together to start laying out the structure of an advisory board, that would work with the colleges to control the lab. An initial committee composed of representatives from Campus Life, ATC, CIT, CS, the Learning Initiatives for Future Engineers Program (LIFE), and representatives from a variety of colleges would monitor the academic programs that use the space and provide technical support in varying capacities. We intend to institutionalize a process so that different fields and colleges would share the space.

Closure

Ultimately, we hope to design teaching and learning environments that incorporate computer technology not just to enhance the learning experience, but maintain a cooperative spirit in the classroom. Without appropriate facilitation of human interaction and cooperation in computer-mediated learning, the use of computer technology can prove inefficient and ineffective. We feel that our proposed computer-mediated cooperative learning lab will provide an infrastructure that supports productive, meaningful learning relationships for the entire Cornell community.