CILT99: Community Tools Abstracts

Presentations

Web Technologies and standards for Distance Learning

Geoffrey Fox
http://www.npac.syr.edu/DC

Lessons from use of Collaboration Systems in Education and Training We give some technical and methodological lessons from use of TangoInteractive in a variety of distance learning scenarios including ongoing teaching at Jackson State Miss. from Syracuse and the Saturdasy Java Academy offered to middle and high school students in Boston, Houston, Starkville and Syracuse. 1) Integration of synchronous and asynchronous modes is simply addressed by using web-based material which can either by directly mounted or made available through web-linked databases or server backend scripts as in NCSA's Biology Workbench. 2) Importance of an underlying document object model which allows sharing of material in a way that respects both the profile of the user and the structure of the data. We show how this can be used to provide cross disability interfaces. 3) Detailed analysis of TangoInteractive's shared JavaScript model as used today shows strengths and weaknesses of current W3C proposed DOM. We suggest changes based on a shared layer using XML and JavaScript, which appear sufficient to provide universal access to education. 4)we note that it appears easier to provide cross disability interfaces to web material respecting the W3C DOM than to general Java applets and similar high end authoring systems which lack constraints of a DOM. 5) We discuss implications for role of Professor/Teacher as lecturer and Mentor.

Collaborative Learning Through Robotic Building

Danelle Hoffa
http://www.legomindstorms.com

As "smart toys" and online "communities" jockey for kids' attention and consumer dollars, creating technology products that invite kids to use their imagination means more than just embedding a computer chip or facilitating chat rooms and members-only areas. Linda Dalton discusses the research, development and philosophy behind the success of LEGO MINDSTORMS Robotics Invention System, an evolution of the LEGO system of play that allows inventive young minds to design, construct and program robots that move, act and think on their own. Dalton will describe how LEGO MINDSTORMS has kept pace with the proliferation of the Internet as an alternative learning environment, by creating an online exchange for young minds to share their robotic inventions and build upon one another's creativity. Dalton provides concrete examples of how LEGO MINDSTORMS is creating both a new breed of consumer product and an online gathering space where learning is based on construction rather than instruction, and where kids not only understand technology but become creative masters of it.

Ted Kahn, Linda Ullah
http://www.designworlds.com

Over the past year, Linda Ullah and her 3rd-6th grade GATE students at Edenvale School, an elementary school in a very low-wealth community in San Jose, California, have been carrying on an online collaborative Web design project with Tania Callegaro, Eliana Fredo, and other teachers and their high school students at E.E.P.S.G. Dona Idalina Macedo Costa Sodre School in Sao Paulo, Brazil. This project involved students in both countries collaboratively studying ecological concerns related to water pollution in order to bring about a cultural and political understanding between the students involved in both countries. The collaboration involved students and teachers at these two schools collaboratively co-designing a Web resource site about the history and nature of problems of water pollution in both San Jose and Sao Paulo, focusing on creating and using art and poetry (both in English and Portuguese) to communicate their understanding and learning: http://www.garlic.com/~lullah/brazilus/water.html

The Edenvale-Idalina collaboration was one of the major successes that emerged from Web andemail-based "matchmaking" for an international conference/workshop for teachers and educators fromdeveloping and developed countries, called "The Art, Science and Technology of Learning (ASTL): Designing Learning Environments for the 21st Century" : http://www.migal.co.il/teleproj/ . The ASTL Conference, held in the Upper Galilee region of Israel in November, 1997, conference brought together six educational coaches or mentors" together with over 40 teachers and educators from 14 developing and developed countries. Participants were chosen after partnerships had been created over the Web, based on the promise of interdisciplinary educational project proposals for providing exemplary educational experiences to students and teachers in both the developing and developed countries. Ted Kahn was one of the conference chairs for this workshop, as well as mentoring the development of the Edenvale-Idalina collaboration which emerged.

The Edenvale-Idalina collaboration is an exemplary model of hands-on, "just-in-time learning" for the students and teachers of both schools. For example, the participants discovered a Web resource that does first order translation between English and Portuguese, as well as other languages. The project has raised the level of cultural understanding of both communities, while also providing the teachers in both countries with a virtual community and "hands-on" approach to ongoing professional development--in the service of creating a shared Web-based "DesignWorld" to expand their own learning horizons well beyond the walls of their individual classrooms and schools.

Web-based, Asynchronous Discussion in Residential University Courses

Charles Kerns

The Stanford University Learning Lab studied the application of a web-based, asynchronous discussion system in residential university courses for the past two years. One of the questions addressed in the study was--why use computer-mediated discussion tools in support of courses that meet for face-to-face discussion.

Learning Lab staff worked with faculty in several freshman lecture courses as they implemented curriculum activities making use of The Forum, an application developed in

the Lab, to facilitate communication, extend discussion, and prepare students for lecture and section meetings. Forum features include student photos alongside every posting and a split organizational system that gives instructors control over general subject headings. Course activities were monitored by the Learning Lab Assessment team. They interviewed students and faculty, studied postings, and reviewed data from the web server.

The initial use of The Forum was in a new course that attempted to transform the large, lecture class into a learning community. In this first course new curriculum activities were developed that had student team projects instead of exams, student panels substituted for some lectures, and a web site that provided a rich set of supplemental materials and on-line assignments. The Forum was a part of all these activities. After the initial trial, The Forum was offered to faculty in the existing freshman humanities courses. Faculty adopted the Forum in many different ways. There were mixed levels of integration into the existing curricula and mixed results in acceptance by students, posting behaviors, and success, as judged by faculty.

The data is still under study but a preliminary review of findings will be presented.

Scholarship of teaching reconsidered in the TL*NCE; teaching and research in learning communities

Thérèse Laferrière, Alain Breuleux

This presentation will share results from Canada's TeleLearning Network of Centres of Excellence (TL*NCE), a collaboration between researchers, developers, and educators to design and investigate telelearning. We will focus especially on the professional development of educators in/with technologies, collaborative knowledge building, and the issue of bringing together educational practice and research through networked learning communities and collaboratives.

In relationship with the professional development of educators in/with information & communication tools, the TL*NCE research program extends the Professional Development Schools (PDS) into telelearning networks for professional development (TL*PDS). The research, a design experiment, reveals the ecology of the networked learning community as based on the co-construction of the possibilities (the renewal of information and communication) and of new practices in teaching and learning. An important effect of the TL*PDS and in particular of this co-construction, is the recombining of research and teaching, centering around collaboration between learning teachers augmenting the language and knowledge of learning (e.g., the Educational Network of Ontario ENO/REO).

Using Note-Taking Appliances for Student to Student Collaboration
James Landay
http://guir.cs.berkeley.edu/projects/notepals/
(Also presenting in Ubiquitous Computing)

Student collaboration is important in courses that prescribe project-based learning in groups. We will describe how we used electronic note-taking appliances along with the

NotePals system to enhance this collaboration in both undergraduate and graduate courses. NotePals is a lightweight note sharing system that captures and provides access to personal notes, presentation slides, and documents of interest to a workgroup (see http://www.cs.berkeley.edu/~landay/research/publications/notepals/notepals-chi99-final.pdf). Students will only be able to take advantage of shared notes when note-taking devices are inexpensive and pervasive. Consequently, we have developed note taking applications that run on inexpensive personal digital assistants (PDAs) and other ink-based capture devices, such as the CrossPad. Notes can be shared with other group members by synchronizing with a shared note repository that can be viewed using a desktop-based web browser. Its lightweight process, interface, and hardware distinguish NotePals from previous systems. We believe these advantages will support the use of this style of note taking in educational settings. We have built an initial implementation of the NotePals infrastructure and will describe the early usage of the system for both group and personal note taking by students. We are planning a larger evaluation of the system in a university course using CrossPads as our note-taking appliance.

Using comparative field research to inform socio-technical design: connecting communities and enhancing learning in project-based environments

Reed Stevens

I will discuss planned socio-technical design activities that build upon recent comparative analyses of a project-based classroom and a professional project-based setting (Stevens, forthcoming, 1999, 1997; Hall, 1995). Both settings involve people doing architectural design. As Schlager et al. (1996) have argued, "[t]o date little has been done to understand or elucidate the form(s) that the participation of outside experts should take, how to support it, or its implications for structuring education (243)." In short, our current technical capacities to connect communities far exceed our knowledge about how to do so in ways that promote learning. I will describe how comparative research of the kind I have done provides a unique and important framework for designing activities and technologies that appropriately connect distinct communities.

The presentation will have four succinct parts: (1) a discussion of a classroom project-based design experiment that sought to foster the learning of mathematics through architectural projects, (2) a summary of comparative analyses that indicate a number of potential opportunities for enhancing the learning of mathematics in the classroom, (3) a proposal for how this type of comparative research hold promise for the iterative socio-technical redesign of existing classroom learning environments, and (3) a sketch of specific designs proposals and working principles.

On the basis of my comparative work, the proposals I will briefly discuss on are: (1) activity structures and tools than can be borrowed from the professional setting and tailored for the classroom setting, (2) ways that professionals can participate in web-based classroom activities that are sensible to professionals and beneficial for classroom learners, (3) how to strike a principled balance between the design of new technologies and the importing of older ones, and (4) practical personnel considerations for building connections (e.g. human mediators) between communities that foster classroom learning.

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WISE on-line communities: Supporting Curriculum Design Partnerships

Jim Slotta, Alex Cuthbert, and Marcia Linn UC Berkeley, School of Education
http://wise.berkeley.edu

The Web-based Integrated Science Environment (WISE) provides a powerful new form of on-line science curriculum. Each WISE curriculum project consists of a series of activities that involve diverse materials from the Internet, on-line classroom discussions, and even hands-on experiments. All student work is managed by our central server, and incorporated into assessments that are integral to the curriculum design.

As we have progressed in our designs of WISE activities and assessments, we have also begun to study the difficult process of authoring effective curriculum. In earlier research, we found that the most effective curriculum is designed by partnerships of educational researchers, classroom teachers, and natural scientists. Such partnerships provide the right balance of expertise from diverse perspectives, and offer the participants a high level of scaffolding for their own processes of knowledge integration.

WISE curriculum is extremely difficult to create, as it involves a novel form of pedagogy, new kinds of activities, Internet materials, and integral assessments. Based on our early experiences with authoring partnerships, we began to develop on-line community supports that respond to these difficulties. Our goal is to make the process of authoring WISE curriculum as straightforward and effective as possible, especially for first-time partners. To do so, we carefully observed the processes and artifacts of our early WISE partnerships, and then designed community tools that capture and support those processes and artifacts. We will present our latest version of a Web-based authoring partnership that supports the design of WISE curriculum -- from initial discussions of project topic all the way to classroom trials. Community tools are now highly functional, and include: electronic discussions, member profiles, collections of shared "bookmarks", html whiteboards, links to authoring tools, and version control of authored materials.

Successful Collaborative Online Networks

Fern Tavalin
http://www.webproject.org/exchange (click on projects)

Beginning with the belief that a collaboration between students, teachers, online mentors, and statewide stakeholders such as representatives from universities, museums, historical societies, etc. would lead to real improvements in student performance, online consortia have been forming in Vermont around the content areas of arts and humanities. These collaborative networks began with funds from The WEB Project, one of the first 19 Technology Innovation Challenge Grants, and most have been so successful in achieving their basic goal of improved student performance that continued financial support has shifted from the original federal funds to those of the schools and agencies who participate.

Through the course of the last four years, online discussions, which were at first superficial, have developed into in-depth exchanges where the improvement in learning is evident for both teachers and students. In the process, participants have identified three major lessons which, once addressed, have led to the improvements mentioned above:

Lesson 1. Back and forth communication is at the heart of our online dialogue. Participants do not naturally engage in dialogue; user tendency is to "talk at" others and most conferencing software reinforces the idea of a message board rather than a discussion. Guidelines established by the WEB Exchange network members, which are then reinforced by the computer interface design, quickly increase the communication. This is easier to promote in discussions that focus on student work and harder to achieve when discussion centers on ideas.

Lesson 2. The online activity needs to be an integral part of what is happening in the classroom (when classroom based). Online discourse goes deeper when it is keyed to specific educational goals. Networks establish these goals together, remembering to select only one or two in common so that there is still room to address locally based needs.

Lesson 3. Overarching standards from a state Framework can serve as a common mediator when discussing the quality of student work with community members or experts in the field. When mentors look at work, the standards and student, specific requests for feedback define the scope of discourse in a way that creates safety.

Portals: Findings from one year of classroom implementation

Kallen Tsikalas
http://www.edc.org/CCT/portals

This presentation tells the story of Portals, its integration and dis-integration in twelve classrooms around the country, and its possible impacts on the communities of teachers, students, and project mentors who used it.

A suite of web-based tools and support materials, Portals was developed in collaboration with teachers in the Department of Energy's Adventures in Supercomputing (AiS) program and Arcus, Inc., with support from the National Science Foundation.

Portals was based on two years of student learning research conducted within the AiS program and developed at the request of AiS teachers and coordinators who found CCT's prior research very valuable. They asked for a similar set of strategies and mechanisms

that teachers could use to assess students' learning during the process of developing complex computational science projects, rather than at the conclusion of this process.

As Portals evolved through formative research with AiS teachers, its evaluative emphasis shifted, and its goals and structure became more flexible--to support and facilitate substantive communication between students and their project mentors, who, as research had shown, were a critical element in students developing successful computational science projects and integrating content comprehension with technical skills.

In the fall of 1997, Portals was made available to approximately 130 teachers in 70 schools in five states. About half of these teachers also participated in live training sessions, and ultimately, twelve opted to use Portals in a multiplicity of ways that even we had not anticipated.

The range of uses teachers found for this tool attests to its flexibility, but also had great bearing on its impact on building and strengthening the communities of students, teachers and mentors needed to support substantive project-based, computational science learning.

This presentation details findings from research on the first year of Portals implementation.

Community Building at The Math Forum

Jody Underwood
http://forum.swarthmore.edu

After briefly describing The Math Forum, this presentation will first define what community building, or what might be called "the growing" of the Forum, involves. Following this, the evolution of the Forum from its roots in the Visual Geometry Project (e.g. Sketchpad) to its present status as an NSF-sponsored virtual resource center for mathematics educators and students will be overviewed. Finally, the dynamic relation between the user community and project development will be detailed.

The Math Forum community consists of a small number of Forum staff, over 400,000 web pages, volunteers (students, teachers, mentors, citizens) doing quality mathematics that is Standards informed. It includes: (a) Projects: Ask Dr. Math, Problems of the Week (elementary, middle school, algebra, geometry, and calculus), Teacher2Teacher, Internet Resource Center, (b) Partnerships with major mathematical associations and research consortia (SRI, NCTM, MAA, TERC), (c) Professional development opportunities: systemic initiatives, technology integration workshops, and standards-based mathematics reform. The strengths and needs of teachers and students inform project design and facilitation as they participate and help conduct Forum services.

The Forum provides a highly effective model of informal professional development that serves educators at a number of levels. Many projects are initiated and created by reform-minded math educators who are invested in developing quality mathematics. The resulting database of resources and the scaling of these projects provide opportunities for many other teachers to reflect on their practice and develop classroom activities. Through their involvement, volunteers encounter effective models for facilitating student problem solving. Educators are attracted to The Math Forum for the quality of the mathematics

resources as well as the opportunity to be part of a knowledge building community. All together this makes for a knowledge building community that is attractive to educators because of the opportunities it offers to play a productive role and the quality of the resulting mathematical resources and professional experiences.

Studying processes of collaboration

Muffie Wiebe

My doctoral research is focused on understanding the processes of collaboration amoung working groups, especially in classrooms organised as communities of learners. It is centred on examining the group's negotiation of the task at hand, which I take to include both the emerging understanding of the work as well as the actions the group takes to accomplish the work. This requires an examination of how the group's conversations develop over the unit, and of how the group members are attending to one another and the various artefacts available to them (including paper and pencil resources as well as computers), and to the teacher and others in the classroom. One of my goals for this work is to produce findings on learning interactions which can inform the design of collaborative tools.

In a current project, I am studying the research practices of a group of 5th grade students during a science unit on endangered species. The unit is designed to engage students in collaborative groups to produce a research report on the survival needs of a species and the causes of its endangerment. I am examining how the students' organization of their research activities progresses through the unit, as they shift from following the teachers' instructions quite literally to generating their own sense of direction about how to proceed and support one another in their research. In a proposed project, I will be examining two groups of 8th grade students during a mathematics unit on functions. This unit is designed to engage students in collaborative groups to model population biology. In the proposed study I intend to examine how the group coordinates itself to understand the mathematics involved in the modeling tasks, and how the emerging work is distributed and assessed by the students.

Posters

KidCode - activities for peer-to-peer learning by email.

Michelle Baker

KidCode is an innovative email-based software prototype that helps young children between the ages of 5 and 10 years of age develop an understanding of symbolic representation through communication. As such, it is among the first software offerings for elementary school children that takes advantage of emerging networking technology. The KidCode prototype consists of a sequence of two-person games which are set within the context of an electronic mail system. It is designed to encourage children to manipulate and explore symbolic representations for the purposes of communication, and to help young children develop an understanding of symbolic representation in many of

its manifestations through experiences creating codes and decoding the communications of their peers.

The ideas for KidCode grew out of research studies that indicate that children's difficulty with mathematics in school arises from the lack of opportunities they have to develop conceptual links between mathematics as a symbol system and mathematical concepts that can be used to describe the physical world. Whereas the development of mathematical thinking in young children and skill in basic counting and arithmetic can be quite advanced when posed in real world settings, their application in school math has seemed limited and often, resistant to further development. A child must develop competence with types of symbolic representations to master school mathematics and to advance in mathematics understanding. KidCode helps young children learn about symbolic representations in the context of exchanging secret messages with a partner.

The goal of this presentation is to describe and demonstrate the KidCode software, to discuss the conceptual framework from which it was derived, and to present findings from formative research studies.

Representing learning transactions in networked learning communities; Who learns from whom?

Alain Breuleux, Janet Blatter, Thérèse Laferrière

We present our exploration of ways of representing socio-cognitive transaction patterns emerging from learning activities in three different networked learning communities: K-12 teachers, elementary school students, and university researchers.
Our research within Canada's TeleLearning Network of Centres of Excellence and other funded projects (FCAR) currently faces next generation issues related to the development of learning communities and of technologies needed to support network learning within and across the three communities. These issues follow the successful formation of networked learning communities, and occur when problems no longer deal with establishing the communities. Our presentation suspends questions around "what" is learned in favor of questions around "agency" in collaborative knowledge building (i.e., Who learns from whom?).

One such issue is the representation of activities between learners in a network. We are exploring models of representation that draw from sociometric structures (Moreno, 1958), activity theory (Cole & Engestrom, 1993) and actor network theory (Callon, 1991).

We present versions of these representations as applied to data from our research. The three communities in our data sets are not symmetrical in terms of their level of community development, the types of knowledge building activities and patterns of interaction, and this allows us to examine different moments of community establishment and functioning. We discuss the different issues that are revealed by these various representations, as well as how they can be articulated with one another and how they can be shared among members of the communities. With respect to the latter, we discuss visualisation issues related to how the representations are expressed and embedded within multimedia technologies. We are particularly interested in visual literacy issues - how the three communities construct and share their interpretations of these different

representations and how we can foster their understanding, what knowledge is needed to interpret and generate visualisations; how are various technologies and artifacts read by diverse, distributed agents.

Finally, we consider the communities' use of the representations for purposes such as monitoring, generating, summarizing, evaluating, and interpreting learning in networked communities.

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Communications History -- Electronic Trade Routes for Learning

David Crowley

We've assembled -- and would like to expand -- our distributed team of researchers and teachers to develop and support web-based resources for teaching the history of communication technologies. The team now consists of education researchers, software developers, as well as editors of an internationally distributed textbook, website designers, and teachers at university, college, and high school levels, all of whom are interested in furthering development of research support tools and presentation support tools that can be utilized by teachers and students at any level to study and report on the many histories of communication tools, from cave painting to the printing press, and electronics from telegraphy to computing.

We'd like to promote this project as a networked collaborative effort and especially to take advantage of our growing electronic resources (virtual museums, low cost editing, bandwidth, digital copyright for collections, such as those of the Library of Congress and the European Union) for working with both text and audio-visual materials online.

Making Sense of the TeleLearning Marketplace

DJ Crowley

We would like to develop a poster session around our innovation research on telelearning innovators and their experiences in developing software and content for the so-called education marketplace.

Several key factors have emerged from our work which suggest a framework for managing and enhancing value for the telelearning market. We hope that organizing a poster session around these results can stimulate interaction with innovators at various stages in developing their own work and, additionally, provide opportunities for us to further expand/support our research network.

Online Collaborations for Professional Development

Terry Dash
http://www.edc.org/LNT/

The Center for Online Professional Education (COPE) at Education Development Center, Inc. provides a series of face-to-face and online professional development activities for school and district leaders. A central goal is to develop an ongoing community of education leaders working together to address the changing needs of schools in the information age.

One key component of our program is an annual "Leadership in the New Technologies" summer institute, in collaboration with Harvard University, at which educators from around the world discuss technology as a tool for powerful teaching and learning.

We also make extensive use of the World Wide Web, including database-driven Web pages and Web-based discussions. Our main Web site, http://www.edc.org/LNT/, provides a resource library and a bimonthly online publication, Perspectives. The materials for both are drawn substantially from members of our community, which now numbers over 1000 subscribers. Recent Perspectives articles have discussed topics such as "A Multi-Age Mentoring Program for Girls", "Providing Technical Support For Teaching and Learning", "Professional Development: From Reports to Reality", and "Interviews with Linda Roberts and Cheryl Garnette from the U.S. Department of Education", among others.

We have also developed a series of online workshops. Utilizing both asynchronous and synchronous tools, including WebBoard, TappedIn, and others, the online workshops foster the exchange of ideas among geographically-distant practitioners. Recent workshops have covered "Policy Implications of the Internet in Schools", "Multi-User Virtual Environments: From Research to Classroom Practice", and "Helping to Meet the IDEA '97 Mandate", among others. From our online workshops, we develop models, methods, and tools that serve educators. In addition, we have begun to propagate these effective practices to school districts, enabling districts build their own capacities to develop and implement online professional development activities to extend their professional development programs.

An Analysis of Knowledge Mining: A Web-based Tool for Community Information Gathering

Carolyn Gale, Allison Moore
http://canvas.ltc.vanderbilt.edu/kmine/poster/

Knowledge Mining is a process developed at Vanderbilt's Learning Technology Center that brings together current thinking of a community with a new asynchronous, Web-based communication tool. The goal is to quickly gather quality information related to a specific topic and synthesize the ideas into a single document.

People knowledgeable about a selected, specific topic are invited to write a short description of important ideas about the topic plus relevant, key references. The result should be a large array of current, pertinent and useful information about a topic from a

variety of perspectives. This process uses a very structured mode of communication designed to quickly gather experts' unique thoughts about a topic. While Knowledge Mining is similar to other online discussion forums like bulletin boards, threaded discussion, and newsgroups, it differs in several distinct ways.

This poster presentation will discuss the process of Knowledge Mining, various topics and situations we are currently testing, and preliminary evaluations of the process.

Constructing Views of Knowledge

Mary Lamon
http://csile.oise.utoronto.ca

To prepare students for the knowledge age schools must reinvent themselves as knowledge building communities. New technology affords new ways of working with knowledge and new ways of working with others to create knowledge. However, the power of technology in transforming schools depends on how well the technology supports knowledge building and, more importantly, on its wise and effective use in instruction, curriculum and assessment (Scardamalia, 1995).

Knowledge Forum™, second generation CSILE, is software designed to help students achieve extraordinary learning by providing supports for collaborative learning and inquiry. At the center is a communal database, created by students and their teachers that provides a forum for the discussion and the development of ideas. Students enter their ideas on any field of inquiry the class is studying. Everyone can read the notes and build on, challenge or comment on each others' ideas. Various note formats and supports are designed to enhance the potential of the communal database for collaborative knowledge-building. One of the most distinctive technological features of the software is that contributors enter their notes into one or more database views. When individuals contribute ideas to a view, contributions are set in relation to others' ideas, and this communal context increases the chances that connections will bring people together in new and interesting ways, based on their ideas. Views become a public design space conveying the need and supports for bringing ideas and authors into new relationships.

This poster describes two case studies on students' use of views. In the first, we describe how constructing views of their work in Knowledge Forum fostered students' understanding of their own knowledge construction efforts; in the second we describe how view replication helped elementary students use the knowledge advances made by high school physics students.

Innovative Use of the Web = Constructivist Learning Environment

Chin-Tang Liu
http://www.smsu.edu/ctl999f

This study is to present findings about the innovative use of a "Discussion Web" in a university level course. As the World Wide Web (WWW) has grown in popularity, educators have sought to embed this new medium into their courses. In this study, the authors created a constructivist learning environment in the form of a Discussion Web

that allows near real-time communication among participants. Students participating in this learning environment showed a positive attitude toward the use of the Discussion Web. Other research findings, such as student achievement and anecdotal comments will be presented. We will discuss how we can make the learning environment be more instructionally beneficial to the learning and teaching process at the secondary and post-secondary levels. We will also share with the audience how this project has evolved over a two-year period, and is continuing to evolve today. The presentation will be followed by a demonstration.

Building a Virtual School

Terry Piper

This presentation describes the creation of the Virtual High School of Newfoundland and Labrador. The school, a project jointly conceived and run by Memorial University, the Vista School District, and the provincial Department of Education with federal

The Science Education for Public Understanding Program in Today's Classrooms

Laura Walhof
http://www.lhs.berkeley.edu/SEPUP/

The Science Education for Public Understanding Program (SEPUP) is an instructional materials development group at the Lawrence Hall of Science, University of California at Berkeley. SEPUP produces elementary and secondary science materials that highlight the science behind today's societal and environmental issues. Materials developed by SEPUP have been used by over 2.5 million students in grades 4-10 throughout the United States, and they have been adapted for use in several other countries, including Spain and Australia. SEPUP's approach to issue oriented science develops an understanding of the science and problem-solving processes related to social issues without taking an advocacy position.

Accomplishing these kinds of goals and objectives for students requires the development of new kinds of instructional programs that focus on the individual and their rights, responsibilities, and expected actions as a member of a global society. The SEPUP staff is in the process of exploring the use of learning technologies in these types of materials for current and future development efforts. We strive to give the individual sufficient experiences so that he/she understands that science, as with all decision making processes, is a way of knowing, not just a set of facts to be memorized. Then, the individual is provided with experience dealing with situations, both simulated and real, that involve the concept of trade-offs and the responsibility of the individuals to themselves and current and future society. The investigations students undertake are chosen so that, in total, they help provide the student with an integrated understanding of the nature of science, its relationship to society, and how "scientific thinking" can be used to guide decisions about one's own life. "Projects" and in-depth investigations that consider issues from all points of view are not add-ons, but rather are a major component of all SEPUP materials.

Kosmeo: Supporting knowledge work in project-based learning

Doug Ward

MC^2 Learning Systems Inc. builds tools to support online project-based learning in K-12 education. Many projects have been produced by teachers, students, and instructional designers with our current product, Zebu™. We are currently in the final stages of development of a second-generation educational groupware tool that builds on lessons learned about technical and educational support for project-based learning. Kosmeo™ is a network-based Java application for collaborative project-based learning, where students and teachers build a database of multimedia representations of their knowledge. It allows teachers to provide structural and substantive support for learning activities based on required curricula and powerful pedagogical principles. It allows students to engage in online learning activities that are appropriate to their learning goals.

A key goal in the design of Kosmeo is to help students and teachers get beyond the surface-level, task-orientation commonly found in project-based learning, and to focus on building deep and shared understanding. In Kosmeo, learners can treat multimedia representations as "knowledge objects" which can have explicit knowledge-oriented properties, a history, and can be shared, manipulated, modified, displayed, and reflected upon. Participants are provided with guidance in creating and using specific types of knowledge and discourse moves to advance toward their learning goals and curricular outcomes. Kosmeo offers tools for adding value to information as students build knowledge through basic text, graphic, video, etc., as well as annotated references, graphical organizers, and synchronous or asynchronous discussions. With Kosmeo, learners can engage in knowledge-centred activities that are appropriate to any knowledge domain.

Our poster will present the design of Kosmeo with examples of possible uses, and the rationale for our approach. Our aim will be to discuss with other participants how Kosmeo could become a platform for further innovation through classroom implementations, research partnerships, and integration with other complementary software.

Demonstrations

E-Tutor Connected Learning

Martha Angulo
http://www.e-tutor.com

E-Tutor.com is a sophisticated Internet site that uses the power of the World Wide Web for learning. The program engages students in their own learning in four curricular areas: Language Arts, Mathematics, Science, and Social Studies. E-Tutor.com provides lessons for students in Early and Late Elementary School, Middle/Junior High School, and Early and Late High School. E-Tutor instruction enhances and enriches the education now provided by schools. The visual instruction is designed to include all curricular disciplines, balance the transfer of certain basic skills, and strengthen the value of

education. E-Tutor has been developed to assist students in learning the potential of the World Wide Web and to increase their knowledge base. The on-line Internet connections open a wide array of possibilities for learning, not limited to the confines of the classroom. Students anticipate new discoveries that lie ahead as they proceed through each lesson.

The on-line educational site provides lessons where students are responsible for their own learning. E-Tutor allows students to work at their own pace and to focus on areas of their choice from a large selection of specific subjects (23). The key to student success is engaging their interests. A wide range of topics, informational web sites, and interesting activities help to create a unique learning experience for students. Lessons are written by educators and reflect the National Goals for Learning. E-Tutor has over 300 lessons, with new lessons added on a regular basis. Students can choose from a variety of subjects in each of the curricular areas. Lessons and activities are fully integrated with the World Wide Web. In other words, students cannot fully complete the lessons without going to the Internet links provided throughout the body of the lesson.

A tour and free lessons are available at http://www.e-tutor.com

Collaborative Environments for Learning

Lisa Bievenue
http://www.ncsa.uiuc.edu/SDG/Software/Habanero

Collaborative technologies represent the next major break-through in communication for the Internet community, and these technologies have the potential to fundamentally change the way we think about learning. This presentation will provide participants with the opportunity to view two leading edge collaborative environments: netLearningPlace and NCSA Habanero. The key characteristic of these two frameworks that sets them apart from most other learning environments is that they each support both asynchronous and synchronous collaborative technologies. In addition, each of these environments is an extensible and flexible framework in which already existing software tools can be embedded.

NCSA Habanero is a collaborative framework and set of applications. It is an environment in which users can create and work in shared applications from remote locations over the Internet. The Habanero framework, or API, enables developers of groupware applications to build powerful collaborative software in a reduced amount of time. Habanero is written in Java; it will run under any operating system that supports the most recent version of the JDK. The Habanero environment consists of a client application, a server application and a variety of collaboration and visualization tools.

netLearningPlace (http://www.ncsa.uiuc.edu/Edu/ITG/netLearningPlace) is a collaborative environment focused on teaching and learning. netLearningPlace is an environment that integrates multiple tools for collaborative distance education, and just-in-time training. The framework provides a database back-end, synchronous and asynchronous communication, delivery mechanisms and file management tools. Using this modular framework, a standard Web browser, and an Internet connection is all that is necessary.

netLearningPlace has been used to deliver entire university courses to remote and local students. NCSA Habanero is being used this spring in a course to facilitate collaborative modeling and visualization. By the time of this conference there will be some limited data to report on how effective each of these environments were as learning tools, as collaborative environments, and as course delivery mechanisms.

Building Blocks for Integrated Learning

Joe Clark

Solving complex problems often requires multi-disciplinary teams of experts and at the very least minds that stretch across the boundries of disciplines. Resources available generally are packaged in discrete disciplinary units. The demonstration will demonstrate a software management system connected to a database which is being developed for seamless access in support of interdisciplinary subjects like environmental sciences, oceanography and thematic topics.

WebConstellations: Online Digital Data Knowledge Construction

Ricki Goldman-Segall, Aaron Goldman-Segall, Bond
http://www.merlin.ubc.ca

WebConstellations(tm) is a developing server-side web database system designed to enable communities of learners, educators, and researchers to catalog, describe, and meaningfully organize data accessible on the Web. The underlying metaphor for WebConstellations is stars and constellations-in WebConstellations, stars refer to pieces of data in the form of URLs; constellations are groups of stars and other constellations made meaningful by users.
Some of the features of WebConstellations are: ï Users can create stars representing pieces of data and tag them with keywords. ï Users have private server space where they can upload their own data. ï Users can automatically catalog stars placed in their server space. ï The information represented by a star is a url, so users can gather data outside of their server space. ï Users can build constellations from both stars and constellations. ï Users can search on keywords to locate stars and constellations and build constellations from search results. ï Users can attach their comments/annotations to other users' stars and constellations.

WebConstellation is jointly developed by Bitmovers Communications Inc., http://www.bitmovers.com , and Ricki Goldman-Segall, Director of the Multimedia Ethnographic Research Lab (MERLin) and Associate Professor in the Faculty of Education at the University of British Columbia. WebConstellations is based on Constellations 2.5, which was developed by Ricki Goldman-Segall and Lawrence Halff at MERLin.

In this demo, Aaron Bond, one of the members of MERLin, and Ricki Goldman-Segall, will demonstrate how WebConstellations is currently being used by various communities of inquiry as a tool for knowledge construction. We will also enter into conversations with people about how to customize WebConstellations for a variety of learning communities.

Internet-based Shared Expedition Environment

Jim Laffey
http://www.muexpeditions.org/

Internet-based Shared Expedition Environment (ISEE) is a collaboration of Motorola University and the Center for Technology Innovations in Education (CTIE) at the University of Missouri.

Motorola University had developed and implemented a program called Explorations that brought children of Motorola employees together in a week-long residential program. During an Exploration teams of youth would work to solve an authentic problem confronting Motorola. The youth learned to apply a quality assurance process while taking on a substantial challenge, and developed their abilities to work in teams, frame ill-defined problems, undertake research, develop a solution, and present that solution to a Motorola team.

CTIE had created and implemented a web-based shared journal system for the teacher education programs at Missouri. The web-based journal system enables easy multi-media representation of experience, sharing of experiences across the Internet, and processes to facilitate support, reflection, and feedback.

Motorola University and CTIE have collaborated in redeveloping the journal system into ISEE, so that it can support induction into the Motorola culture and facilitate internet-based experiences that map closely to the efforts of an Exploration. A key feature of an Expedition is the role of mentor who will use ISEE to guide teams of young participants as they take on the challenges of an Expedition. An 8 week pilot will be undertaken starting in late April around the theme of Telematics.

Our presentation will demonstrate the key features of the ISEE system and describe lessons learned during the early parts of the pilot.

Collaborative Modeling for Curriculum Integration - An Example in Chemical Engineering

Matthew Realff

Collaborators: Dr. Pete Ludovice, School of Chemical Engineering, Dr. Mark Guzdial, College of Computing, Dr. Tom Morley, School of Mathematics, Georgia Tech

One of the critical problems of many undergraduate curricula is the lack of integration. While practicing experts and course instructors recognize that there is a relationship between calculus and later classes in engineering, students may not recognize this relationship. Instead, students often demonstrate inert knowledge (Brown, Bransford, Ferrara, & Campione, 1983), where knowledge clearly learned in one context seems only to be used in examinations and not in real problem-solving. We are exploring the potential of collaborative spaces to encourage cross-curricular integration and to promote transfer of learning between courses and disciplines. In addition, we have run pilot studies on students collaborating between classes, such as seniors in a chemical

engineering control course with sophomores in an applied mathematics course. Explicit demands are placed on the students to collaborate, for example by sharing data.

We are advocating the use of a common notation, a forum for students to get and supply help in this common notation, and a resource library that integrates across classes. The technology consists of a collaborative space constructed in a CoWeb (Guzdial 1999) where students provide the content in the form of project cases, discussions, and tutorials and where graduate students index the material to identify cross-curricular ties. The key challenges we face are:

To promote the ownership and development of the CoWeb by the students themselves, particularly in the highly competitive environment of an engineering school.
To engage the community outside of specific courses, in other disciplines, in the environment so that it can expand beyond a narrow focus of a few Georgia Tech courses.
To use the CoWeb to promote learning by the course instructors so that the barriers to cross-course activities and transfer are lowered.
To develop and apply appropriate assessment measures to the technology to understand and document the effects of the system on student learning.

The space is fully editable by the community of course instructors, teaching assistants and students, and in fact anyone with web access. We believe that is of relevance to the theme team of "Tools for Learning Communities" that is developing software and methods for supporting virtual learning communities and collaborative learning on the Internet.

TAPPED IN On-line Community of Educators

Mark Schlager
http://www.tappedin.org

The TAPPED IN project is an NSF research testbed project that investigates how to establish sustainable and scalable on-line teacher professional development (TPD) communities. Our goal is to begin supporting education professionals during their pre-service education and continue to serve them as they become leaders in their professional community. To help achieve this goal, we have developed a Web-based virtual environment designed to meet the needs of our large and diverse community of education professionals (currently over 3000).

Activities occur in virtual rooms that provide a basic yet powerful set of communication mechanisms and support tools (e.g., whiteboards, notes, recorders, and shared Web viewers). TAPPED IN members can attend activities hosted by partner organizations, conduct their own activities, or expand their circle of colleagues by participating in real-time or discussion-board groups. We and our partners provide the tools, resources, and social support needed to supplement face-to-face events and sustain collaborative work. Our partners include nationally-recognized education organizations (e.g., Lawrence Hall of Science, Wiesenthal Museum of Tolerance, Geological Society of America, American Association of School Librarians), educational Website hosts (e.g., Swarthmore College Math Forum, ED's Oasis), preservice and master's degree programs (e.g., Pepperdine Univ., Univ. of Illinois, Univ. of Wisconsin, Michigan State), and state and local education agencies (e.g., Kentucky Dept. of Educ., Los Angeles County Office of Educ.,

New Haven USD, Joint Venture: Silicon Valley Challenge 2000) and scores of small groups and projects around the country. By sharing TAPPED IN, the organizations enable their affiliated teachers to gain access to expertise, ideas, and resources that no single organization could provide by itself. The educators, in turn, can participate in, help shape, and take ownership of a familiar and supportive on-line home. We invite new content partners to contact us at contactus@tappedin.sri.com.

eduVILLAGE

Wee-Chee Sim

eduVILLAGE seeks to (a) provide learners a centralized access to repositories, project resources and library resources that supports project work, (b) provide a suite of online tools to help teachers to effectively monitor and assess project work processes, and (c) provide a suite of online tools for students to collaborate effectively online as part of the project work processes.

WebGuide: Computational Perspectives for Learning Communities

Gerry Stahl
http://www.cs.colorado.edu/~gerry/webguide

WebGuide is an interactive computer-based learning environment initially targeted to middle school project-based collaborative learning, but currently being used at the graduate seminar level as well. It provides a structured medium within the World Wide Web for students to conduct individual and group research and reflection.

Like CSILE and similar systems, WebGuide is intended to support communication and collaboration within a learning community such as a group of students pursuing research. Although it supports threaded discussions, it is designed more for the collection and organization of related ideas.

The technical innovation consists of a computational perspectives mechanism. This allows a shared information space to be seen from different perspectives.

Each community member has their own personal perspective in which they can construct their own system of knowledge--their own "perspective" on the shared research. In addition, collaborators can form team perspectives in which they share ideas and develop team perspectives on the evolving state of understanding. Finally, there are comparison perspectives corresponding to each team and to the community as a whole, in which the ideas from multiple perspectives are brought together for comparison, negotiation and synthesis. The perspectives mechanism provides for the definition of a hierarchy of perspectives in which information is inherited from one perspective to another automatically.

The WebGuide prototype has been used in two classes this semester. This initial experience has raised many important issues for software support of collaboration and has suggested a number of promising responses to these issues. The solutions involve a synthesis of social practices and software affordances.

WebGuide is being developed by Gerry Stahl and colleagues at the Institute of Cognitive Science and the Center for Lifelong Learning & Design at the University of Colorado at Boulder, in collaboration with NOAA and the Logan School for Creative Learning.

Knowledge Forum™

Chris Teplovs
http://csile.oise.utoronto.ca/

Knowledge Forum™ is a second-generation version of CSILE (Computer-Supported Intentional Learning Environments), a problem-centered, collaborative knowledge medium that operates over a computer network. Released in late 1997, Knowledge Forum™ is the culmination of two decades of research in the fields of writing, intentional learning, and expertise.

The heart of the system is a student-generated database of multimedia notes within which participants define collective problems of understanding and work together to advance communal knowledge. Unlike other electronic discourse systems, Knowledge Forum™ provides unique and distinctive supports for a wide range of high-level cognitive operations. Some of the program's advanced features include:

drag-and-drop note referencing;
note co-authoring;
advanced search functionality;
the ability to arrange notes in multiple configurations and against different backdrops using the view facility;
a collection tool that allows the learner to cluster notes around core concepts;
contribution folders that learners use to solicit ideas from others;
'rise above' functionality for synthesis and summary operations;
drag-and-drop quotations with an automatic footnote facility.

The software is currently being used at all levels, from grade 1 through University graduate classes.

Crit: Adding Your Own Comments and Connections to the Web

Ka-Ping Yee
http://crit.org/

Several hypertext linking features that are essential for supporting critical discussion and document annotation are missing from the World-Wide Web. The Crit software augments the Web with some of these features, including bidirectionality, extrinsic links, link typing, and fine-grained link ends, and hence enables the public annotation of any document on the entire Web.

Not only is Crit the first working implementation to enable public annotation of the Web, but it also accomplishes this in a way that allows any user of any browser to participate instantly without installing any software. With Crit, one can walk up to a browser

anywhere, visit a random news article on the Web, and attach a note to the article which expresses agreement or disagreement with a specific word, sentence, or paragraph, possibly also connecting the article to other related articles or comments. One can even make annotations on the annotations themselves.

Crit opens many interesting possibilities for learning communities and for collaboration on the Web in general. Some application areas for further exploration include group critiquing of articles on the Web, collaborative revision of documents, structured discussion and argumentation, and the support of group knowledge evolution.

Crit went "on the air" in June 1997 and development continues. Although anyone can use Crit on public websites by simply visiting the public service at http://crit.org/ , one might also want to install a private Crit server for enabling annotations on private documents, or setting up a private collection of annotations visible only within a smaller workgroup. For this purpose, the source code for Crit is freely available for download.

Distributed Learning Trends Supported by Tool Development at IBM

Maryann Yeomans

The evolving demand for distributed learning is being driven by the availability of a variety of new, more complex technologies, as well the demand for more equitable access for the learner, teacher, worker, and parent. This increasing demand means educational institutions must search for better tools to facilitate and manage learners without increasing time pressures for instructors or substantially increasing administration costs.

IBM's Pacific Development Centre (PDC), located in Burnaby, B.C., Canada, uses a distributed learning framework to describe the fundamental concepts of trends in educational delivery models. Under this framework, IBM has developed many tools and technologies that assist as well as support the learner, instructor, mentor, and parent.

The PDC's development efforts in collaboration with educational partners has evolved into a holistic approach to distributed education that defines the need to re-use online content development, streamed objects, and multimedia components, in an intuitive, media rich, development interface.