AN ONLINE COMMUNITY: DEPARTMENT OF DEFENSE EDUCATION ACTIVITY (DoDEA) AND THE UNIVERSITY OF HAWAI'I

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Online communities are meeting places for learners on the Internet designed to facilitate interaction and collaboration among people who share common interests and needs. Most participants are drawn by an opportunity to share a sense of community with like-minded strangers, regardless of where they live. School communities can be distinguished by goal: there are communities of practice (teachers in the same practice or department sharing information), communities of learning (student and teacher study groups), and communities of purpose (project groups, committees, etc.).

This paper will focus on online communities in K-12 school settings and the higher education communities that support them. It will describe some of the initiatives between the Department of Defense and the University of Hawai'i occurring right now and also offer my perspectives on needs and opportunities for the future.

Department of Defense Education Activity

DoDEA <www.odedodea.edu/> provides education to eligible Department of Defense (DoD) military and civilian dependents from preschool through grade 12 with two programs, the DoD Domestic Dependents Elementary and Secondary Schools (DDESS) for dependents at locations within the continental United States where DoD operates schools, and the DoD Dependents Schools (DoDDS) for dependents outside the continental United States. Courses of study in DoDEA schools parallel those found in public schools in the United States. The DDESS system serves an estimated 36,360 students in 70 schools located in seven states, Guam, and the Commonwealth of Puerto Rico. The DoDDS system serves about 76,428 students in 154 schools in 13 countries. Classrooms lie as far a-field as Sasebo, Japan and Mainz, Germany.

The University of Hawai'i is part of a consortium with Mississippi State University and Indiana University of Pennsylvania under contract to the DoDEA to improve instruction at all levels of education through more effective use of technology. It is important to the DoDEA's mission to use this century's information technologies effectively, particularly as its student body is mobile and geographically dispersed. Many students find themselves in foreign countries and remote locations as a result of their parents' overseas duties.

As part of this collaborative effort, the University of Hawai'i Curriculum Research & Development Group was charged with the task of researching, developing, and disseminating the technology tools to enhance instructional practices for students and teachers from kindergarten through graduate school. This was an excellent opportunity for CRDG to work with an established system operational in 11 time zones.

Our work began in 2001, developing visual and simulation enhancements to online courses being delivered to DoDEA schools. These high school courses were Advanced Placement (AP) Calculus, Science Research Seminar, Economics, and Visual BASIC, and were authored by the instructors who taught them. The students took the online courses in their school, in a room, usually the library, with a facilitator, usually the librarian, present. There was no guarantee that facilitators possessed any knowledge of the subject matter. Textbooks were used in all four courses.

The learning management system (LMS) used by DoDEA is Lotus Notes. An LMS is Internet-based software that deploys, manages, tracks, and reports on interaction between: a) the learner and the content, and b) the learner and the instructor. Lotus Notes was originally designed for online corporate collaboration. In educational settings, learning management systems perform student registration, track learner progress, record test scores, indicate course completions, and finally allow instructors/trainers to assess the performance of their students. Learning management systems administer and track both online and classroom-based learning events, as well as other training processes, and can be accessed with either a Web browser or with Lotus Notes client software.

The client software does a superior job of handling threaded class discussions. Students and teacher become a close community through these threaded discussions. Their interactions are thorough, and the asynchronous nature of the "conversations" that develop allows time for thoughtful written responses to questions and discussions.

Integrated databases that contain lessons and quizzes can be set up by the teacher beforehand, and then put on line at the appropriate time. Currently, course templates follow the "Understanding by Design" methodology, which requires that instructors define learning goals and student assessment strategies before instructional episodes are designed (Wiggins & McTighe, 1998).

Instructors do not have to be online all the time. Lotus Notes' online replication capability allows the instructor to connect to the Internet for just a few minutes several times per day. During connection time files that are not on the instructor's computer are downloaded from servers, and files that are on the instructors computer but not on the server are uploaded. When disconnected, the instructor can be anywhere responding to student submissions, as well as creating lessons. The instructor's location in the world is relatively unimportant, so long as he/she has access to an Internet connection. The replication capability of the servers

provides a system beneficial to the student. Usually, network connections within schools are very fast and connect the school Lotus Notes server and the student computers. Connections between individual schools and outside servers have varied capability. But even with a slow connection speed, files may have many hours to replicate before the student arrives at school the next day. Then all the information is housed on the school server and the student is able to interact rapidly with the system.

Course Ware Design and Development

In 2001 design teams included DoDEA instructors, and UH instructional designers, subject matter experts (SMEs), graphic designers, video and audio specialists, and software engineers. The DoDEA teachers were located in Alabama, Mainz-Kastel Germany, and Sasebo Japan. The distance-learning principal was located in Mainz-Kastel.

After several weeks of phone calls and e-mail exchanges, we decided that rapid courseware design was called for with teams meeting at one place. Several DoDEA teachers from Alabama and Sasebo were brought to Hawai'i for one week. The DoDEA instructor of high school Science Research Seminar and high school Economics were not mobile, so a UH design team went to Mainz-Kastel. At a minimum, teams included an instructional designer, a programmer, and an artist. The process was especially interesting in Germany because the instructor taught regular biology classes at midday. In the morning before his regular classes, we met with him to draw out possibilities for a series of software enhancements. They included illustrations, short animations, movies, simulations, and specialized instruments such as calculators. During the day the team discussed, wrote up, and sketched out what the program or visualization might look like. Each late afternoon we would meet with the instructor again to present sketches and write ups, and gather together reflections and feedback.

We used Lotus Notes to post software versions, discuss testing issues and gain users' impressions of the software. One benefit of this procedure was that we were working in the same platform that would be used by the high school student consumers of the software. In effect, the same Lotus Notes discussions could be used in our learning content management system and learning management system.

Software was developed in several formats including QuickTime movies, Flash applications, and Visual BASIC applications. Most were interactive, including the QuickTime movies, and were imbedded into Lotus Notes instruction.

In the Visual BASIC course, the most effective instuctional subunits turned out to be a series of 33 incomplete computer programs called "Baby Steps." They required only a line or two of coding by the student to become operational. These units covered a range of software engineering issues and could be covered in three to four weeks right at the beginning of the course. After that the students had working knowledge of a wide range of the programming language's capabilities. This knowledge supported their ability to make sense of the textbook and later create large custom projects of their own choosing. Aside from the "Baby Steps" units, visualizations were created to be used for event driven models, multitasking and parallel processing.

Visualizations and tools in the Economics course were designed for areas that were identified as either stumbling blocks or else required further interactive elaboration. The "Life Scenario" calculator, for example, helped students make personal budget decisions based on income and expenses. A long audio piece (22 minutes in 500 kilobytes) was developed on the evolution of banking and visualizations created on such topics as the dollar and demand elasticity.

The Science Research Seminar covered experimental design and statistical analysis to high school students–a topic that is challenging enough even for graduate students. The added challenge that these high school students had to face was that their instructor was not working in their classrooms, but might be on another continent. Simulations were designed to develop an understanding of the issue of sampling in the areas of physics, technology, biology, and social science. Movies were developed for ANOVA, Chi-X, Man Whitney-U, and T-test. We also designed an interactive Decision Tree for statistical tests along with an activity where the students matched research scenarios with appropriate careers and statistical facts.

In order to address topics that are often stumbling blocks for students in AP Calculus, we created a number of visualizations and quizzes which included "Average Value of a Function", "Chain Rule", "Product Rule", "Exponential Functions", and "Volume of Rotation." Because developmental testing of the software could not be done in DoDEA classrooms, it was sent out to volunteer Hawai'i teachers who were teaching similar subjects at the same grade level. These teachers provided written feedback about all aspects of the software. Human-computer interaction experts at the University of Hawai'i Information and Computer Science department reviewed the software for ease of navigation, visual clarity, clearness of meaning, and multimedia interaction.

Future Online Learning Standards

For the past four years, the Department of Defense has been working with hundreds of academic institutions, standards bodies, corporations and private organizations to develop an open-architecture standard for a global distributed network of interoperable and reusable learning objects. Its aim is to divide content into much smaller, more concise elements—perhaps even individual paragraphs and images. These "chunks of knowledge" conform to a content specification called the Sharable Content Object Reference Model or

SCORM. It was born out an initiative called Advanced Distributive Learning (ADL)–a separate organization funded by the DoD in 1997 <http://adlnet.org>.

Mark Oehlert, the deputy director for communication for an ADL Co-Lab, states that SCORM is a reference model but not a standard. It is an accumulation of work performed by a number of organizations: the Institute for Electrical and Electronics Engineers <IEEE, www.ieee.org>, the Aviation Industry Computer-Based Training Committee (AICC), <www.aicc.org>, the Association of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE) Foundation <www.ariadne-eu.org> and the Advanced Learning Infrastructure Consortium in Japan <www.alic.gr.jp/eng/>. SCORM describes the framework for developing Web-based instructional materials in a way that allows the global e-learning community to use it with a variety of systems. Users create their own units of instruction by mixing and matching pieces to construct learning units that are useful in a particular context. Pieces are granular, reusable, interoperable, and networkable. Content pieces tend to be authored to stay independent of larger contexts. SCORM content also stays independent from the system that renders it. Right now most higher education institutions do not require SCORM-compliant course learning objects as does some U.S. industry and the U.S. military (Letts, 2002, 6).

SCORM requires tagging of content with metadata that describes what the content is. The number of compulsory tags or labels is relatively few. This is both good and bad. The good part is that the content developer has less work to do describing the content they have already developed. The bad part is that most content will be hard to find by instructors for reuse because of the minimum number of labels. An examination of the labels (Klemm et al, 2002) revealed that SCORM contains no teacher education categories.

Emerging Educational Technologies

Prospective teachers and in-service teachers have little opportunity to observe a variety of teaching techniques and learning situations. It is very hard for them to see good models of instruction. There just isn't enough time or opportunity to visit a variety of exemplary classrooms. In order to observe a particular technique, several unlikely events and opportunities would have to intersect in traditional classroom settings. For example, the teacher would have to be free to travel, be in a position to determine before hand that a teacher in the vicinity was teaching the subject, and be assured that the same teacher would be incorporating the technique in their lesson. They would also have to obtain permission to visit the school on the correct day and at the correct time.

One way to overcome these difficulties is to develop a web-searchable database of teaching and learning videos accessible any time and anywhere. Search categories for the professional development video database would include the subject area, language, school setting, and grade level of students. It might also include more detailed information such as developmental skill level, location of instruction, grouping, communication mode, inclusion/diversity, ability grouping, instructional design, type of instructional plan, questioning strategy, standards, instructional alternatives examples, student products, student performances, part of lesson plan, stage of lesson, problem solving, instructional objective, teacher experience, teacher type, assessment, course and classroom management, parental and community involvement, design process, text-based resources, technology resources, type of video, subject area, specific curriculum, process skills, and structure of knowledge. (Klemm et. al., 2002).

The University of Hawai'i has successfully deployed two such Web-searchable databases for students: the Hawai'i Watersheds Database <www.hawaii.edu/environment> and the School Web of Instructional Media (SWIM) Database <www.hawaii.edu/swim> for students and teachers. The Hawai'i Watersheds Database enables school groups to enter and analyze environmental data. The SWIM Database offers multimedia supplements for the high school student textbooks The Fluid Earth (Klemm, et. al., 1990) and The Living Ocean (Klemm, et. al., 1995). SWIM evolved from a CD-based delivery of hypermedia instruction. (Speitel, et al., 1999, 372). However, a rich web-searchable video database for professional development still does not exist.

Learning Content Management Systems

Modern on-line authoring and content management is being merged into sophisticated systems, called Learning Content Management Systems or LCMSs. An LCMS provides the content, testing, and sequencing, that is required by the Learning Management System or LMS. Developers and developer/teachers work with the LCMS. Students and teachers work with the LMS. An LCMS is more than a courseware object repository. As an example I will describe some of the features of an LCMS as part of a system called ASPEN by the company *click2learn* <www.click2learn.com>. All features they describe happen on-line over the Internet where courseware developers are able to collaborate no matter where in the world they happen to be. Project managers assign task assignments and specify authoring roles. Permissions can be set up at different levels to allow different developers access to specific aspects of the course. Developers check out and check in modules. Versions of software with author modification connections are automatically archived. The project manager can observe and modify workflow. Content status reports related to production goals can be sent out by the system automatically.

Most of the authoring is WYSIWIG and template based.

Templates are modifiable. Much of the authoring can be done offline. There are tools for test development and sequencing of learning objects. Multiple course tracks can be created with rule-based feedback. Learning objects can be labeled in the system with SCORM categories and others, making them potentially findable and reusable in other courses and situations.

The Future for Online Learning Communities

Textbook publishers have been rapidly dying off over the past 20 years. Meanwhile, the online learning community has been rapidly expanding and evolving, though they still have a long way to go. One of the effects of this is that intellectual property rights have become blurred and less easy to sort out.

Young children are becoming progressively technology ready and eager to embrace the more technologically developed world of the future. New ways of interacting with students are constantly evolving. These ways need to be tested and their educational potential evaluated and explored. Such potential is not limited to educational institutions and we are now witnessing the involvement of large corporations such as Lockheed, who do not hesitate to offer courses online to all their employees. As new technologies evolve and as new agencies begin to tap into their potential, the field of on-line learning will continue to be an exciting arena of educational development.

Most educators maintain that the virtual online world will never replace face-to-face teaching, but only augment it. Yet the virtual world of synchronous on-line classrooms is not too different from the world of in-classroom instruction. Instructional design and management tools will continue to get better. Hopefully, teachers and students will find ways to banish classroom isolation and form bridges to richer learning communities.

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