Designing Pedagogical Learning Environment

Amar Balla
Ecole Supérieure d'Informatique, Laboratoire LMCS
ESI, BP 68M, Oued-Smar, 16309, Algiers, Algeria
amar_balla@yahoo.fr

Abstract

The use of ICT (Information and Communication Technology) to activate distance education courses has made it possible to create new ways of training, certainly more efficiently and potentially more effectively. Internet, and in particular the World Wide Web, is becoming a learning space which is used increasingly in several educational contexts from secondary schools to post graduate courses. Learners can choose to take training modules and, in some cases, entire programs through the Net; the on line environment may be the only possibility to acquire knowledge on some topics for learners who do not have the opportunity to attend traditional classes; besides the communicative power of Internet tools can allow the activation of new ways of teaching/learning. As the number of on line learners is increasing, it is crucial for training centers and institutions to create effective on-line learning environments according to the specific needs of each learner. In fact, a lot of aspects have to be taken into account to project and activate a good distance course: effective presentation of contents, consideration of individual differences of users, adoption of several models according to educational objectives, and so on.

In this paper we propose a pedagogical learning environment which and which makes students more interactive in learning process. Our system lets students collaborate among them in order to construct their knowledge as much as possible and to find solutions of many problems that occur during learning.

Keywords: Pedagogy, Pedagogic, Pedagogical Learning Environment, Training, Course, Distance Training

1. Introduction

A lot of courses are available on the Net, and the potential e-learners are increasing quickly. These courses are characterized by several ways of interpreting the new communication mode; in fact the models underlying the courses can be very different, greatly influencing the ways of learning and teaching [1][2][3].

Two opposing views in the design of distance instruction are:

- Environments for the transfer of knowledge from the teacher to the learner, with tests and exams for the assessment;

- Cooperative environments where teachers lead learners through a series of steps to cooperate with them and among themselves to acquire some competencies and skills, with a formative evaluation.

Several parameters can influence both the models, i.e. the number of participants or the taking into account of the differences and prior knowledge of the learners.

In the first approach, teachers/trainers organize information in several modules, usually made available by a web browser, and guide learners in the acquisition of subsequent levels of knowledge, with few interactions with them by simple communication tools, mainly by email. The advantage of this approach is the implicitly of use that encourages e-learners who are not very skilled with ICT. On the contrary, the limited interaction with trainers/teachers or other learners can increase the dropping out typical of distance courses.

While the first approach is usually based on the web, eventually integrated in more or less complex Learning Management Systems (LMS) or with simple management functions, the second approach requires specific learning environments, which allow the setting up of groups and the organization of contents for distributed classrooms, in which to activate different ways of cooperation. This kind of distance training is mainly used by trainers with a good expertise in ICT for distance instruction, and with learners who are not worried by new kinds of tools.

Naturally, between these two opposing views, there are a lot of intermediate situations that can lead to effective instruction through the Net. In particular, some web based courses are integrated with the use of other environments specific for communication and interaction, even though not specific for educational aims. For example, tools for chatting and the sharing of resources and applications, such as Net-meeting, are frequently used for more detailed study of educational material on the web or for the tutoring of learners in computer-based activities.

The model of web based courses can be enriched, extending it beyond the simple distribution of information. In this direction, the integration of interactive forms has proved to be very important, allowing immediate feedback from learners and stimulating the cooperation among them. Interactive forms are also useful as a part of the formative evaluation; they can allow instructors to monitor and assist the process of learning. Collecting data from the monitoring and the feedback from learners can permit tutors and instructors to improve the organization of the learning process, identifying the main areas of difficulties for learners and adopting immediate remedial actions.

It is also important to integrate in the educational material forum areas, where all the users can discuss the topics proposed by the teacher, in organized groups or with all the other users, in synchronous or asynchronous ways. The participation in these kinds of activities is important both for the evaluation of learners and for monitoring of the level of participation in the courses; naturally, there are other ways to monitor and get feedback about the whole course. In particular, most of the LMSs allow trainers to keep track of learners' paths in the learning environment and make it easy for them to set up tests linked to the modules.

2. Designing Distance Training Courses

2.1. Classroom-Based Methodology

This is now a well-known approach [1][2][4][5] to produce course contents involving three main stages:

2.1.1. Before writing the contents, the course must be anticipated: The main purpose of a course being that the public should retain something or do something after listening to it, in order to make a course which respects this aim, a teacher must answer these questions: What public is concerned? What is the message to deliver, the principal objective

of this course and its intermediate aims? What is the public supposed to have learnt, or learnt to do at the end of this course? What do they need to know or know to do so as to understand or take advantage of this course? How to know what they understood of the course? What is the duration of this course? Is it adapted to the public? What are the significant stages of this course? At each of these stages which questions may be posed to ensure that the public follow the course? How to evaluate the public? How far will this course allow the teacher to better know his/her public?

The teacher must find a balance between his/her intervention time and the production time of the learners. This will be facilitated thanks to a plan of his/her course.

2.1.2. The teacher must anticipate what can happen during the course: Since making the learner develop new personal qualities by doing the wanted activity requires the respect of some rules, therefore, each learner has the right to listen to the message of the teacher/tutor at every moment, each learner must have an activity, and each learner must have the right to concentrate on an activity at every moment, the teacher/tutor must know what such a learner is doing.

2.1.3. Constraints of teaching: The constraints of teaching entail parameters that are essential for a training that respects the pedagogical rules. The training system must, on the basis of these constraints, refuse or allow access to a course or one of its parts, to provide the best training to the learners.

- The length of the course: generally, in distance learning, there is no control over the necessary time to follow a course. It can be made in one day as it can be spread over one month. This total liberty is not pedagogical. Indeed, in a very short period, the learner will not assimilate all knowledge. The same holds true for a very long period of time as the learner can forget the links between the parts of the course. Therefore, for every course an interval of optimal length must be respected. With the notion of virtual class, this interval is defined by the tutor of the class.

- Points of synchronization: they describe the coordination and the relations of synchronization of the activities of different participants in the learning process. For example, the tutor can define dates for the synchronous sessions at the middle of the course that are going to be the points of synchronization for the learners of the same class. These points can be inserted at the end of a chapter in order to ask questions, to exchange ideas or to organize a debate. Therefore, all the learners of the class are obliged to finish the chapter before the given date for the synchronous session.

- Organizational constraints: the administrator can also define the minimal and the maximal dates to allow an enrolment in a class and this for pedagogical and organizational needs.

2.1.4. Any course is supposed to be evaluated: To improve his/her course, a teacher can at least (among many other ways of assessing courses) build a chart in which he/she analyses "what doesn't work", and which contains the following statements [6][7]: thinking of the cause according to four axes (the content, the message, the management of the learners, the

management of the course), search of solutions, solutions to keep, search of criteria to evaluate the solutions.

2.2. Computer-Based Methodologies

There is a big difference between the earlier and current forms of online learning [3][7]. The earlier type, called Computer-Based Instruction (CBI), focused on the interaction between the learner and computer drills, tutorials or simulations. Today, the prevailing paradigm is the Computer-Mediated Communication (CMC), where the primary form of interaction is between learners and instructors, mediated by the computer. CBI is usually individualized (self-study) learning, while CMC involves teacher/tutor assistance. We can break down, as in [1][5][6], the online course development process into various phases:

2.2.1. Analysis: This will result in taking into account four elements which are successively the need, the learner's expectation, the available technology and resources. It is quite easy to specify the reasons which motivate the development of the online course and its context. All courses will be gradually available online in the future. The online course can be a simple self-study tutorial or a virtual classroom with interaction between instructors and learners.

2.2.2. Instructional Design: The term Instructional Design has many definitions: it can be seen as a discipline, a science, a system, a reality or a process.

We are more interested here in the last definition: Instructional Design as a Process is the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction. It is the entire process of analysis of learning needs and goals and the development of a delivery system to meet those needs. It includes development of instructional materials and activities as well as tryout and evaluation of all instruction and learner activities. It has its place here, as the material consisting of computers and network is more sophisticated.

Thinking over educational goals aims to define the objectives of the course. What should the learner know after completion? The teacher must minimize deviation during the course, and design tests to allow learners to evaluate their performance.

The Course Map/Flowchart is, whenever needed, the structure of the web pages that must be defined as early as possible, integrating all parts: main menu, lessons, tests, forum...A map can be parameterized, depending on the user profile. The aim is to facilitate navigation and the work necessary for site maintenance.

Detailed course content chunking and rewriting? It is suggested to rewrite the course content for the web, keeping in mind the level of the learners, and their ability to use computer interfaces. The text must stay clear, attractive and simple, made to be read. It must also incorporate some motivational elements [8], that is to say, certificate of completion, discussion boards for interaction with other learners, simulation, etc.

The texts of each part must only contain the essential; moreover, the most important points are to be underlined to catch the reader's attention. The use of graphics allows a better comprehension. Some links can be proposed in order to deepen information for the learners who need additional ones.

The duration of course determines how long it will take the learner to complete the course. The duration must be communicated to learners who will then be able to plan their learning time effectively. If modules are too heavy, they can be divided into smaller ones, or better, resumed, in order not to discourage learners.

Test questions and quiz scripts can be installed, programmed with the correct answers and feedback. Pre and post quiz scripts comprising multiple choice and true/false questions can be used. It is important to feedback according to the learner's answer (encouragement if correct answer, and explanation if wrong answer). Learners have to know right at the beginning what is expected and what resources (time, internet connection etc.) will be needed. A certificate of completion or any other motivational elements can keep them going till the end, and even coming back more.

A glossary of terms must be implemented in a way it is easily accessed by the learner, should he/ she require any clarifications, and it should be easily expanded. Since a teacher does not know who the learner is, all terms should be explicitly defined without making assumptions.

Interactive media enables learners to achieve topic goals, to receive meaningful intrinsic feedback.

2.2.3. Interface Design: The interface is what the learner will see on the screen. It is made up of navigation features (like buttons and links giving easy access to important and relevant information), orientation (this tells the learner where he or she is within the course), metaphors (choose a look and feel or theme for the entire course). This includes colors, background graphics, names of key elements etc.

During the life cycle of the Interface Design, template design and usability testing take place naturally. Usability testing helps to improve the feel and even the look of the Interface, it is important to have it tested by several persons, in order to determine if the interface is really intuitive and easy to understand. It is not a linear process, but once the version (from prototype to used version) of the interface is tested and finalized, a template can be created. Using the flowchart (course map) for reference, all the pages can be created with a blank space for the content. All these pages can be linked and the navigation tested for functionality.

2.2.4. Online Evaluation: In this context of production for teacher-to-learner collaboration and vice-versa, online evaluation starts with uploading files, online testing, evaluation and then approval. After developing all the elements of the course, they must be transferred to the remote hosting server (uploading) using any of the available tools.

It is necessary to test on various browsers and browser versions as well, since one never knows what browser learners are using. After FTPing the pages and thorough testing, the online course is ready for evaluation. The online course must be evaluated keeping the objectives specified in the needs analysis.

2.2.5. Site maintenance: Site maintenance is an ongoing process. Updating information, fixing bugs, moderating discussion forums, updating the calendar of events and adding new courses is necessary to keep your site vibrant and alive. Adding new features and building a community will help make the site user-friendly and keep learners coming back. There is no limit to what can be done; hence it is better to design the site for easy expandability. The flexibility of the web allows easy modifications.

Two types of e-learning on the web must be distinguished: asynchronous distance training and synchronous distance training. In asynchronous e-learning, training takes place in different time frames and trainees access information at their convenience.

On the other hand, synchronous distance training takes place for all learners at the same time and information is accessed instantly. This form of distance training provides more interactivity.

2.3. Our Approach

2.3.1. Designing Distance Training Courses: A lot of technologies are available to activate and manage on line courses, but trainers are too bound by them. Starting from the experiences of on line courses carried out at our Institute, we are activating a research project concerning the development of a new kind of support systems for the setting up of distance courses.

The approaches adopted in our DT (Distance Training) courses were based on the web and on cooperative environments.

In one of our courses the aim of the Web learning sections was to allow learners to deepen the programming language, by analyzing technical aspects. Because of the availability of our project through the Web, it has been straightforward to adopt the Web as the interaction environment for the actors of the didactic process.

The teacher integrated, through the WWW, part of bibliographic material in his explanations; in this way, he teacher built up a digital library structured according to his own needs and criteria.

If we analyze the organization of the learning section of the web site, it allowed for various communication modes according to the general flexibility of CMC-based learning environment. The main communication mode was a form based interaction, by which the web pages were updated automatically when the teacher added a topic or learners answered to some questions; in this way the teacher-learner interaction was based on a list of topics proposed by the teacher. To each topic corresponded a web page and every message sent (from the teacher or the learners) regarding that topic, was added to that page. By means of this list, the teacher highlighted the most interesting technical aspects; learners were encouraged to work by themselves or in group towards an answer or simply to discuss the topic.

Other courses carried out at our Institute were mainly based on communication and cooperation environments, supported by and integrated to the educational material on the web (managed in some cases by LMSs). In these experiences we have obtained very interesting results and a good level of acceptance of the courses [9]. In particular the courses aimed at the training of programming and e-learning, have confirmed the potential of ICT and in particular:

a) DT introduces flexibility in the training processes, by reducing time and pace of learning constraints: training schedule is much more flexible for each trainee than in traditional training settings are.

b) DT removes the need of physical co-presence of trainers and trainees.

c) DT enables "just-in-time training" approaches, since it is straightforward to activate DT courses on rapidly changing knowledge, as in the Information Society (scientific and technological knowledge evolves continuously).

d) DT encourages the cooperation between learners and enables the development of a permanent training service in the workplace.

Despite of the potentials of Distance Training, there is still a limited (in number and quality) availability of Distance Training courses.

Some reasons for not already using E-learning systems and tools are:

b) Short availability of models for Distance Training;

c) Most of the models for Distance Training "belong to" the academic and research world, and there is not an efficient transfer to the training sector;

d) Limited availability of software platforms for distance training based on specific methodologies;

e) Existing software platforms for DT do not make explicit the educational models behind the distance training; as a consequence:

- There is not support for trainers to reduce the risks involved in distance training (lack of face-to-face relationships, motivation, isolation, and so on);

- Low acceptability of the system by the trainers and consultants mainly, but also by the trainees;

- These platforms provide trainers with a set of tools which are quite good from a technological point of view, but their correct use in an educational setting is not supported (which tools should be used in a specific point of the training process, for which kind of activities, if it should be used for individual activities rather for group ones, how should different tools integrated from a methodological point of view, and so on);

f) The use of most of the existing software platforms for setting up on-line courses requires IT-skills that are not so common among trainers;

g) Effectiveness of the courses based on existing platforms is limited by the fact that they support only a sub-set of the interaction and cooperation modes necessary to fulfil different training needs; consequently, quite often it is necessary to integrate many software packages in order to have an effective on-line course: high IT-skills are required for the integration of different software packages.

Therefore, we are activating a project to develop a software platform for DT based on rigorous but flexible training models [1][6][9].

The objectives of the project are therefore:

- In-depth analysis and evaluation of the needs for Distance Training.

- Elaboration of new training models for Distance Training.

- Development of a software platform for Distance Training, based on and integrating the models defined above

The transfer of DT-knowledge into the software platform supports the reduction of trainers and consultants dependency on external IT-based training experts; consequently, it encourages trainers to use the potentials of DT for their activity, thus enlarging the offer of training courses. From the trainees point of view, they are given the opportunity to get an easy and effective (methodology driven) access to training modules, thus encouraging the activation of lifelong learning mechanisms and, consequently, promoting their participation in the Information Society.

The most critical part of the development of the system is the elaboration of innovative models for distance training. This will be achieved by the project partners' experiences in education and training, by transferring their knowledge of training in traditional settings into efficient new forms of training. To elaborate the new models it is first of all necessary to determine the beneficiaries of the training and their needs, but also the demands for the software platform have to be taken into account as the technological building blocks of the software environment and the scientific elaboration of the models are in mutual relation to and dependence of each other. A close co-operation and exchange of education experts and the experts of ICT is required in order to create an optimal system, regarding the programming of the software platform as well as the conception of the training methods.

Specifically, the training modes will be defined starting from traditional training models (in-presence training), literature (including distance education), direct experiences of the partners in (distance and traditional) training, and so on. The evaluation of these training models is an important part of the project; we will activate some courses by means of the prototypes of the platform; starting form the evaluation, models will be adapted to make the courses more effective [2][6].

2.3.2. Modeling Distance Training Courses: in our pedagogical learning environment, we have proposed an approach where the subject of training and the pedagogical learning methods are interconnected. We have devised a model that represents the pedagogical progression of the learner in the course parts according to orientations defined by the author as well as the tutor.

This model, shown below in the graph, consists of a set of knot that represents the pedagogical Knowledge Unit (KU) to be followed by the learner. These KUs are interconnected by links that express precedence relations. As for links, they can be labelled by conditions symbolizing the prerequisites and/or the pedagogical constraints of access to a KU.

A KU constitutes a separate whole, it is a scenario designed to develop knowledge or the know-how. It can be a degree curriculum, a course, a chapter, a synchronous session, an evaluation, or others.

Transition from a KU to another depends on the rules of sequencing defined by the author at the time of the production of his course.

Thanks to this modeling, the author will be able to put in place his diagram of guided training, avoiding the anarchic navigation in the document. As he can easily express his support and help by the addition of other optional KUs that the learner will be able to browse through if he can't manage to assimilate a concept in the course.

Some components can be strongly connected by dependency constraints. We define two types of constraints:

- Cause-effect relationship (KUi → KUj): KUj is the effect of KUi ;

- Achievement relationship (KUi ← KUj): In order to achieve KUj, it is necessary that KUi happens.
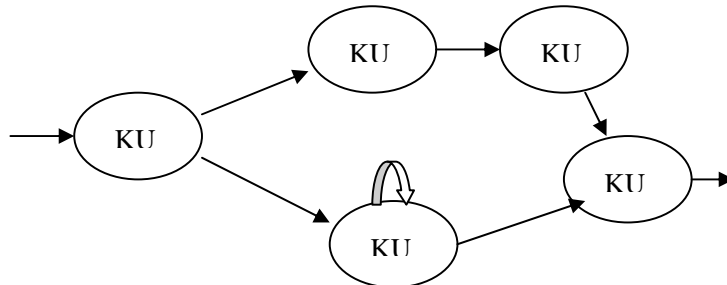

Figure 1. Example of a pedagogical progression graph

Figure-1 represents an example of a pedagogical progression graph, where the learner won't be able to gain access to the pedagogical sequence KU2 or KU4 unless he has gone through the pedagogical unit KU1.

To reach KU5, the learner has the choice to pass in unit KU2 and KU3 or to go through conditioned KU4. This condition can be the result of a test assessing the knowledge acquired at the time of the passage through KU4. If the condition is not met, the system suggests to the learner to review KU4 parts (supposing that the KU4 can be broken down). The author can also assist the learner by providing him with optional KUs in the form of examples or simulations to clarify the ambiguity.

2.3.3. Learning sequence: users (students and teacher) access remote learning resources asynchronously using a Web browser. Students continue their learning by reading the learning material step by step according to their paces of learning, and also collaborate among themselves using evaluation to gather more knowledge or to ensure their comprehension of learning material [6][9]. In our system, students proceed through the learning process as shown in Figure 2.
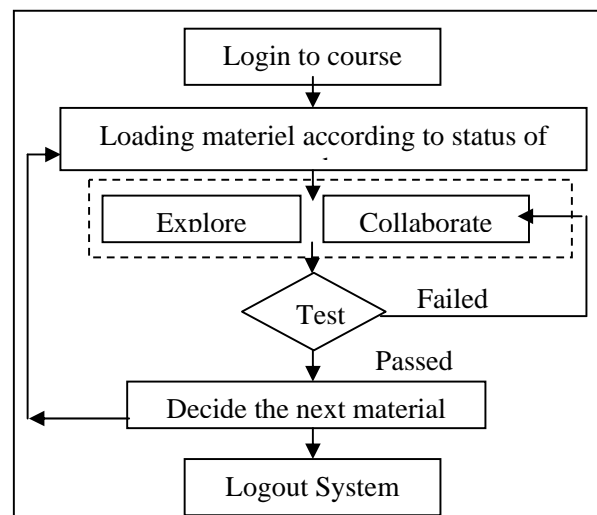

Figure 2. Learning sequence

Firstly, students, students have to be registered in order to participate in this system. Only the registered students can login to the system. After login, the system will load the learning material related to student's learning progress. During learning, students not only learn the material, but also collaborate with each other asynchronously to acquire more knowledge through collaboration. Collaboration gives many opportunities for students to communicate with each other, so that the further knowledge can be acquired [10][11]. Students are allowed to participate in evaluation collaboration according to their knowledge level of the material. The system requires students to do exercises at the end of every level of materials in order to recognize their degree of comprehension. If students fail in the test, they have to learn again the current or the previous materials until their comprehension becomes enough to continue with the next material. On the other hand, students who have passed the tests are allowed to proceed to the next material. Of course students can also stop their learning at any time and logout from the system.
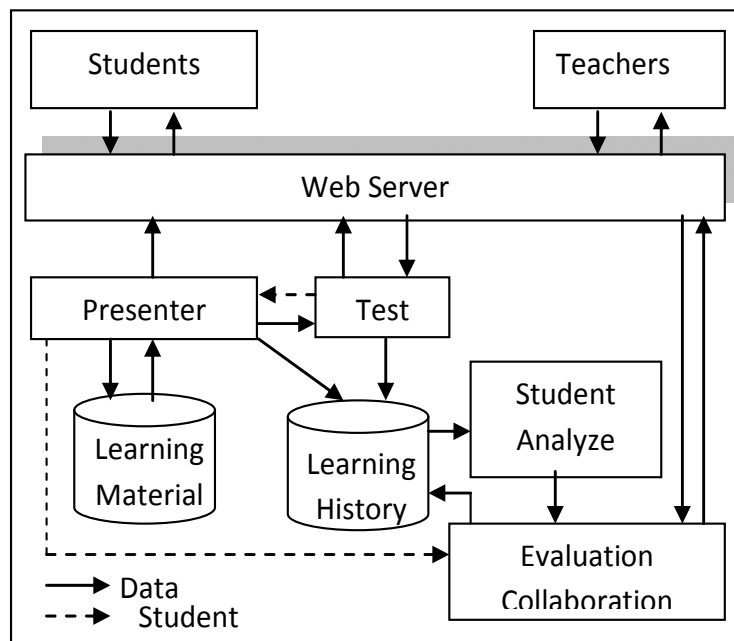

Figure 3. Pedagogical learning system

2.4. System configuration for implementation

We will be implement our system using three tiers of Client/Server architecture based on web technology. All modules will be built using Java, and all data required for performing the system are stored and manipulated using a relational database system. Figure 3, shows architecture of our system that consists of:

a)   Presenter subsystem

It is the most fundamental part that arranges and shows the teaching-materials to students according to their level of learning using Web browsers.

b)   Evaluation Collaboration subsystem

A collaboration function is used in order to acquire more additional knowledge of learning material. This subsystem will check every incoming question and processes it according to position of students in material and student model.

c)   Student Analyzer subsystem

In current implementation, basically we use an overlay student model to model learning history and determine students who have enough knowledge to participate in collaboration. Students can join the collaboration according to their pace of learning.

d)   Test subsystem

Learning materials consist of some modules that include tests for checking the degree of comprehension of students. The result of tests will be stored into a database and will be reused again as learning data history for analyzing learning performance of students. This system uses a multiple-choice type of question, so that the result of tests can be automatically checked by the system. The result of tests at each learning material will determine the learning progress. If students are failed in the test, the system will keep the current student model, and will require students to learn again the current learning material. But if students pass the test, the system will update the student model, and students can proceed to the next material.

3. Evaluating the courses

A central characteristic of distance courses is their flexibility and adaptability to changing educational needs. This leads to a different way of evaluating them: the evaluation process is continuous and it is strictly connected to the acceptance, participation and results of the course users. In this way, the evaluation has an immediate implication on the educational material and the structure of the whole course.

Most Learning Management Systems allow teachers to set up tests and exams that can be useful in evaluating learners and, consequently, can become a first means for evaluating the course [7][12]. Besides, adding specific forms and several ways of communication with and between learners, teachers can obtain other important feedback to improve the quality of the content, adjusting it according to particular learners' concerns or enriching it with new material in its weak points.

Then the two main questions are: what do we have to evaluate in a DT course? How do we evaluate it?

First of all, the evaluation must concern the multimedia educational material: a lot of methods have been defined and they are focused mainly on its completeness, correspondence to aims and target, structure and organization. Furthermore, in on line environments it is important and simple to get feedback from the final users, adding specific forms.

In fact, making the web courses more interactive can also allow individualized learning, addressing the learners' concerns and levels of knowledge [2]. To this aim it is important to set up short introductory questionnaires to identify the interests and the levels of learners; the monitoring and the feedback from learners during the learning activities are crucial to understand the level of acceptance of the course; in this way instructors can add supplementary readings, examples and other explanations, or more complex material for

expert learners. A final questionnaire can be also useful to identify specific problems and assess the general satisfaction with the course.

Another point to be evaluated in DT courses is the effectiveness of available interaction functionalities and modes, and in general the distance training features. In fact, even though the training material may be satisfactory, the course can be lacking in effective ways of interaction between learners and trainers [4][11].

Naturally, distance training features are strictly related to the number of participants, the level of confidence with ICT both of trainers and learners, the kind of contents, the available technology, and so on. Also in this case adding short forms about these features is very helpful, but the trainer can obtain important information by the monitoring of the participation of learners in interactive sections. In particular, by analyzing the frequency of interaction and the pertinence and adequacy of the communication tool that the learner chooses each time, the teacher can have a clear idea of the effectiveness of interaction tools integrated in the course.

If several communication areas and modes are set up in the initial organization of the course, the best way of evaluating their acceptance, clarity and efficacy is to analyze the modes most frequently adopted by the users [9][13].

The analysis can lead to the elimination of some ways of interaction from the course, because they are confusing or not suitable, or to a clarification of less used features. In this case, when teachers want to change the first spontaneous approach of users to the communication in the course, they can lead learners to acquire new effective modes of interaction stimulating discussion in different ways/areas [9].

Collaboration using evaluation provides many opportunities to find the solution of problems, and make students acquire more knowledge than just reading the material. Collaboration also gives students some motivation of learning through knowing other students' activity, and rechecks each other. Therefore, collaboration not only makes students have opportunities to be more interactive at communication with others in order to increases students' knowledge and ensures their comprehension.

4. Related work

There are many network technologies including Web, which can be used for implementing educational support systems, so it becomes possible that learning can be performed in distance without any restriction of time and place. In general, the application of distance learning systems is divided into two types; the one is synchronous and the other is asynchronous. In this paper, we focus on asynchronous learning environment based on collaboration. Specifically we focused on question and answer (Adaptive Evaluation subsystem) where students collaborate among them by asking question and answering. Our environment is based on collaboration because of the importance of collaboration in asynchronous learning environment.

There are similar systems such as PHelpS [10] and KSAS [12]. PHelpS uses synchronous and asynchronous tools for providing question-answer, so that the duplication of questions will easily occur between these two tools. When there are many questions, the respondent selects a certain question to answer without any supporting from system. Therefore, it is difficult to say that PHelpS can satisfy effectiveness of functions of Evaluation.

The evaluation in KSAS is processed through collaboration between students and teachers. In this kind of collaboration, teacher's load would increase along with increasing number of questions, because only teachers can give appropriated answer of questions. On the other hand, we focus on the collaboration among students because it is necessary to reduce the teacher's load, and also to acquire additional knowledge through evaluation process. Therefore, our system provides particular functions such as searching similar questions for every incoming question, and selecting question by priority to achieve effectiveness of Evaluation.

5. Conclusion

The design of distance training courses is a process that involves methodological and technological aspects. The constraints that the technological environment imposes on instructors and learners are considerable, and, consequently, the methodology of training and studying depends on it.

Besides, it is important to highlight that the course design is a continuous cycle, and the evaluation is a very important phase in it. In fact, evaluating the contents, the interaction modes, identifying the areas where learners have more difficulties, and the general acceptance of the course, trainers can reorganize the material and/or the interaction among users, reducing the weak points.

There are several types of collaboration, but we focused on evaluation in which students are able to communicate and collaborate among them, in order to find problem's solution regarding the learning material, and to check the comprehension of learning. Students construct knowledge by exploring the learning material, and by collaborating among them in order to comprehend the material in detail. It is expected that the final outcome of learning using this system would be better because of collaboration. For the future's work, we need to add a function for viewing evaluation's condition easily [9]. We also need to do some experiments to evaluate the performance of our system.

References

[1] N. Bousbia, A. Balla, "Processus de modélisation de contenus pédagogiques destinés à la FOAD", Revue e-TI, no. 3, 2007. http://www.revue-eti.net/document.php?id=1181.

[2] K.C. Seal, Z.H. Przasnyski, "Using World Wide Web for teaching improvement". Computer & Education vol. 36, pp. 33-40, 2001.

[3] E. Aimeur, C. Frasson, and H. Duffort "Cooperative learning Strategies for ITS". Applied Artificial Intelligence. An International Journal, Vol. 14(5), pp.465-490, 2000.

[4] P. Brusilovsky, "Adaptive navigation support". In: P. Brusilovsky, A. Kobsa and W. Neidl (eds.): "The Adaptive Web: Methods and Strategies of Web Personalization." Lecture Notes in Computer Science, Vol. 4321, Berlin Heidelberg New York: Springer-Verlag, pp. 263-290. http://www2.sis.pitt.edu/~peterb/papers/8_Brusilovsky.pdf

[5] P. Williams, "How to Develop an Online Course Stylus", Systems Pvt. Ltd. (extracted Jan 2002). http://stylusinc.com/online_course/development.htm .

[6] A. Balla, "An Educational Asynchronous Learning Environment". ACS/IEEE International Conference on Computer Systems and Applications, AICCSA '2007, May 13-16, 2007, Amman, Jordan.

[7] J. Hughes, G. Attwell, "A Framework for the Evaluation of E-Learning", seminar series on Exploring models and partnerships for eLearning in SMEs, held in Stirling, Scotland and Brussels, Belgium, in Nov 2002 and Feb 2003. http://www.theknownet.com/ict_smes_seminars/papers/Hughes_Attwell.html

[8] F. Spring-Keller, H. Schauer, "Learning Behavior in Games for Learning". Proceedings of the 2nd. European Conference on Games Based Learning. Barcelona, Spain, Oct. 2008.

[9] N. Bousbia, J.M Labat, and A. Balla, "Detection of Learning Styles from Learner's Browsing Behavior During E-Learning Activities". Intelligent Tutoring Systems, 9th International Conference, ITS 2008, Montreal, Canada, June 23-27, 2008, pp. 740-742, Proceedings. Lecture Notes in Computer Science 5091 Springer 2008, ISBN 978-3-540-69130-3. Beverly Park Woolf, Esma Aïmeur, Roger Nkambou, Susanne P. Lajoie (Eds.).

[10] J. Greer, G. McCalla, V. Kumar, G. Collins, and P. Meagher, "Facilitating Collaborative Learning in Distributed Organizations", Proceeding Of CSCL, 1997, pp. 73-82.

[11] S. Münzer, B. Bo Xiao, "Synchronous Cooperative Distance Learning at the Workplace: Technology and Other Factors Determining the Quality of the Learning Process". Proceedings of I-KNOW '04, Graz, Austria, June 30 – July 2, 2004, http://www.know-center.tugraz.at/previous/i-know04/papers/muenzer.pdf

[12] S-T. Park, D. W. Byun, D.W. Park, and H.Lee, "Evaluation System in e-Learning Through the Knowledge State Analysis Method", 3rd International Conference on Multimedia and Information and Communication Technologies in Education, m-ICTE2005. http://www.formatex.org/micte2005/370.pdf

[13] P. Brusilovsky, J. Knapp, and J. Gamper, "Supporting teachers as content authors in intelligent educational systems". Int. J. Knowledge and Learning, vol. 2, no. 3/4, pp. 191–215, 2006.

Author

Dr. Amar Balla is a Senior Lecturer in "Ecole nationale Supérieure d'Informatique", Algiers, Algeria. He works within a project in "Laboratoire LMCS". He is a director of research for two teams of teachers-researchers. His current researches are related to eLearning, adaptive hypermedia, collaborative work and agent based software engineering. He directs doctoral theses, magister and engineers dissertations in computer science. He is also the responsible of "specialty department". He gives lectures on eLearning for graduate students and computer architecture for undergraduate students.