

Interaction in Online System is A Favor Yey for Learners' Success

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Abstract— Nowadays, the online interaction has become more necessary and vital in terms of both socio-cognitive and socio-affective levels. It fully plays an important role in the acquisition of knowledge in online learning. However, the way in which these interactions take place remain little regulated and less efficient. Recognizing this, we have developed an approach used to automatically schedule the interactions in the learning process of learners. These interactions will easily help learners to assimilate the obscure concepts and quite difficult to understand. Our goal is achieved basing on intelligent agents modeling of virtual learners. These agents enter into discussion with learners and are widely involved in clarifying these concepts. To affirm the importance of our study in e-learning, we have given a questionnaire to the learners of the Master in French literature. This latter has confirmed that the majority of the learners choose to collaborate and interact with each other to come over the blockage points in their learning process. Furthermore, the empirical result has shown that our approach contributes effectively in online learning. A significant increase in learner results is well noticed.

Keywords— E-learning; online interaction; collaborative learning; intelligent agents; optimal learning.

I. INTRODUCTION

On the shadow of developed research in the field of the traditional teaching, the interaction between students is a fundamental key of both knowledge assimilation and school success [1-3]. It has become a tool that we cannot neglect in the classical education thanks to the contributions that it provides. It maximizes the acquisition of learners through his active participation and his vigilance to hear and to analyze what has been discussed [4]. In fact, by making the interaction in class a mode of exchange and sharing assists in the development of oral and written skills of learners [5-7]. Their individual contribution is presented through the sense of competition, the reasoning efficiency, the desire to be the best of the group as well as the motivation and commitment in the debate [8]. It also well encourages collaboration, mutual assistance, and the inter-influence between learners at the collective level [9].

Thus, the interaction between learners has gained much interest in the field of research, which of course contributes to the emerging of multiple approaches.

Several studies have been conducted in this direction drawing in the disciplines of language, technical communication, as well as mathematics, etc.

Using new pedagogical approaches, for example: the implementation of the reversed class that promotes mutual interactions between learners for a wide acquisition of knowledge [10]. The cooperative learning, which allows learners to learn from, and help each other in order to ensure a unanimous profit [11]. Learning by project is also operational nowadays, it helps learners to acquire skills of expertise, and interact with each other for optimal success of their project [12].

Most of these developed approaches are based on the principle of interactivity and exchange in class whether between learners or between learners and teachers. This principle is the key to success thanks to the advantages it provides: it contributes to the development of expertise skills and interpersonal skills among learners which are expressed by self-confidence, speaking as well as reasoning and judgment of ideas. Moreover, it encourages the assimilation and acquisition through a convenient discussion and an unconscious repetition of ideas [13]. Unfortunately, the majority of these benefits are restricted to the traditional teaching. But when we look at the online learning mode, learners are alone in front of the building of their knowledge. This isolation is the substance of e-learning. Being independent and singular is the origin of distance learning [14]. However, this foundation can be the brake on the success of learners, if they are sociable and habitually prefer

collaborative learning habit. E-learning can cause failure as well as demotivation and abandonment of this type of learners. Indeed, one cannot deny sophisticated solutions that e-learning have provided to motivate, encourage and help learners to achieve their objective. Take the example of tracking learners [15-16], collaborative learning [17-18], individualization and adaptation of content to the level and characteristics of learners [19-21], etc. But in spite of all these features, it remains limited to replace classical learning and its vitality. Concerning this, we propose to develop an approach simulating the traditional teaching through a virtual modelling of an abstract class of learners in which they help each other by the exchange and the reciprocal communication between them. This approach serves to support and accompany learners to overcome their difficulties of understanding as well as all the obstacles against the success of their online training. It is also a matter of designing efficient teaching devices and monitoring the quality of e-learning. The goal of the mutual interaction approach is to lead learners to success by helping them understand and assimilate courses through intelligent agents. Indeed the integration of these entities in our work is indispensable to ensure an automatic and distributed treatment in addition to a dynamic and powerful information exchange. The agents modelled in our approach aim at establishing a good quality and educational framing as well as an effective interaction management.

This approach will allow us to keep the major asset of classical learning that is the mutual interactivity between learners for an optimal learning. In our case, the intelligent agent paradigm is implemented in our approach to ensure automatic treatment and dynamic communication [22-24].

In section 2, we present our simulation approach of a real world of interaction between learners for optimal learning, and how to create a virtual group of learners and automatically trigger the online interaction. Section 3 affirms the importance of our approach by experimental results and statistics showing the satisfaction and the performance of learners. In section 4, we give a conclusion and a few prospects for the future directions.

II. MATERIAL AND METHOD

Fully or partly adopting the interaction as a solution for the acquisition of knowledge to approximate the real world of learning in the e-learning is worth being developed. In this context, a simulation approach of removing ambiguity context of a difficult topic to understand through the virtual interaction is implemented. This approach aims at helping learners understand a subject by a reciprocal exchange between a set of virtual learners, including the target learner. In order to achieve this objective, we have adopted the intelligent agents as a key solution to our modelling regarding the benefits they offer [25-26]. We have associated each learner to autonomous agents group which act and react automatically and intervene on the scheduled time in the system. These intelligent agents communicate, interact and coordinate their expertise to astutely clarify the enigma, and easily eliminate uncertainty in learners. Also they appeal to the target learners to interact with them by asking for their point of view to enable them and draw their attention.

The above figure 1 illustrates a real view of our approach, favoring an efficient atmosphere for optimal learning of a relatively obscure concept among the majority of learners.

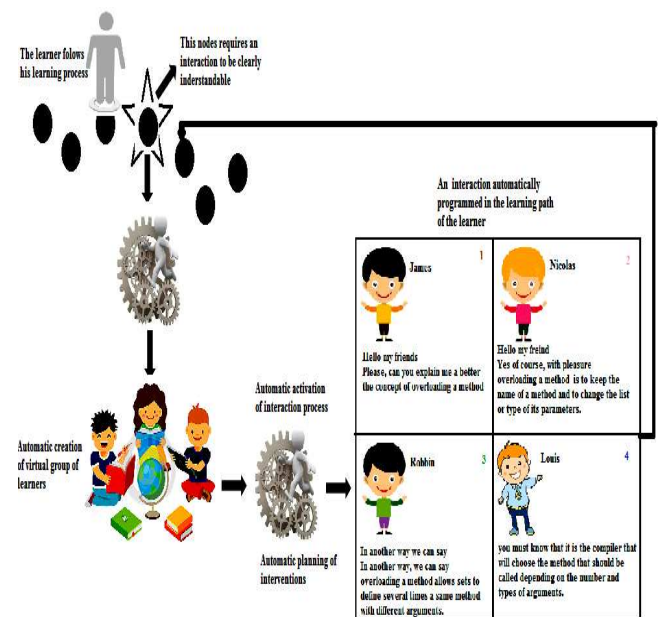


Fig. 1 Approach of interaction between Learners for Optimal Learning

Figure (1) describes the general idea of our approach, which is the accompaniment and support of learners by clarifying concepts that are difficult to assimilate easily. This objective is achieved through the implementation of a virtual group of learners working in collaboration in a cohesion and automatic organization. This, of course, is for the establishing of a quality framework. The group of learners is modeled by intelligent agents involved at the programmed time to explain the obscure concepts and maximize the chances of achieving brilliantly the objective of the training.

As it is defined, the approach that we propose initiates the online interaction online to a mixture of concepts integrating several components which, in their mixture, constitute a novelty:

- Automatic choice of interaction concept;
- Automatic creation of virtual group of learners who will interact with the target learner;
- Automatic planning of interventions.

Each of these axes is discussed in depth in the next section.

A. Automatic triggering of the topic of interaction

To automatically trigger a debate in a virtual online classroom, it is necessary that learning units registered in distance learning system database are annotated by the responsible tutor. These Annotations indicate in each unit the points or concepts characterized by a high level of difficulty and that need a discussion and exchange between learners to be clearly understandable. This description of the units allows the system to automatically determine the time and location for launching the online interaction. Each learner follows his path of learning, when it comes to a subject of a particular conversation, at this moment the system automatically launches the virtual class of interaction, which will allow the target learner to fully understand the

new concepts and at the same time activate him in their learning process.

B. Automatic creation of virtual group of learners

This means to provide to learners the agents with which they can interact and communicate to well assimilate the concepts which are a little difficult to understand. These agents are created automatically during the arrival of learners to a discussion topic and in case of lack of real learners on the same subject. These intelligent entities play their roles in a full synchronization and for a configurable period. We have chosen to create a group of three virtual agents in order to ensure a large equity between participants, and develop a sense of closeness and solidarity even if with virtual learners. In order to achieve this goal, each agent of the group is responsible for a task programmed in advance and participates effectively and actively in the achievement of the common target of the group by the interactions that it creates with the other agents. Of this fact, the agents that we propose in this approach is designed as a set of entities more or less independent but its existence and operation are closely linked to the strong objective assessment of the approach. Thus, we distinguish:

1) Animator Agent

This agent is responsible for opening the online interaction, the reception of the participants, the closure of the discussion and everything that concerns the smooth running of the interaction. The animator facilitator is in charge of the introduction of the concept to discuss and the distribution of words between the other agents and the learner which it seeks to support.

2) Explanatory Agent

This agent is responsible for giving more information and detail to the concept that it seeks to explain and make clear to the learner (Examples, illustration, in-depth analysis ...). The explanatory agent actively participates in the discussion and plays a dominant role to assist the learner to understand the concept of discussion.

3) Synthesizer Agent

This agent is responsible to recapitulate the discussion and giving a report serving the learner to assimilate and memorize the explanations and clarifications given by the explanatory agent. In general, teamwork is undoubtedly the most effective way to ensure a good understanding of the concept and leading learners towards success. And the integration of intelligent agents participates amply in this objective; they play a key role in our approach through their dynamic and automatic interaction.

Figure 2 gives an overview of the online interaction process.

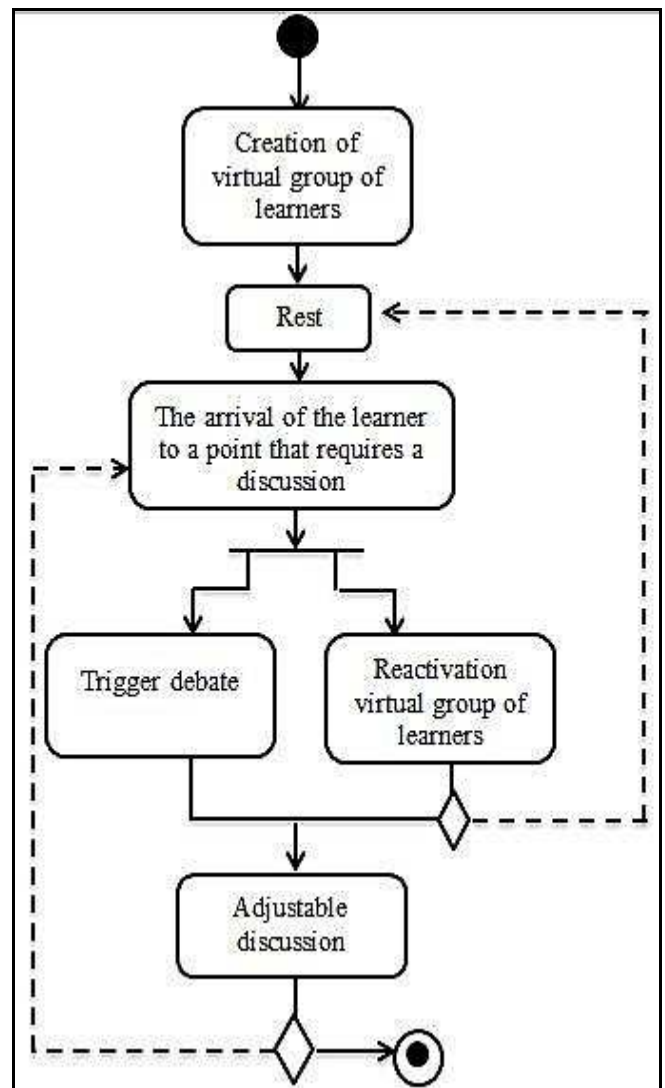


Fig. 2 Tripping of interaction subject and automatic creation of virtual group of learners

In order to clarify the features that our approach will put in place, we have resorted to the UML modelling: Unified Modelling Language provides a graphical representation of the various system functions [27-29]. In our work, we focused particularly on activity diagram which notably allows representing the treatments performed by the system. As this diagram (figure2) illustrates, a group of virtual learners is created and put at rest waiting an event likely to activate and trigger a process of its own. This event is the arrival of the target learner to a learning unit (definition, theory, concept or other) which requires an interaction to be clearly understandable. At the end of this learning unit, the virtual group is reactivated and the debate is triggered. The created agents discuss among themselves the complicated notion and attract learners to anticipate making him an active actor. This discussion lasts a configurable time by the responsible tutor. At the end of this interaction, a conclusion is given by one of the agents

In order to facilitate memorization and assimilation of learners and the group will put at rest awaiting the arrival of another event to reactivate.

C. Automatic planning of interventions

After reading by learners a concept which the tutor estimates that it is not easy to assimilate quickly, an interaction space is launched in an automatic way. This space includes our virtual agents and the target learner. Each of these agents has its own setting which is modelled by the time of intervention, and the intervention content. These parameters are planned and programmed in advance by the system. The content given by each agent is formulated in a very clear and precise way to help the learner assimilate it easily. The interaction is shown schematically in three basic steps. In the first step, the animator agent initializes the process of interaction between agents, announces the ambiguous idea that they will discuss and Gives an introduction describing this discussion point. In the second step, an exchange and a thorough explanation by examples is used between animator agent and explanatory agent. The explanatory agent tries to clarify as much as possible the concept by giving examples, synonyms and cases of studies, etc. In the third step, animator agent requires the point of view of the learner to ensure his activation and follow-up of discussions. This method is effective and responds well to what our objective which is to create a lively atmosphere for interaction between learners. This atmosphere will motivate the learner to complete the learning process and at the same time help him to remove the ambiguity which may have in some notions that are quite difficult to apprehend. In the fourth step, a reminder and a conclusion are given by a synthesizer agent to assume the acquisition of the discussed idea. This synthesis given by our agent ensures that our learner is able to memorize and understand unconsciously the correct notion of a rather difficult concept to understand. This method is found to be an innovative and very promising solution for optimal learning. And finally to the fifth step, the animator agent intervenes to close the discussion and thank the participate agents for their contribution and the effort to succeed in this online interactive.

Each agent is intervened at the programmed time and gives intelligently his own participation. Also, our agents remain active throughout the period of discussion, listening to the messages exchanged between the co-agents. This method will allow us to simulate the real world of discussion and exchange of ideas.

D. Inter-agent communication

In order to develop an effective mode of interaction, it is necessary to establish a communication medium between the different entities of the system. This support promotes active listening and information exchanging of the series of messages in a continuous way. The communication inter-agent is fundamental to a dynamic relationship between two or more agents through reciprocal actions.

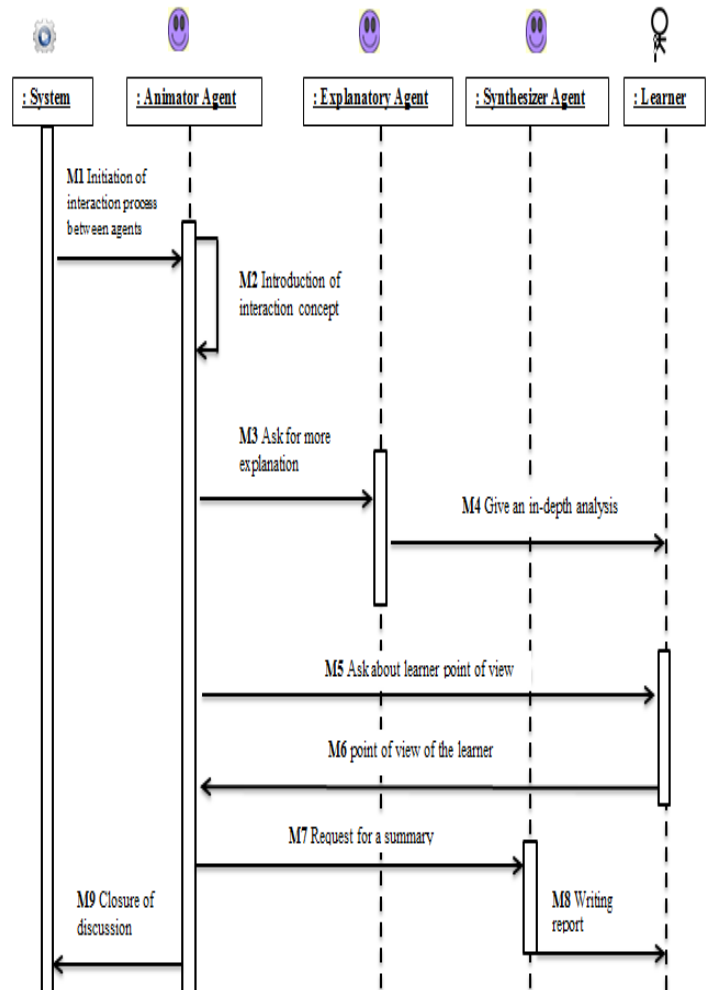


Fig. 3 Sequence diagram illustrating the communication between the different entities

The modelling presented in this figure (figure 3) is based on communication between a set of agents to properly conduct the online interaction process. This type of communication allows agents to send and receive a series of messages M. These messages facilitate the process of automatic interaction which is the ultimate goal of optimal online learning.

III. RESULTS AND DISCUSSION

While experimenting our approach, we want first to prove that the interaction between learners is the optimal solution chosen by learners when they face any difficulty. For this purpose, we have applied a survey on to a sample of 49 students of the Master in French literature and Islamic education at the Faculty of Letters and Human Sciences, Moulay Ismail University, Meknes, Morocco. These learners enrolled in an online course. The applied survey will allow us to determine what is the most solution opted by these students to overcome their difficulties (Figure 4).

In order to limit the number of solutions chosen, we gave learners the possibility of choosing between three solutions enabling them to overcome their blocking points.

The solutions given are as follows:

- Work together: the learner prefers to collaborate with co-learners to overcome blocking points and he is unable to assimilate the course by relying on his individual efforts. The learner strongly needs pedagogical interaction to avoid ambiguity and to understand the course.
- Self-research: The learner chooses to make individual efforts: read and reread slowly and carefully the course, do research on the net in order to fully understand the course. These types of learners prefer to rely on their personal abilities and they promote individual learning.
- Not interested: The learner follows his learning process. On arriving at a concept difficult to assimilate, he makes no effort to understand it. He simply exceeds it and moves on to the next unit. These types of learners also need online interaction to accompany them in their learning processes, even if they did not choose it. These are lazy learners need to the collaborations in order to help them in their learning at the same time to motivate them.

It is possible that learners having more than one choice. For example, they prefer to do self-learning, and at the same time share their knowledge with other learners in order to well assimilate the course and also correct the erroneous notion.

The following figure illustrates the choices made by our learners.

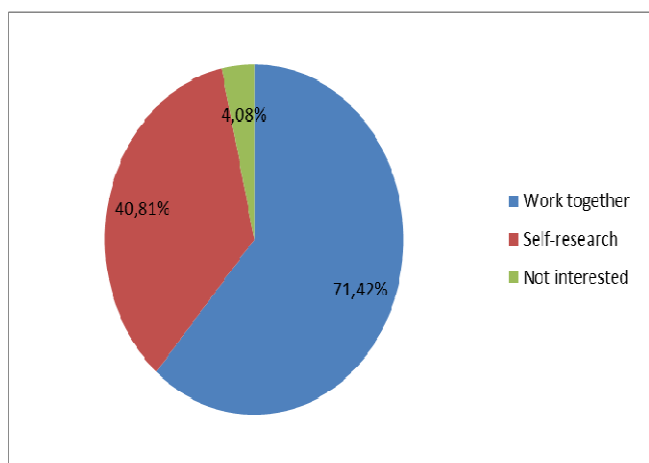


Fig. 4 The choice of learners in the blocking situation

As it is shown in this figure (fig. 4), the majority of students, 71.42% (35 learners) chose to work together to clarify the ambiguities that exist in some of them. While fair, 40.81% (20 learners) have preferred the self-research to overcome their difficulties. And only 4.08% (2 learners) who are not interested in blocking concepts in their learning process. According to the survey, the majority of learners confirms that the interaction between them and collaborative work plays a favourable role in their learning and consequently in their success.

These results are very encouraging and motivating to put implement our approach and serve online learners to benefit

from the contribution of this methodology in learning and the assimilation of concepts that appear difficult at first.

To test our approach, we proposed a course in online to these students with an automatic planning of interactions in the points previously annotated. These annotations represent the points for which the tutor has observed that the majority of these students have difficulties to assimilate easily. The decision of the tutor is taken on the basis of his / her extensive experience in teaching and his long observation of the behaviour and reactions of the learners in front of these points of the course.

At the end of the course, a test is scheduled for students to evaluate their acquisitions and examine the assimilation of concepts that seemed to be difficult at the beginning.

The results of this test have shown a prominent increase in the level of acquisition of learners.

A significant increase in the results of the second test results compared to the first ones (without interaction between learners).

In the first test 27 of learners are unable to answer correctly questions about concepts that require high concentration and a little intelligence to be assimilated. While in the second test after an interaction followed in the learning process, 41 of learners answered correctly and efficiently to the questions that appeared difficult for the first time. A positive contribution of our approach is very remarkable. Fourteen learners have benefited from the input of the approach and they have correctly answered to the questions that appear difficult at first.

Figure 5 presents a comparison of the percentages of learners' success and failed with and without interaction.

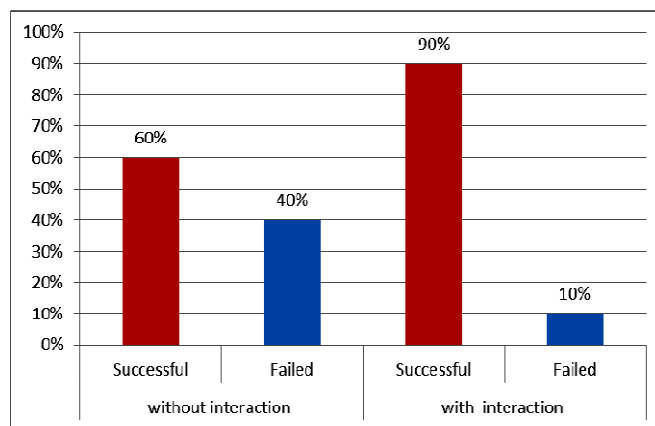


Fig. 5 Result of the interaction approach

As it is shown in this figure (Fig. 5), there is a strong influence of collaboration and interaction between learners of their acquisitions and success. We note that the proportion of learners who obtained a good note without passing through an interaction between them is (60%). While with an interaction and exchange between learners their proportion of success is arrived to (90%). The number of successful learners is increased by 30%. The value of this percentage is very significant.

We also calculate the average relative gain of learners to show that participants have really progressed in terms of their learning. This gain represents the ratio between what

has been earned and what could be earned (maximum score=10), and it is calculated by the following formula:

$$\frac{\text{Score after} - \text{Score before}}{\text{Maximum score} - \text{Score before}} \cdot 100 \quad (1)$$

In our case

$$\frac{8-5}{10-5} \cdot 100 = 60\% \quad (2)$$

The analysis of this gain allows us to better understand the effect of online interaction on learners' learning.

The learners are satisfied, there is a remarkable improvement in the mastery of course content. Score 8 is a better indicator of mastery.

The result is important (60%), it indicates that there is a positive learning effect which confirms the pedagogical effectiveness of the proposed approach.

The conclusion that can be drawn from this experiment is that the online interaction between learners plays a major role in the acquisition of knowledge and learner success. The learners are able to achieve a high level of learning if they have been helped where and whenever they encounter a particular difficulty.

An overall educational effectiveness of the action of training is present. The online interaction tool has met the expectations of learners and also improved the quality of e-learning.

IV. CONCLUSIONS

The interaction is a relevant practice that supports learners facing difficulties. It ostensibly participates in their audience to assimilate fairly difficult concepts. In this perspective our approach has been given birth. It is presented as an essential complement to online learners ensuring their learning and acquisition of knowledge. The main contribution of our approach lies essentially in the automatic scheduling of interactions in subjects that require a broader discussion to be clearly understandable. This object is achieved using intelligent agents who know in advance when and how to interact. The results are very convincing and learners come to come over their difficulties. In our future work, we also wish to automate the selection of items that requires interaction to be easily assimilated based on the learner experience.

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