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### From the editor ..

Welcome to the January 2002 issue of *Learning Technology*.

The call for submission is finally out for IEEE International Conference on Advanced Learning Technologies (ICALT 2002), September 9-12, 2002, Kazan, Russia. The website of the event is http://lttf.ieee.org/icalt2002/. The call for participation is available in this newsletter below. This year, our IEEE Learning Technology Task Force is sponsoring two other events: IEEE International

Workshop on Wireless and Mobile Technologies in Education (WMTE 2002), August 29-30, 2002, Växjö, Sweden, and IEEE International Workshop on Knowledge Media Networking (KMN'02), July 10-12, 2002, Kyoto, Japan.

You are also welcome to complete the FREE MEMBERSHIP FORM for Learning Technology Task Force. Please complete the form at: http://lttf.ieee.org/join.htm.

Besides, if you are involved in research and/or implementation of any aspect of advanced learning technologies, I invite you to contribute your own work in progress, project reports, case studies, and events announcements in this newsletter. For more details, please refer author guidelines at http://lttf.ieee.org/learn_tech/authors.html.

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**IEEE International Conference on Advanced Learning Technologies (ICALT 2002)**
**September 9-12, 2002**
**Kazan, Russia**
**http://lttf.ieee.org/icalt2002/**

**Sponsored by**

- IEEE Learning Technology Task Force
- IEEE Computer Society
- Kazan State Technological University
- Academy of Sciences of Tatarstan Republic

**Conference theme**

"ADVANCED LEARNING TECHNOLOGIES: MEDIA AND THE CULTURE OF LEARNING"

ICALT-2002 invites submissions with a good theoretical base or formalism and vital inspiration that present new, yet unpublished, solid achievements based on experimental and/or theoretical evidences that come to answer concretely one or more of the questions above or can point to possible answers. Survey papers are also accepted, if they are well documented, make a contribution to the field, and reveal new aspects and perspectives, as well as future directions. This year ICALT will offer in particular a platform for those who bring additional methods, tools and criteria for successful media development. Traditionally, the evolution of media for learning was based both upon theoretical and artistic grounds. We now gradually see intermediate foundations between these two (often irreconcilable) godfathers.

The first influx that helps us in this reunion is that learners themselves become active players in the way media manifest during the moments of ultimate learning. The second is the stepwise acceptance of learning practices that rely upon aesthetic, emotional and social factors. New (virtual) learning communities arise on the WWW with the goal to promote one's courage to change himself as a learner. Thirdly; many successful learning tools were initially not aimed at learning: Simulations programs, expert systems, agents, virtual reality and all WWW-based communication tools.

It seems that learning is a many-facetted process that benefits from new tools and interaction games all the time. The binding factor between learning and media development is the cultural heritage to assimilate new genres, new fashions and new etiquettes in our way to express meanings and promote mutual tolerance. Here we have the responsibility to make learners conscious of their identity and their responsibility to help others to learn as well.

We would like to invite you to bring in papers, based upon your experience, intuition and beliefs that are worth to be discussed from a scientific point of view. The more concrete you express your message in terms of media and new technologies, the more welcome you

are.

**Topics of Interest**

The focus of the conference is on the design and development issues of advanced learning technologies. The topics of interest for the conference include but are not limited to:

- Adaptive and intelligent applications
- Advanced uses of multimedia and hypermedia
- Application of artificial intelligence tools in learning technology
- Application of instructional design theories
- Architecture of learning technology systems
- Building learning communities
- Collaborative learning/groupware
- Creative Design methods for new learning media
- Distance Learning
- Evaluation of learning technology systems
- Integrated learning environments
- Internet based systems
- Knowledge Testing and Evaluation
- Long-life learning
- Media for learning in multicultural setting
- Metadata for learning resources
- Practical uses of authoring tools
- Robots and Artifacts in Education
- Socially intelligent agents
- Speech and (Natural) Language Learning
- Teaching/learning strategies
- Virtual reality

The conference will focus on where the research in advance learning technology is heading and what are the implementation challenges in the real-world situations.

**Submissions**

Submissions are invited in following categories:
- Papers
- Panels
- Tutorials
- Workshops

Details of submission procedure are available at:
http://lttf.ieee.org/icalt2002/

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**IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE 2002)**
**August 29-30, 2002**
**Växjö, Sweden**
**http://lttf.ieee.org/wmte2002/**

**Sponsored by**

- IEEE Learning Technology Task Force
- IEEE Computer Society

The IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE 2002) will bring together researchers, academics and industry practitioners who are involved or interested in the design and development of Wireless and Mobile Learning

Technologies. Understanding of the challenges faced in providing technology tools to support the learning process and ease the creation of instruction material using mobile technologies will help building a direction for further research and implementation work.

It is expected that the workshop will promote a very intensive interaction among those attending it, giving ample time to discuss papers. Each full paper will have a 30-minutes slot for presentation and discussion. Short papers and work in progress will have 20 minutes. In both cases, a moderator will present his/her view of the paper to initiate the discussion.

The Workshop Proceedings will include contributions accepted by the International Program Committee, and will be published by IEEE Computer Society Press.

**Topics of Interest**

The topics of interest related to the conference theme include but are not limited to:

- Architecture of mobile learning systems
- New emerging wireless technologies
- Ubiquitous computing and integrated learning environments
- Innovative use of wireless and mobile technologies for learning
- Mobile agents for learning
- Practical uses of wireless and mobile technologies
- Groupware solutions for collaborative learning
- Learner-supportive interfaces for mobile applications
- Evaluation of mobile learning systems

**Program Co-Chairs**

- Ulrich Hoppe, University of Duisburg, Germany, and Växjö University, Sweden
- Marcelo Milrad, Växjö University and Framkom, Sweden

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- Eilif Trondsen, SRI Consulting, USA
- Julita Vassileva, ARIES Lab, University of Saskatchewan, Sakatoon, Canada

**Submissions**

Submissions are invited in following categories:
- Full Papers (8 pages)
- Short Papers / "work in progress" (4 pages)
- Interactive Posters (2 page descriptions)

**Important dates**

- Submissions due: April 11, 2002
- Notification of acceptance: May 3, 2002
- Final articles due: June 1, 2002
- Workshop: August 29-30, 2002

**Submission Guidelines**

Authors are encouraged to submit papers according to the different categories as described above. All papers will have an extra cover page. Over-length papers may be rejected without review. While preparing manuscripts, the authors are required to follow IEEE Computer Society Press guidelines, which are available at:
http://www.computer.org/cspress/instruct.htm

All papers should be submitted electronically. PDF and Word formats are preferred (optionally zipped), but other formats may also be accepted at the discretion of the Program Chairs. If you have any query for submission, please contact the Program Chairs.

The cover page of the paper should contain following information:
- Title of the paper
- Author names with affiliation, postal and email addresses, phone and fax numbers
- Name and email of contact author
- Abstract of no more than 200 words

The papers should be submitted electronically to the following e-mail address:
wmte2002@msi.vxu.se

For further information and more details about the workshop are available at the conference website:
http://lttf.ieee.org/wmte2002/

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**IEEE International Workshop on Knowledge Media Networking (KMN'02)**
**July 10-12, 2002**
**Kyoto, Japan**
**http://lttf.ieee.org/kmn2002/**

**Sponsored by**

- IEEE Learning Technology Task Force
- IEEE Computer Society

**Post-conference Proceedings by**

- IEEE Computer Society Press

**Deadlines**

- Submission Deadline: April 10, 2002
- Acceptance Notification: June 3, 2002
- Final Paper Due: July 10, 2002

**Topics of interests**

- Architectural aspects of designing knowledge media spaces (3D virtual presence, Internet, Agents, Mobility, VRML, MPEG4, MPEG7, TV)
- Interconnection of heterogeneous communities, resource sharing, Quality of Service (QoS)
- Sensors, mobile devices networking, ad-hoc networking applications, active networking applications
- How can people socially augment knowledge bandwidth, through gathering, discussing, annotating and rating?
- What types of agents should be offered and what roles should they have (distributed cognition, dynamic adaptation, focus of attention, social awareness..)?
- What kind of rules, artifacts, conventions and infrastructure must be provided to help community members self organize and manage their affairs, increase
  knowledge bandwidth, develop a feeling of social awareness?

**Co-Chairs**

- Prof. Toru Ishida, Kyoto University, Japan
- Dr. Bokuji Komiyama, ATR Labs, Japan
- Mr. Tatsuya Yamazaki, CRL, Japan

**Program Chair**

- Dr. Tadahiko Kumamoto, CRL, Japan

**Submissions**

Papers up to six pages (including figures, tables and references) can be electronically submitted as PDF or PostScript files to kmn02@khn.crl.go.jp.

Position papers of two to three pages in length can also be submitted. Papers should be formatted according to IEEE Computer Society guidelines available at:
http://www.computer.org/cspress/instruct.htm .

All submisson should include a title, the name and affiliation of each author, an abstract of up to 150 words and no more than eight keywords. Authors are also required to provide contact addresses, if different from the submitting electronic address.

All submissions will be peer reviewed. Papers should be electronically submitted to kmn02@khn.crl.go.jp.

Further details are available at:
http://lttf.ieee.org/kmn2002/

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## Filling the Learning Gap:
## Syrtis Designs Clinical Simulation Tool for McKenzie Institute USA

**Client**

McKenzie Institute International, founded by Robin McKenzie, certifies individuals in diagnosis and therapy of spinal pain. The McKenzie Institute USA is located in Syracuse, NY and is the first official branch of this not-for-profit organization.

**The Challenge**

The McKenzie Institute USA wanted to increase the opportunities and enrollment in their advanced degree certificate program. Students who had completed the first certificate were not enrolling in the advanced degree because of travel costs, lack of incentive to enroll and/or not enough hands-on experience to enroll in the advanced certificate.

**The Solution**

Syrtis, a Syracuse-based instructional technology firm, has developed an online learning environment by which clinicians can receive diagnosis experience. The web-based training consists of 12 case studies and can be accessed from any computer after the clinicians have enrolled. The case studies provide the clinicians with real life experience through a series of scenarios and probing questions. A combination of stimulating interactions on the web site and skillful programming of the databases enable this online learning environment to become a useful tool for developing critical thinking and practical hands-on experience for the clinicians.

At the beginning of the Lower Back Pain case study, clinicians are given a brief introduction by a physician and some history and physical information on the patient. This patient information is provided in a separate assessment, which displays in a separate window. The assessment form is identical to the form clinicians use in their practice. The case study continues as if the clinician were actually interviewing a patient and identifying the problem, and determining the correct treatment. The value of this strategy is that it allows the clinician to work through the diagnosis without constraint.

The program acts much the same way a choose-your-own-ending book would read. Clinicians make selections from the multiple-choice answers or questions based on their diagnosis. Immediate feedback is given and the clinician may either advance to the next segment of the case or revise their diagnosis. The diagnosis is correct and the next segment begins. If the diagnosis is incorrect, the

clinician must return to the previous segment and make revise their diagnosis.

The clinician may repeat the case study as many times as they like, but there are a set number of five acceptable answers. Only one answer is truly the correct answer. Each time the clinician answers a piece of the diagnosis correctly, the assessment form displays in the information. This shows the clinicians how to use the diagnosis forms correctly.

One of the unique aspects of this training is the layering of information within the database. This allows the clinician to make their own assumptions about the patient, as they would in an office setting, but develop critical thinking by probing their reasoning for making such decisions. Syrtis designers and developers accomplished this by mapping four different types of questions to certain pages within the course. A template was created from these questions, so more question types can be added as needed. All information is housed on a Macromedia Cold Fusion server that generates the questions and responds to the clinicians' input.

The case study is interactive with audio and video features. The lesson combines the use of Macromedia Flash with audio to allow the user to see different views of a patient with spinal pain. This allowed Syrtis developers to create a visual experience with minimal download time. Because of time constraints on this project, the design and development teams were limited in the amount of interaction they could incorporate into the courses. The first case study was completed in two weeks.

The tools created for this project can be re-used in other facets of education for The McKenzie Institute, such as, web communities for clinicians, a case-of-the-month, and the addition of other case studies for clinicians at varying levels of expertise. The online training can be used by instructors at all levels of involvement, from distance learning to incorporating the case studies into classroom lectures.

**Results**

Currently, 12 case studies are being created and tested for future use. The first phase of course development has been completed and Syrtis is now working with content experts to refine the dynamics of the case studies. The actual cases will be presented at the McKenzie North American Conference in Tuscon, AZ, August 9 - 11, 2002. For more information on Syrtis, contact, Frank Caliva at FSCaliva@us.syr.edu or 315.443.2804. Visit our website at www.syrtis.com.

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## Notes on Extending IMS Educational Technology Specifications Regarding Questionnaires

### Scope and Objectives of the IMS Question & Test Interoperability Specification

The IMS Question & Test Interoperability (QTI) specification describes a basic structure - and its mapping in XML format - for the representation of question (item) and test (assessment) data and their corresponding results reports, targeted towards data exchange between Learning Management Systems (LMS), as stated in (Shepherd et al, 2001). The specification, currently in its 1.2 draft version, is comprised by a series of documents, extended from the initial 1.1 version (Smythe & Shepherd, 2001) that established the core information model for questionnaires, called ASI (Assessment, Section and Item). According to the specification, an 'item' contains a question, layout rendering information and response processing information among other data. 'Sections' are a grouping mechanism for items inside 'assessments'.

In the process of analyzing QTI specifications to initiate the development effort of an IMS-compliant Assessment Engine, we have discovered a number of issues about the QTI specification that either fall out of its scope, or are not explicitly supported in its information model. In the former category, the most important area is that of using questionnaires for usability, functionality or teaching evaluation; the latter category includes the support for psychometric characterization of items. Although the QTI spec is currently an evolving set of documents, and provides some extensions mechanisms to accommodate variations, we feel that these issues (and possibly others) are worth being considered for inclusion as supplementary extensions. In what follows, we briefly describe the just proposed extensions along with their rationale.

**Extensions Needed for Item Banking**

The construction, sharing and exploitation of large item banks in virtual learning environments are requirements explicitly cited as objectives by the IMS QTI Working Group in developing the QTI specifications (Shepherd et al, 2001). Nonetheless, the QTI information model lacks an explicit representation for important information about item characteristics that is necessary to implement reliable item banks. This information is related to Item Response Theory (IRT).

**Classical testing and IRT**

Classical testing methods and measure procedures have some well-known shortcomings (Hambleton, 1991). One of the most important is that examinee characteristics and test characteristics cannot be separated. Aspects like this make difficult several operations on questionnaires like the construction of tests for examinee populations that are dissimilar to the population of examinees with which the indices were obtained, the comparison of examinees who take different test, or the comparison of items whose characteristics are obtained using different groups of examinees. Alternative test theories, like IRT, enable solutions to disadvantages like the previous cited ones.

**Item Characteristics in IRT**

IRT requires that some information about an item's characteristics is made available, usually in the form of an Item Characteristic Curve (ICC). ICC is also the basis for adaptive testing, - see (Weiss, 1997) - that tailors the item selection of tests to the user. The construction of adaptive tests is made conditional to the existence of suitable item banks, which contain items that are considered as independent entities unrelated to a concrete test or assessment - for example, a recent application is described in (Gouli, 2001) .

In order to provide support for item interchange between banks to construct new assessments, the information model of the QTI ASI specification should include ICC information. Usually, the curve is described by a logistic model equation. For example, a two-parameters logistic model applied to dichotomous item response data is given by the equation:

$$P_i(\theta) = \frac{e^{Da_i(\theta - b_i)}}{1 + e^{Da_i(\theta - b_i)}}$$

where Pi(q) is the probability that a randomly chosen examinee with ability q answers the item correctly, bi is the difficulty of item i, a is the discrimination parameter and D is the scaling factor (it has been proven that 1.7 is an appropriate value).

**Embedding ICC Information in QTI data**

QTI XML bindings can be extended to support the above described item information. As an example, the following XML fragment shows a simple QTI item description with added ICC information (in bold type face):

```
<item ident="IMS_V01_I_BasicExample001a">
  <itemmetadata>
    <irt:icc type="TwoParameterLogistic">
      <irt:difficulty> 1.2 <irt:difficulty/>
        <irt:discrimination> 1.5 <irt:discrimination/>
      </irt:icc>
    </itemmetadata>
    <presentation label="BasicExample001a">
      <flow>
        <material>
          <mattext>Paris is the Capital of France ?</mattext>
        </material>
        ...
    </presentation>
  ...
</item>
```

As ICCs are defined as specific functions, the type of functions can be codified as attribute values in extended markup (inside the QTI <itemmetadata> element, note that a more elaborated version should use the IMS vocabulary facility). If a non-common function needs to be used, a fragment of MathML (http://www.w3.org/TR/MathML2/) can be used to provide an arbitrary function definition.

The ASI Assessment Engine described in the QTI spec should be responsible for exploiting ICC data in test administration and data processing, according to IRT principles.

**Other proposed additions**

We think that there are other aspects that fall in the scope of the QTI specification that are worth examining. For example, currently, presentation options are mixed with the item itself, and two slightly different renderings for the same item result in different item elements - this is shown in (Smythe, 2001, p.30-33). By separating the item contents (that is, text or media independent of layout options along with metadata) and item rendering in different markup elements, we could enable the concept of rendering templates for items, and redundancy can be avoided if more than one presentation scheme is being interchanged for the same item (or perhaps you could interchange only the item contents, and discard presentation issues). A template could be defined as a <presentation> QTI element applicable to a specific type of item (of course, the definition of templates requires a new XML 'sub-language').

In addition, there are some information attributes that could be specified as attributes of the association between an item and an assessment (or a section) rather than as item's attributes. For example, in QTI the <rtiming> attribute inside an item definition indicates whether or not the responses are time-dependent, but in some situations we'd want to define item q as time-dependent in assessment A, but as time-independent in assessment B.

**Broadening the Scope of the Specification**

Although it falls out of the current scope of the QTI specification, questionnaires are used in other areas of educational systems besides student knowledge's assessments.

More specifically, questionnaires are a commonly used method in the evaluation of both teaching quality and functionality and usability of learning technology. These kinds of questionnaires are of a different nature than those described in the QTI specification, since they measure attitudes or subjective satisfaction rather than knowledge. For example, questionnaires are used in (Taylor et al, 1998) in course development phase and also when the course was running, and a questionnaire-based usability evaluation of a Web learning system is described as a part of an evaluation framework for Web learning environments in (Veen et al, 2000).

The last out-of-scope aspect we'd like to note about QTI is related to the Content Packaging IMS specification (Anderson, 2001). This specification provides the functionality to describe and package learning materials into interoperable, distributable sets. Although commercial learning environments do not always provide learning paths, the definition of graphs of possible paths across knowledge modules is an strategy that enables learning personalization - a review can be found in (Brusilovsky, 2000) -, and can be integrated with IMS specs, as described in (Martinez, 2001). Navigating from a node to the following one is determined by the knowledge level of the student, which is usually assessed by a test. Content Packaging specification can be extended to include the possibility of specifying the assessment associated to the vertex between two nodes, making a reference to the test (defined through QTI structures) that evaluates the required knowledge to progress in the course.

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## Long-Life Learning Communities Based on PBL Courses

**Abstract**

The aim of this paper is to present a research proposal for the creation of learning communities during the graduation period. The use of PBL (Project/Problem Based Learning) approaches and a virtual platform can be the facilitative factors for the creation of these communities. We propose that learning communities created through such a process will be able to continue their existence after the graduation, involving external actors and promoting a real long-life learning process.

**Introduction**

The traditional structure of a higher education grade is supported by a set of courses. It is expected that the set of courses, as a whole, should provide, to each student, some personal knowledge, some individual and collective competencies and technical skills. At the moment of the graduation, it is expected that each student will be able to perform a certain profession. We identify some difficulties concerning this perspective of higher education. Some of them are:

- Usually, each course provides some specific content and skills, playing the role of isolated islands in a graduation, and missing links between them. Even if in certain specific cases this situation can be acceptable, it is not in some other. When the student finishes all the courses, he gets his graduation that represents a sum of different parts, but not a whole. In order to deal with most of the real and professional life problems, graduation courses should provide holistic lenses to students. Problems should rarely be seen as isolated, with well distinct limits and predictable results. Very often they are, in fact, just problems that need to be solved. To solve them, one needs the ability to find the best solution or, at least, a feasibly one. In different contexts, completely different solutions will appear. This integration of knowledge and skills from different scientific disciplines is made through knowledge management (Davenport, 1998; Huber, 1991): capturing the necessary information, analyzing and processing it, and obtaining new knowledge, under the form of a problem solution. Very often , these solutions are also the result of teams or workgroups, involving different scientific areas;
- After the graduation, or even during this period, the student starts his/her professional life. In fact, usually he/she experiments the feeling that he/she is beginning another life, with little aspects in common with his previous experience as a student. The experience shows that the new professional quickly looses his/her connections with the university. In this way, he/she cannot contribute with his/her new experiences and insights to the development of a higher education system adequate for the real world and for the solution of the real problems. Accordingly, the university does not receive much feedback from their old students, because they are not involved in this process anymore;
- We live now in an "electronic" and collaborative world. Most of our activities are done using computers and electronic communication systems. This is true in personal terms, as well as in professional terms. The higher education system is not very well aligned with this reality. Most of the times, the computer is not present in the classroom and it is not used as a tool for solving problems. Although the computer is sometimes used as a communication system (mostly email and web pages), it is not used as a collaborative tool, used to learn, to solve complex problems collaboratively, or to help to develop interpersonal capabilities.

In spite of the negative aspects concerning higher education, we do believe that it also has a positive role in the life of our students. Furthermore, we believe that a different approach concerning the way students are taught and learn, will help them to develop the necessary skills and competencies. In the next sections, we present a part of our vision of higher education. We also make some considerations about the PBL approach, followed by a proposal for a research challenge. Finally, we present our conclusion.

**Vision**

Our vision for higher education is based on the premise that, during the graduation period, each student must become a member of one or more learning communities. Each learning community is built by, and with, students and teachers (being facilitators and, also, learners) and, hopefully, should include third parties, as entrepreneurs or external consultants (interested in new knowledge and in the possibility of taking part of the educational process that will provide new professionals). The learning community exists in the virtual world, and all of their members share the use of a computer-based collaborative system. Each member has full access to the collaborative system and, consequently, has access to the knowledge of their learning community.

Figure 1 illustrates our vision. There, we can see that each student will be part of, at least, one learning community. This community is created during the graduation period (yellow). During this period, it is expected that third parties will be involved (blue). After the graduation, the community is maintained (orange). The maintenance of the learning community depends on the collaborative system they use, which must be sponsored by the university or in partnership with other entities.

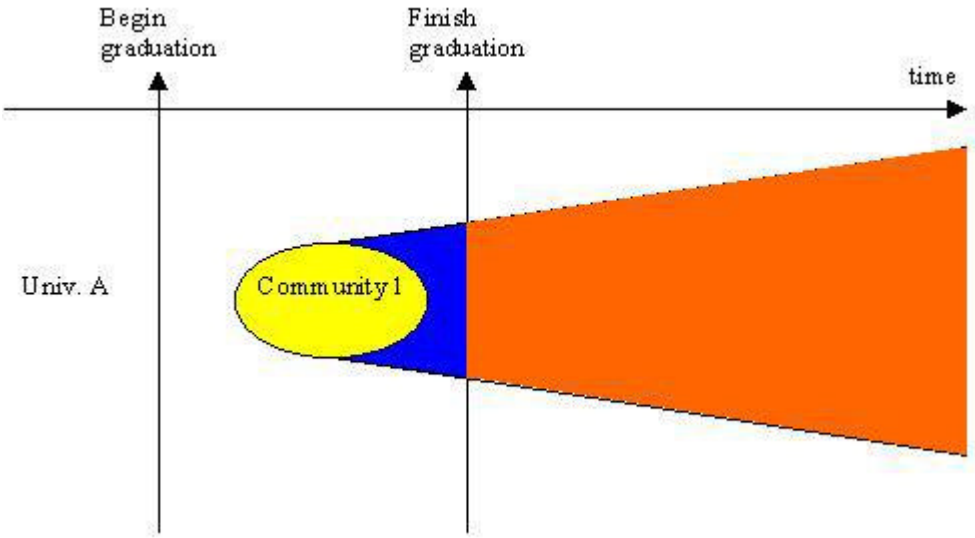


Figure 1 - A vision for developing learning communities in a single university.

The collaborative system must have some characteristics and provide some tools:

- The learning community share an electronic private space;
- The learning community space is fully accessible by each member from anywhere and anytime;
- The collaborative system provides synchronous and asynchronous communication tools;
- The collaborative system provides tools that can be used for collaborative work;
- The collaborative system provides the ability to store materials in a shared repository;
- The collaborative system provides the ability to search information in the community repository;
- All the tools provided by the collaborative system should be smoothly integrated in the community electronic space.

This vision has more possibilities. For example, a learning community originated in a university can be crossed in the future with another community from another university, as is illustrated in figure 2.

Figure 3 presents another possibility. We can imagine a situation in which one community involves people from more than one university. This could be possible in partnerships between universities or between similar courses in different universities. The universities involved can be from different countries.

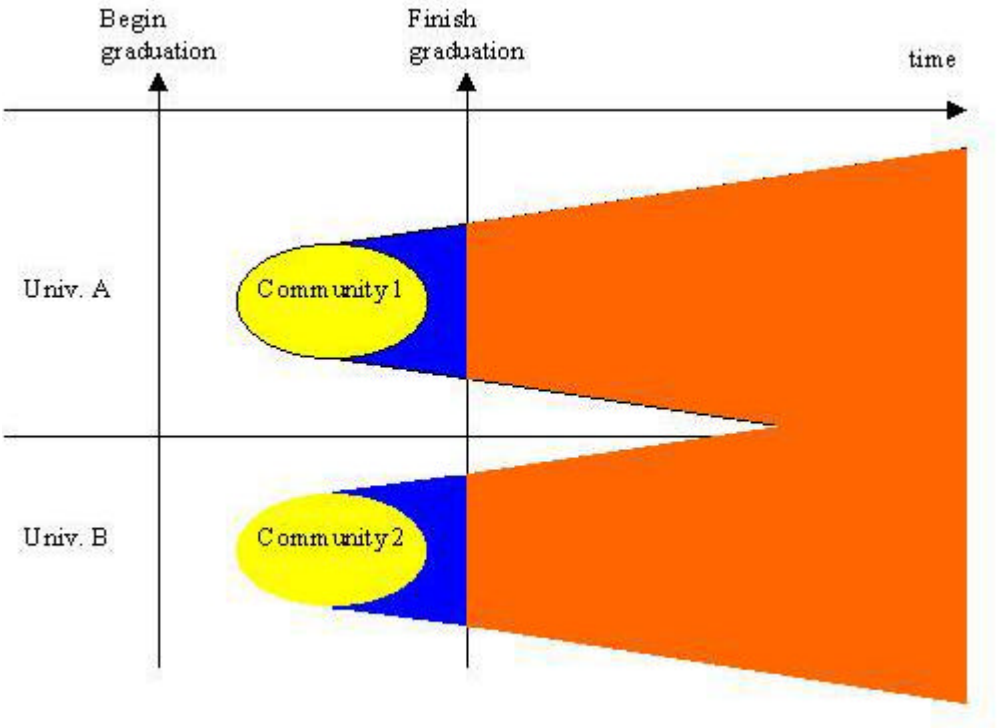


Figure 2 - Crossing learning communities from different universities.

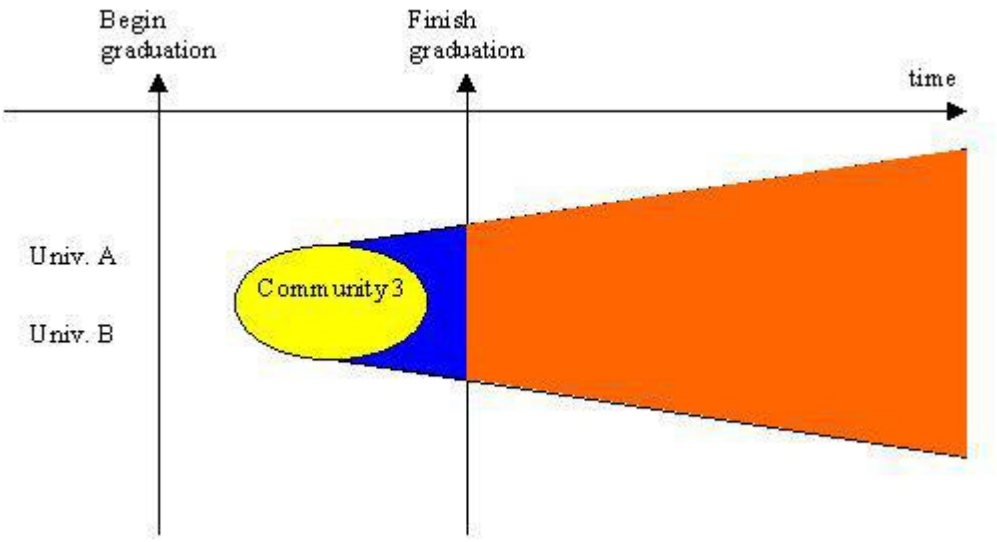


Figure 3 - Developing one learning community supported by different universities.

**PBL and the Use of Information and Communication Technologies**

A major question emerges at this moment: how can we create, nurture and maintain such communities of learners? We hypothesize that one possible way is through courses based on PBL approaches (Kjaersdam, 1994; Powel 2000). PBL approaches were already applied in several universities (Aalborg, Twente, Delaware, Aveiro, among others). We can characterize generally these approaches pointing that the focus of process:

- Has moved from teaching to learning;
- Became less individual learning and more group learning;
- Is oriented for stimulating team work and interpersonal skills;
- Is based on project development, solving not necessarily structured problems, and with unexpected results.

Teachers play the role of facilitators, or tutors. For each project, there are teachers from different scientific areas. The participation of

the teachers in activities is very intensive. Frequently, debates are made around solutions for problems and projects. Teachers should be very exempt, flexible and learning-oriented in order to keep free space for students learning activities. Because no one knows exactly how each project will evolve and which knowledge will be necessary to solve it, PBL approach appeals for an effective and very deep multi-disciplinarity.

Among students it is also evident a high degree of involvement and participation on learning activities, not only in their own work group, but also with other groups involved in different projects.

Overall, we can state that PBL approach promotes an increase in the interactivity between all the learning community members. It also facilitates continuity between different projects/problems.

Consequently, more than being only a quite interesting method of knowledge integration and harmonization, that methodology can drive to a continuous learning process, since we can get the same way to maintain a certain continuity on development of projects and problems solving. It can be achieved through the maintenance of the operational structure and of the teams of participants, and by changing them progressively, for example. Those participants can be either old students that leave school for professional activity or other professionals interested in upgrading their capabilities. We believe that the continuity of operative activities and the personal contacts between participants from different academic and professional environments will generate a very rich learning process.

Besides, it can drive also for real long-life learning communities, supported by e-learning platforms provided by universities and other schools of higher education for their students and other professionals.

That is not yet the current practicing in most of the schools that apply PBL methods, but it can be done more and more easily using information and communication tools.

**Research Challenges**

We can now contribute with one research challenge for technology supported learning. The challenge is: how can we use PBL approaches to create, nurture and maintain learning communities, created during the graduation period (in a course that uses the PBL approach, at least during part of it), involving third parties (i.e., business) before the end of the graduation period, and lasting their existence after the graduation period? Which technological infrastructure is necessary to be used/created/develop to this end?

**Conclusion**

To become successful, the long life learning concept depends on an efficient continuous learning process and needs to be supported by effective learning communities. Using adequate technological infrastructures and methodological approaches like PBL we can achieve that goal easily.

At our school, we have a special course that uses PBL approach. Quite naturally and without being conscious of, students and lecturers create informal learning communities during this course. Those communities are, in some ways, like learning communities described in this paper. Given this, we are now designing in detail a plan for action that we are considering to submit as a proposal to our school, in order to stimulate, develop and formalize the creation of future long-life learning communities based on that course.

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**The perils and joys of running a web conference**

Looking for a way to increase discussion on a topic we like to talk a lot about, we came up with the idea of holding a virtual conference called "Best Practices in Journalism Education: An International Web Conference." The initial idea was for an online conference on a grand scale-invited papers from big names, plentiful submissions from around the world, an engaging discussion on each paper, and even a CD-ROM containing all papers and the threaded discussions to participants. To achieve this scale would require promotion, dedicated webspace, and registration oversight-skills the authors do not have. For these, we turned for help to an organization experienced at managing conferences, the World Campus at Penn State.

Following World Campus guidelines, Berner met with a team of himself, a marketing person, a program developer and a program manager. The team quickly learned that duplicating the CD-ROMs and sending one to each participant would increase the cost of the conference to $125. So the CD-ROM was dropped, and, after some calculations, the team decided that a $95 registration fee would cover the cost at Penn State.

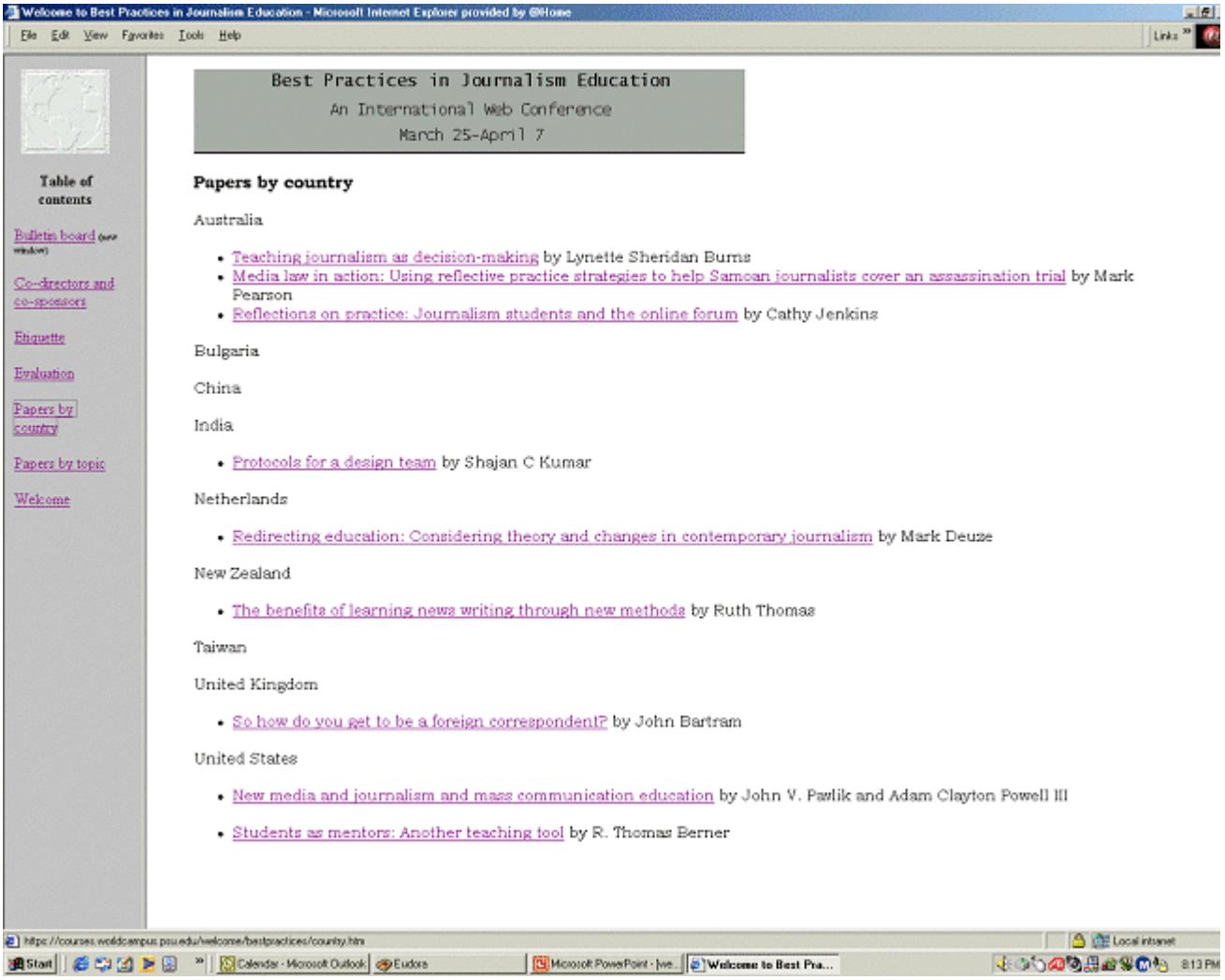
The marketing member of the team purchased a mailing list from the Association of Education in Journalism and Mass Communications, and Berner and Grow began promoting the web conference via on-line discussion groups. In the meantime, the World Campus sent an announcement to everyone on the AEJMC mailing list. The international journal Journalism Studies agreed to be a co-sponsor and to publish one free advertisement about the conference.

After some discussion, we decided to hold the conference on March 25-April 1, 2001. Earlier and we would have bumped into spring break at many universities; later and we would have collided with end-of-semester activities. We also did not want the conference to compete with AEJMC's annual convention in August.

Meanwhile, the conference received word-of-mouth promotion among colleagues at other meetings. When Berner attended the Journalism Educators Association conference in Mooloolaba, Queensland, he was given an opportunity to promote the web conference to the assembled group. In addition, he sought out attendees whose papers fit the web conference's theme and encouraged them to submit their papers to the web conference.

During early planning sessions, Grow had argued that the fee would be a problem since most faculty would see themselves as doing the conference organizers a favor by submitting papers and would not want to pay a conference fee on top of that. Grow also pointed out that faculty were accustomed to free listservs. Berner argued that faculty paid to attend face-to-face conferences and give papers. Surprisingly, the fee argument Berner heard in Australia focused not on the reasons for the fee, but on the exchange rate between the Australian and U.S. dollar-about 50 cents on the dollar.

We received a total of nine papers: three from Australia, two from the United States and one each from India, The Netherlands, New Zealand and the United Kingdom. (We had also been promised papers from Bulgaria, China and Taiwan.) Of these, only two came unannounced. We estimate that about 25 people participated or lurked, nine of whom submitted anonymous evaluations at the end. Some of the responses from participants, and our own reflections, may be of interest to anyone thinking of conducting a web conference.




Generally, comments about the fee suggested benchmarking with other conferences and being making adjustments in the fee to compensate for the exchange rate. But two participants emphasized that for any fee to be acceptable the quality of the papers had to be better. They needed to be, in the words of one, "unique and not offered elsewhere for free." Along those lines, another participant suggested recruiting speech and English professors to contribute papers giving their take on writing methodologies and mentoring work.

Most respondents thought the content was fine but wanted more papers. One respondent suggested "papers by big names (invited papers)." We did invite some people to submit papers, but since the main purpose of the conference was to help faculty improve their papers so they could later be presented at some other conference or in a journal article, we weren't looking for stars. We would argue that "big names" could scare away the very people the conference was trying to reach. We did try to reprint a somewhat provocative speech by an editor to serve as a keynote, but he never responded to our request to use his speech.

During the online conference, Berner and Grow attempted to stimulate discussion by posting questions for each paper. The results were mixed, and one participant wondered if each submitter had not posed questions at the end of his/her paper. One participant revealed that he had sent his comments to the authors directly rather than posting them, which, of course, counters the point of having a conference at which people share ideas with everyone.

The technology used in an online conference is always an issue, especially in an international conference. In designing the online appearance of conference material, we tried to be as minimalist as we could, using frames so we could maintain a table of contents on the side and not force participants to rely on a back click to find a site recently visited. The bulletin board seemed to work fine, although when it was moved from a secure server to a public server, it changed into a format that offered a confusing number of choices. One participant suggested we should have mailed instructions ahead of time, just to reduce the initial confusion.


Participants themselves were divided on how an online conference should present itself. One suggested that we not use "frames, javascripts or macromedia animations" because "not everyone has a T1 connection." But two others said we should have had material that takes advantage of the Web's many audio, video and visual features. The experience of running the conference has left us favoring our initial decision to keep the layout simple.

We were able to find out about a few unanticipated successes brought about by the conference. A journal editor who knew about the content of the paper the Chinese professor promised to write tracked him down through Berner and offered to publish the paper. And another participant, this one from a small country with few journalism programs, said the web conference provided her a way of writing a paper that she then revised for a later face-to-face conference - a revision that cited two of the papers from the web conference.

Our conclusions about the conference are mixed. We are pleased with our initial efforts and encourage others to recognize that such a conference could be built into something substantial and recurring, and that it has the potential to provide a valuable service to emerging scholars. However, we also discovered that we are reluctant to invest the substantial amount of time required to mount such a conference again. It required significant planning and a major commitment of time and effort. The marketing and promotion were expensive and also time consuming. Some web conferences manage to keep their fees under US$50 by means of subsidies from sponsors. If a faculty member has access to the necessary server, a no-fee conference would be feasible-provided someone finds it professionally worthwhile to donate the substantial amount of time such a conference requires. But we doubt that universities, many of which have invested heavily in technology and operate on a cost-recovery basis, will welcome free conferences on their servers. However, web conferences, especially international ones, may become more feasible, respectable, and popular, if university travel budgets tighten and people remain skittish about getting on airplanes.

Like telecommuting, videoconferencing and virtual committee meetings, the web conference remains one of the tantalizing-though not quite fulfilled-promises of the digital age.

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## Trends in Workplace Learning:
## KNOWLEDGE MANAGEMENT and LEARNING MANAGEMENT SYSTEMS

Periods of rapid change create a premium on learning– for both individuals and organizations. Prosperity and growth are the rewards for those who are the fastest at learning and putting their learning into actions. In an era when it is knowledge rather than physical assets that increasingly defines competitive advantage, the process of managing knowledge becomes a central part of the learning process.

The business imperative to accelerate organizational learning has created new functions within organizations to speed up the process of creating, capturing, and disseminating information and knowledge. The same forces that are creating a focus on knowledge management are causing firms to develop their learning strategies. As training moves to learning, more and more organizations are looking to foster a learning environment to piggyback on training or to create an architecture in which learning, both formal and informal, is ongoing and consistent.

**Problem / Opportunity**

Cutting-edge organizations regard human knowledge and development, and the management of that knowledge and development, pivotal to its competitive advantage. Many such organizations have adopted Knowledge Management (KM) the process of capturing and utilizing intellectual resources, both explicit and implicit, to improve its organizational performance.

Knowledge Management is not just about technology, it is not solely about information repositories, and is not singly about organizational learning. KM is comprised and a combination of all three. Envisioning KM as the 'bigger picture', the focus of this article is primarily on the organizational learning component, and specifically on Learning Management Systems (LMS). Organizations are challenged with the development of an enterprise-wide learning strategy that is in sync with the organization's goals and missions, and then to manage this strategy. Emerging Learning Management Systems (LMS) may provide the tools and methods to address this challenge.

LMS, and e-learning in general, have already, in their short but frenzied history, changed the way corporations look at its organizational performance. But for all the impressive tales of better learning and higher efficiency, the flourishing offerings in LMS have brought with them a mountain of chaos. What is an LMS? What are its features, advantages and benefits? And ultimately, is it a necessary tool for implementing a learning organization's KM strategies? These are all questions that face today's learning organizations.

**LMS Defined**

The utilization of LMS is the application of technology to create an integrated training and knowledge management system that enables an organization - and all the individuals who support that organizations - to share their knowledge and convert that knowledge into a training system that is based on organizational learning objectives. In other words, LMS are the central hub for learning, knowledge management, performance management, and more.

More specifically, LMS are software programs that deploy, manage, track and report on the interaction between the learner and the

content, and between the learner and the instructor. LMS perform student registration, track learner progress, record test scores, and indicate course completions, and finally allow instructors/trainers/managers to assess the performance of the learners. Yet LMS are more than an automated registration system, more than online course directory or file management system, and more than a record keeping database focused on training activities.

At this point in history LMS are any and all of the above. LMS provide tools that help author, archive and manage learning assets. They are tracking systems that produce countless reports for students and management alike. The definition is changing daily as new technologies emerge and as we discover new ways to take advantage of such systems to solve real business problems.

**LMS Features**

Features common to LMS products are listed below.

- online and classroom-based tracking
- management of corporate-wide training records
- pre- and post-tests
- course registration
- various reporting options
- reusable education

LMS vendors are promising to:

- improve employee efficiency
- cut administrative time and expense
- provide just-in-time information availability
- expand training options; using a variety of formats i.e. Internet, Intranet, CD-ROM, print-base, and instructor-led
- accelerate learning
- lower employee downtime
- reduce the time it takes to develop courses
- customize the learning environment
- connect with distant learners, in any environment
- personalize instruction via learner-centered training
- connect learners with each other
- leverage HR tracking
- provide central repository for the knowledge of the organization
- facilitate learner interaction using collaborative tools
- assess skill gaps
- manage knowledge

**LMS Market Trends**

The LMS market will rival the customer relationship management (CRM) industry in size and importance over the next five years, according to a recent report from W.R. Hambrecht and Co., a financial services firm in San Francisco (www.wrhambrecht.com/research/coverage/
elearning/ir/index.html). Hambrecht predicts the LMS will become as pervasive as CRM and enterprise resource planning (ERP) systems. And prices are expected to rise to those of more mature enterprise applications

Corporate buyers are becoming more sophisticated. The decision-making process for LMS implementations was about six months a year ago; buyers now take only three or four months, on average, to decide on an LMS purchase. Also buyers are far more concerned about features and integration than price. (onlinelearning, July 2001)

ROI matters more. In the current economic environment, buyers are increasingly concerned about proving a return on their LMS investment. In response, LMS vendors are better prepared to give potential customers ROI statistics and analyses,

Vendors are looking more alike. As the leading LMS vendors continue working toward the same goal of object-oriented platforms with additional features and functionality, their systems will look more and more alike from a customer's point of view. The companies that stand out will be the ones that provide the best service and implement their systems the fastest, as well as the ones with the greatest brand awareness and customer base.

Organizations should be leery of the promises that LMS vendors make in regards to KM. Some vendors are alluding (in not right-out stating) that by using their product, your organization will be a KM organization. Utilizing LMS are only steps to reach the goal of KM; they are not the complete answer.

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## Learning in teams using collaborative tools that scaffold facilitation, knowledge creation and thinking skills

**Abstract**

Students are able to easily facilitate complex learning activities and create their own knowledge in all key learning areas using a collaborative learning technology.

**New tools for learning faster**

Trials of a new collaborative learning technology in Australia are leading to its use in school classrooms to scaffold facilitation, knowledge creation and thinking skills.

Learners work in teams and facilitate their own sessions to discover new ideas, concepts, frameworks and paradigms for themselves. They create their own new knowledge rather than being told it, a problem well identified by leading educators (Scardamalia and Berieter).

The system is installed in 80 schools in Australia, New Zealand and the United Kingdom. British Prime Minister Tony Blair and Secretary for State for Education Estelle Morris experienced it first hand in December 2001 when they visited Greensward College in

Essex. They participated in a science class where students collaborated to derive chemical formula from first principles.

Fig 1. UK Prime Minister Blair and Education Secretary Morris participate in a Zing session.

The Zing Classroom system comprises:

- Software and hardware for structured, open and simultaneous collaboration. Twelve keyboards are connected via a multiplexer to a computer or linked to other networked or multiplexed computers.
- A user interface with a control panel to present the topic, images and web pages, a "playspace" for each participant and a "teamspace" where ideas collect.
- Thinking and decision methods from leading thinkers or created by the learners themselves.
- An etiquette (Talk-Type-Read-Summarise) that are the norms for using the system.
- Facilitation methods any student can use to run almost any kind of complex learning or decision processes after only a few hours training.

Fig 2. Mount Hutton, Australia, Primary classroom using the Zing GDSS system

In the classroom, teachers can use the system to:

- Easily organise group work that keeps a class focused for several hours. Participants stay on task and make the shift from disorganised groups to top performing teams (Findlay).
- Promote learning through discussion, discovery, peer teaching and process improvement. Students design "edutainments" to explore images, text or simulations available on the Internet.

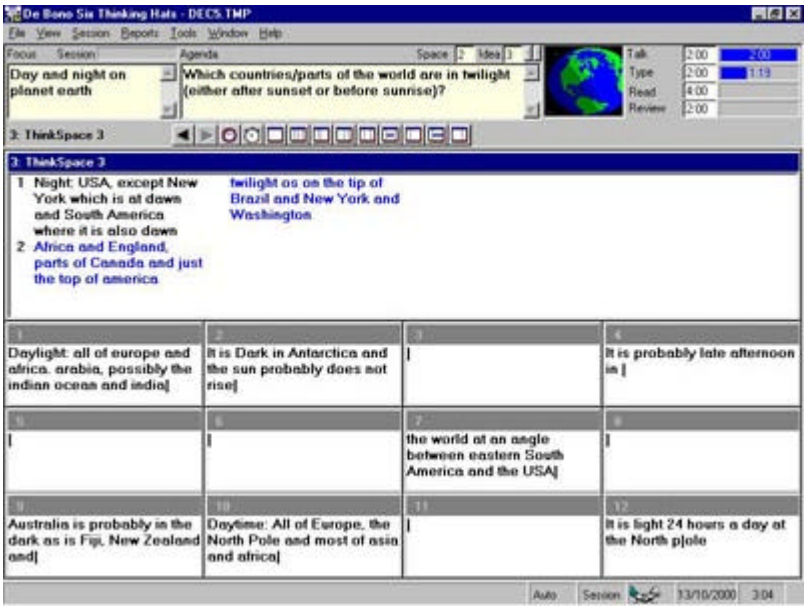


Fig 3: Zing User Interface.

- Observe on the computer screen what individual students are thinking or saying, whereas in a conventional classroom students tend to work alone and learning difficulties remain hidden.

**Trials of Team learning**

The research was undertaken in 1999-2000 by the author (the developer of the Zing system) and five teachers at the Conservatorium High School (CHS), Sydney.

Science and mathematics classes in Years 7-12 worked through complete thinking processes as a class with small groups each sharing a keyboard. The technology was used as a capture and display device. The class then discussed which ideas made sense and which did not, or summarised what had been learned.

The following case studies show how the system was applied to teaching in a collaborative environment.

**Learning by error correction and detection**

Twelve students from Conservatorium High School from years 7 through 10 were assigned to an experiment in remedial mental arithmetic. Instead of 12 weeks of extra lessons, students attended four one-hour Zing sessions.

The session was designed so the students would discover their errors for themselves and devise improvements. The method was borrowed from the business world, where quality consultants help teams design new work procedures and willingingly adopt the new methods because no one is blamed for past failures.

It was expected that the mathematics students would be more amenable to solutions they helped devise. This is what occurred. When tested prior to the trial, the average error rate was 7.5 mistakes out of the 20 of the most common errors. At the end of the trial, the students were re-tested and the error rate had dropped to 1.5 mistakes out of 20.

At the first session, the students were presented with 100 multiplication tables problems, 8x4, 9x 12, 7x7 etc. using the Zing system. Students submitted their ideas blind and completed the entire sequence of questions before reviewing the results.

At the end of the session, the students reviewed all their responses and made a note of their errors, generally the higher factor 7x, 8x, 9x and 12x tables. They then brainstormed a list of ideas for reducing their error rate.

Students also created ascending and descending series of numbers such as down from 108 by 9s and then identified patterns and soon discovered that difficult-to-remember multiplication tables could be inferred from an easy-to-remember set of tables.

**Designing "good guessing" methods**

CHS science classes used the technology to explore astronomy topics. They also invented their own method for forming hypotheses.

The students were shown pictures from the Hubble Space Telescope web site. Each of the 12 keyboards was assigned to a team of 2-3 students. Each team selected a picture of an astronomical object such as a planet, star or galaxy, then submitted their guess for review. The guesses were read out and compared with the website.

Each team then devised a 4-5 step guessing method that was then refined by the facilitator to use for the next round of guessing, which led, after several rounds of improvement to achieve the following method:

1. Collect data
2. Compare with known information
3. Suggest possibilities
4. Eliminate unlikely candidates
5. Guess

Not only did the students create their own knowledge about the astronomical objects but they also developed an intuitive understanding of a process for solving other problems in science.

**Conclusions**

Collaborative learning systems which scaffold thinking methods, the etiquette for computer collaboration and on-line facilitation techniques have the potential to help make it easier for teachers to teach in teams and shift the responsibility for the creation or adaptation of the knowledge from the teacher to the learner.

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## ATutor: Adaptive Learning Online

Over the past decade or so online learning has become an important part of education as Web-based technologies become better equipped to deliver a wide range of content formats across virtually all subjects. The introduction of many Web-based course-authoring tools, often called courseware, has made it relatively easy for educators to develop and manage educational content on the Web. While these tools have evolved rapidly in recent years, advances have been geared toward management of educational content, rather than the delivery of adaptable content that accommodates a diverse range of learners.

In an attempt to address the relative absence of adaptive learning environments within currently available courseware, the ATutor project was conceived. ATutor is an Open Source project in which public contributions are possible, and the software is freely available under the GNU General Public License (GPL) for non-commercial use. ATutor is also based on other Open Source technologies including the Apache Web server, PHP hypertext preprocessing language, and the MySQL database, each available freely for non-commercial use. This paper describes ATutor's early development and directions for future versions of the software.

**Adapting content to individual skills and learning styles**

ATutor addresses two key aspects of delivering adaptive Web-based educational content: the adaptation of informational structure, and the adaptation of perceptual presentation. Adaptation of informational structure consists of presenting content to accommodate global, hierarchical, or linear learning preferences, while adaptation of perceptual presentation consists of delivering content to accommodate visual, verbal, and experiential learning preferences. Typically learners will combine a number of structural and perceptual formats to mold the content to their liking.

To accommodate structural preferences ATutor offers a variety of navigation tools that allow learners to move through the information being presented in many different ways. For those who prefer to develop a "big picture" of the content being studied, often described as global learners, a collapsible main menu presents a complete list of topics with quick access links to each. Links between related information also allow global learners to jump around the content to better understand the relationships between concepts being learned. For learners who would rather structure the information in a hierarchical manner, breadcrumb links, heading links, and history links allow them to navigate "up and down" through the information. For learners who would rather learn in a linear manner, sequence links allow learners to move "back and forth" through a sequential presentation of the same information.

To accommodate perceptual preferences a number of presentation options allow learners to adapt the information to an image rich or a text-based presentation, to adjust the "theme" to present the information in a number of different colour schemes, and to adjust the layout, positioning navigation tools to suite their preferences. To accommodate experiential learning a variety of "Learning Concept" icons can be included throughout the content by designers to trigger various types of thought, allowing learners to add experience to the information they are reading about.

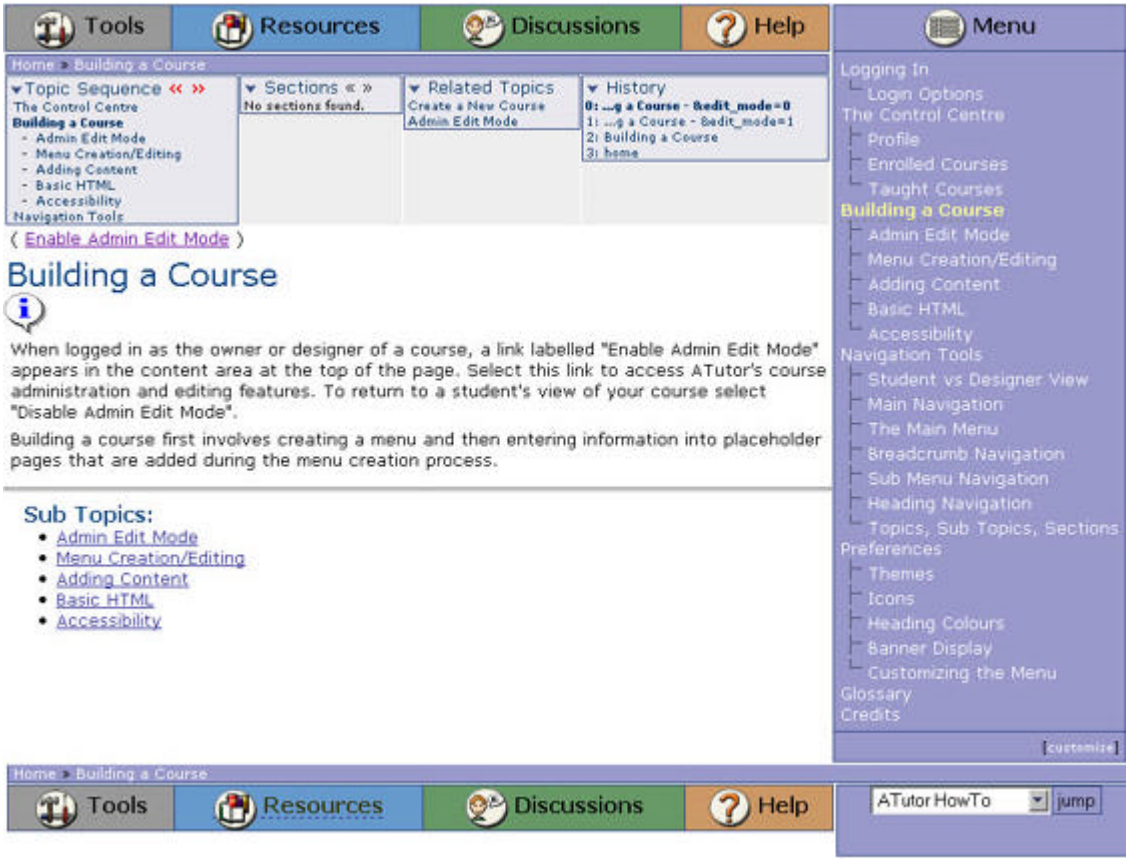


Figure 1 A screen shot of A Tutor. Main navigation links appear at the top and bottom of the screen. Breadcrumb links appear immediately below the main navigation at the top, and immediately above the main navigation at the bottom. Sub menu navigation appears below the breadcrumb links at the top, including topic and section navigation, links to related information, and links to a history of pages recently visited. The Main Menu appears to the right.

**Building content**

Content designers can easily assemble their educational materials through the online authoring tools available in ATutor. The designer will typically define a set of topics and subtopics in a given content area, and use those topics to construct a main menu. While constructing the menu, placeholder pages are created for each topic into which content can be added. For advanced designers HTML formatting can be used to create customized presentations, or to add multimedia components to their content.

Content is structured up to 4 levels deep: topics, subtopics, sections, and subsections allowing designers to add a fine-grained structure to the information being presented. Links can be made to related information by selecting from a drop down menu any of the other pages included in the content. Images can be uploaded and inserted anywhere throughout the content. Where a particular "mind set" will aid in learning a specific piece of information, Learning Concept icons can be added by the designer to trigger particular thoughts

in the learner (e.g. think critically, a discussion topic, an important piece of information…)

**Accessibility**

The primary focus for ATutor has been on accommodating learners with special needs, though an adaptive learning environment can benefit any learner. By offering an environment that can be "molded" to the characteristics of a particular learner, one with a learning disabilities for instance, content can be adapted to match the individual's profile of learning strengths. By offering an environment that is fully accessible to learners using assistive technology to access the Web, ATutor ensures an inclusive online classroom, accessible by the blind or those with severe motor impairments for example. ATutor complies with AA accessibility standards as described in the W3C Web Content Accessibility Guidelines.

**Directions**

This first phase of the ATutor project has produced the authoring tool for content developers, and the adaptive learning environment for online learners.

The second phase will focus on developing a tracking and feedback system that monitors learners' navigation patterns and preference settings, adjusts the environment to accommodate those patterns and settings, and provide feedback to inform users about the learning tendencies they exhibit. Feedback will teach users about themselves as learners, making them aware of cognitive skills and habitual tendencies associated with learning.

The data collected through ATutor during the second phase will provide a rich source of information about learning behaviour in Web-based learning environments, an area of research currently in its infancy.

The third phase will see the development on an institutional version of ATutor that will adapt to large educational settings.

**Conclusion**

The Web has opened up a whole new medium for delivering education, and our educational practices must be adjusted to incorporate what has been described as the "ultimate in educational tools". Like other mediums the potential of the Web to exclude certain groups is quite possible, with particular groups unable to access or benefit from information because of characteristics associated with a disability. This need not be the case. By addressing accessibility issues, including skill level and learning tendencies, it is possible to create an adaptive online learning environment inclusive to all learners.

More information, a demo, and a download are available on the ATutor Web site at http://www.atutor.ca.

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## Using The Brain in Case-Based Courses

**Introduction**

Student centered learning in complex subjects requires the application of a sophisticated theory of cognition to course design. Instructional techniques and strategies that work at the knowledge and comprehension stages of cognitive development may actually inhibit learning at the more advanced levels. Helping learners to achieve the evaluation and synthesis stages of cognitive development requires a cognitive paradigm that focuses on critical thinking and knowledge transfer. Cognitive flexibility is a case-based approach for the improvement of upper-level cognitive skills, particularly the ability to transfer knowledge to novel situations. A fundamental issue in applying the cognitive flexibility approach to course design is how to develop a web interface that is faith to the underlying theory and still practical in terms of student learning. This article describes the application of knowledge management software, The

Brain, to achieving these ends.

**Case-Based Approach**

According to Spiro, et al (R. Spiro, P. Feltovich, M. Jacobson, and R. Coulson, 1995), cognitive flexibility is the "ability to spontaneously restructure one's knowledge in many ways, in adaptive response to radically changing situational demands." In complex environments, learners generally cannot retrieve an intact learning structure from memory; instead the mind combines, recombines, and reinvents structural components to meet the requirements of each particular situation. Spiro, et al contend that these impediments can be overcome by moving from a learning process that emphasizes the retrieval from memory of intact preceding knowledge to a system that stresses the flexible reassembly of preexisting knowledge to fit the needs of various situations.

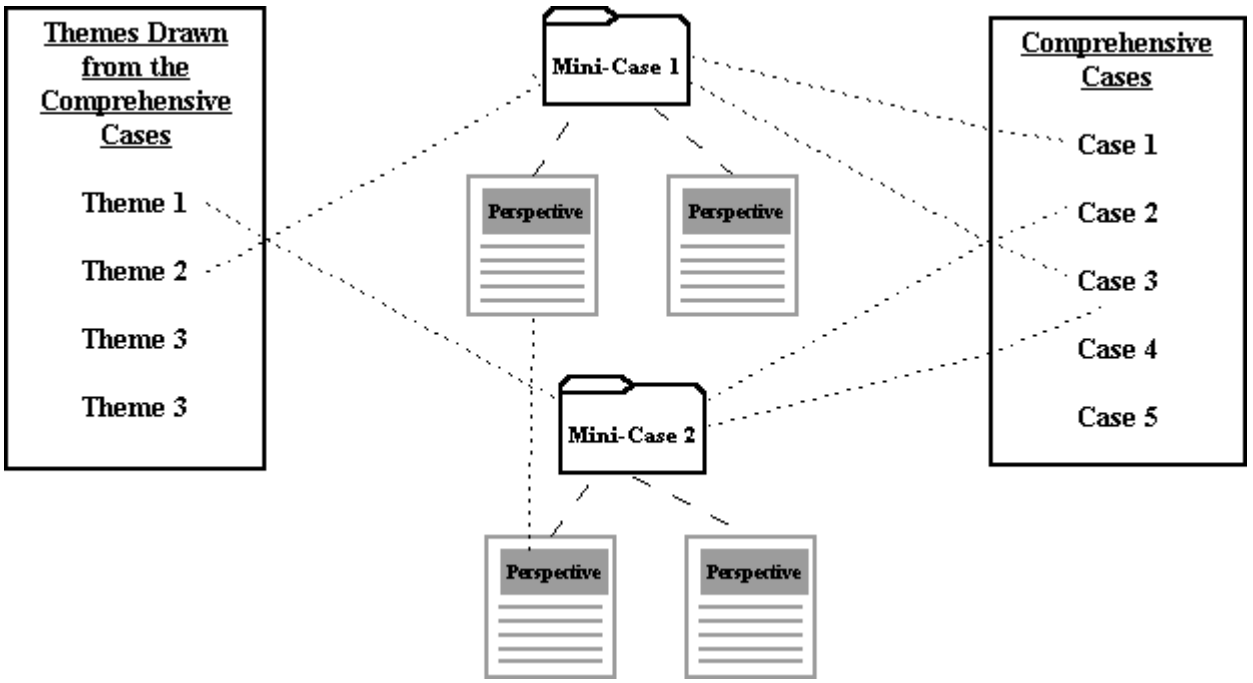
The following four points summarize the cognitive flexibility approach to learning.

1. Learning activities must provide multiple representations of content.
2. Instructional materials should avoid oversimplifying the content domain and support context-dependent knowledge.
3. Instruction should be case-based and emphasize knowledge construction, not transmission of information.
4. Knowledge sources should be highly interconnected rather than compartmentalized.

While this approach focuses on case-based learning, it goes beyond the prototype case as an illustration of an abstract concept. Learners must be exposed to many case experiences in order to emphasize the multifaceted nature of complex environments. By seeing multiple representations of the same phenomenon learners develop the mental scaffolding necessary for considering novel applications within the knowledge domain. They begin to think about how they recognize and analyze a new situation.

**System Components**

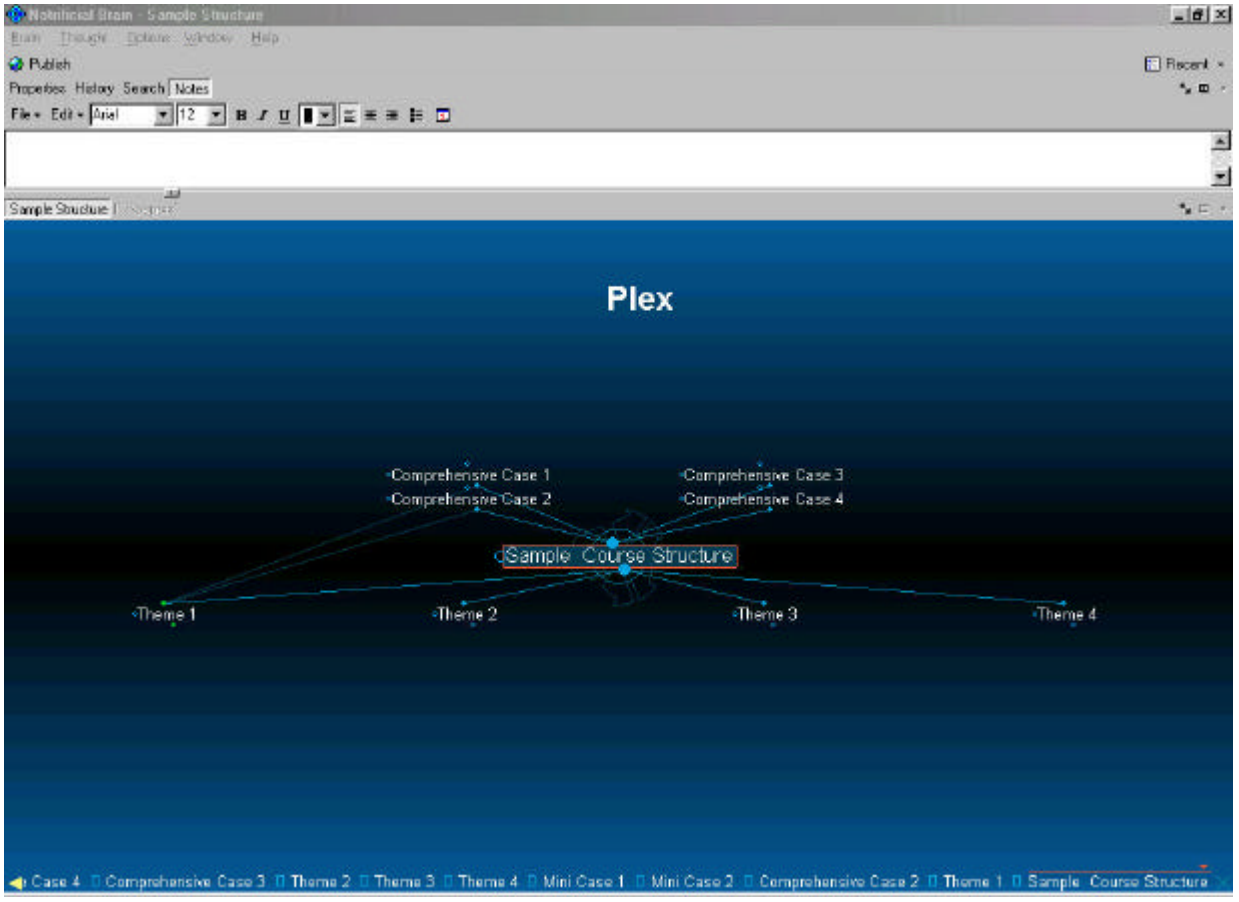
As a learning system, cognitive flexibility is constructed on the four strategic components shown in the diagram below.



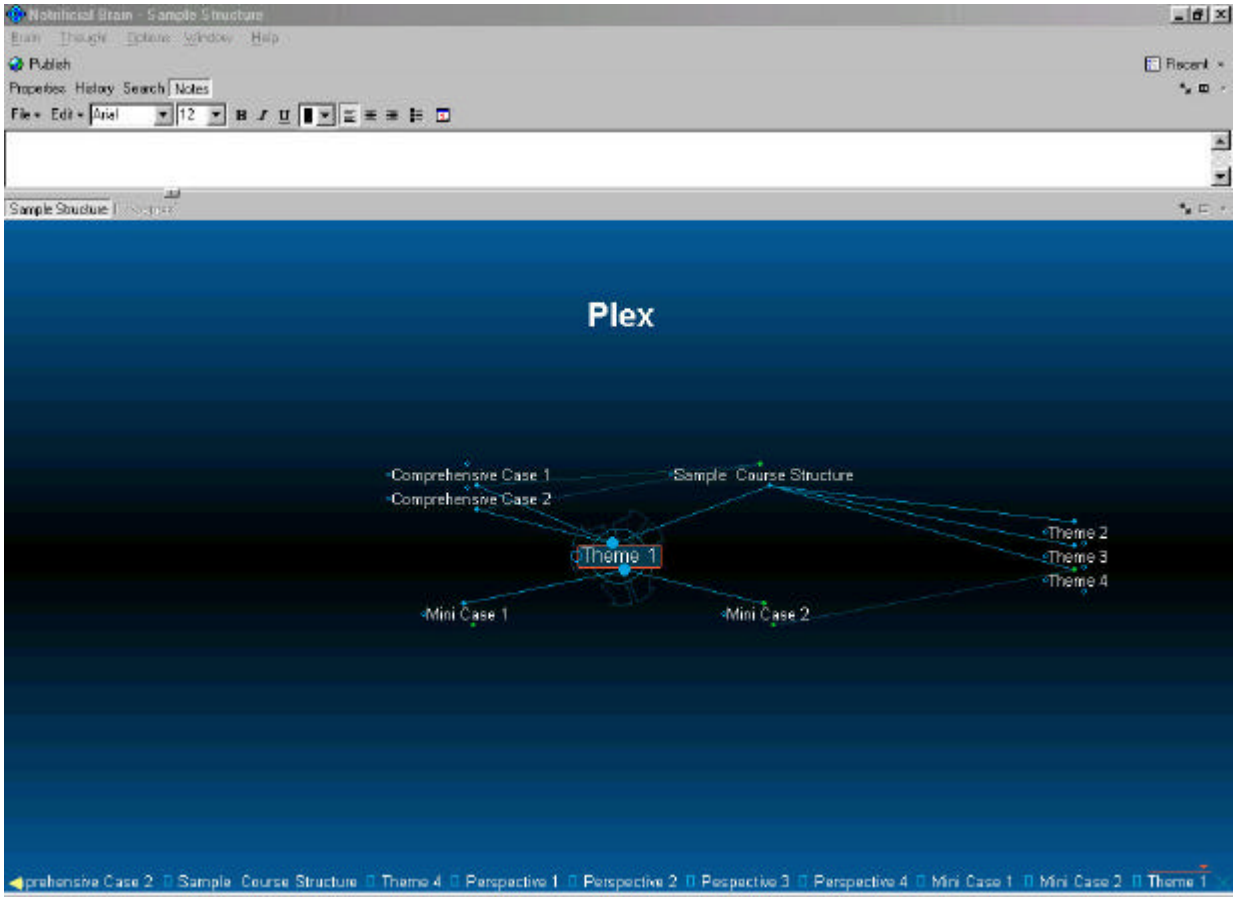

1. Cases. The heart of cognitive flexibility is the comprehensive case. Not one prototypical situation but many wide-ranging cases. Cases illustrate the multi-dimensional nature of real life experiences. However, no one case applies to all situations. Fragments of different cases (experiences) combine to form the basis of a reconstructive reasoning process.
2. Themes. Themes are ideas expressed by subject experts as possible basis for understanding the complex scenarios being presented to the learner in the cases. No one theme will be the correct answer or capture all of the dimensions of a case. The focus is on developing a comprehensive set of themes that reflect the best understandings of content experts.
3. Mini-Cases. The disassembled units of a case are referred to as mini-cases. Mini-cases are text selections from complete cases or scenarios that encompass particular themes in the cases. Learners can focus more ready on the overlapping themes in the various comprehensive cases by analyzing the mini-cases draw from the primary case material.
4. Perspectives. Conceptual and semantic elements within a mini-case are referred to as perspectives. Perspectives represent fundamental ideas, concepts, and definitions relating to the themes. As hyperlinks, perspectives provide intra-case and inter-case connectedness. Intra-case hyperlinks connect basic or surface elements within the individual cases to the abstract or conceptual ideas that provide the learner with deeper understanding of these features. Inter-case hyperlinks connect perspectives among the various comprehensive cases.

**Web Interface**

The application of cognitive flexibility hypertext to case-based learning requires a web interface that emphasizes theme paths rather than the traditional hierarchical structures. Hierarchical course structures are useful and improve on unstructured environments, particularly for students just beginning a subject. However, hierarchical menu structures are incapable of expressing the web of associative links that combine to form the subject matter of a topic or course. The interface that is needed in this environment is one that allows entry into the subject matter through any theme path. A software tool meeting these requirements is a knowledge management tool called The Brain developed by The Brain Technologies Corp. The figure below illustrates The Brain's plex.

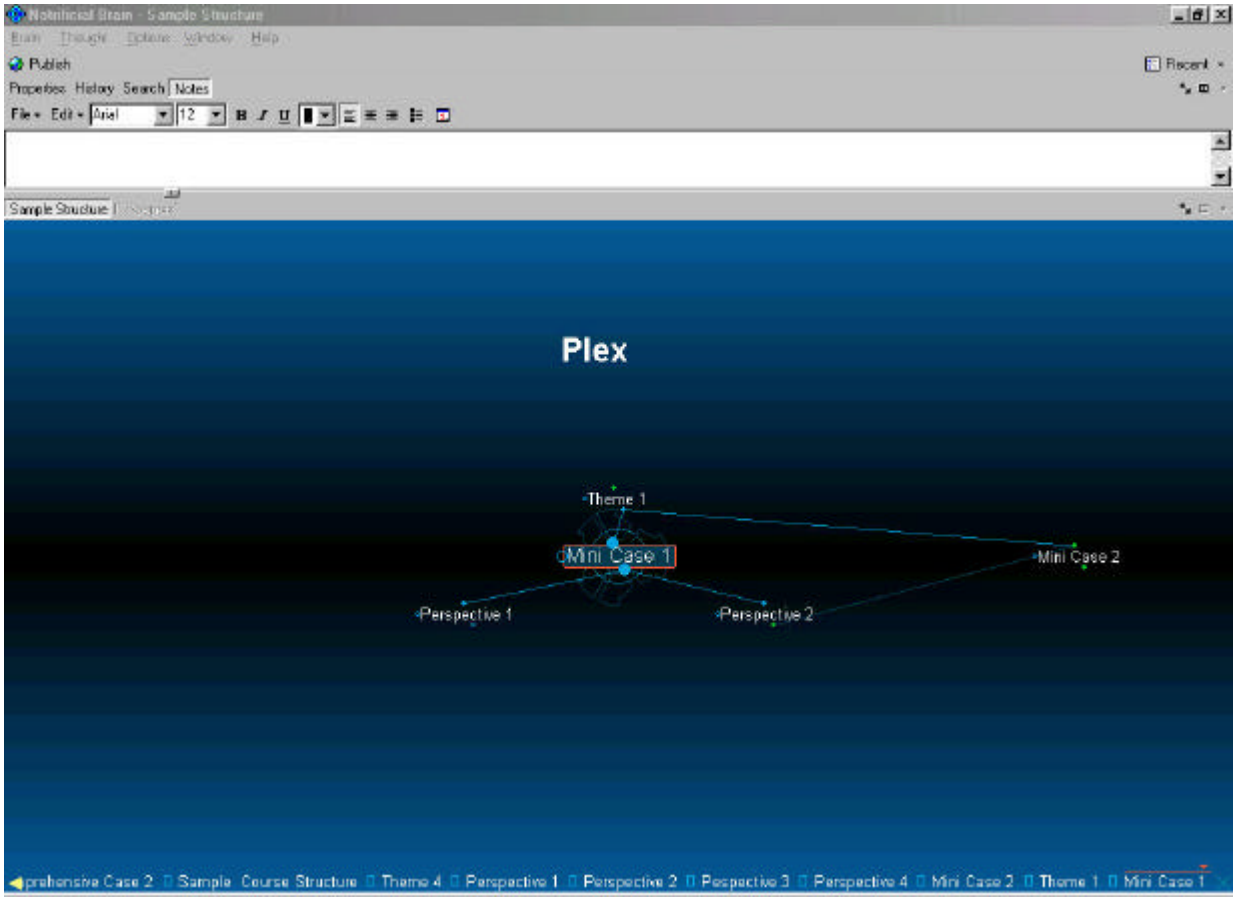



The plex houses The Brain's thoughts. In this context, thoughts include the information that demarcates the course or topic being considered. Any descriptive material about the thought process that the designer wants to include can be entered in the text area above the plex. Thoughts can be active or inactive at varying points or positions in the plex. For example, in the diagram above, sample course structure is the active thought and the comprehensive cases and themes are inactive thoughts. Within this thought structure any piece of information can be associated with and visually linked to any other piece of information. In this case the themes are child thoughts to the parent comprehensive cases. Note that in this example, theme 1 is linked to comprehensive cases 1 and 2 but could be an element common to all of the cases. The diagram below illustrates the pathways to the mini-cases through the gateway themes.

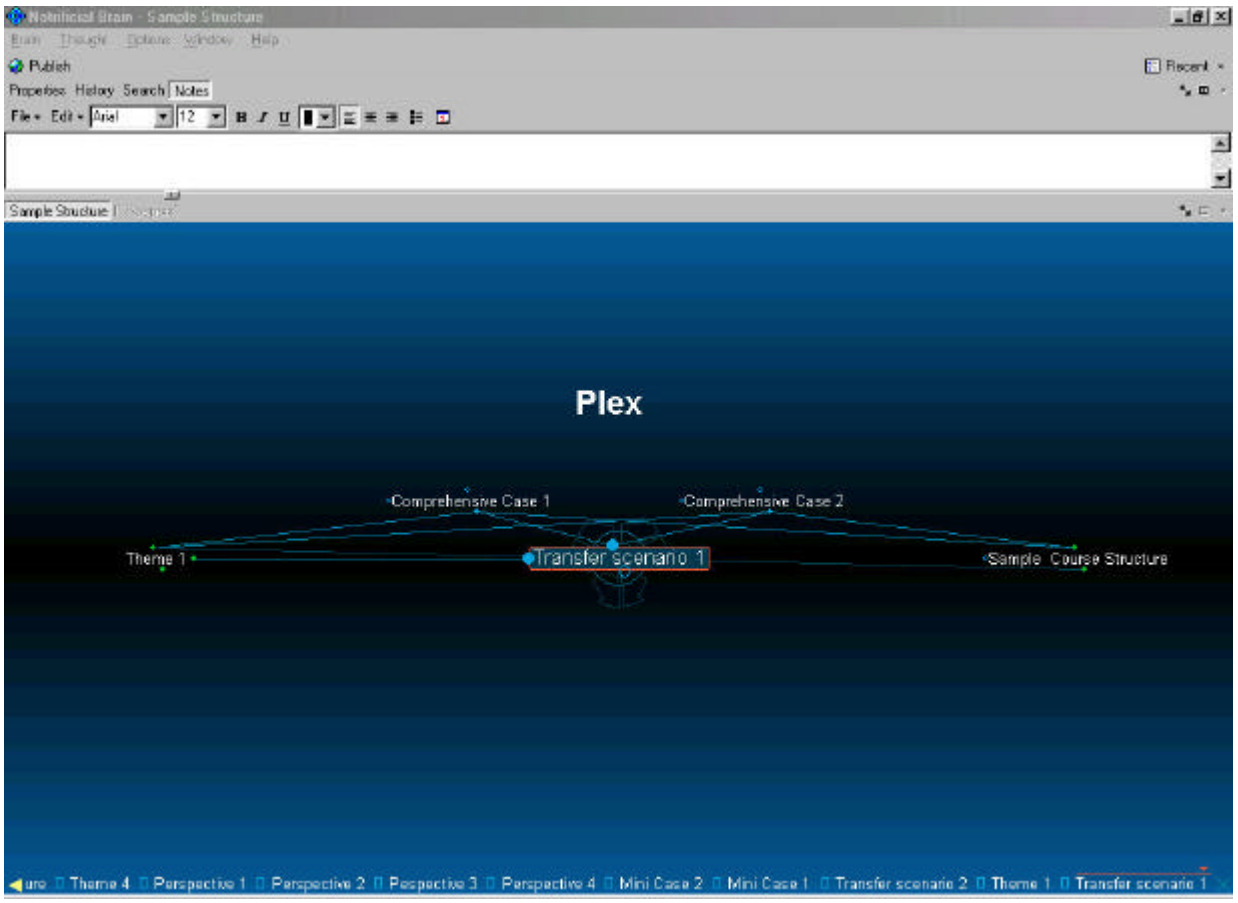



In this example theme 1 becomes the active thought. Theme 1 has two explanatory mini-cases. Mini-case 2 connects directly to theme 3. No matter which theme is the active thought, all of the themes are available for the learner's use in understanding the course material. Clicking on any one of them will activate it and reveal its pathways to the other thoughts. The mini-cases reveal another thought structure for understanding the themes and comprehensive case situations (agglomeration of themes). Mini-cases explain and highlight various aspects of the theme being considered, in this case theme 1. Mini-case 1 has two perspectives that re-enforce concepts within the mini-case and connect to other aspects in mini-case 2. The theme remains present in the plex so the learner can quickly reconstitute the original course structure and refresh their memories about the theme pathways.

The cognitive flexibility paradigm emphasizes the transferability of knowledge from one situation to another. As expressed by Jacobson, 1991, "transferability involves the reconfiguration of knowledge by the learner in response to being confronted with novel facts or a new situation." The primary goal of the cognitive flexibility approach is to enhance the learner's capability to flexibly reassemble the thematic dimensions in novel situations.




Transfer scenarios are easily included within the structure of the plex to provide a basis for the formative or summative evaluation learner progress. The plex below illustrates this aspect of the course structure. The actual evaluative scenario would be included in the textbox above the plex.



**Conclusions**

The cognitive flexibility approach to course design highlights case analysis. However, the focus is really on experiences in analyzing the particular thematic dimensions that define the topic being discussed. The emphasis is on multiple representations of thematic dimensions and connectivity among important case elements. This approach lends itself well to a hypertext instructional environment. This type of interface allows the learner to proceed through different levels of the material by starting or moving to any point in the thought process (plex). Flexibility is enhanced over the hierarchical structure that forces the learner to proceed in a linear fashion. The Brain interface facilitates random access instructional design, a hallmark of the cognitive flexibility approach. Random access in this context means using knowledge flexibly; that is, developing understandings without having to proceed through a sequential retrieval process from its inception.

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## World Wide Web (WWW) and Global Learning Environment for adults

**Abstract**

Learning process at the global environment has been becoming the need of 21st centaury, which can be exploited carefully. Development in the computer technology can create a uniform strategy and plan irrespective of the boundary of country, age and culture. Present article highlights some interesting features related to global learning process for adults using information technology tools. We can effectively define and develop the indicators for the learning using the Internet for the adults.

**Introduction**

Developing computer technology especially for the World Wide Web creates a great challenge for the learning process and its implementation in the global environment. Every organization has been trying to explore latest tools and technology for its students. However, strategies and the learning processes are varying across the country, culture and age.

Apart from the technological challenges there are various other issues that can change the entire way of human thinking. We can find large enormous amount of information over the Internet and many of them are repetitive and duplicate in one or in other sense. Off course, these information are more or less useful in various ways to few or large number of people in some part of the world. However, these can be made highly useful to every person irrespective of the country, culture and age provided we could develop a uniform strategy and developmental plan.

There are additional factors, which also affect a local environment in the particular educational situations. There are apparent learning and teaching methodologies and philosophies among the different environment. There are also different teaching techniques and mental pictures for the delivery of different courses. However, distance education needs a uniform model or picture of our teaching philosophy in a so-called international atmosphere (or global atmosphere).

Many teachers at institutions world-wide are trying to explore the potential of the online environment to deliver material of the uniform quality to people. This is an exciting and challenging time not for only education while also for the students themselves.

Online education is bringing uniform, timely and collaborative learning to the forefront and is also affecting the way traditional courses are taught to adults.

The minimum requirement for students to participate in an online course is access to a computer, the Internet, and motivation to succeed in a non-traditional classroom. Online courses provide not only an excellent method of course delivery while it is unbound by time, location or country or culture.

Adult learners in particular, find the online environment a convenient way to fit education into their busy lives. The ability to access a course from a home computer via the Internet, 24 hours a day, seven days a week is a tremendous incentive for this group to reach their academic and career goals.

Australian distance education detailed by Amundsen (1993), which is based on the six theoretical frameworks provided by Peters, Moore, Holmberg, Keegan, Garrison and Verduin, and Clark. According to Amusndsen, there are some principles required for the distance education, which should be incorporated into the corresponding material prepared. These can be expressed as:

1. Personal communication to counteract the problem of separation between student and teacher
2. Teaching which motivates and stimulates the adult learner
3. An appropriate instructional approach for the discipline
4. Provision for the learner's need for structure and control

**Distance Versus Traditional Education**

Research indicates that (Threlkeld and Brzoska 1994) the instructional format itself (e.g., interactive video vs. videotape vs. "live" instructor) has little effect on student achievement as long as the delivery technology is appropriate to the content being offered and all participants have access to the same technology. Why always we think that a distance education means only one young student sitting traditionally at remote place? We can also organise more than one student or as an entire classroom consisting of adult, young or other type of students at the remote place (e.g.: - video conferencing).

Research also suggests (Bernt & Bugbee 1993) that distant students bring basic characteristics to their learning experience, which influences their success in coursework. Distance education students are voluntarily seeking further education.

Normally the conventional instruction is perceived to be better organized and comprehensively presentable than the distance education. Do we think that distant students learn as much as students receiving traditional face-to-face instruction? Research comparing distance education to traditional face-to-face instruction indicates that teaching and studying at a distance can be as effective as traditional instruction, when the method and technologies used are appropriate to the instructional tasks, there is student-to-student interaction, and when there is teacher-to- student timely feedback (Moore et al 1970, Verduin, Clark 1991). However, do we think that it is really the picture in all subjects and even for the flexible learning system?

Distance education for adults is typically not different. Adults are mature minded and normally regarded as more responsible. Indicators for learning for adults may be more positive provided we organize our courses, lecture material and technology in such a way that it becomes a self-learning process in less time in simplest language. Modern information technologies may be used to achieve goal.

**Adult Student Roles for Engagement in Learning**

*Explorer*

Adult students discover concepts and connections and apply skills by interacting with the physical world, materials, technology, and other people. Such discovery-oriented exploration provides students with opportunities to make decisions while figuring out the components/attributes of events, objects, people, or concepts.

*Cognitive Apprentic*

Adult students become more and particular type of cognitive apprentices when they observe, apply, and refine through practice the thinking processes used by real-world practitioners. In this model, adult students reflect more than a normal traditional student on their practice in diverse and unique situations and across a range of tasks, experience and they articulate the common elements of their experiences. Since adults already have acquired experience in their life and therefore they can interact in his or her own way.

*Producers of Knowledg*

Adult students generate products for themselves and their community that synthesize and integrate knowledge and skills. Through the use of technology, such students increasingly are able to make their contribution to their field of working.

We can use the Internet in the lights of the above facts to develop the learning indicators for the adults. In the table given below is the summary of the facts that how modern information technologies may be useful to realize the corresponding indicator:

| Indicator | Example of distance based teaching and learning methodology |
|---|---|
| Communication literacy | Use of self-expression to other similar fellow students and staff members. Can use e_mail or directly discuss with other users on the Internet |
| Understanding the technology | Working with the IT tools, Using practical skills with the computer. Can compare with the existing technology. |
| Self evaluation | Comparison of various assignments and their evaluation which are on the world wide web |
| Critical Approach | Knowledge of latest technological tools and their critical uses which are available on the Internet |
| Learning strategy | Range of tools and assignment are available using various type of audio visual equipments on the Internet |

**Conclusion**

The present article highlights and evaluates the learning principles for the adult students using the World Wide Web. Using the World Wide Web a uniform environment all over the world can be created which can interest to wider community. In this way we not only create a uniform platform for learning while we can also evaluate the learning principles and learner uniformly irrespective of country, time and culture.

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## Driving Home the Buffer Overflow Problem: A Training Module for Programmers and Managers

**Overview**

Repeatedly, news headlines read: "Buffer overflow in vendor's product allows intruders to take over computer!" This widespread programming mistake is easy to make, exacerbated by the ubiquitous C language, and very simple to exploit. The buffer overflow problem is our starting point for a security module development grant at Embry-Riddle Aeronautical University (http://nsfsecurity.pr.erau.edu).

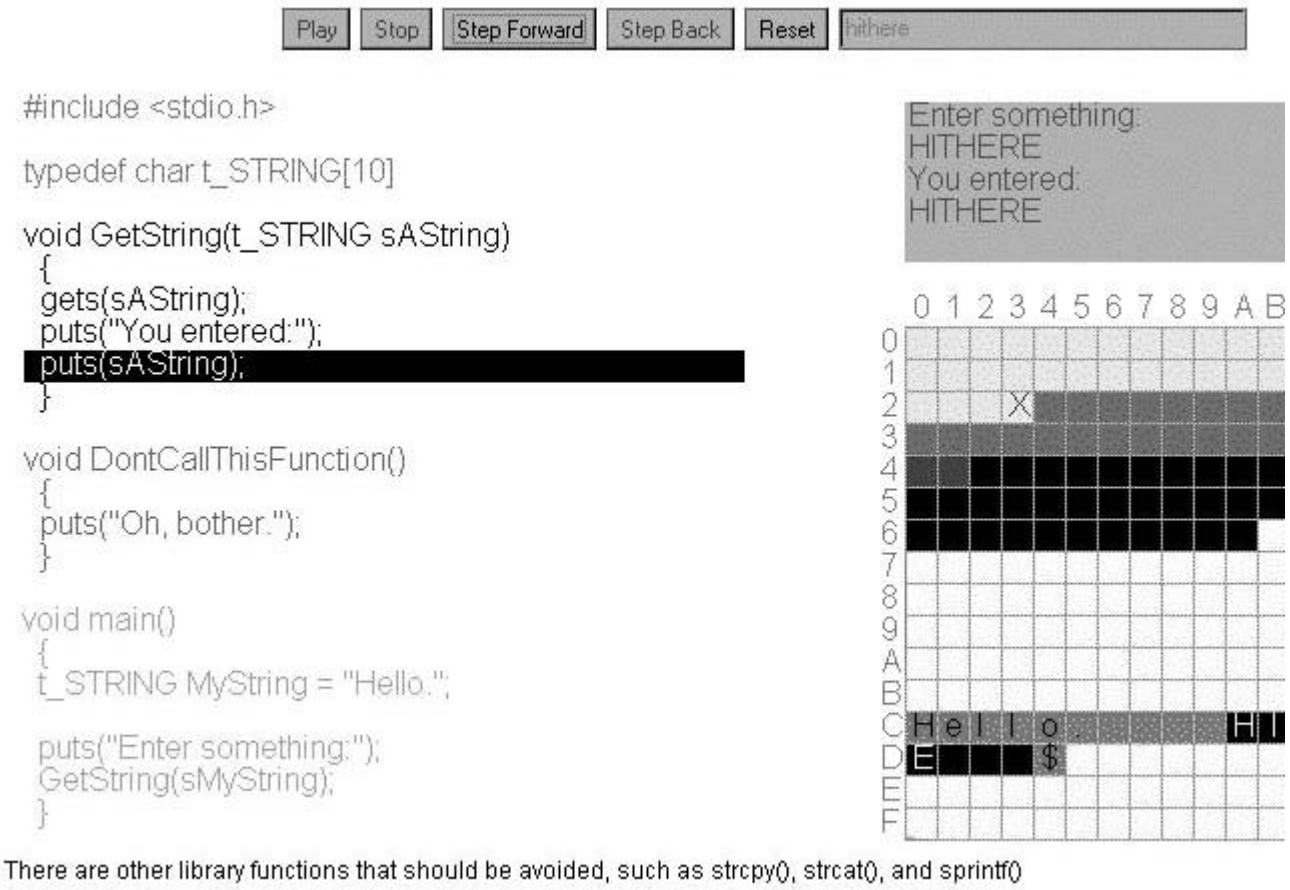
Embry-Riddle Aeronautical University students are self-selected for future careers in aviation engineering, intelligence studies, airlines, and the military. The initial steps in this project are targeted topics to (1) maximize current security content of the curriculum (2) assess student interest, and (3) increase faculty competence and involvement. In addition to fitting into existing curricula (1) modules should be interactive using current computing technology, (2) we should apply standard methodology for designing and evaluating instructional modules, and (3) the end results should be disseminated to other training sites.

**The Buffer Overflow Module**

Among programming bugs notable to the public [News], the "buffer overflow" is vying with Y2K for top billing. A "buffer overflow" is said to occur when a pointer (as in C) goes out of range to access memory beyond the buffer. While Web explanations are readily accessible [IBM,RSA], traditional textbooks do not directly address the problem. In addition, software testing for the problem is often minimal at best.
The Buffer Overflow Module was an obvious starting point, given the notoriety and persistence of the problem. It also fit well with our curricula, with its first programming courses in C. Starting from an in-depth web search that identified key papers, the undergraduate co-author developed the Java applet demonstration prototype at http://nsfsecurity.pr.erau.edu/bom.

Our goal was to drive home the seriousness of buffer overflows. Our primary measure of understanding was that the student as a future programmer never makes a buffer overflow error and the student as future manager is able to take preventative actions and to control the effects of buffer overflow attacks. The prerequisite knowledge necessary for using the module would be about that of a beginning-programming student in C.

The purpose of the Java applet is to provide a visual and animated representation of the different concepts needed to understand buffer overflows. An abstract machine was created in Java to hide details that might hinder the student's understanding, such as the use of a specific memory architecture or assembly code. The user of the applet can be a student trying to learn about buffer overflows or a presenter using the software as a demonstration, perhaps on an overhead projector.




In the abstract machine, a C program is shown on the left. In the color Java applet, each function is a different color. Each function has a corresponding executing code segment (on the right) that is painted the same color. The line of code that is being executed is highlighted. The input and output of the program is shown in the box on the upper right. If the buffer used to store the input is overflowed then anything that comes after it in memory is overwritten. The user of the applet plays the role of the attacker and tries to

find an input string that will circumvent the imaginary security measure.

Currently there are four lessons: one to demonstrate the stack structure of activation records, another to demonstrate a buffer overflow attack that overwrites data, the "stack smashing" lesson shown above, and a variation of the "stack smashing" lesson to demonstrate how one particular defense works. Developing new lessons takes very little time because of the object-oriented approach.

**Module Experience and Evaluation**

Effective evaluation of educational processes can involve many strategies. For interactive learning systems, evaluations are usually conducted in two phases: ongoing formative evaluations during development and a summative evaluation at the conclusion of development.

The goals of the initial analyses were to (1) better understand the preliminary level of knowledge possessed by undergraduate computer science students of the buffer overflow problem, (2) obtain student feedback on the effectiveness of a java applet in presenting the material, and (3) obtain student feedback about possible modifications or additions for best effectiveness when the applet is presented without live interaction from the applet's author.

Formative evaluations thus far reveal that most students were not aware of the details of the buffer overflow problem prior to the applet presentation in class, and students were enthusiastic about the module content and Java applet. Comments about the class presentation will be helpful in designing the module in the next steps of development.

**Next Steps**

The next steps in development of the Buffer Overflow Module will involve transfer of the live class presentation to a computer-based product. Our intent is to distribute the module through the Internet and on CD-ROM. The interface will be designed using authoring products such as Authorware and Flash (Macromedia). The computer-based product will build around the buffer overflow Java applet with the addition of supportive texts and detailed graphics that go beyond the capabilities of Java.

Feedback gained from the students in initial evaluations of the module will be incorporated into the authored interface, which we expect will undergo revisions as user feedback is gathered at each level of development. Evaluation of the module at the next stage will focus on assessment of the interface design and content incorporation.

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Increasing Security Expertise in Aviation-oriented Computing Education: A Modular Approach

A more detailed version of this document is available at: http://nsfsecurity.pr.erau.edu/bom/ncisse2002.pdf

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**'Intelligent Feedback' can Preempt Dropout**

New computer-mediated communications technology now facilitates student-to-student pairwise and student-to-other-students interactivities for efficient cooperative group learning of foundational knowledge, and for collaborative group learning of non-foundational knowledge. What has been largely ignored in the past decade is the new utilizability of this technology for tutor-to-student feedback to each student which can be individually tailored to each student as 'intelligent feedback' initiating the student's intrinsic motivations to learn and consequently preempting dropout from distance education.

All the motivations to learn can be categorised as vocational, academic, personal, or as social motivation, and these sub-divided as either intrinsic or extrinsic. There are the three important sub-types of intrinsic personal motivation - challenge, curiosity (sensory, and cognitive), and fantasy (details Kawachi, 2000 ; 2002).

Intrinsic social motivation is the integrative motivation, while the intrinsic vocational, intrinsic academic and intrinsic personal motivations constitute the instrumental motivation. Integrative motivation has been identified through factor analysis and correlated with low quality learning. In contrast, open learning and distance education are much concerned with fostering a deep approach to studying, and to achieve this we need to stimulate the various instrumental motivations especially in adult distant students who are (unlike adolescents) less likely to hold integrative motivation. The adult student is often learning part-time, has family and other occupational commitments and is not choosing distance study for social or affiliative purposes. However, as younger and younger students now engage distance education, studies are showing that newcomers often during their first year of a foundational course demonstrate a specific want and need for the virtual 'coffee shop' or chat-room (sometimes extrinsically to discuss their anxieties and worries with the new technology, but occasionally to share concerns and insights forming a community of learning intrinsically that relates to fulfilling the objectives of the course). In an objective controlled study, Boling and Robinson (1999 : 170) found that there was some considerable trade-off (an inverse correlation) between distance students' satisfaction with social aspects of the course and the actual quality of learning achieved. This would suggest that integrative intrinsic social motivation may be not the best for deep quality learning and abstract learning valued in higher education.

Newcomers to distance education also demonstrate performative anxiety. Thus there is a role for fun to initiate intrinsic social motivation especially in adult students who often do not bring this integrative motivation with them to the course, and tend to feel isolated. The only educational role for fun is to reduce performative anxiety, and this leads to the development of a community of learning. Reduced performative anxiety directly leads to (however small or gradual) achievement in learning, and this initiation of achievement motivation (despite being extrinsic) can serve as a bridge to persistence in distance education.

From the very first email, web-postings, or conferencing, the tutor can begin guided conversations to initiate and promote the instrumental motivations for individual learning and in each participant for collaborative group learning. In particular (due to its one-to-one individualised nature), feedback from the tutor to each student about an assessable assigned piece of student output can be cognitively designed to initiate each and all of the intrinsic vocational, academic, and personal (challenge, curiosity, and fantasy) motivations. This would be 'intelligent feedback'.

Briefly, the tutor should elicit, involve and refer to the student's own (past, present, and future) individual needs and context (continually, since needs and context develop and change). The tutor should employ empathy - rephrasing the student's main points to establish mutual clarity and understanding, and at the same time give vicarious experience. Giving vicarious experience is either through giving examples so the student sees the topic in a new light with personal relevance to the student's own life (thereby initiating intrinsic vocational motivation) or through giving one's own experiences so the student sees the topic through the tutor's eyes and feels the tutor's passion for the topic (thereby initiating intrinsic academic motivation). The tutor interprets the course and moderates the difficulty level, so that each step may be achieved by the student. The tutor then explicitly explains what the student will be able to do or do better as a result from achieving the next step - and involving and referring to the student's needs and context this explanation should be personally meaningful (thereby initiating challenge). The tutor should use icons, text designs (with appropriate language), sounds and colours (thereby initiating sensory curiosity), give positive cognitive comments (praise) to reveal hitherto unforeseen complexity (thereby initiating cognitive curiosity). The tutor should show how the learning or skills to be achieved in the task forum (the fantasy) could be applied to the student's advantage in new contexts in the student's real present or future world (thereby initiating fantasy). This includes sharing with the student the rationale behind each learning task or interactivity (such as non-authentic online debate). Initiation of intrinsic fantasy personal motivation increases the perceived relevance of the learning task, and increases the ratio of perceived benefit to expended effort. The tutor also needs to give negative comments to correct misunderstanding and prevent fossilization. This reduces and dispels (the hitherto useful but no longer necessary) integrative intrinsic social motivation and thus releases the student to develop the instrumental motivations for deeper quality of learning as an independent learner or as a collaborative group learner.

Feedback should be immediate in order to closely guide and direct the individualised optimalisation of the student's subsequent activity to maximise quality learning achievement. Pacing can be used to moderate the difficulty level, and should allow sufficient time for the student to fully explore the task (freely to make mistakes) to achieve mastery. There is a case to be made for the tutor to hide the student's grade from the feedback in the early learning of foundational knowledge, so that no serious consequence is attached to these desirable explorations by the student.

In summary, 'intelligent feedback' can be designed based on cognitivism and social constructivist theory of learning, and deployed using the new communications technology which enables close interactivities for guided learning in distance education. By initiating the intrinsic motivations to learn, 'intelligent feedback' can preempt attrition and bring about desirable deep quality learning.

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## Sivanet: A New Remote Physical Scenario For Control Self-learning Through The Internet

**Abstract**

This paper describes a new system for remote education for automatic control self-learning. By means of a servo motor system and a camera, students are able to per-form several experiments with a real laboratory through the Internet. The aim of this sys-tem is to provide every element necessary for student training, that is: theoretical back-ground, lab equipment and self-learning methods. Internet constitutes the ideal way to reach these objectives.

**Keywords**

Control education, distance learning, Internet, self-learning.

### Introduction

Education in control engineering is faced with several drawbacks. Ideas and concepts are some times very complex and difficult to illustrate on the blackboard. Students need to experience and observe these phe-nomena in order to broaden their knowledge. How-ever, the implementation of these experiments some-times proves difficult and expensive, as universities need to spend more on resources in laboratories, per-sonnel and equipment.

In recent years, the issue of education via advanced technologies as for example the World Wide Web has experienced an extraordinary growth [1], [4], [7]. The system presented builds on this idea and serves as a broad base for teaching and research.

This system is called SIVANET and consists of a controllable environment located at the DISAM [3] laboratory that may be visualised by means of a cam-era.

### System Description

SIVANET system is based on a client-server architec-ture (figure 1). The server is the physical lab, and the client can be any standard Internet browser.

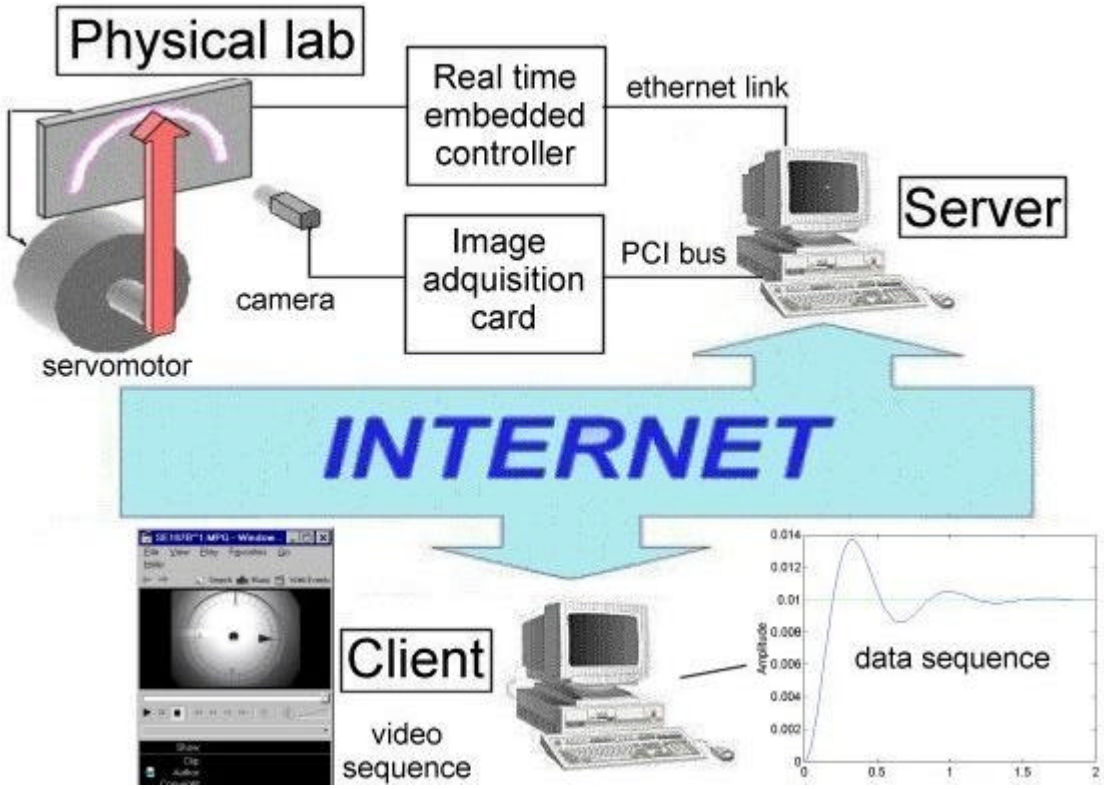


Figure 1: Client-server architecture of the SIVA-NET system.

The server module consists of the following elements:

1. A server PC. It is a PC clone with Linux operat-ing system. The HTTPd server Apache [2] has been installed.
2. A physical system. It consists of a servomotor (figures 2 and 6).
3. An embedded computer controller. This is also a PC clone with RTEMS [5] operating system. It function is to control the motor according to the control law dictated by the server computer.
4. The image system. (Figure 6). It consists of a camera, and a frame grabber.

The student can access the server through the client. It could be any computer with an Internet connection.

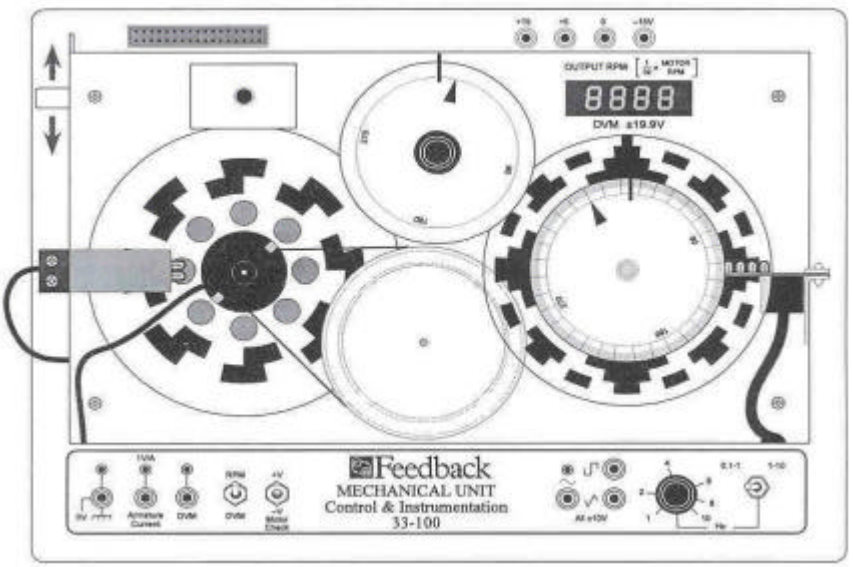


Figure 2: Detail of the servomotor.

**Server Operation Description**

The control process is a DC motor (figure 3). The control law, as well as the reference input, is gener-ated by the server, which can also acquire field data. The negative feedback can also be connected accord-ing to the decision given to the server PC, which also controls the acquisition of the video sequence.

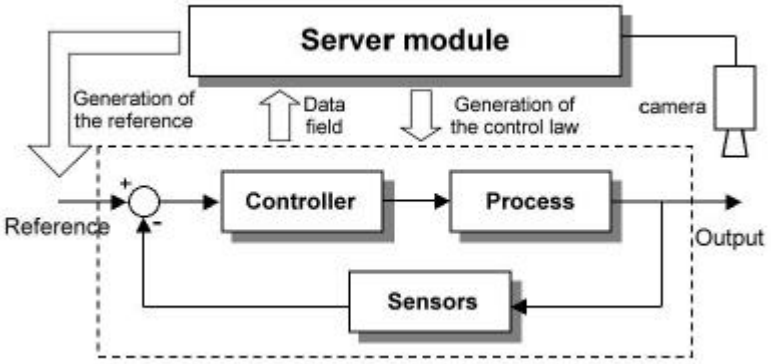


Figure 3: Server diagram of the SIVANET sys-tem.

**Client Operation Description**

Students handle the physical system with the interface shown in Figure 5.

Firstly, the user should indicate the system, the sam-pling period and the sequence time that decides the total time the physical system is going to be con-trolled by the regulator and the acquisition time of the video sequence.

Secondly, the type of input may be chosen; step, ramp, or predetermined input that tests the behaviour of the regulator design with irregular input patterns.

Thirdly, the user has to give the figures for the con-troller in the client browser. The embedded real time controller of the server implements a general-purpose discrete regulator with a third degree numerator and denominator polonium.

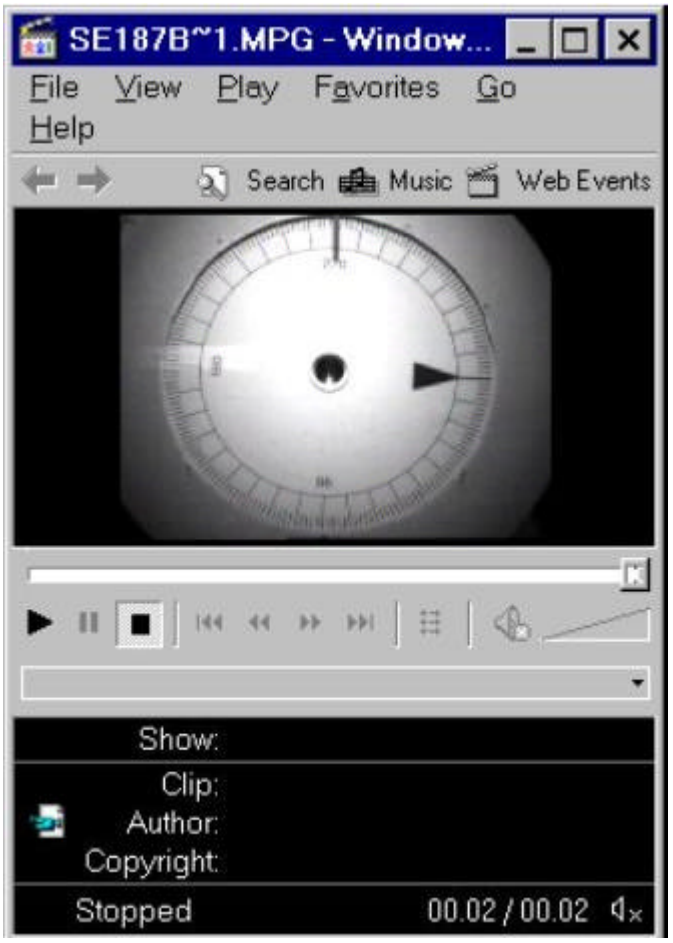


Figure 4: Video sequence down-loaded by the student.

Finally, the type of feedback must be indicated before the control sequence occurs. The typical case of nega-tive feedback in position is shown in figure 5.

By clicking on the circular ruler picture, the client module sends all the information to the server mod-ule, where it is placed in a queue. When the specific order is processed the server stores the video se-quence as a compressed MPEG file, and the data is kept as a text file for posterior downloading.

**Practicals**

Four practicals can be done with SIVANET.

*System identification*

The DC motor can be modelled on a second-order system with a pole in the origin [6]. The open loop transfer function is indicated in equation 1, where k represents the static gain and T is the time constant.

$$G(s) = \frac{k}{1 + Ts} \cdot \frac{1}{s} \quad (1)$$

Students must estimate these two parameters. To manage this, they can introduce a step to the open-loop system and analyse the resulted sequence.

*Continuos regulator design*

Students should design the best continuos regulator that fulfils the static and dynamic specifications. Laplace 's' variable must be replaced as shown in equation (2) for regulator discretization.

$$s = \frac{T}{1 - z} \quad (2)$$

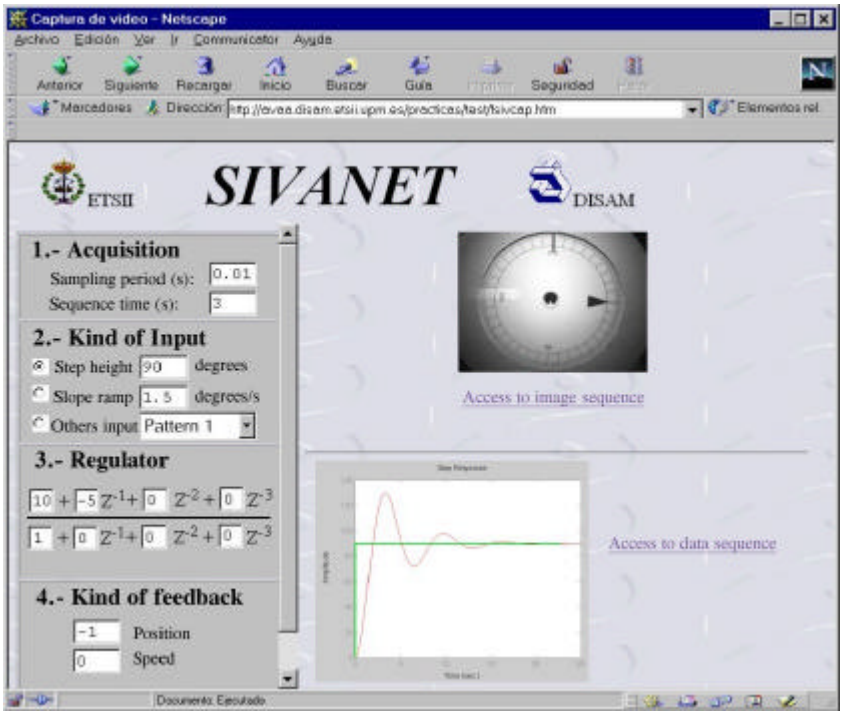


Figure 5: Client interface of the SIVANET system.

*Discrete regulator design*

The transfer function G(s) calculated in practical 1 should be converted to BG(z). Before implementation of the regulator, the student has to design the discrete regulator that best fulfils the static and dynamic speci-fications with a particular sampling rate T. The student must implement the regulator.

*State feedback control system*

The modern control theory is used at this level. As in practical 3, the discrete equivalent model BG(z) is obtained, and a state feedback regulator is designed to fulfil the predefined specifications.

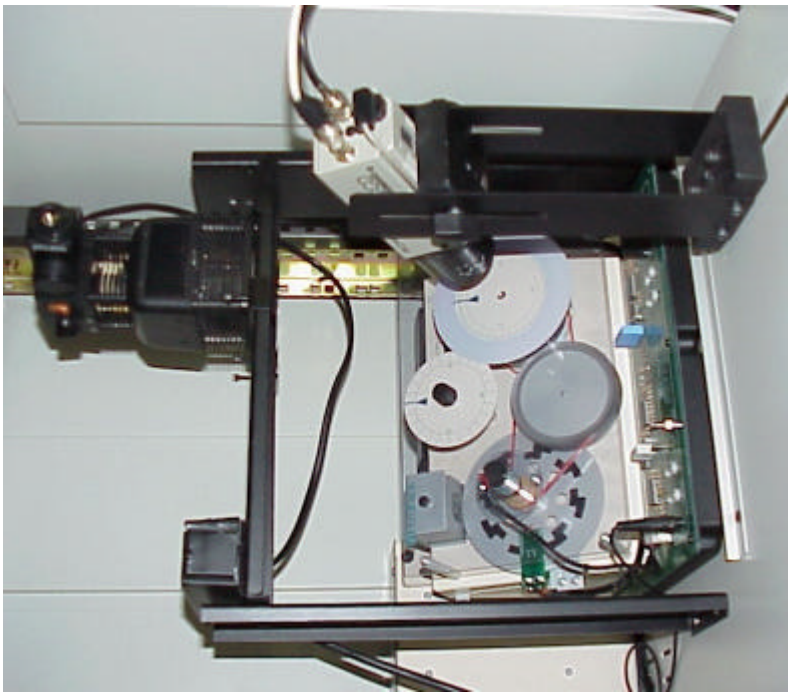

Figure 6. General view of SIVANET.

**Conclusions and Future Work**

By implementing systems as SIVANET, students will be able to perform more practicals in order to benefit fully from their training, and universities will not need to spend more on resources, in laboratories, per-sonnel and equipment.

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## Distance Education Field Experience

**Description of the project**

Purdue University education students have few opportunities to experience a local school placement reflecting the ethnic, linguistic, socio-economic and other diversity of the United States urban areas. I is therefore necessary to reach out to classrooms in other parts of the state. The Purdue Program for Preparing Tomorrow's Teachers to Use Technology (P3T3) project set up partnerships in schools in diverse areas of Indiana. The P3T3 project is designed to prepare pre-service teachers to demonstrate fundamental technology competencies, to use technology as a tool for teaching/learning, personal productivity, communication, and to reflect on their teaching; and to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves.

Within the larger P3T3 project, there is a project in which elementary education students have their field experience in one of the partner schools. Using Poly Com video conferencing and the Internet a teacher and students in a grade three bilingual class in a diverse inner-city school in East Chicago and faculty and students at Purdue engage in a virtual field experience. The sites are connected once a week for two hours. Pre-service teachers observe the classroom, interact with the children and teacher, and teach using the interactive capabilities of the Poly Com technology. Prior to each interaction the grade three teacher posts suggestions for activities on her web site. The pre-service students check the classroom teacher's web site, and in on-line group chats plan enrichment activities. Purdue

technology personnel facilitate the weekly interactions and train the students and faculty in use of the technology.

This project has been conducted over four semesters and has grown from one class in which 11 students volunteered to participate, to a full class of 22 students. The first two sessions of each semester, two hours each time, were devoted to learning the technology. The initial session consisted of manipulating the equipment: learning how to dial into the site, how to operate the remote which controls the camera both at Purdue and the school, and developing signals to facilitate communication. The second and third sessions consisted of "teaching" a lesson from a "remote" site; one group of pre-service teachers interacted with another group in different rooms in the university. A checklist of procedures to follow prior to and while connecting was distributed to students.

A trip to the school took place for the fourth session. Pre-service teachers spent the day in a tour of the school, met staff, teachers and students, and interacted with students in the grade three class involved in the project. The students were given guiding questions to do a mini-ethnographic project aimed to uncover assumptions of the school and students. Virtual experiences began the next week and continued for seven weeks. Students wrote journals after each classroom "visit". They commented on the technology in each journal.

**Observations/Activities**

Pre-service teachers spend the first session connected to the school solely observing. All other interactions began with the classroom teacher teaching a lesson; pre-service teachers then took turns, individually or in small groups, teaching the remainder of the lesson. These activities provided reinforcement of or enrichment to the curriculum. Pre-service teachers engaged in a variety of activities. They taught lessons on equal and unequal fractions using every day objects, colorful graphs, and diagrams and charts. They brought in childhood objects to share memories with the children, read stories and provided follow-up questions, and been a "reading center" that groups of students rotated through like centers physically present in the class. They researched information about Benjamin Franklin, and presented it to students in the form of a skit. Some groups presented material in both English and Spanish, thus affording the opportunity for the pre-service teachers to practice the language, and to see how it can be used in a bilingual class. They prepared interview questions for the teacher related to curriculum and teaching they have observed and taken part in, and for students on what makes a good teacher and a good student. One particular session was devoted to discussing the World Trade Center disaster. Purdue students and the grade three students wrote memoirs about where they were that day as part of a process writing activity. The teacher provided links on her web site that the pre-service teachers used to see how to discuss sensitive topics with children.

The pre-service teachers asked the teacher and students how they felt about being part of the technology experiment. The teacher indicated reservations about feeling as though she was on display. She said the students "went a little wild" after we signed off. On the positive side she felt her students benefited from contact with Purdue students, enjoyed the activities, and readily spent time preparing for them. She said the work with pre-service teaches kept her thinking fresh. The students indicated a range of feelings, most extremely positive. They said they felt like they "had a friend with them" and they "liked the attention". Some said they were nervous.

**Pre-service teachers' learning related to diversity**

Pre-service teachers understanding of diversity grew during the project. In interaction with the teacher and students they found that the teacher did not "water down the curriculum", had high expectations, taught in an integrated style, and built on the students' prior experiences. They began to question their assumptions and beliefs about teaching and learning of diverse students. They had expected badly behaved students and indicated "surprise" at the well-maintained school and the well-behaved students. Pre-service teachers learned to prepare materials aimed at diverse students, and learned to work with students using the distance mode of education. Some expressed an interest in working with diverse groups of children.

**Strengths of Technology**

Pre-service teachers learned to see technology as a tool that enabled them to communicate with students they have had little experience of in the past. Group discussions after each session were rich and varied. Pre-service teachers learned to work together in groups and in partnership with the faculty member and classroom teacher. Considering all factors, as a part of a teacher education program, which has at its core an emphasis on early and continued field experiences, an emphasis on developing technological skills and on understanding diverse learners, a virtual field experience in a classroom they could not experience locally is worthwhile.

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**Issues, Ideas and Inklings in K-12 Technology Integration**

There are those who believe that if schools have a computer or two (or three) in every classroom and/or a computer lab (or two) in every school then the professional staff will readily and willingly embrace the technology revolution. And as a result the children will become proficient computer users, the curriculum will be improved given the ready availability of content, and the professional staff will, themselves, become literate, which will further drive curriculum improvement. Given this, local administrators and state departments of education believe that 'things will magically take a giant-step forward.' However such has not been the case. Based upon such thinking many missteps were taken, will be taken and this will continue.

The powers-that-be have an idea, they have an inkling, they think what they are doing will work. However no one really seems to have a plan by which to operationalize his or her ideas, inklings, or thoughts. For example, there is an unsubstantiated belief that if computers 'descended from the mount' then school teachers would be drawn into computer use and then 'something' would happen to improve the curriculum-a "build it and they will come" mentality, which is faulty thinking at best. Well, the 'something' never happened. If the truth be told (well, my truth anyway), there are several 'somethings' that are absent.

The linchpin issues should have been foreseen. But even in the face of such a glaring lack of prior planning, some of the issues still exist and continue to be mishandled. In the quest to have education embrace technology these linchpin issues should be considered (reconsidered):

**Technology-ready administrator vs. Luddite administrator**

Given a technology-ready administrator, there is a high probability that technology integration will flourish. Schools that have even a marginal technology program have seen significant improvement when a technology-ready administrator was at the helm. It seems that a technology-ready administrator is the single most important factor as to whether or not technology integration in a school will be successful or unsuccessful.

Some believe that an innovative staff person can 'infect' a school's staff and thereby provide for technology integration. But too often in too many schools we see such a dynamic innovative staff member who provides, what seems to be, a model for other staff members to follow; but 'follow the leader' does not work for technology integration in a school absent the support of school's administrator.

At a higher level, misdirected educational reformists compound this issue. The problem is that these reformers are exclusively non-educators and rely on their own experiences as students. It's interesting that medical doctors are relied upon to police themselves and expected to reform themselves-such is not the case in education. Interestingly enough in Massachusetts and many other states being a public school educator will preclude a person from serving on a state college/university board of trustees (even if the person is, for example, a teacher at a public elementary school with no connection to any college/university). And this model is carried forward to the federal level. In short, we have no educational leadership either at the national level or at the state level. Education, and by decendancy, technology integration, is in the control of capitalists and non-educators.

There does not seem to be a ready-made fix for this issue. It is highly problematic to attempt to compensate for a lack of administrative leadership. Perhaps one solution is employ a Technology Director that has a strong personality, a strong sense of mission, and can work with a Audited administrator so that there is an appropriate and bona fide leadership 'at the wheel'-no informal chains-of-command are effective in implementing technology integration-effective measures come from bona fide administrators.

**Living in an 'ivory tower' makes professional development difficult**

It seems to be more of a reality that teachers work alone in their classrooms and have little or no interaction with other staff members. With the many mandates of various education reform laws, the time that teachers once had to interact with their colleagues is gone. Even with 95% of schools being wired for the Internet, few teachers have any on-line contact with peers. Even if time were available this is not happening. These circumstances create isolation and create a situation where teachers lacks an understanding of how the real world actually works, which is what education is preparing our youth for. At an even more basic level, there is the simple lack of understanding that technology integration is really curriculum development; technology development is not actually supposed to focus on technology-it's supposed to focus on the curriculum.

Even when teachers do interact with peers on release day, in-service days, etc., the training they experience is different than in-service training that has proven to be effective in other professions such as for: lawyers, doctors, athletes. I suppose this is just another example of poor planning-it would seem that looking to other professions for models by which to provide professional development would be a rather trivial project.

It is also an issue that pre-service teachers receive virtually no technology training as most professors are not willingly creating courses that deal with technology. I am not sure what to suggest about this issue as education reform and accountability have not yet reached into higher education as it has in the K-12 realm!

**Plain old management skills-too many machines too few electronic janitors**

It's curious that principals and superintendents must come up through the ranks as a professional staff member. I'm not at all sure that good teachers, or even bad teachers for that matter, necessarily make good administrators. Certainly administrators must take college courses to become certified as administrators. But other than college field experiences there's no previous experience as an administrator-a manager of a business; and remember that school is also has a business side. But administrators, who, granted, do have experience in education are expected to address far too many issues, which are not educational issues but business-related and human resource-related. For example, the business world's ratio of computer-to-techie is about 35 to 1 but educational administrator's routinely allow this ratio to be in 250 to 1 range. It appears that there's not much more to say about this issue! The solution seems obvious but…what's obvious to me is not obvious to many state departments of education and school boards.

There are a number of other issues that may spring to mind, but I suggest that they flow from the three I have suggested as linchpin issues. Hopefully I have offered some insight into the needs and shortcomings involved in K-12 technology integration. Hopefully the current trend will change by having administrators become more technology aware, by having more technology directors and technology committees understand and advocate for needed changes. Sine the state departments of education, Governor's offices, legislatures, and Congress are political issues, I fear that they will remain unchanged.

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## Designing collaborative teaching and learning in virtual environments - a case study

Our starting point and subject of this study is the "Online Seminar" of the University of Innsbruck and the Saarland University, which has run six times over the past few years, and has dealt with various topics (http://seminar.jura.uni-sb.de). Special concerns for this course include:

- It is directed towards an international audience
- It accommodates a large number of participants (100-300 people)
- It has diverse student profiles, i.e. a mixture of students and people already working in their profession (mixture of university and continuing education)
- It actively integrates all participants
- It utilises collaboration as a vital part of the course concept
- It is transparent to the public in all activities
- It allows constant evaluation
- Keeping the design course concept as flexible and open as possible

Newly added to the summer 2000 course "Teaching and Studying in Virtual Learning Environments" design is the ability of participants to decide which facet of the overall seminar topic they wish to engage in. Course contents and group works then are adapted according to their profile and interests, depending if disciplinary in-depth or inter-disciplinary discussions are wished. The participants work alone and in groups, write papers, pass tests and take part in public conferences. Quizzes and competitions are added in order to maintain vitality, support the pedagogy, and provide guidance to achieve better collaboration and learning results. Assessment of generated outputs (products) are evaluated by the organising team and the participants. The participants also asked to assess themselves and their team-mates in order to invest the learners as much as possible into the activities and to keep motivation levels high.

**Schedule (Summer term 2000)**

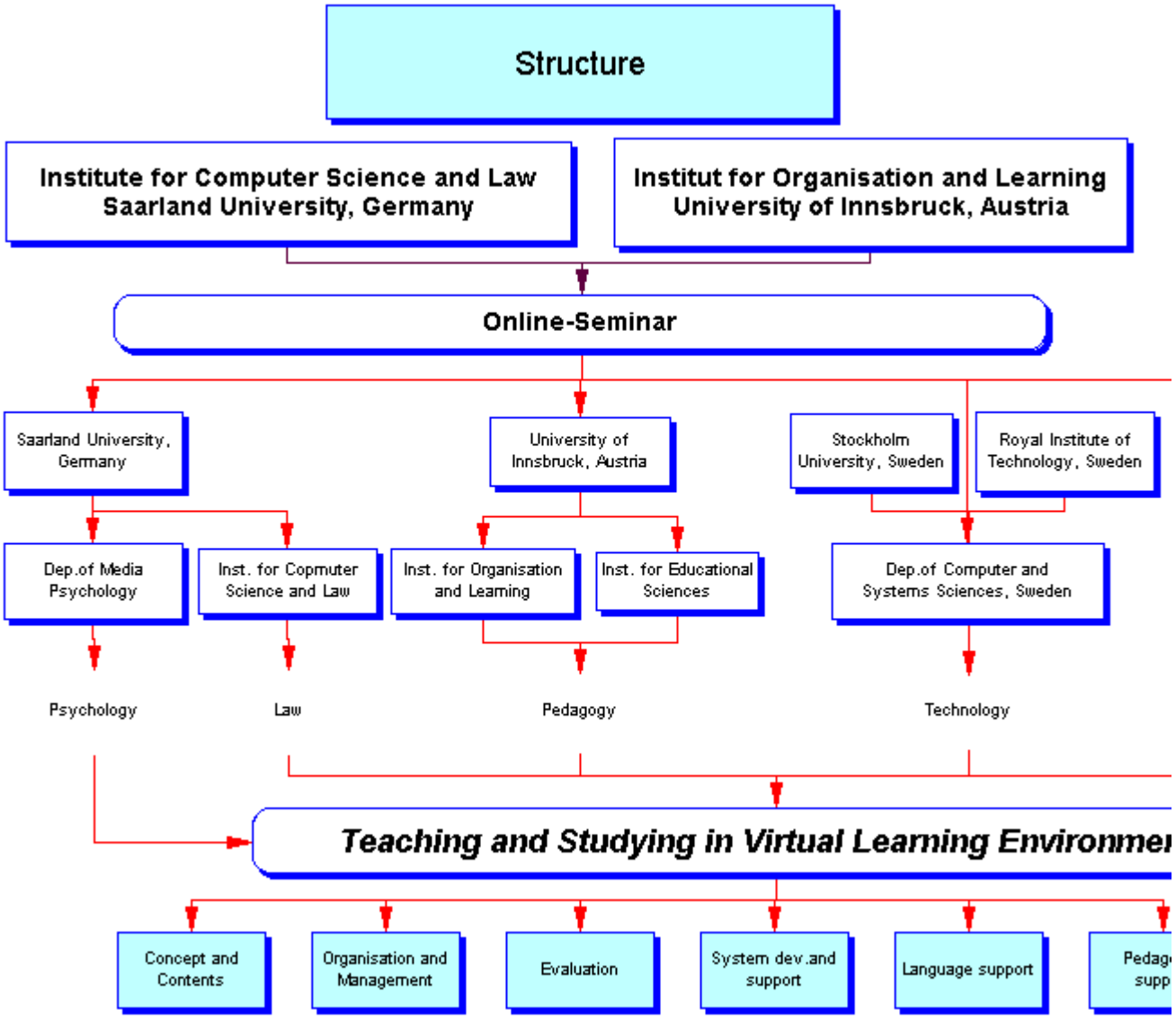
| Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|
| Week | Date | Phase | Activities | | | | |
| 1 | 4/4 - 4/11 | 1 | Presentation | | | | |
| 2 | 4/11 - 4/18 | 2 | Literature phase | Study group I | Individual work | Quiz 1 | |
| 3 | 4/18 - 4/25. | | | | | Quiz 2 | |
| 4 | 4/25 - 5/2 | | Test | | | Quiz 3 | |
| 5 | 5/2 - 5/9 | 3 | Group work I | Study group II | | Quiz 4 | |
| 6 | 5/9 - 5/16 | | | | | Quiz 5 | |
| 7 | 5/16 - 5/23 | | | | | Quiz 6 | |
| 8 | 5/23 - 5/30 | | | | | Quiz 7 | Design Competitio |
| 9 | 5/30 - 6/6 | 4 | Group work II | | | Quiz 8 | |
| 10 | 6/6 - 6/13 | | | | | Quiz 9 | |
| 11 | 6/13 - 6/20 | | | | | Quiz 10 | Questionnaire |
| 12 | 6/20 - 6/26 | | | | | | |

(Coulours: Blue: ungraded work, yellow: individual work, green: collaborative work)

Interest to participate is high as there are no fees for the seminar. We begin with more than 200 registrations (summer term 2000: 620) from over ore than 30 countries of the world to eventually run the course with around 100 active participants, bringing together students as well as professionals within the learning environment.

One advantage of online courses is the potential for communication, collaboration, and the constant exchange of knowledge between students and educators, which brings them closer to (and perhaps supersedes) "real life" teaching. The Online Seminars have opened up new possibilities for students and teachers, and permit interdisciplinary and international collaboration but has also proven to be far more time and personnel intensive than regular courses. Computer-Mediated Communication (CMC) therefore becomes an important research area for education. Our investigation explores the role of organisation of communication and moderation, the analysis of interactivity and working styles, and the results of the learning process.
Recent literature shows that analysis of course design for learning environments predicated on social constructivist theory have focused on selected components within those environments - but we feel that this learning analysis cannot be done in isolation. Effective and efficient delivery of instruction in a higher education setting must consider the whole context and process from course development, organisation, delivery and evaluation. Therefore a concept for course design based on inter-cultural and inter-disciplinary collaboration on both the instructors and students level had been developed and successfully applied during the last years.

The online seminars are a co-operative international venture. The roles of each of the co-operating institutions dependent on the focus, resources, personnel, and disciplines of these institutions. Currently (Summer 2000) this collaborative venture involves participation of Higher Education institutions in Germany, Austria, Sweden and Kazakhstan. Each of these institutions may in turn collaborate with other local institutions. Co-operative decisions are based on common educational and research interests, competence, persons in charge, technical resources and the cultural background. Educational interests can therefore be implemented in ways not known before ICT (Information and Communication Technology) and the Internet was available.



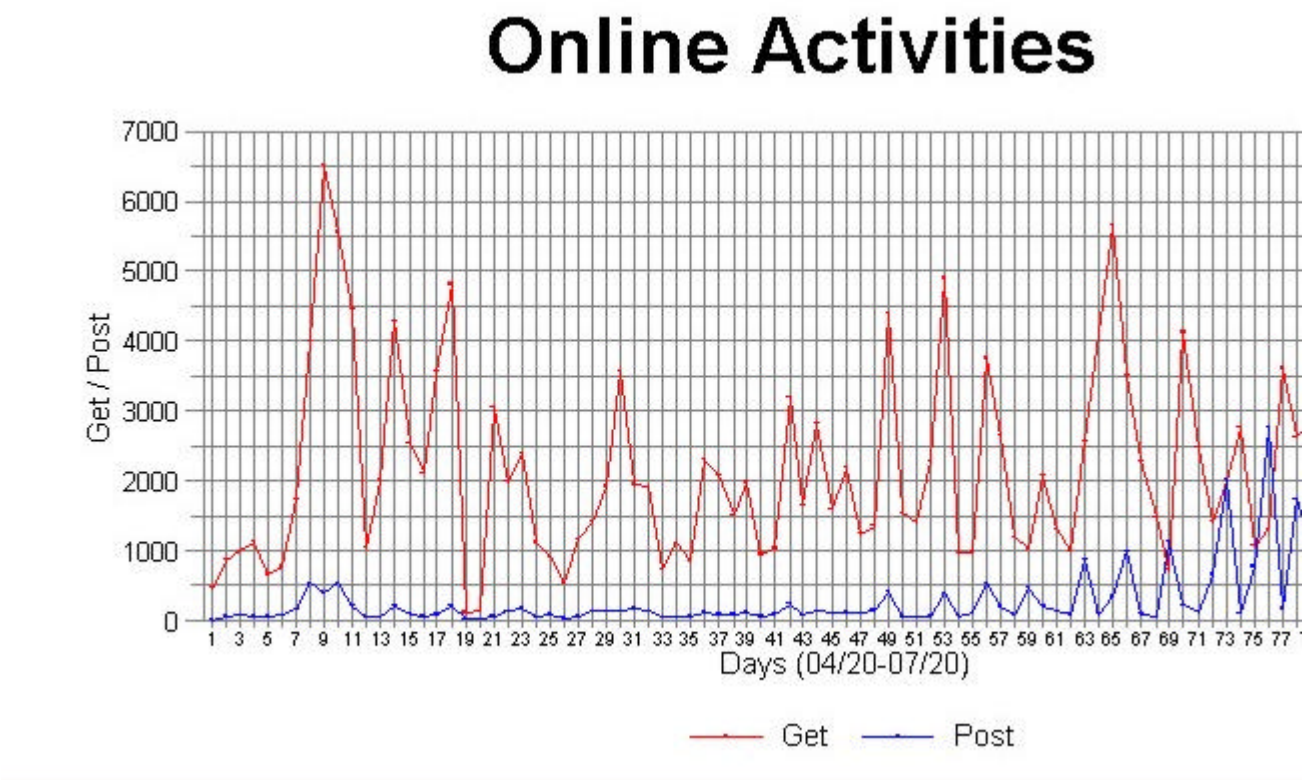

On a broad scale, collaboration takes place among students, between students and teams, and among team-members. Student collaboration needs to be organised and co-ordinated too. No learning environments are known in formal education, where students meet voluntarily in order to collaborate for performing certain certified tasks. Taking a closer look at the role of collaboration will show considerations to be globally viewed on four levels; On the students level within the course, on the team level within the course, on a local level and finally on an institutional level: i.e. collaboration between international universities.

The Online Seminar-environment different teams consist of some 30 individuals from many different countries. These team members are lecturers, agents, volunteers, former seminar participants and students doing research work. Most of today's volunteers in the moderation of group discussions are former students of the seminar. Several tightly bonded groups have been formed as a result of the seminar on varying levels. For example "Cyber Grannies" was formed by some of the student cohort during the 1999 seminar. Consider too, this paper is a result of collaboration between the principal project investigator, and two former students of the seminar who are now members of the team. Learning processes are also encouraged for the team - currently we are developing training for moderators. As you can see, design is complex and multi-faceted.

Learning within the environment is structured to be multi-leveled and complex. Learners are learning from the team, but also from other learners. The team is learning from learners and other team members and participating institutions are learning from learners, teams and other institutions. These complex webs of different learning levels are intimately related to the collaboration taking place across all these levels. Meta-learning is built into the design. Feedback has shown that learners rate this collaboration structure highly.

Designing and developing effective on-line courses requires attention to technical execution, adaptation of content and course concepts, attention to motivation, and must afford interactivity. Certain aspects are problematic. A vast investment of time during the development and the realisation of such on-line courses is mandated to maintain organisational and support activities. On-line support consisted of technical work as much as on-line mentoring support. Without the active help of professors and lecturers (occupied with content support, management and didactics) as well as a number of students who volunteered to help also during the on-line course the high goals set for the course could not heave been reached. We found that communication between participants needed to be regular and that those communication processes needed to be checked continually (several times daily) to detect possible problems and initiate immediate intervention to avoid negative outcomes. Given those facts, participant interaction and their mails have to be monitored constantly - even on weekends or else there will be a huge workload at the beginning of each week. This would not be manageable and

would affect the overall communication in the course negatively.




What has the Online Seminar accomplished so far? It is believed that progress to date has produced a very good test bed for investigation of the following aspects: the organisational methods for this kind of activity, methods of training teachers in online teaching, and how to use available resources more effectively. Experience also shows that it is necessary to count in the legal and economic factor as well. The next courses will start in Autumn 2002 with the financial support of the EU Minerva Action (Project "ikarus"). You are invited to participate at: http://seminar.jura.uni-sb.de

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## ELearning doesn't have to be lonely - learning online through Colloquia

A new degree, the BA Internet, Learning and Organizations [1], has begun at the University of Wales Bangor which, whilst it uses eLearning for delivery at a distance, is based on an essentially discursive model of teaching. Students' responses have been very positive about the experience and the model challenges the expensive, content-focused approach of much of eLearning. This article describes the theoretical background to our approach, and the experience of the first semester of the degree.

### Background

The Centre for Learning Technology (CeLT) [2], which developed and is responsible for the teaching of the degree, has extensive experience in developing tools and implementing e-learning in Higher Education, with particular expertise in the area of Virtual Learning Environments (VLEs) [3]. Many of the team are experienced teachers, and they have developed a pedagogical framework for designing and evaluating VLEs [4]. CeLT's approach is founded on systems theory and cybernetics, informed by Stafford Beer's Viable System Model (VSM) [5], and a conversational approach to learning. It has developed its own Virtual Learning Environment, Colloquia [6], informed by these theories. Colloquia differs from other VLEs in that embraces a peer to peer model, i.e. it is not based around a web server. The implications of this are (a) that students have the same software capabilities as teachers - they can initiate activities and discussions, and (b) it provides for a more private and intimate experience than server based systems.

The team has been responsible for promoting and supporting eLearning at Bangor for many years. Many of the problems institutions have experienced in implementing eLearning have resulted from the fact that they have not understood the three essential and interrelated aspects which must be addressed - the technology to be used, thepedagogical model, and the organizational structure in which these are embedded work. The last of these is usually the dimension to be missed. This three dimensional approach can be generalized to other implementations as well as is acknowledged by the British Computer Society[7].

The degree explicitly addresses the three areas identified - the Internet, learning and organizations. It thus provides us with a way of putting our theory into practice, and addressing the huge skills gap in this area.

### Teaching the degree

The degree is offered part-time, through distance learning. A small pilot group (19) was recruited and despite very low key advertising there was a great deal of interest. The students were located reasonably locally so that if things went awry we could call them in!

After a face-to-face induction weekend the degree has been taught completely online, and the teaching approach has been based on the best aspects of face-to-face learning with a great deal of regular contact between lecturers and students and between students themselves. A variety of learning materials are used and often personalized, and students and tutors can work at any time of day or night to suit themselves.

In common with the way that a face-to-face course is taught over a period of time with lectures and practicals, online material is sent in small chunks over time with discussion. The materials are produced using a 'low-tech' approach in that the teachers produce Powerpoint presentations with voice-overs and post these out regularly, along with a variety of readings and online web-based resources. But the most important part of the process is the ensuing conversation and debate that takes place, and the exchange of weekly tasks and activities. A further dimension is that Colloquia is available in the Welsh language, and students can, and do, work through the medium of Welsh when they wish. In a short space of time a high level of group identity has developed, with a great deal of mutual support, and at times moral support for tutors!

Those of us who are experienced teachers (one originally at Primary school level!) have found that Colloquia has allowed us to adopt an approach very similar to face-to-face teaching, with the focus on group discussion. This approach runs directly counter to the standard (perhaps extreme) view of distance learning as being primarily content-based, involving the receipt of a large pack of materials (paper, CD Rom or Internet based content) at the beginning of a course to be worked through individually at one's own pace, before perhaps being assessed through a multiple choice automated system. Common problems with this sort of approach are student isolation and high drop out.

### Students

The students range widely in background and age from unemployed individuals, grandparents, and teachers, through to local government officers and university employees. They have been a very enthusiastic group who have risen to the challenge of being on the pilot of the course and have, so far, been extremely positive.

> *I just wanted to let you know, that I am really enjoying studying this way, having spent the last few years in a more formal study situation, I really appreciate the flexibility being able to send my work whenever I want 24/7 at the click*

> *of a button. Being able to attend lectures, so to speak whenever I want to seems to make me more receptive to the learning, I thought it might be a little isolating but now it's all up and running there's quite a nice community feel about it too which is great.*

This course has embarked, somewhat quixotically, on a route which has had multiple developmental aspects - a new degree, a new form of delivery for Bangor, and an open access admissions policy. Many dimensions are therefore being addressed for the university leading to the adaptation of systems for recruitment, student support, assessment, network implications, access to the library, staff development, support for students' computers and so on.

**Results**

We have been very pleased with how well things have worked so far. Students have been very positive despite the steep learning curves involved, and the level to which the group has gelled and supported each other has been exemplary. Whereas typically it is expected that the highest levels of contribution to online discussions is up to a third we have had almost 100% participation and 'attendance' most of the time. We believe that this is because as a peer-to-peer system, Colloquia supports closed discussions which have a more private, intimate feel than web-based or other server-based systems. So far no students have left the course, and all the first assignments were handed in on time and often well before the deadline!

A pleasant surprise is how enthusiastic students have been about the Powerpoint presentations, which we felt were not 'glossy' enough, but they felt were personal and relevant to them.

There are currently high levels of interest in what eLearning has to offer, along with a concern to break down the barriers to Higher Education, but the cost and organizational implications of these are huge [8]. Many institutions are considering the adoption of a single platform, but the risks of making expensive investment mistakes are great. All VLEs have an inherent pedagogical model which may not suit all teaching in all subjects, nor allow lecturers the flexibility to teach as they wish. This course is developing a cheap, personal, communal, flexible and effective model.

> *I'm really enjoying the learning experience, and have already been able to link what I've learnt into my work situation. I can see flaws in systems and find myself "pulling things to pieces" (in my own head). I now look at things with new eyes.*
> *Here's to the next 4 yrs!!!*

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# Some Peculiarities of Distance Learning Development in Ukraine


## Abstract

The article deals with the author's personal point of view concerning the stages of distance learning development in general. It also gives a short background of distance learning development in Ukraine, as well as its peculiarities nowadays.


## Introduction

In Ukraine the process of DL development has long been practiced, primarily in the form of print-based correspondence courses since the late 1920s. From the early 1980s up to the present, emerging technologies facilitated the development of a new stage of distance learning, exemplified by many universities which combined television, radio and telephone with print. At Ukrainian universities there teams of instructors developing special programs for part-time students, textbooks, workbooks and other educational materials were formed in the 1970s. There were also instructors who had their practical classes for part-time students at regional or local TV and radio broadcasting stations or combined television, radio and telephone with print for the same purpose. There is a highly developed system of the 1st and 2nd stage distance learning in Ukraine. The two stages of distance learning have been co-existing in Ukraine up now. Currently our higher educational institutions are at the third stage introducing the Internet and World Wide Web into the educational process for our full- and part-time students, as well as for so called distance learning students who are taught using the newest technologies in the whole process of their studying at the educational institutions.

## Peculiarities of DL development

*Rich country - poor students*

Ukraine is known in the world for its rich chornozem (black earth) i.e. agriculture; industry: automotive industry, aircraft industry, rocket industry, Hlushkov Institute of Cybernetics other industries; nuclear power stations and, unfortunately, for the Chornobyl's disaster.
Nevertheless, in view of the present economic crisis there are many problems in Ukraine now. For example, many people are poor enough to study at our educational institutions, which necessitates a need in cheaper educational forms and technologies. They would prefer correspondence studies now with their present highest technologies - Internet and WWW, so called distant learning.

*Conceived: 1996. - Begun: 2000*

There was a possibility to develop the distance learning in Ukraine at least in 1996 or still earlier. However, it was not until the year 2000 that the relevant official order by Education Minister, enabling the higher educational establishments in this country to introduce the distance learning, had been issued. Two main state documents signed in the summer of that same year are sure to favor the development of distance education in this country, viz.: the Decree of the President of Ukraine and the Order of the Ministry of Education and Science of Ukraine to create the Ukrainian Distance Education Center.

*Science and technology: huge potential - deep crisis*

Many old and new universities are there in Ukraine. Among the oldest ones are the Kyiv Mohyla Academy (1632), the University of L'viv (1661), the University of Kyiv (1834), L'viv Polytechnic Academy (1844) and others.
There were 653 institutions of the first and second levels of accreditation and 298 institutions of the third and fourth levels of accreditation (institutes, academies, universities) in 1998/1999 with 503.7 and 1210.3 thousand students, accordingly.
But many of the graduates from those institutions are unemployed in Ukraine and have to work abroad, especially specialists in computer science and engineering, physics, chemistry and other fields of science and technology.
There is, for example, a large programmers' firm in L'viv that does research, develops software for foreign companies in this country and abroad but we have to buy distance learning systems from the USA or other countries.

*Modern communication lines: available - unavailable?!*

Over the last 5 years the possibility to connect to Internet has extended considerably in Ukraine. But there is a lack of modern communication lines in our cities, small towns, especially in villages because of the high cost of telephone lines, Internet access.

*Other peculiarities*

***The role of state- and non-state-owned higher institutions in DL introduction***. Only a few state educational institutions can afford purchasing modern computers, software and having an access to Internet. Non-state-owned higher educational institutions have more possibilities to organize distance education for their students.

At the very start of their activities state and non-state educational institutions used foreign experience in organizing distance education at their own institutions. At present they are compiling their own distance learning courses using our more than half-a- century rich experience in compiling textbooks and other educational materials for correspondence studies, TV - and radio courses for part-time students.

***Usage of DL elements in traditional studies.*** At present lecturers and instructors are widely employing audiocassettes, video-films, CD-ROMs, their own electronic textbooks, especially for part-time students as well as networked computer and language labs for full-time students.

***Teacher and student training for distance learning.*** To organize the distant learning courses the Ukrainian higher educational institutions need highly qualified instructors as well as students who could use the necessary equipment: computers, video-tape recorders, video cameras, etc for their training.

To this end, most of my colleagues at the Department of Applied Linguistics extended their qualifications during the retraining courses in the USA, Great Britain, Germany, France.

***Educational materials and eguipment for DL.*** It is common knowledge that a good teaching of any subject, including foreign languages, is impossible without effective textbooks, dictionaries, video and audio records as well as other educational materials. One of the ways of solving this problem is a compiling of educational materials in cooperation with our foreign partners. One of the first Ukrainian textbooks compiled together with our British colleagues from Coventry University was the textbook [1] for the first-year L'viv Polytechnic students. Now the distance learning course materials are being prepared on the basis of the joint projects with our partners from the USA, Great Britain, Germany, France and other countries.

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## Virtual Learning Communities: A Solution for Geographical Educational Systems?

**Introduction**

Taking the Learning Technology Newsletter as a showcase, I would like to expose an idea, a reflection that hangs about my head and in which I have been working for some time past.

In the last ten years, a pressing need for creating useful knowledge for the society has been detected in the Spanish Research Centres which are developing IRD projects. Insufficient levels of practical application of the knowledge obtained through research characterise the Science-Technology-Society System in Spain and, in general, in all Europe. It is essential, therefore, to make the collective effort profitable.

In order to spread the research realised all over the society, its technological and humanistic necessities must be taken into account at all levels, that is, local, autonomic, national and international; accordingly, the research must be of quality, well-known by its beneficiaries and transferable. Starting off from this fact, these Research centres have developed projects that aim at diminishing the time that it takes to transfer the new knowledge obtained through the investigation projects to the Spanish Society.

To the day of today, and it is my particular case, I have taken part in the development of an on-line technical e-education system that allows the transference of accumulated knowledge from the centres in which it is generated to target groups of potential users. This

system will equip with contents by means of batteries of courses and high technical level training modules that reflect the knowledge accumulated in investigations through the development of projects.

At the moment, this is my humble contribution to the convulsed match formed by the NCIT and the Formation field. I know where I am heading for and what I want to obtain to the day of today.

**The vision**

But I have gone further on. I feel captured by the idea of creating a virtual learning community, limited to a concrete geographic scope, like an independent community, in which the education system is regulated, in an occupational or continuous manner, and which allows the free sharing and interchanging of formative material, providing the necessary tools to turn it into new customised, didactic units to be used and enjoyed by each pupil and the teacher or trainer. This material can be published afterwards in a "traditional" format (better designed, structured, didactic after all).

***The strategic pillars of the vision***
The ones to be trained could make an strategic use of this idea of " community of virtual learning" that leans on two points:

1. the increasing importance the use of the new technologies of the information and the communication (from now on ICT) have acquired in the field of the "regulated" formation, both occupational and continuous;
2. the fact that the access to didactic contents and the interchange of them by the trainers makes it possible to carry out an agile and permanent adaptation in the process of class preparation on a daily basis.

Although the access of the Spaniard trainers to the ICT is greater and greater, it is also true that currently the possibility they have to publish courses in the network is certainly limited, due to the nearly non-existence of ample friendly to use tools which could allow them to build the online courses themselves.

On the other hand, being able to interchange formative material in a simple way and having a quick access to quality, acceptable information concerning concrete matters or subjects to be used as teaching material, occupational or continuous, is nowadays an authentic challenge for any trainer.

***The place of the student***
When it comes to the pupils that are to be trained, they are directly affected by such problems. Although access to the Network is getting ampler, the on-line formation supply is minimum, and this becomes the main source of waste of opportunities not only to develop it in the TIC but also to take advantage of the existing set of tools. The aforementioned advantages, many of them related to the future labour insertion possibilities , are therefore diluted, and this is one of the main reasons that encouraged me to support an idea of a regional level, autonomic community, similar to pilot project that allows the experiencing of this idea and its applicability and efficiency.

***Objectives of the Vision***
On one side, it would be very positive to get the trainers that are part of the education system could be able to, using the TIC:

- to deposit contents in an interchange community (metabase of data), in a fast and simple way;
- to update the didactic contents of its respective courses in an agile and friendly form, since they will be able to have contents deposited by other trainers supported by a training contents management tool ;
- to publish these courses off-line with a more attractive format, helped by a didactic methodology and an author tool designed specifically for this objective
- to publish their own courses online helped by a didactic methodology and a tool of author designed specially with this objective.

On the other side are the students:

- they benefit from the advantages of the online training (high interactivity, self-learning quota, easy accessibility).
- They learn and use the on-line communication and team work tools (forums, chats, lists).
- They interact with other students in the same situation, work, learn…

The benefits derived of the fact that not only the trainers but also the trainees can interact in a virtual learning community could be, between many other:

- Increase of the quality and the homogeneity of the formation in the geographical area;
- To open a direct communication channel between the trainers of that area, their students and both groups,
- To facilitate the access to the New Technologies and their daily use,
- Job creation through the appearance of new professional profiles like developer of didactic materials online, tutor/teacher online, etc.
- To introduce the multimedia and virtual reality systems in the knowledge transference.

**Beneficiaries/Target Group**

1. The target public of this community would be on the one hand, trainers pertaining to the educative system, not only those integrated in the network of regulated formation, but also those acting within the vocational and the continuous training system.
2. These individuals could be able to contribute training material of quality coming from their own agendas, experience and professional research; and as well, they would have available material coming from all the geographic scope in the learning community to update their material.
3. On the other hand we find the students of the geographical area, the integrated in the network of regulated formation, and those within the vocational and continuous training system.

**Conclusion or Summary**

As a conclusion, trainers should be aware of the fact that new technologies can really do something for us, that is, to give us wings to imagine new training models, and tools to experience new methodologies, and all this so that we can improve the quality of our education and at the same time to improve the formation of our students, because at the end, is all about that, isn't it?

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## Information Security in the Context of eLearning

**Abstract**

In this article I point to research results on how security of eLearning applications can be increased. The focus lies on information security and on threats specific to eLearning. Beside an overview of risks I cite other research work of how different weaknesses can best be addressed. Protecting eLearning basically includes the protection of content, exams and user profiles.

Considering the enormous costs involved in creating and maintaining courses, it is surprising that security is not yet considered an important issue by most people involved including teachers and students. Unlike traditional security research, which has largely been driven by military requirements to enforce secrecy, in e-learning it is not the information itself that has to be protected but the way it is presented.

**Security**

Traditionally, there are three fundamentally different areas of security, which are illustrated in Figure 1.

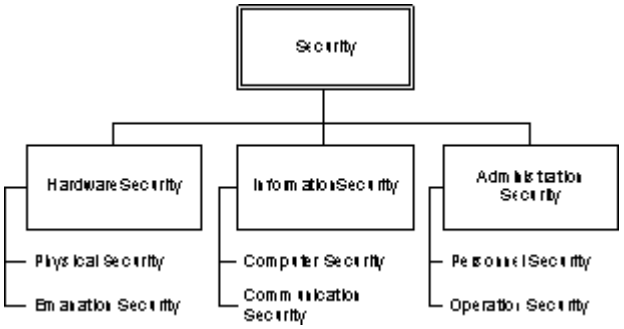


Figure 1: Categorization of areas in security.

Hardware security encompasses all aspects of physical security and emanation. Compromising emanation refers to unintentional signals that, if intercepted and analyzed would disclose the information transmitted, received, handled, or otherwise processed by telecommunications or automated systems equipment [NIS 1992].

Information security includes computer security and communication security. Computer security deals with the prevention and detection of unauthorized actions by users of a computer system [Gollmann 1999]. Communication security encompasses measures and controls taken to deny unauthorized persons access to information derived from telecommunications and ensure the authenticity of such telecommunications [NIS 1992].

Moreover, organizational or administration security is highly relevant even though people tend to neglect it in favor of fancy technical solutions. Both personnel security and operation security pertain to this aspect of security.

**Risk Analysis**

In this section I summarize the main security risks that eLearning can suffer from. Throughout this section I point to publications which address specific issues mentioned in this outline.

*Scope*

With the rise of mobile communication, it is an obvious step to provide training and learning opportunities - an important form of e-business - to people wherever they are. However, since eLearning material is a valuable asset that needs an appropriate level of security, protection must also encompass mobile devices. In "The Transition from E-commerce to M-commerce: Why Security should be the enabling technology" [Weippl 2001a] I have described the main reasons why security in eLearning will become more relevant in the future

*Interdependence*

It is not only possible, but even common practice for an ILT program that the content delivered is solely up to the teacher and the participants, the immediate managers, and the training provider. In contrast, even the smallest e-learning program requires a wider group of people. In most companies representatives from the information technology and human resources departments will be involved as well as an organization-wide task force. In many cases, especially for university or company wide programs, the scope of the project often dictates that there are more decision makers and stakeholders involved than in ILT programs.

"Developing Web-Based Content in a Distributed Environment" [Weippl 2001b] describes how such a project can be efficiently organized by separating development into a core team and satellite teams. The main benefit of this approach is to minimize communication overhead

*Content*

In addition to all the security threats inherent to digital communication, there are several issues specifically relevant to eLearning. [Weippl 2001c] describes "Countermeasures against Security Breaches in Web-based Training Environments".

One of the most pressing issues is the effective protection of digital content; as previously mentioned, the value of many digital goods lies not in the content itself but in the presentation; for instance, digital textbooks contain information that is readily available but the effective transformation to an interactive textbook is what is of real value in eLearning. In "An Approach to Role-Based Access Control for Digital Content" [Weippl 2001d] I describe which means of protection seem promising and what the drawbacks of existing approaches are. In "Content-based Management of Document Access Control" [Weippl et al. 2001] we describe how sensitive content can be automatically classified according to its content. This approach is especially useful when dealing with corporate education where - unlike in university teaching - some content may be restricted to certain job functions or departments (e.g. strategies for entering new markets).

Beside the protection of content, security issues relevant to exams and teacher evaluation also need to be addressed. "An Approach to Secure Distribution of Web-Based Training Courses" [Weippl 2001e] gives an overview of the specific security issues relevant in web-based exams and teacher evaluation.

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