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CDESACL Conception and Development of Educational Scenarios for an Adaptive Online Training Device Based on Collaborative/Cooperative Learning: Work Methodology

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ABSTRACT

The objective of this work is twofold, on the one hand, it concerns the definition of the basic concepts of our theoretical framework which touches the adaptive e-learning, the pedagogical scenario, and collaborative/cooperative learning. On the other hand, it concerns the proposal of a work methodology to lead to the design and realization of educational scenarios based on collaboration for adaptive online training.

KEYWORDS: Adaptive e-learning, educational scenario, collaborative/cooperative learning.

I. CONTEXT OF WORK COLLABORATIVE

learning is an active phase in which the learner works to build his knowledge with a group of learners (Henri and Lundgren-cayrol, 1998)[1]. This allows the levels of adaptive systems to offer large and comfortable workspaces to learn and present this knowledge. But generally, there are only classic presentations of data, courses without communication and a more basic exchange of information, this type of teaching does not offer the means and the tools necessary to build knowledge. To solve this problem, it is necessary to answer the following questions:

- How can we determine the methodologies and techniques to adjusts collaboration in e-learning?
- With what methods can several learners collaborate in a learning system?
- How can we propose collaborative learning scenarios in E-learning?
- How can we present adaptive pedagogical scenarios in an adaptive collaboration system?

Our work concerns the proposal of educational scenarios based on collaboration for adaptive online training (adaptive e-learning).

II. THEORETICAL FRAMEWORK

Through this theoretical framework, we will focus on three essential concepts that constitute our framework: adaptive learning (adaptive e-learning), the pedagogical scenario, and collaborative/cooperative learning. Based on research, we propose definitions of these three concepts and at the same time, we propose our approach.

A. Adaptive E-learning

Adaptive Learning is a new approach to education. It is about adjusting learning to the individual needs of each learner, using technology. In this sense, Adaptive Learning, or adaptive learning, is a technology on the way to revolutionize education. To define this concept simply, it is a method of learning in which one or more characteristics of the learning environment adapt to the learner.

Three main elements to consider in defining this adaptivity: appearance, order, and support towards the goal.

- Appearance, or form of learning, is how learning actions (content, text, graphics, videos…) are presented to the apprentice;
- Order is how learning actions are ordered and connected according to the pace at which the learner is progressing;
- Coaching towards the goal refers to the actions of the system leading the apprentice to success, for example, the level of difficulty.

The main idea of Adaptive Learning is to meet the individual needs of each learner during the learning process. Even for the best teachers, it is indeed difficult to fully understand the profile of each student and to adapt the program accordingly. This is why technology can be a great help. Rather than imposing a single program on all learners without taking into account their respective abilities and needs, Adaptive

Learning allows them to develop personalized learning that they will be motivated to follow.

Laski and his collaborators in 2013 proposed an adaptation according to 4 modalities (Laskri et al., 2013) [2]:

- Adaptation of content, for example, Adaptive dynamic hypermedia, Content modeling, and domain modeling, Adaptive pedagogical scripting.
- Adaptation of learning methods, for example: in a cognitivist approach, adapt the theory and the exercises proposed, in a constructivist approach, use learning by doing, simulations, games, case studies, in a socio-constructivist approach, develop projects in groups, search for information necessary for the project
- Adaptation of UIs, for example: Textual, auditory, kinesthetic, visual (images & videos)…
- Adaptation of distribution channels, for example, Ubiquitous Learning, Multi-media outputs texts (pdf), PreAO, Web, Mobile Learning, Desktop computer, laptop computer, PDA, Mobile phone.

Thus at the level of the adaptation of content considered as a capital research field in this work, we note that adaptive e-learning raises several questions at the level of methods, and techniques for adoption, and how to offer adaptable content to learners with the personalization of profiles, and finally to visualize the preferences of each learner in an e-learning system (Fernandez-Manjon and Sancho, 2002).

Thus, the development of educational content with the use of online technological tools is structured in several stages, the teacher creates a space or an educational environment and manages a process to be followed to successfully receive and operate the information to learners, this leads us towards the personalization of learner profiles and educational content (Köck, 2009)[17].

In this research, we focus our work on adapting e-learning regarding collaboration by realizing educational scenarios for collaborative work. In the following, we define the notion of an educational scenario and the notion of collaborative learning.

B. The educational scenario

The term "educational scenario" is the subject of many definitions. A pedagogical scenario presents a learning activity initiated by a teacher to supervise the learning of his learners. An educational scenario presents an approach aimed at achieving educational objectives and acquiring general or specific skills related to one or more disciplines. He presents a learning activity, initiated by a teacher to manage the learning of his students (before, during, and after the activity with self-assessment and evaluation sheet, scenario, teaching resources, etc.). In this work, we propose three definitions proposed by Pernin, Quintin, and Guéraud concerning the field of the Computer Environment for Human Learning (EIAH).

According to Pernin and Lejeune, "a scenario is defined as a description made a priori and a posteriori, of the progress of a learning situation aimed at the appropriation of a specific set of knowledge, specifying the roles, activities, and resources for manipulating knowledge, tools, services, and results associated with the implementation of activities "(Pernin and Lejeune, 2004)

The teaching scenario is the method of establishing a teaching process and the flow of content. It is also the trace of the educational path at the level of online training, by detailing the activities of each learning situation in an e-learning training, the teacher presents the educational tape simply, and clearly to the users of training or learners with a very framed piloting in terms of the presence of technologies, and educational tools (Quintin, et al, 2005[3]).

According to Guéraud, "the scenario has a threefold role: it precisely defines the activity offered to learners on the OPI (Interactive Pedagogical Object); it also specifies the control that will be made of the learner's progress during this activity; finally, he determines the educational assistance that will be provided automatically based on his progress. Our concept of scenario is (a priori) distinct from the concept of "pedagogical sequence scenario" often present in Open and Distance Learning platforms. A sequencing scenario makes it possible to specify how the various teaching activities will be linked together while our scenario concerns an activity (using an OPI) and enables the progress of a learner to be followed towards the objective set by it. » (Guéraud, 2006)[4].

For the realization of our educational scenarios, we based ourselves on the work of Khaldi and his collaborators concerning the proposal of an architecture of a learning situation of an educational scenario taking into consideration the management and the decisions to be made. By the teacher depending on the context and the situation.

Thus, the designer of a pedagogical scenario must first have a very good knowledge of the content dealing with the learning situation to be developed which will allow him to clearly outline his objectives, which he must achieve at the end of his situation. Learning, to clearly define the knowledge to be acquired and the skills to be mastered by the learners. Secondly, he must have a good knowledge of teaching/ learning models and strategies to decide on the different choices he must choose his activities according to the contexts and situations and at the same time according to the specificity of the discipline, he teaches (Khaldi et al., 2019)[5].

Whereas the conceptualization of an architecture of a pedagogical scenario consists of four blocks (Khaldi et al., 2019; 2020) [5].

The first block concerns the proposal of a technical sheet containing a set of non-exhaustive information concerning the learning situation to be treated. The second block concerns the definition of objectives relating to the specific

content of the learning situation. This definition affects general objectives, specific objectives, and intermediate objectives, we have provided an example of the architecture of the various objectives. It also touches on the disciplinary skills specific to the specific content of the situation by focusing on the knowledge to be acquired, and the skills to be mastered by the learners at the end of the situation. It also affects the transversal skills to be exploited during the situation. Finally, it concerns the definition of the prerequisites (prior knowledge) necessary for the acquisition of knowledge and the mastery of the skills of the learning situation.

The third block concerns the learning activities concerned with the structuring of concepts and knowledge of the situation. Indeed, after presenting the notion of the learning activity, we presented three types of activities in the form of phases.

- The discovery phase which concerns the simulation activity. In our case, we used the scenario as an introduction and presentation of a learning situation and at the same time as an assessment tool to test the prerequisites of the learners.
- The second phase of this block is concerned with the structuring phase and which concerns the conceptualization/experimentation activity that we have proposed in two forms depending on the nature of the discipline and above all depending on the choice of the approach to be followed. Thus, we have proposed the phase of a presentation of a concept in a learning situation based on the deductive approach which obeys the direct teaching strategy and which is strongly guided by the teacher. Then, we proposed the phase of an experimentation/ discovery of a concept in a learning situation based on the inductive approach which obeys the indirect teaching strategy and which is cantered on the learner.
- The third phase of this block is concerned with the generalization phase and which concerns the objectification activity which promotes the coherent assembly of all the objectives achieved through discussions to pool and generalization of results.

At the end of this block, without taking into consideration the nature and type of learning activity, we have proposed the architecture of a learning activity. Thus, we have proposed through this architecture, a set of components that we consider essential for the scripting of a learning activity, and which allow having a global vision of a learning activity. To be defined, the specific objective, the intermediate objective which allowed the proposal of the learning activity, the problem situation, the task and its instructions, the nature of the group of learners for the realization of the task, the material didactic and technological necessary for the accomplishment of the task, time management, the role of the teacher and the activities of the learners in the various actions of the learning activity, as well as the documents to be offered to the learner and their correspondent for the teacher.

The fourth and last block concerns the learning activities focusing on the transfer activity which allows the reinvestment of knowledge in a context other than that of the initial learning through which the learner must reinforce, consolidate and fix his acquired by generalizing them.

For our work, we will propose pedagogical scenarios adapted to the collaboration.

C. Collaborative / cooperative learning

Cooperative learning and collaborative learning both involve a particular structure: the group. Get learners to work together, bring them together to study a point in the school program, get them to develop social skills; this is not very original or very innovative in the field of education. That said, there is a common denominator here that can be a source of confusion, which can create an amalgam between these two forms of learning. All the more so as the terms cooperation and collaboration are very similar. They have very similar meanings and generally refer to a collective activity involving two or more people. Hence the interest of studying a little more closely what to put under these two types of learning. In short, a comparative analysis is required to try to clarify these various points and to better understand the content of two learning structures which are quite similar. To do this, we will begin by studying the main definitions or clarifications provided by the authors on, on the one hand, cooperative learning and, on the other, collaborative learning.

***Cooperative learning*:** At the level of cooperation, learning will be carried out in a group with the facilitation of work methods, the teachers forced on the learners to follow a pedagogical structure for discovery and writing the content (Mangenot, 2003)[7].

This type of learning is attached to the teaching environment developed by the trainer with a cooperative relationship that must be personalized and particular tasks to receive clear and easy content for users.

The work in the cooperative framework offers a simple distribution of work between the learners. This way of cooperative work offers each individual to facilitate the task and make it clear and simple, to establish a work ultimately full of different information and ideas. So the learner works individually and produces their content without communicating with others before sharing with the work team and this will give responsibility for these developments (Boudreault et al, 2001)[8].

Indeed it is the collective organization, that is to say, each learner works individually, on a task already divided into sub-tasks, to be responsible for these achievements and these reformulations of content or work in general, even if his result will be shared in a group, this increases the number of individual activities, and finally, the task is completed, the

teacher will be responsible for sharing his work and adding value to the actions of each learner (Frayssinhes, 2016) [9].
The following figure presents a presentation on cooperative learning as well as the roles played by the teacher and the learners, in the cooperative model, the teacher maintains complete control of the class, even if the students work in groups to achieve an objective of a course. The teacher asks a question and provides additional items for students to read and analyze, beyond the text, then asks students to work in groups to answer the question. The groups then present their results to the whole class and discuss their reasoning (McInnerney & Roberts, 2009) [17].

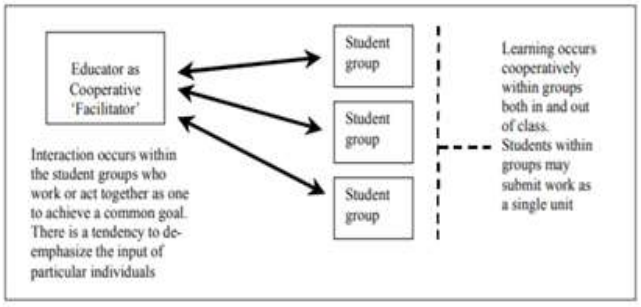

Figure 1: Cooperative learning

Collaborative learning: At the level of collaborative teaching and learning is a teaching approach that involves groups of learners to solve a problem, complete a task, or create a product (MacGregor, 1990)[10].
Collaboration is based on the idea that learning is a naturally social act in which participants talk to each other through the discourse that learning occurs (Gerlach, 1994)[10].
Referring to the work of Tadlaoui and Khaldi concerning the notion of collaborative learning which is a notion is complex given that the social is an essential foundation of this type of learning. Dillenbourg in 1999[6] proposed an interesting (and provocative) definition which makes possible a necessary step back from the notion. Generally speaking, the shift to more horizontal relationships, found in learner groups, is thought to involve some form of collaborative learning. Dillenbourg's definition might suggest: "collaborative learning is a situation in which two or more people learn or try to learn something together" (Tadlaoui and Khaldi, 2020 [12]; Dillenbourg, 1999) [13].
Collaboration is the result of individual work exploited by activities in a group or an online class. It is the sharing of learners' resources with the group so the realization of learning in a group uses the work done in groups (Boudreault et al, 2001) [8].
Then the learning activity will script simply and flexibly. So the structure to develop the content and build this knowledge and open. Using collaborative distance learning they can access a clear and simple environment in the e-learning world. In their book on collaborative learning, Henri and Lundgren in 2001[14], consider that any learning activity carried out by a group of learners with a common goal, each being a source of information, motivation, interaction, Mutual aid… Each of the contributions of the others benefiting from the group system as well as the guide of a tutor well-presented individual and collective learning (Henri and Lundgren, 2001) [14].

Collaboration is a situation in which two or more people learn or attempt to learn together. Two or more can be interpreted as a pair, a small group, or a class. Learning something can be interpreted as taking a course; perform learning activities such as problem-solving. The whole can be interpreted in different forms of interaction which can be face to face or computer-mediated (Laal and Laal, 2012)[16].
The following figure illustrates a presentation on collaborative learning as well as the roles played by teachers and learners, building knowledge is the learner's job to fit into the collaborative learning process. And to carry out these tasks we find the trainer who plays the role of manager and facilitates the presentation of learning in a group to participate as a source of information (McInnerney and Roberts, 2009) [17].

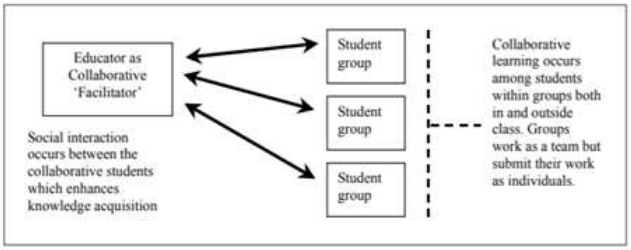

Figure 2: Collaborative Learning

The collaborative approach recognizes the individual and reflective nature of learning group interaction. So the collaborative approach brings together two approaches: that of the learner and that of the group.
In the collaborative work, there are participants in the group without any division of tasks, the learners will work in a way to build the content all in groups and carry out each step together, this creates a very coherent and strong environment between the learners and develops self-confidence in the group (Boudreault et al, 2001)[18].
Collaborative work is based on communication and the sharing of information at each stage with the valuation of the effort of each. The collaborative work model is new in the e-learning world. This type of work trains many students to communicate together and use new technologies and educational resources via platforms or chat forums or video conferences.
So it is the consequence of a work well organizing and structuring the effort and collaborating the learners to carry out and build the same task at the same time, which also offers facilitation of work on the task/activity and the sharing to the maximum of the group level information.

D. From the cooperative approach to the collaborative approach:

Generally, we agree that cooperative and collaborative groups act and work to achieve a common or shared goal. Cole, however, wishes to qualify this proposition to recall the two meanings that we can give to the meaning of the word sharing (Cole, 1993) [19]. On the one hand, sharing refers to dividing a whole into several parts. On the other hand, sharing also means taking part in or participating in something. Cole observes that cooperation perceives sharing in the sense of division, while in a collaboration he perceives sharing in the sense of participation. We find this strong nuance useful to help us distinguish the two modes of operation.

Indeed, cooperation is based on the division of tasks and responsibilities within a group. Each member is responsible for taking an action or performing a sub-task. All of these actions and activities lead the group to the desired objective. It is the group as an entity that achieves the goal by carrying out the task from which a collective production emerges. Each learner contributes to the achievement of the objective by making a specific contribution to the collective work (Abrami et al, 1995). The following figure illustrates the modality of the cooperative task.

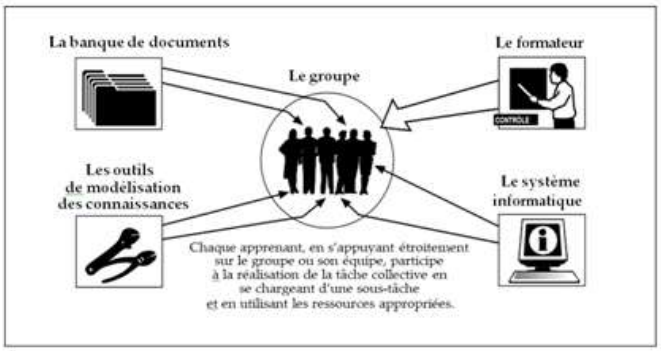

Figure 3: Modality of the cooperative task

While in collaboration, group members also give each other a common goal. But it is not only the group that, through its activities, will work to achieve the goal: each member, individually, will seek to achieve by himself this goal that is consensus within the group. This will result in several productions, collective production, and the individual productions of the learners. The following figure illustrates the modality of the collaborative task.

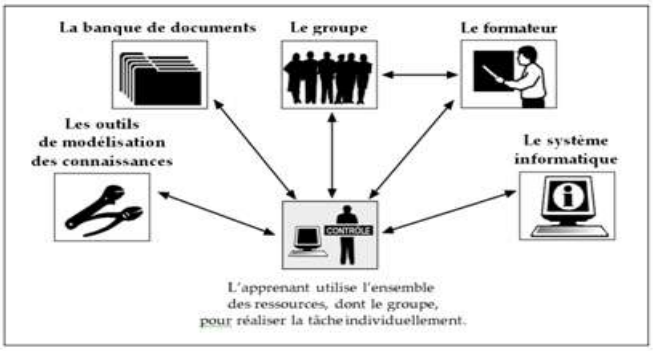

Figure 4: Modality of the collaborative task

While in collaboration, group members also give each other a common goal. But it is not only the group that, through its activities, will work to achieve the goal: each member, individually, will seek to achieve by himself this goal that is consensus within the group. This will result in several productions, collective production, and the individual productions of the learners. The following figure illustrates the modality of the collaborative task.

E. Methodology of work

After having defined our basic concepts in our theoretical framework, our job is to develop pedagogical scenarios adaptable to collaboration and cooperation for distance learning situations. So our working methodology consists of going through several stages. In this work, we only point out the main lines of this methodology to propose the details of the different stages in the next works of our research.

Indeed, our methodology consists of:

- First, a methodology must be determined to adopt the collaboration in an e-learning system,
- The second step is to define and choose the techniques to adapt to the collaboration in e-learning.
- Thirdly, we must define and choose the teaching methods allowing collaborative work in a learning system.
- The fourth step is to provide collaborative learning scenarios for online learning.

As a final step, adaptive learning scenarios need to be designed in an adaptive online learning system.

III. CONCLUSION

As a conclusion to this work, based on research work, we have defined after asking our research questions, the basic concepts of our research. Note the adaptive online learning (adaptive e-learning), the pedagogical scenario and collaborative / cooperative learning. Thus, taking educational processes into account is a major issue for the design and development of new adaptive educational systems. It is a matter of considering educational activities in the same way as educational content. Indeed, by adapting the pedagogical scenarios to a collaborative learning system, by formalizing and managing the processes, it becomes possible to personalize the pedagogical strategies and methods.

Finally, we proposed a work methodology spread over several stages to lead to the design and implementation of educational scenarios suitable for collaborative / cooperative learning. Note that this work is the first work for a series of works which will be proposed later.

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