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The Development and Application of Distance Learning Courses on the Internet

HUGO FUKS, MARCO AURÉLIO GEROSA & CARLOS JOSÉ PEREIRA DE LUCENA
Software Engineering Laboratory, Computer Science Department, Catholic University of Rio de Janeiro, Brazil

ABSTRACT: *This paper presents the methodology, results and difficulties encountered in the development and delivery of a course through the Internet. The course, which is about the application of information technology to education, is being delivered using the AulaNet environment, which is groupware for the creation, participation and maintenance of Web-based courses. A model for group work is provided. This paper also shows how this kind of environment can be used to provide support, and to facilitate and manage cooperative learning.*

Introduction

Society is changing. The rhythm of the production of knowledge and new telecommunication technologies are changing the way humanity lives and works (Harnad, 1992). Knowledge workers are in ever-greater demand. Besides possessing the knowledge necessary to do their jobs, workers must also have other, perhaps more important, skills (Twigg & Millof, 1998). They must learn how to learn so that they are continuously able to adapt to the constant evolution within the work environment and to the tools of their trade. They must learn to work within a group, which is one of the aspects most required today by corporations. And they must learn how to creatively change an old knowledge set into new knowledge, the most important element in modern institutions.

The changes in work patterns are also noticeable within the field of teaching (Lucena & Fuks, 2000). In order to acquire the new skills demanded by the new work concept, education is undergoing a process of adaptation. Use of the Internet makes cooperative learning easier to implement (Hiltz, 1998), allowing for a rich exchange of information between members of a knowledge community.

Despite the fact that the Internet brings us innumerable possibilities and facilities for teaching/learning, there are also many difficulties associated with it. For instance, if the institution does not provide its teachers with support for Web content development, they must learn technologies that normally are not part of their field of study, such as *HTML*, *Java*, *JavaScript*, *XML*, *Flash*, *HTTP* and others. In order to get round this problem, they can use environments like the AulaNet that separate content from navigation. This permits teachers to concern themselves with the production of educational content, using habitual tools such as word processing programs, while letting the environment worry about learner management

and navigation. Moreover, these environments offer integrated communication, coordination and cooperation services that can be added to the course as it proceeds, in order to supplement it.

It was with this scenario in mind that the Information Technologies Applied to Education (ITAE) course at the Catholic University of Rio de Janeiro was designed and is being delivered. Its purpose is to get students to learn to work with information technology as a group, turning them into Web-based educators (Khan, 1997). The class has been conducted since 1998 as a regular course and currently is wholly taught via the Internet through the AulaNet environment.

In this paper we report on the methodology that was used, the results that have been obtained, and the difficulties that have been encountered in the development, delivery and integration of the course with the environment.

ITAE and its AulaNet Environment

The AulaNet (Fuks, 2000) is an environment based upon a groupware approach for the creation, delivery and administration of Web-based courses whose development has been carried out since June 1997 by the Software Engineering Laboratory of the Catholic University of Rio de Janeiro. This groupware approach has a fundamental role in the ITAE course since the cooperation between the learners in a class—the groupwork—is more important than the individual study of the content of the course (Gokhale, 1995). Also since ITAE teachers also coordinate the AulaNet project, the ITAE serves as a platform for trying out ideas and for testing new functionalities in the environment, perfecting the AulaNet-ITAE relationship and vice versa.

In AulaNet courses teachers can have two different roles: coordinator and instructor. The coordinator's role is to author the course, defining and configuring the content and the services that are made available to learners. The instructor is the person who animates the group, maintaining order, motivating and evaluating learner interaction.

The AulaNet environment offers a standardised interface for taking courses on the Web. This interface is made up of a menu that is presented graphically as a remote control unit, which provides access to the course's services, and windows where the learner interacts with the course's contents, with the instructor and with the other learners.

The thinking that guided the design of the AulaNet and the ITAE is that for group learning an individual must share ideas (or communicate), be in tune with the other participants (coordinate), and carry out tasks in a satisfactory manner (cooperate) (Fuks, Laufer, Choren & Blois, 1999), (Figure 1). All AulaNet services are based upon these concepts. The services are placed at the disposal of teachers during the creation and updating of a course, permitting them to select those that they want to make available to the learners, and configuring them within the course's workspace. In ITAE, the services are added to the course as it unfolds in order to smooth the absorption of the environment by the learners.

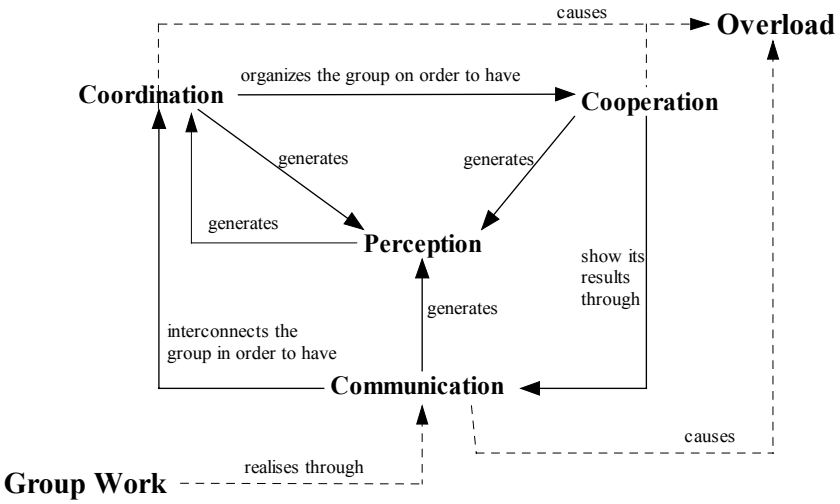

Figure 1: Modelling group work [Fuks & Assis, 2001]

Communication services

The communication services provide the facilities that permit the exchange and sending of information (Gay & Lentini, 1995). These services include tools for individual electronic mail exchange with the instructor (Contact with the Teachers), and with the entire group (Discussion Group), an asynchronous text discussion tool in a forum style (Interest Group), a synchronous text conference tool popularly known as "chat" (Debate), and a tool for the instantaneous exchange of messages with participants who are connected to the course (Contact with the Participants). Since ITAE is a course that is based mainly on participant interaction, it uses all of the communications services.

Contact with the Teachers is a channel for contacting members of the course's teaching staff. The messages are sent through electronic mail to the instructors or coordinators, depending upon the learner's choice, and are kept available in the environment for subsequent consultation. The ITAE's students use this service to resolve operational doubts and to make comments or complaints that are not relevant to the other participants. When the subject of the message is of interest to the entire class, the learner is asked to use the Discussion Group or Interest Group services.

The Discussion Group service acts like a mailing list and is used to communicate with the entire class. When a message is posted on this service, besides being filed within the environment, it is sent to the electronic post office box of all members of the group. As a result everybody is aware of the activities of the Discussion Group, even if they do not enter the environment. In the environment the messages are shown as a chronologically sorted list. This service was used for the discussion of the course content and for coordination messages from the instructors.

The Interest Group operates like a conferencing system where it is possible to answer a message, and the answers are attached below it forming a threaded discussion. This structure permits the organisation of a discussion by topics, with related messages remaining compartmentalised below the original topic message. This is different than the Discussion Group service where messages about different topics are mixed together, often making it hard to reconstruct the linkages. In the ITAE, the Interest Group service is used to develop course themes, and topics selected by the class itself, in depth.

The Debate service is a real-time conversation through text chat. In the ITAE, the topics are divided into classes and the Debate is used for weekly discussions. Since it is a synchronous communication tool (Long & Baecker, 1997), everybody has to be connected at the moment of the debate. For this reason, before beginning the course, the learners are informed about the time slot that has been reserved for debates.

Finally, the Participant Contact service is the only tool that is used by the ITAE without having a specific purpose. It lets members of a group who are simultaneously connected to the environment contact each other through messages that open up in new windows, like the popular ICQ (ICQ, 2001). Some uses for it that have been seen are individual communication between members during a debate, the request for information and the resolving of doubts.

Coordination services

Coordination services provide the means for managing the group's agenda and competence. These services include a notification tool (Notices), a tool for the basic coordination of the flow of the course work (Lesson Plan), evaluation tools (Tasks and Exams), and a tool for monitoring group participation (Follow-Up Reports). The ITAE course uses the following coordination services: Lesson Plan, Tasks and Follow-Up Reports.

The Tasks service is used to assign work to learners. The AulaNet manages task resolution file submissions and lets the instructor make assessments and comments. In the ITAE, this service is used to assign final monographs at the end of the course. The environment permits configuring so that a learner's task resolution is visible to the others. This is allowed in the ITAE since monograph themes are all different, and having access to papers produced by colleagues motivates those who are developing their own topics, thus enriching the learning process of the entire class (Burd, 1997).

Teachers use Lesson Plan to structure the course's educational materials, separating them into classes. These classes follow an order that is suggested, but not imposed, indicating a basic flow for the course. In the ITAE the lesson content is made up basically of video streams, slide presentations, and supplementary texts, that learners may consult at any time. The environment allows learners to take private notes on a class (like using a notebook) that remain on file for their personal viewing.

The Follow-Up Reports make the quantifying and qualifying of learner participation possible. Figure 2 shows the evaluate button in the instructor interface of a message from the Interest Group, and the grade selection screen.

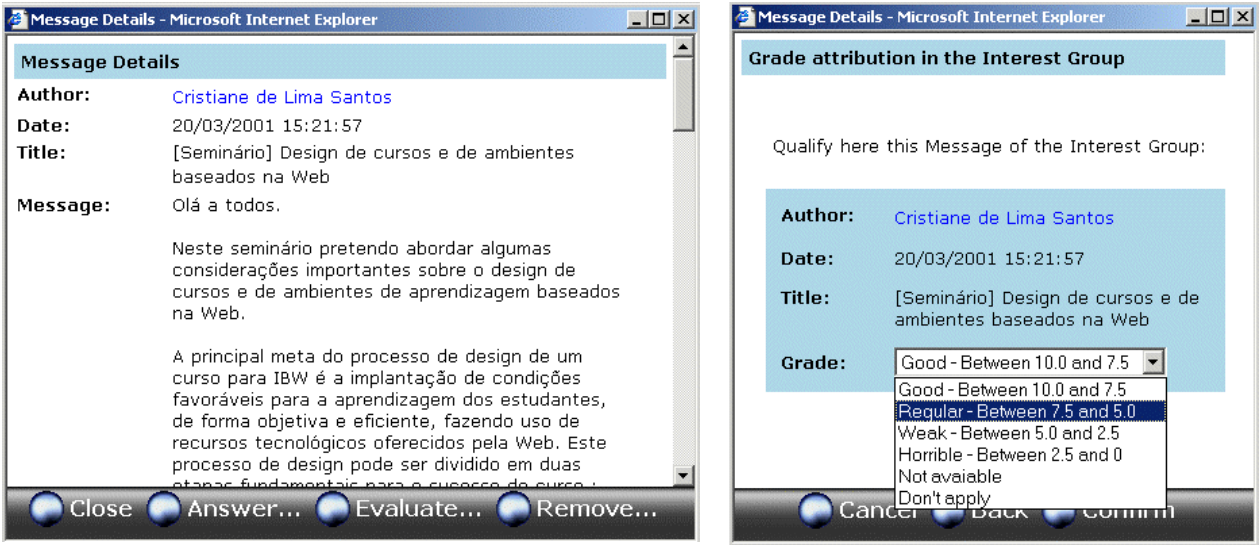

Figure 2: Instructor interface for a message showing the possibility for handing out a grade

Cooperation services

The cooperation services provide the means for cooperative learning (Harasim et al, 1997), problem resolution, and course co-authorship, both for teachers (Teacher Co-Authorship) and for learners (Learner Co-Authorship). The cooperative services also include a list of extra contents that are not associated with any specific lesson (Documentation), and references to textbooks (Bibliography) and Internet pages (Webliography). The ITAE uses Bibliography, Webliography, Documentation and Learner Co-Authorship cooperation services.

The Bibliography, Webliography and Documentation services are another means, besides the Lesson Plan, through which the teacher can present educational content to the learners. The Learner Co-Authoring Service is used to permit learners to supply new content to the course.

Course Methodology Evolution

The ITAE course summary covers the following topics: groupware concepts, digital communication, Web-based instruction (WBI), learningware, interactive multimedia, learning environments, education in the Internet 2 project, and knowledge communities. The objective of the course is to train educators to use the new technologies for teaching/learning, and to develop a community of persons who are interested in the subject.

First presentation of the course

The course was taught for the first time during the first half of 1998 and its structure has been evolving ever since. Initially the course structure included a weekly live class and a debate via the Internet, using the AulaNet's integrated chat tool. This embryonic version of the ITAE served to generate educational content for the course. Content was produced by recording the teachers' presentations during the weekly live classes (Laufer, Fuks & Lucena, 1998) and through the use of the transcripts of the chat sessions. As they were generated, this content was made available within the environment so that learners could access it at any time and from any computer connected to the Internet.

Besides serving as a repository of educational content, the environment also supplied tools for group communication through the Discussion Group, Interest Group and Contact with the Teachers services. The Discussion Group was used by means of a vote to choose the five central topics that would be discussed in the Group Interest forums. At the end of the period, each participant had to prepare a report summarising the discussion generated by one of the themes. Final evaluation of the learners was based upon the amount of participation and the quality of their contributions (McConnell, 1994).

Course contents

The first presentation was an interim arrangement prior to the second when the course was taught totally at a distance beginning in the second half of 1998. During presenation the only event that is scheduled with a date and time is the weekly debate, through the chat service, when previously studied content is discussed. Every presentation takes advantage of the content produced in the previous semesters (with some adaptations) and this remains available within the environment for learners during the entire course. This demonstrates the evolutionary aspect of the generation of a community—that is, the passing along of an existing culture and evolution for new participants.

In order to help in the generation of content for the course, in some of the presentations the learner's final task is to prepare a new class or paper on a theme discussed in one of the Interest Groups, using the necessary resources (slides, text, images, video, HTML pages, etc.).

In the fifth presentation the learners began to complain that the course content was out of date. Some references made to Internet pages in slide presentations were no longer valid, and some information in the content was no longer current.

Organisation of participants

In the second presentation, besides the regularly enrolled students, the course was also followed by outside individuals interested in the topic or the manner of delivery. This resulted in having a total of 100 learners. The excessive number of participants made it difficult to prepare a cooperative learning process that could count upon everyone's participation. Since the course is based upon interaction between participants, hundreds of messages were posted weekly in the Discussion Group service, making the task of reading them all before the debate an arduous one. To solve this communication overload problem (Fussell et al., 1998), since the third presentation the learners have been divided into smaller subgroups of no more than 25 participants, each with its own teacher-facilitator.

In general, it was also noted in the second presentation that the students who were enrolled on the course and who consequently would be graded according to their work, participated more than the others. One of the classes of the third presentation, comprised of students who were not regularly enrolled, did not live up to expectations; they left some activities unfinished, and some debates were cancelled for lack of a quorum. The presence of "tourists," students who entered the environment on an occasional basis, inhibited some participants. The lack of a grade or a payment that served as a commitment for participation can bring unexpected effects in terms of the lack of interaction (Thorpe, 1998).

Participant stimulation

To encourage greater learner participation, every student was designated a seminar leader for one of the weekly class topics. This individual was responsible for researching into the discussion topic, and preparing an essay presenting his point of view about the theme. Each of the other learners prepared their own contributions for the Seminar, delving in greater depth into an aspect of the topic. Another function of the seminar leader was to coordinate and animate the Debate together with the instructor, encouraging learner participation, proposing topics, and maintaining the focus of the discussion. Since one of the objectives of the ITAE is to train instructors to teach courses via the Internet, nothing could be better than to learn by doing.

To help the teacher accompany the students, and to make it possible for the learners to evaluate their own level and quality of participation, follow-up reports were developed on the AulaNet presenting information about the quality, quantity and type of participation (Dushastel, 1997). As qualititative information cannot be extracted automatically, participation has to be evaluated by the instructor. He has to grade individual participation in the debates, and the messages in the Discussion Group and in the Interest Group.

The message evaluation provided feedback to the learners regarding their contributions, as well as a point of reference for other learners. Knowing they were being evaluated, the learners worked hard to obtain good grades on their messages, which led to an improvement in the quality of the contributions in comparison to the previous presentations when the evaluation had not yet been adopted. Despite this positive effect, the message evaluation system also generated adverse comment within the group. The main complaints were about lack of knowledge of the judging criteria, the lack of teacher comments about positive and negative aspects of the work, and the possible effects inhibiting learners from sending in contributions, knowing they were being graded.

Introduction to the course

To break the inertia and initial fear of the participants, and bring them closer together as a group, since the fifth presentation of the course the learners have been asked to introduce themselves to the group during the first week. They are asked to discuss why they are taking the course, their name and occupation, their expectations, and their previous experience with the subject matter.

In order to help learners understand how things should be done, leadership of the first seminar is assigned to an instructor on the topic, “Introduction to the AulaNet Environment and the ITAE course”. During this seminar the service environment and methodology is explained, as well as the behaviour that is expected from the participants. In this first seminar the learners have the opportunity to make free use of the environment in preparation for the later discussions on the course’s subject matter.

Message Categorising and Structuring

Seeking a better organisation for the large volume of messages, message categorising was implemented on the AulaNet. The coordinator chooses desired categories and, upon sending a message, the participants have to select the one that most reflects their intention. In the fifth presentation of the course, the first time this feature was available, the following categories were chosen for the Discussion Group: *Presentation*, for the participant’s self presentation;

Seminar and *Contribution about the Seminar*, for messages from the seminar leaders and contributions to them; *Operational Problems*, to report on problems; *Question*, *Position* and *Argumentation*, for discussion of topics through questions, answers and explanations; and *Generic*, for messages that did not fit into any of the aforementioned categories. The use of categories made the messages more organised, also making it possible for participants to identify the content of the messages much more quickly.

The result of the Discussion Group service is shown in Table 1. In this presentation of the course, the group comprised seven learners and one instructor. The table shows that participants were initially euphoric, generating on average 12.5 messages during the first two seminars; then there was stabilisation during the next eight seminars, at approximately 8 contributions each; and then a brusque decline at the end of the course (an experience also reported by Salmon, 2000).

Item	Subject	Total	Instructor	Learner	Presentation	Seminar	Contribution	Operation P.	Question	Position	Argumentation	Generic
1	Presentation and farewell	**10**	1	9	9	-	-	-	-	-	-	1
2	Group motivation	**9**	9	-	-	-	-	-	-	-	-	9
3	Course information and methodology	**16**	16	-	-	1	-	2	-	-	-	13
4	Notices about new tasks	**6**	6	-	-	-	-	2	-	-	-	4
5	Event notices	**25**	25	-	-	-	-	-	-	-	-	25
6	Operational problems	**8**	2	6	-	-	-	8	-	-	-	-
7	Discussion about the course	**33**	5	28	-	-	-	-	9	5	2	17
8	Discussion about content	**3**	1	2	-	-	-	-	2	-	-	1
9	Seminar 1 (Groupware)	**14**	1	13	-	1	13	-	-	-	-	-
10	Seminar 2 (Digital Communication)	**11**	-	11	-	1	10	-	-	-	-	-
11	Seminar 3 (WBI Concept)	**7**	1	6	-	1	6	-	-	-	-	-
12	Seminar 4 (WBI and the classroom)	**5**	1	4	-	1	4	-	-	-	-	-
13	Seminar 5 (Learningware)	**9**	-	9	-	4	5	-	-	-	-	-
14	Seminar 6 (Teaching and learning)	**10**	-	10	-	1	8	-	-	1	-	-
15	Seminar 7 (The roles of the facilitator)	**8**	-	8	-	2	6	-	-	-	-	-
16	Seminar 8 (WBI and multimedia)	**8**	-	8	-	1	7	-	-	-	-	-
17	Seminar 9 (Design in WBI)	**9**	-	9	-	1	8	-	-	-	-	-
18	Seminar 10 (Environment features)	**7**	-	7	-	1	4	-	-	-	-	2
19	Seminar 11 (The environments future)	**4**	-	4	-	1	3	-	-	-	-	-
20	Seminar 12 (Setting up WBI)	**2**	-	2	-	1	1	-	-	-	-	-
21	Seminar 13 (Knowledge communities)	**1**	-	1	-	1	-	-	-	-	-	-
	TOTAL	**205**	**68**	**137**	**9**	**18**	**75**	**12**	**11**	**6**	**2**	**72**

Table 1: Classification of Discussion Group messages by subject matter

Analysing the data in Table 1 we note that basically there were two groups of messages: 107 messages were about the course itself (items 1 to 7) and 98 messages were about content (items 8 to 21). Since these two types of messages were sent to the same list, the messages were intermingled, making the list disorganised.

Table 1 also shows that the participants discussed the subject matter among themselves on a cooperative basis (items 8 to 21), with very little intervention on the part of the instructor. The messages from the instructor for the most part (94%) regarded coordination (items 2 to 7). Both the learners and the instructor were active during the discussion of the course (item 7).

The discussion of the course encompassed all of the messages that represented suggestions, doubts or questions about the methodology; the selection of topics for the Interest Group; doubts, criticisms or suggestions about the environment; the possibilities of a face-to-face meeting; and other messages about the running of the course unrelated to course content.

In the sixth presentation of the course, in an effort to solve the problem related to the lack of structure and organisation of the Discussion Group, discussions about course content were transferred to the Interest Group service. A new forum was created for each lesson and the messages were organised and compartmentalised there. The Discussion Group service was basically left for group coordination.

The categories *Presentation*, *Operational Problems* and *Generic* were maintained in the Discussion Group service. As can be seen in Table 1, 96% of the generic messages were used for discussion about the course or for coordination messages from the instructor. In order to reduce the number of generic messages, a *Notices* category was created for notices, *Monograph* for messages related to the student's final paper, and *Evaluation* for the learners to assess the course.

Categorising of messages was also adopted for the Interest Group service. The categories *Seminar*, *Contribution about the Seminar* and *Question* were transferred from the Discussion Group. The categories *Position* and *Argumentation* were condensed into a new category named *Argumentation* and a *Counter Argumentation* category was created for messages that oppose arguments. Finally there were the *Doubt* (for questions that do not generate debate), *Clarification* (to resolve doubts and misunderstandings), *Case* (for exemplification) and *Generic* (for messages that do not fit into any other category) categories. The number of messages for each category and a comparison with the previous semester can be seen in Table 2, where DG means Discussion Group, IG is Interest Group and the number in parenthesis is the category's quantity of messages. This presentation had 7 learners and 3 instructors enrolled in the course.

Fifth Presentation	Sixth Presentation
DG – Seminar (18)	*IG - Seminar (13)*
DG – Seminar Contribution (75)	*IG - Seminar Contribution (33)*
DG – Presentation (9)	**DG - Presentation (12)**
DG – Operational Problem (12)	**DG – Operational Problem (14)**
DG – Question (11)	*IG – Question (65)*
DG – Position (6)	*IG - Argument (129)*
DG – Argument (2)	*IG – Counter Argument (26)*
DG – Generic (72)	**DG - Generic (20)**
IG – Generic (90)	*IG - Generic (12)*
	IG - Doubt (7)
	IG - Clarification (25)
	IG – Case (2)
	DG - Assessment (18)
	DG - Notice (50)
	DG - Monograph (20)
Total: 288	**Total: 446**

Table 2: Comparative use of categories in two presentations of the course

The transfer of the topic on course content from the Discussion Group to the Interest Group made it possible to increase the discussion of the course subject matter, raising the average

number of messages per seminar from 7 to 24. Since new categories for discussion appeared, the learners discussed these, and the rule about making a *Contribution* during the weekly Seminar was relaxed, diminishing the number of messages in this category from 75 to 33.

The possibility of nesting messages significantly favoured the use of categories aimed at the discussion of topics. The quantity of messages that were posted in the *Question*, *Argument* and *Counter Argument* categories in the 2nd semester of 2000 (220 messages) was 11 times greater than the quantity of messages in the Question, Position and Argument categories during the 1st semester of 2000 (79 messages).

The *Case* category practically was not used at all and there was a significant decline in the quantity of *Generic* messages in the Discussion Group (72 to 20) with the adoption of the *Notice* category.

The quantity of the messages in the *Seminar*, *Presentation* and *Operating Problem* categories practically did not change from one semester to another. This fact had been expected since there was no change in methodology that could have justified the favouring or restriction of the use of these categories.

Considerations regarding the ITAE course

Now let's look at some of the observations and conclusions that were obtained over the six presentations of the course, and that may be useful in order to prepare and perfect distance-learning courses via the Internet.

Cost of development, updating and delivery

In principle, the time and effort needed to develop good educational content are substantial and possibly prohibitive. In order to develop attractive content, besides understanding of the subject matter, other skills are required for teaching, such as knowledge of graphic design techniques, which the teacher generally does not possess. The ideal situation is for the teacher to have the support of a team that has such skills. Nevertheless, a team of this type requires a high level of financial resources. Since the ITAE does not have such resources, it was developed over time and a large portion of its educational content was re-used and added to with the help of the learners. The re-use of content for new presentations amortises the initial production costs over time.

Regarding the updating of the content, the major obstacle that was encountered was the difficulty in editing video and sound streams due to the complexity of modifying only part of a speech without having to re-record the entire talk. Media such as text and slide presentations do not present this type of problem. External Internet page references also generate problems; since the Internet is in a state of continuous mutation, from one minute to the next the reference can cease to be valid and there is no way the instructor can constantly check all of the references.

The cost of monitoring the learning process, moreover, uses up a lot of the time of the instructor, who must accompany, assess and motivate the learners and answer their doubts, which because of the relative ease of sending a query are usually in greater volume than in live teaching.

Communication Tools

The Discussion Group, which is based on a mailing list and on every participant receiving the messages of the service in his mailbox, is suitable for notices, discussion about the course and other coordination messages.

The Interest Group is suitable for the course's topic of discussion since it makes it possible to organise the messages into topics as well as structure the argumentation. As for the Discussion Group, it is an asynchronous communication tool where the participants have more time to prepare their messages, which therefore are usually more elaborated and complete than the ones from the synchronous services such as Debate.

During the debate, given that the time to answer questions is limited, in general the contributions are short, not well elaborated, and full of abbreviations and typing mistakes that are tolerated as long as they do not distort meaning. As a participant writes a message while other messages are being written and sent, the topics intermingle and are easily changed, making it difficult to discuss any single topic in depth. Thus a debate theme is widely discussed, but only superficially and usually sticking to the most polemical topics.

Learner participation

With very few exceptions, the participation of the learners during the course has been satisfactory given that the course methodology requires their intense participation. But there are times when the level of interaction begins to decline, requiring the intervention of the facilitator, who needs to send out motivational messages to individuals or to the group. Other factors that harm the level of participation are the difficulty of using the environment and the necessary technology, and the inhibition of learners who are afraid of exposing themselves. The facilitator must maintain order and evaluate and correct mistakes, but also must take care that these attitudes do not inhibit learner participation.

Group size and overload

The first classes in the course, with over 100 learners, were not satisfactory in terms of interaction. But in order to monitor the progress of individual learners and to maintain order in the communication services, we currently understand that the number of learners per class should not surpass 25, and when the participants are particularly active, this number should be around 15. The service most harmed by a large number of participants is the Debate, where participants all write in at the same time.

Evaluation of the learning process

Evaluation of learners in the ITAE is based on their participation and the quality of their contributions over the period of the course (Hodgson & McConnell, 1995). Although the AulaNet contains evaluation services in the form of exams with questions, the ITAE did not make use of this service in order to evaluate learners based upon cooperative rather than individual tasks.

Evaluation in the ITAE sought to involve the learners in a group process (Mason, 1995). However, to make an evaluation that is based upon contributions is an arduous task. The teacher must constantly keep up with the group in order to be able to verify the quality of the contributions.

Evaluation of the course by the learners

On request of the instructors, six students from the fifth, and eight from the sixth presentation of the ITAE, evaluated the course. This evaluation was not mandatory, and the learner could speak freely about the course. The learners mainly raised issues about their individual level of satisfaction, the content and methodology, participation, and the environment. Below we summarise their comments.

For the majority of the ITAE learners, it was their first experience with Internet-delivered education. Some said that before the beginning of the ITAE they had some doubts and qualms about whether it was possible to take a quality course via the Internet. The learners reported that despite the sensation of freedom and the facilities provided by education via the Internet, the responsibility, the level of participation, the commitment and the time dedicated to the course were greater than they had imagined. They also recalled that the difficulties and mistakes they noticed helped the learning process, in that the positive and negative points were observed and debated.

In general, the learners liked the content and thought the subject matter had been well selected. One point that was strongly emphasised was the variety of content formats: video streams, text and slide presentations, so that learners could choose the form that most pleased them (Laurillard, 1993). The only reservation was the difficulty in watching videos during peak time on the Internet. Although they liked the content, the learners affirmed that the learning process occurred mainly during the exchange of points of view and experiences with other learners. Furthermore, in relation to content, the learners reported some problems with the Internet page references as well as some out-of-date or incomplete information. One observation cited by a number of the learners was that there was an insufficient number of Internet references. The idea is that the course should supply only some initial references and the learners must find others in order to prepare their seminars and contributions. As a result, the references consulted by each learner, in general, are different from those found by others. Some learners, who were new to the field of information technology, complained about the excessive use of technical terms and suggested that a course glossary be created.

According to some participants, the repetition of the same scheme each week, and very similar subject matter, contributed to a decline of interest over time. Suggestions were made to vary the methodology, including the adoption of a two-person format for papers and seminar leading, allowing individuals to take turns over the period as a way of enhancing the interaction between learners. Another suggestion was to invite well-known personalities in the subject matter under discussion to participate in the debate. The learners also stated that the heterogeneous set of activities (seminars, contributions, debates, interest groups, monographs, etc.) permitted a major involvement on the part of the participants, and allowed them to assimilate content in a more constructive manner. It was also reported that the obligation on the part of learners to prepare a seminar and contributions to the seminars contributed to both individual and group learning.

The learners reported that the participation of the instructors in conducting the group had been good, praising, motivating, demanding and criticising when necessary. However, they complained that the instructors should participate more actively in orientation of the discussions regarding the content of the course, instead of merely observing and evaluating. The learners thought that this posture, instead of working as an incentive, inhibited them. This view was cited by 33% of the learners. They also reported that the act of only grading

messages without providing an explanatory comment and personalised tips not only did not aid the learning process, but also caused fear and insecurity.

Evaluating their own participation, the learners reported that they participated sufficiently but would have liked to participate even more, but that personal problems restricted the time they had available for the course. They thought that at the beginning the participation was very impulsive, and that they became more reflective as they gained more maturity. According to them, one factor that acted as an incentive to participation was the organisation and seriousness of the course, from the registration process through to the punctuality of the debate starting and ending times.

The communication tool that was most cited (66% of the learners) was the Debate. As positive points of the tool, they said that the weekly debate generated a sensation of proximity between colleagues and instructors, and the discussion of the topics took unexpected directions that were only possible to attain through the collaboration of the group, thus generating new questions and ideas. The negative points mentioned were the difficulty of following a discussion when so many individuals wrote in at the same time, and to know which question to answer when there were several posed at once.

All of the learners who evaluated the AulaNet were positive about it. They emphasised that it really helped the learning process due to the variety of services and the simplicity of its use, even for those who do not come from the field of information technology.

Conclusion

The Internet can offer the learning process a variety of benefits, including easy access to educational content, interaction (learner/learner and learner/teacher), a cooperative learning process, and the re-use of content.

Environments such as the AulaNet provide the means to structure the learning process. The ITAE course was developed by the AulaNet team to to apply information technology to education, serving as a test environment and enabling the generation of ideas.

The ITAE was developed for Web-based delivery. This model brings with it all of the advantages and limitations of the technology. The cost of developing the course, in principle, was significant, but it declined over time as a result of the re-use of the content. The group of learners had to be limited in order to create a sense of community, to make their participation possible, and to satisfactorily monitor what they were doing.

Since there never had been a completely face-to-face presentation of the course, it is impossible to say if the use of the Web increased or decreased the results that were obtained in the learning process. However, the results that were obtained by the learners were in the view of the instructors satisfactory regarding student progress and individual evaluations.

The group work model described in Figure 1, as observed by the instructors, covers the interactions of the ITAE course. The group work, in our case the learning process, took place more as a result of communication among the participants than through individual study of the course's contents. The communication also interconnected the group and made it possible for the instructors to coordinate the activities and organize the participants to make the cooperation possible.

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Dr. Hugo Fuks is Assistant Professor and researches on groupware and learningware, Software Engineering Laboratory, Computer Science Department, Catholic University of Rio de Janeiro, Brazil. Mr. Marco Aurélio Gerosa is doing his MSc. on the subject of groupware and learningware. Dr Carlos José Pereira de Lucena is Professor of Software Engineering and Head of the Software Engineering Laboratory researches on Formal Methods for Software Engineering. Address: Software Engineering Laboratory, Computer Science Departament, Catholic University of Rio de Janeiro, Rua Marquês de São Vicente 225, Gávea, RJ, Rio de Janeiro, Brazil, 22453-900. E.mail: hugo@inf.puc-rio.br

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