Learning Technology

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From the editor ..

The last few years have seen such tremendous growth in the use of technology in education that 'Learning Technology' has now justified itself as a full discipline in its own right. Although the use of technology in teaching and learning is not new, in recent years there has been an incredible integration of various technologies in institution-wide education. These changes are now being reflected in normal university curriculum and are accompanied by the emergence of various advisory and research groups. For example, the IEEE Learning Technology Standards Committee (LTSC) has been successful in initiating the development of technical standards in the Learning Technology areas; Instructional Management System (IMS) is working towards the development of information content metadata; the Advance Distributed Learning (ADL) initiative has been launched by the United States Department of Defense and the White House Office of Science and Technology Policy; and the European Union has launched an initiative called PROMETEUS (PROmoting Multimedia access to Education and Training in EUropean Society).

This Learning Technology newsletter is an effort to document the lessons learned from the integration of existing technologies, as well as new developments, in modern education. It will also report the activities of the IEEE Learning Technology Task Force, announcements of various conferences and other events in this field, and opportunities for participation various projects.

I am pleased to bring you this first issue of our newsletter and hope you will find it interesting and insightful, and representative of the pioneering work in the field of Learning Technology. As the work of the IEEE Learning Technology Task Force progresses and additional projects are initiated, the contributions to this newsletter will hopefully become an archive for future for researchers and developers. Our success, of course, will largely depend on your continued interest in Learning Technology issues and your active participation in the IEEE Learning Technology Task Force.

Once again, on behalf of our editorial team, I present this inaugural issue and welcome your active participation, both in submitting contributions to the newsletter and in offering feedback/comments.

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From IEEE LTTF chair ..

Welcome to the IEEE Learning Technology Task Force (LTTF). If you are part of the Learning Technology revolution, LTTF is designed for you. Our 'Publications' will keep you abreast of emerging technology and other happenings in this field. The 'Collaborative Project Forum,' through web sites and e-mail lists, will help projects build awareness and create online project teams (see article below). Our 'Liaisons Forum' (still being initiated) will help build synergy with other related organizations. Our 'Related Links' section is growing steadily and will eventually provide a comprehensive view of this field. Our 'Standards' activities will be in support of our sister group, the IEEE Learning Technology Standards Committee (LTSC). Our first conference will probably be in late 2000. ...And this is just the beginning. Please visit the LTTF site at http://lttf.ieee.org and take a tour. If you are doing work in the exciting field of Learning Technology, we hope you'll join LTTF (it's free), but more importantly, we hope you find a way to get involved and start benefiting.

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Collaborative Projects Forum

Imagine traveling up the stairs onto a stage before a packed auditorium. You read a brief statement and one by one, the hands up go. Some people offer you advice. Some people offer their help. Some people speak of related topics. You go off the stage feeling satisfied, as you now have a community of contacts, and you are ready to make progress.

This is what the IEEE Learning Technology Task Force Collaborative Projects Forum is. The forum is a place where researchers can present their research projects and get advice, participants, and information about related projects. The LTTF Forum is web-based. Currently, there is a web page dedicated to these projects (http://lttf.ieee.org/projects.htm) and from this page, a user can access

detailed information about each featured project and can contact the leader of these research efforts. A user can also join an email mailing list, hosted by LTTF, but dedicated to an individual project, and become a participant.

The forum is constantly growing and changing. The end product will be a robust forum, made up of a variety of projects having to do with research into learning technology. Researchers will build a group of participants through their email mailing lists, and breakthroughs in learning technology will be made.

To build up and publicize this forum, I started out by gathering a list of organizations, conferences, and publications related to the learning technology field. As a service, users can also access this list of related links at http://lttf.ieee.org/links.htm. From this point, I combed these web pages for related projects and then emailed the leaders of the projects with a message describing the LTTF and the Collaborative Projects Forum and inviting the project leader to bring their project into the forum. From the response I got, I worked the project into the web site, set up an email mailing list for the project, and also added the project leader to a separate mailing list, LTTF-PL (Project Leaders). This mailing list allows the project leaders to remain in contact with each other.

Currently, there are 10 projects in the forum. Some of the projects include a collaboration to link supercomputers and then use the power to aid in teaching and a project to develop effective methods of tutoring over the internet. The overall response has been very positive. For more information on how to become a collaborative project, please contact Kris Sundaram at sundram@hotmail.com .

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Learning Technology Glossary

The work of Learning Technology Standard Committee (LTSC) may be considered as a search of some "common denominator" in engineering solutions or a unified approach that could form a general background for interoperability and re-use of Learning Technology Systems (LTS). It is based on established practice, and is aimed at preserving the state of the art, whereas Learning Technology Task Force (LTTF), on the contrary, represents a diversity, exploration and trial. This basic difference can be illustrated by Glossary projects that exist both within LTTF and as a Working Group (WG) of LTSC.

Glossary WG creates a LT Glossary focusing on the terms used in LTSC documents. It is a typical Glossary, in a sense that

- a content of the Glossary is defined by the restricted number of documents, not the terminology of the domain at large;
- an explanation of the term sense is derived primarily from its meaning in the document, although it may be generalized to the extent acceptable for the understanding of the document;
- definitions of the terms are short, the use of cross- references, examples and other means for clarification of the terminological structure of the domain is restricted.

Nevertheless, during the creation of LTSC Glossary some additional material is being collected that can be used for extensions of the Glossary both in quantity and quality, to enlarge the amount of information related to a term, the number of terms, and to reconstruct plain terms repository into interactive structured Glossary.

LTSC Glossary currently answers the primary need of a unique source of the standardized terminology

in Learning Technology. This field, which is experiencing rapid changes due to both technical innovations and development of new learning and instructional paradigms, still lacks an approved terminology source. As a result, the use of some terms diverge from one research team or user group to another, emerging concepts often have several names given by different vendors, the meaning of some educational terms keeps the flavour of national education system.

Discussion of the Glossary terms in the WG revealed the need to demonstrate relations between the corresponding concepts and preserve elaborated explanations for the readers. The resulting product will overgrow the tight framework of a glossary, towards an encyclopedic reference book or a concept map. The reader will be able not only to grasp some general idea of the concept represented by a term, but also to find out the origin of a term, see some examples of its use, reveal more general and more specific concepts, explore different contexts in which the term is used and other terms mentioned within the chosen context. For this purpose, both paper-based representation and the use of interactive media is considered.

International participation in the creation of the extended glossary could make it more balanced, ensure the representation of various national and cultural specificity of educational terminology as well as multilingual content, facilitate its wider acceptance and use for learning objects search and interchange.

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Supporting Continuing Education with Metadata Links

New educational resources are constantly being generated in digital formats and are made available on the World Wide Web. To help manage this information explosion, automated methods are being developed to discover, catalog, sequence, deliver and maintain the available data. This technology allows both experts and novices to use online information more effectively for continuing education. Enough online resources currently exist to allow nearly anyone - at any level of knowledge or experience - to tailor a self-directed learning program to suit his/her objectives. However, the situation is particularly appealing for those who are already accomplished specialists and experts. Online information technology provides an unprecedented opportunity for self-directed continuing education to expand the breadth and depth of these experts' domain of knowledge. An illustration of this point is found in a compilation [1] from discussions taking place on the Bionet News Groups in 1996. Another reference is the award-winning pioneering course on biocomputing [2] on the Internet given by the GNS VNBS. With this freely available course material and the references in the compilation [1], a scientist/engineer with only a basic background in molecular biology can become an expert in contemporary applications in such advanced fields as biotechnology and genetic engineering.

One may conjecture that even the most advanced topics of specialized subjects seem difficult to understand only because the reader is missing important prerequisite background knowledge. Consider as an example an article in a specialty journal - perhaps in an area of theoretical physics or mathematics. Readers who are not specialized in this area would usually find the article hard to understand. However, very often their confusion is due to the use of exotic symbolism and the assumption by the author (following the style currently perpetuated by peer pressure) of a certain level of background knowledge on the part of the reader. However, modern hypertext technology now permits the author to provide links in the article that enable the uninitiated reader to refer instantly to

the prerequisite background theory/material.

This hypertext technology could lead to a new concept of 'completeness' of an article or a set of linked articles, where the entire knowledgebase required to understand the top level article from a given starting point, say, graduate level training in the sciences, are available through hyperlinks. An expansion of the example of a single article would be several articles and books belonging to a specific domain, which would share numerous common background links - a trunk, so to speak, in the knowledge representation tree. The ontological and formal aspects of the technology for constructing such knowledge representation trees are still being worked out by the LTSC, yet the time is ripe to start constructing actual application examples.

This is a prospective project for the Learning Technology Task Force to consider. By taking advantage of current standards, documents can now be tagged with metadata and linked through a meta-document or other appropriate software. The design of a self-sustaining mechanism for this purpose can be attempted in order to attract large-scale participation and automation on some suitable platform like CORBA.

References

1. The Knowledgebase and Analytical Tools of Bioinformatics (A Survey of World Wide Resources on the Web), K. Sundaram, 1996 BioInfo.htm
2. Hypertext Course Book on BioComputing Conducted by the BioComputing Division of the Virtual School of Natural Sciences Hypertext Course Book on BioComputing

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Web-based Assessment of Knowledge of Electronics

This is an invitation for you to collaborate in the development and testing of Web-based assessment focusing on knowledge of electronics and associated basic skills. This is also an invitation for you to share information you have about possible related projects.

A group of content experts and educators should be able to create a reasonably large database of quality questions useful for:

1. COMPETENCY CERTIFICATION
   Portable credentials would enhance employment mobility for workers who have trained on the job and for people who learned through self-study.
2. OUTGOING ASSESSMENT
   Documentation of student learning is required by educational accreditation organizations.
3. INCOMING ASSESSMENT
   Knowledge gap determination would be very helpful for advising students enrolling electronics courses and programs.
4. TECHNICAL SKILLS CONTESTS
   Skills contests sponsored by organizations such as the Illinois Association of Electricity and Electronics Educators (IAEEE) may increase student interest and may spark curriculum revision. Simple lab skills such as multimeter operation might be tested using Web-controlled peripherals

such as BASIC Stamp from Parallax Inc.

Unless there are more popular Web-learning tools, I tentatively propose that collaborators share WebCT questions in a common repository. While I have not used WebCT questions extensively, my WebCT experience has been positive with about 100 students using WebCT communication and grade record tools. Because of possible WebCT licensing restrictions, institutional license-holders may not wish to provide repository services. If there is sufficient interest, we could ask WebCT developers to waive license restrictions or even better, to provide repository services.

Please consider working together to compose and peer-review questions. In the next two years, I hope at least 10 or so us could contribute the necessary collective wisdom and time to create a high quality, Web-based question bank. If you are interested in exploring this possibility, please contact me at Jleap@ieee.org or (USA) 217 344 3486.

John Leap

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The Student Instructional Technology Corps (SITC), University of Colorado at Denver
or
What are inner city teenagers doing in the TLT FACULTY training lab??

Back in 1998, I defended my dissertation. I'd found out the levels of use, reasons for use, challenges to use, and suggestions for improving use of the Internet, CEO (the School of Education's FirstClass BBS), and the WWW for instruction. People will use Internet tools as long as they feel they have the ability and confidence to do so, and only insofar as they place value on it to enhance teaching and learning. But my real interest lay beyond simply finding this out: I wanted to DO something to support instructional technology at UCD. I now have that opportunity, with the SITC.

As faculty begin to adapt instructional technology, the need for programming (largely HTML), hardware maintenance, software troubleshooting, and time for ongoing learning grows quickly beyond the resources of their department and the campus. A recent national study shows that over 1/4 of all available computer technology positions cannot be filled because of lack of trained personnel. That is as true of UCD as it is of industry. In surveys and interviews, people told me over and over again that they wanted one-on-mentoring and technical support. They also needed administrative support if they were expected to integrate instructional technology into their teaching and learning strategies. Where could they find that support? This is where the SITC fits in.

Through a grant from UCD's Office of Teaching Effectiveness, Jason McDaniel and I are now training six low-income students for about a month in instructional technology support. Each student will then be assigned to a UCD department/program -- preferably the one housing the student's chosen major Training will consist of HTML programming, CU-Virtual uses (including electronic conferencing), common hardware and software maintenance, and student survival skills (including time management). Students are paid $1000 for their training, and will work at work-study rates in their assigned department for about ten to fifteen hours per week for the coming academic year. Student selection is based on need, academic record, and interest.

We envision this program will provide UCD departments with unprecedented support and students with excellent marketable and interdisciplinary skills. After their summer training, these entering freshmen will be assigned to departments or other units who will manage them as their own employees. The Office of Teaching Effectiveness will then only monitor the success of these students and the program,

and help provide "just in time" continued training as needed.

If this proves to be as beneficial as we believe it will, the Office of Teaching Effectiveness will request permanent funds to help continue the program. We also envision that this first cohort of student trainees will serve as mentors for those who follow. This will eventually result in a "trainer of trainers" model, which my own research has shown to be effective for building capacity within a host of other instructional technology training programs.

Visit the SITC website at http://ceo.cudenver.edu/~lorraine_sherry/sitc/ for further information.

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SouthEast Partnership to Share Computational Resources (SEPSCoR)

How many supercomputers can your university afford? The usual answer is none or one. And if a supercomputer is purchased, research faculty often grumble that it is the wrong one for their application. The SouthEast Partnership to Share Computational Resources (SEPSCoR), made up of major universities in nine states, has agreed to pool their resources giving the participating institutions access to nine different supercomputers, representing all those architectures manufactured in the United States. Under a KDI-EPSCoR award from NSF and industry, SEPSCoR has tied their high performance computers together via vBNS connectivity and is testing the performance of the high bandwidth network by measuring its response to sustained load under IP videoconferencing and media-rich Web-based learning. Led by the University of South Carolina, university partners include West Virginia University, the University of Kentucky, Louisiana State University, Mississippi State University, Georgia Institute of Technology, and the University of Tennessee. The Alabama Supercomputer Authority and the North Carolina Supercomputer Center, which serve higher education and industrial needs in their respective states, complete the network. Industrial partners participating in the research include BellSouth, GTE, Lucent Technologies, PictureTel, VCON, and VTEL.

The R&D will create 18 Web-based training modules, two for each of the nine institutions, so that researchers can learn how to use any of the supercomputers without traveling to its location. The first module will explain how to use the XYZ supercomputer; the second will detail the architecture's strength in a particular engineering or scientific application. The interconnection will enable researchers

in participating states to have access to the supercomputer that best suits a particular task. For example, an engineer in Kentucky studying stress and strain on mechanical parts might borrow Alabama's Cray for its strength in solving a large number of simultaneous differential equations. For West Virginia pharmaceutical researchers experimenting with synthetic organic materials, LSU's digital data switch supercomputer might be considered most effective to forecast whether a drug would attack a specific disease. For Mississippi State University researchers working with a CAVE system, USC's IBM SP2 might be used to exhibit a variety of complex tasks, such as a time-dependent seismic analysis.

The project incorporates 50 videoconferencing systems (five in each SEPSCoR state and five in Washington D.C.) to facilitate regular collaboration among the researchers. In addition to creating the Web-based training molecules, SEPSCoR will test network capacity to determine limitations or failure points under incrementally increased videoconferencing loads. From these tests, SEPSCoR researchers expect to recommend Acceptable Use Policies to guide network managers as users increase their demands through the use of improved video applications. "We intend to use the video systems for quarterly virtual meetings among the 20 Co-PI's and for teaching 20 graduate students how to maintain help-desks and produce Web-based training modules," said Dr. Paul G. Huray, Project Director. "NSF is also contrasting us with existing supercomputer centers that emphasize training at the site of the supercomputer," Huray continued, "because we take the opposite approach; we teach researchers to use our resources from their home institutions."

South Carolina Educational Television (SCETV) brings their unique entertainment perspective to a rigorous academic pursuit by contributing a producer and an instructional designer to the knowledge transfer process. The SCETV media lab director has a 35 year history of delivering knowledge, but unlike most content-focused, Web-based learning modules their instructional objectives require programming that is sensually stimulating, intellectually palatable and engaging to the learner. In their words, "We produce multimedia, digital programming with depth and interactivity as opposed to linearity, and with liveliness as opposed to the dryness of much academic learning content." As a form of communication, multimedia combines the most technologically advanced forms of basic communication concepts - language and image - by connecting text, sound, images, and video. The result is increased flexibility, better retention, and lowered costs.

The researchers have stated their vision that SEPSCoR will become recognized as the leading source of knowledge about how to use U.S.- made supercomputers and their applications.

Additional project information can be obtained at http:\\www.sepscor.org.

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