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Communication, Coordination and Cooperation in Distance Education

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Introduction

The main driving factor for Web-based training is the necessity to find methods of bringing training directly to the desktop in a continuous just-in-time way. We need to understand how established instruction systems (eg: classrooms) can migrate to a more open organization, in which part of the lecture could perhaps be given according to the “dynamic community model for apprenticeship”.

A learning process, at any level of instruction and training, normally incorporates the following actions [1]: (a) establishing the objectives of the learning process; (b) finding and revising (or creating) instructional material; (c) assessing students’ level of knowledge; (d) assigning appropriate material to students; (e) defining the form of access students have to components/modules; (f) revising and following-up students’ progress and intervening when necessary; (g) providing and managing communication between student and instructor and between students themselves (synchronous as well as asynchronous); (h) assessing the learning process and (i) preparing reports of the results of the learning process.

AulaNet is a groupware learning environment based on the Web developed in the Software Engineering Laboratory (LES) of the Department of Computer Science at the Catholic University of Rio de Janeiro (PUC-Rio), for creating and attending distance courses. Currently AulaNet is available in Portuguese <www.les.inf.puc-rio.br/aulanet>, in English <english.les.inf.puc-rio.br/aulanet> and a Spanish version is being prepared. In this paper we present our cooperative approach for Web-based instruction. We also give a description of the AulaNet environment. Finally, we present our conclusions and the results we believe will be achieved in the future.

A Cooperative Approach to Web-Based Instruction

The majority of the available digital learning environments use the traditional school physical elements metaphor: corridors, blackboards, general office, classrooms, library and etc. We believe that learning and

the intellectual aspects of working are becoming one and the same thing, therefore, we are proposing a groupware approach, based on the idea that in order to cooperate, people have to become coordinated, and in order to become coordinated, people have to communicate. Hence, the key words of our approach are *communication*, *coordination* and *cooperation*.

The boom in the number of distance education environments should be partly credited to the Internet; a digital communication culture is growing. There are three Internet communication technologies essential to AulaNet, namely: electronic mail, the World Wide Web and videoconference. The digital communication culture is forcing a paradigmatic shift from the traditional push education that takes place inside the confined walls of an institution—inherited from the Industrial Revolution—to a pull-based educational system where choice and quality are very important. Therefore, the entertaining aspects of didactic materials will eventually become a decisive factor when students will go shopping for courses.

Actors

AulaNet considers that the following actors are involved in the teaching/learning process:

1. The Administrator facilitates integration between teacher/course/learner, and deals with matters of a predominantly operational nature, like enrolling students and other general office kind of tasks.
2. The student, now becoming the Learner is the final user of the course, representing the target-public, for whom the final product obtained by the use of AulaNet is intended.
3. The Teacher is AulaNet’s intended client. He is the creator of the course, who participates from the initial description until the content is entered. He may or may not be the person responsible for applying the course. If he is, then he also performs the function of the instructor, who may or may not have the help of a monitor, who deals with the practical aspects of the course and helps in assessing students.

It should be possible to create content without resorting to any kind of low level navigation features like

hyperlinks. The teacher, now playing the author's role, should use his usual text processor to prepare documents, and save them in AulaNet formats like HTML files. By doing this, the author just concentrates on his working subject avoiding the need to do any kind of Internet programming. Updating, re-using and migrating this material to related Web-based environments is made easy for the author.

The Teacher Interface

AulaNet offers teachers a pedagogic orientation, divided into 6 steps, to facilitate course creation and future updates. The first step is to provide general information about the course.

Steps 2 to 4 are devoted to selecting various mechanisms that will be converted into services—high level navigation facilities—for learners. AulaNet comes with a set of pre-selected mechanisms as a starting point for the teacher. He can always select and de-select mechanisms according to his pedagogic needs. The mechanisms in AulaNet, come under three group headings shown in the three following sections.

Step 5 is used to define a lesson plan for the course. Finally, step 6 is dedicated to inserting content into the lessons defined in step 5 in accordance to the various mechanisms selected in steps 2 to 4. Two points should be clarified about this step: (a) there is no need to configure selected mechanisms; and (b) inserting content means basically performing the same task that is required to upload a file in your personal computer running Windows. First the material is prepared and saved in a format accepted by AulaNet. Then, during content input for a specific service, the teacher is prompted to select the file that will be uploaded to the AulaNet server. Material could be prepared by the teacher using authoring tools or it could even be outsourced to third parties. What the teacher will need in step 6 is simply the resulting file.

Communication Mechanisms

They provide the means for communication between teacher and learner and among learners. AulaNet offers the following communication mechanisms: (1) **Contact with the Instructor** permits asynchronous communication between learners and teacher; (2) **Discussion Group** is a general discussion list for the course. Every posted message is sent to the learner's mailbox and also stored for future reading; (3) **Interest Group** permit threaded discussion about some specific issue like in Newsgroups; and (4) **Debate** is a synchronous communication mechanism that could be purely textual using a chat tool, or multimedia using low cost videoconference software.

AulaNet is a high-tech solution for low end users, and low bandwidth availability is a widespread problem,

especially for the so-called low end users who are normally connected to the Internet via modem using POTS. For this reason, AulaNet is geared to asynchronous rather than synchronous communication which is typically a bandwidth eater. Chat and low cost videoconference software are used to supply some form of synchronous communication. Apart from the bandwidth problem, synchronous communication is quite expensive and difficult to manage, like organizing a live videoconference at a specific time, involving people from all over the world living in different time zones. It is also reminiscent of the traditional school environment class schedule that we want to avoid.

Asynchronous communication on the other hand, uses less bandwidth, and enables the possibility of on-demand consumption, which, for instance, minimizes the aforementioned time zone problem. It also provides learners with the freedom of choice to schedule their learning tasks according to their own possibilities.

Coordination Mechanisms

The coordination mechanisms provided by AulaNet are for scheduling tasks and assessment. AulaNet offers the following coordination mechanisms: (1) **Agenda** is a mechanism for scheduling events like chats and announcing deadlines; (2) **Course News** is a billboard where news about the developments on the course are posted; (3) **Exam** permits the learner's assessment using exams; (4) **Work** permits the learner's assessment using works; and (5) **Exercise** permits the learner's assessment using exercises.

While Agenda and Course News are time-based coordination mechanisms, the others are competence-based coordination mechanisms.

Cooperation Mechanisms

They provide the means for cooperation between teacher and learner and among learners. In this case, cooperation [2] should be understood as the preparation of material by the teacher for the learners' consumption and also, in a constructivist way, making room available, for other people (invited teachers and learners) could prepare material that could be incorporated into the course later on. We believe, like the Zen master, that we should offer the *fish* and the *rod*.

AulaNet offers the following cooperation mechanisms: (1) **Slide** is a mechanism that permits the utilization of slides (PPT files) as certified course material; (2) **Recorded Presentation** [3] is a mechanism that permits the utilization of recorded presentations (RM files) as certified course material; (3) **Presentation Material** is a mechanism that permits the utilization of presentation material (PDF or HTML files) as certified

course material; (4) **Text Book** is a mechanism that permits the utilization of text books (HTML files) as certified course material; (5) **Bibliography** is a mechanism that permits the utilization of bibliography (URLs) as certified course material; (6) **Demonstration** is a mechanism that permits the utilization of demonstrations (GIF, JPG, RM files) as certified course material; (7) **Instructor Co-Authorship** is a mechanism that allows the teacher to invite other teachers to be co-authors of the course; and (8) **Student Co-Authorship** is a mechanism that allows the teacher to assign students to prepare materials for the course that will have to be later certified by the teacher.

The last two cooperation mechanisms, **Instructor Co-Authorship** and **Student Co-Authorship**, are of a different nature. They make it possible for the teacher, to invite other teachers and also learners, to share his teaching workspace, in order to build knowledge together.

The Learner Interface

The learner's empowerment is epitomized by the remote control. It offers the menu of services—high level navigation facilities—tailored by the teacher's previous selection of the communication, coordination and cooperation mechanisms. Learners are very familiar with remote controls for their pervasiveness in home electronic appliances. Using the remote control, learners choose between different services like contact with the author, discussion lists, interest groups, and agenda etc.



Figure1: The Learner Interface showing the remote control

Figure 1 above shows the learner interface for an AulaNet course lecture. In this specific case, the authors used all the possible materials allowed for the lecture workspace.

AulaNet deliberately does not offer any kind of synchronization between different material, on purpose, because we believe that the learner should be in control. A learner could place the video on the background and

just listen to it, restart or advance the video presentation, close the video window, move the frame division separating slide from the presentation material to maximize the view of one or the other, among other options to optimize the monitor screen area according to his needs.

Conclusion

AulaNet differs from the majority of digital learning environments available, because it is based on a groupware approach—*communication, coordination and cooperation*—while most of the other related environments virtualizes the traditional school physical elements metaphor: corridors, blackboards, general office, classrooms, and library etc. A preliminary comparison with related environments is shown elsewhere [4].

The main beneficiary of this environment is the teacher. With AulaNet the teacher does not need to know any kind of Internet programming languages to create, update and give distance courses. AulaNet fosters the separation of content from navigation releasing the teacher from the programming task. The learners—active students—also benefit from using the environment. Instead of low level hyperlinks, the navigation is provided by a menu of high level services, that help reduce the lost in hyperspace problem.

Our aim is to provide knowledge building environments for communities that share the same kind of interest. In this way, AulaNet is being tailored for the workplace set-up, because, as previously mentioned, it is an environment for both learning and working, i.e. an environment for creating and managing knowledge by a group of people.

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