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Modeling collaborative practical work processes in an e-learning context of engineering electric education

Fahd Ouatik[1], Mustapha Raoufi[2], Mohamed El Mohadab[3], Farouk Ouatik[4], Belaid Bouikhalene[5], Mohammed Skouri[6]
[1,2,6]Laboratory of Physics, High Energy and Astrophysics Cadi Ayyad University,
Marrackech Faculty Science Semlalia, Morocco
[3,4,5]Laboratory of Innovation in Mathematics and Application and Information Technologies,
Sultan Moulay Slimane University, Morocco

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ABSTRACT

This work deals with the modeling the processes of the collaboration in practical work of electronics in a context of e-learning and the remote laboratory which is a new technology allows students to manipulate the practical experience the electronics by controlling all equipments and instruments of a laboratory via the web without moving to t laboratory. That is for to solve the problems of overcrowding students in universities and the restriction of time and places and the lack of some instrument in laboratory. Even this new project will allow the sharing all instruments and equipments between universities in the world for to have a cooperation in scientific learning. In this work we are interested to modeling the processes of collaborative electronics practical work, whose actors are: tutor, member, coordinator and the secretary and collaborative tools. Two models have been developed: a tutor-student model showing the activities of the learner and tutor, and moderating-member-secretary model that focuses more specifically on the roles of the moderator (coordinator) and the secretary (reporter). This modelling has made it possible to better understand the processes considered and to detect the various problems that may arise during an online particle work collaborative process.

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Corresponding Author:

Fahd Ouatik,
Laboratory of Physics, High Energy and Astrophysics Cadi Ayyad University,
Marrackech Faculty Science Semlalia, Morocco.
Email: fahd.ouatike@gmail.com

1. INTRODUCTION

One of the important factors in the formation of physic science specialy in the field of electronic is the Practical work. This is allows students to acquire the necessary technical skills. Through the realization of experiments for verify and supplement the knowledge provided in the theoretical courses. This desire is confronted with a set of problems: overcrowding in front of the large numbers of students, Insufficiency of materials and equipments. Insufficiency of practical work premises, security of the material and the students.

Classical method for solving this all problems are: Group work. The benefits of working in a group are many: sharing tasks, sharing knowledge, and idea but some time we need student to be autonomy and relies on himself. Simulators: same as ISIS and MULTISIM. This virtual solution are used to explain the theoretical framework by simulations. but for the exact sciences, we need student to see and notice the effect of environment and the take real measurements.

Hence the need to find a solution is the manipulation of practical work online and remotely is an alternative solution to help solving these problems. Our solution is Create a embedded system allows students to control and manipulate all laboratory equipment and measuring instruments just via the web [1].

In our previous work we have interested about the performance of this system. For that it is necessary this system of Learning uses and respects the pedagogical standards followed in the teachings [2]. On the other hand, this system must make it easier for the laboratory manager to prepare and manage access to experiments and manipulations. The performance of the system regarding the precision and speed of interaction with the laboratory [3]. And in this work we will be interested in a very important topic in the teaching and education it is the collaborative work and more precisely. The collaboration in the practical works of electronics online between students. is an active means by which the learner works for construction his knowledge. It is an educational strategy that promotes exchange, interaction between members and sharing a common goal. This type of learning requires the presence of several actors whose main ones are the learner who can be a simple member of the working group or play the role of a moderator and a secretary and the tutor whose function is the accompaniment of the group during its formation. and an embedded system that will offer tools for online collaboration via the web.

A modeling of collaborative work processes in the practical work of electronics in an e-learning context is carried in this article [4]. More precisely, we have schematized the different activities of the actors and we have arrived at three models: a tutor-student model showing the activities of the learner as well as those of the tutor, a moderating-member-secretary model that focuses more specifically on the roles of the moderator (coordinator) and the secretary (reporter) and a moderator-member model that excludes the secretary role. Finally, the problems encountered in accomplishing these processes are presented. This article is structured as follows: in the second section, a general idea is given about distance education and tutoring. The third section presents the collaborative work: its characteristics and its different actors. The fourth section presents the models that were developed during this work. The fifth section highlights the main problems encountered during online collaborative work. Finally, a conclusion completes this article.

2. E-LEARNING AND PRACTICAL WORK OF ELECTRONIC ONLINE (E @ LAB)

E@lab : is an open source web conferencing system for on-line learning is an embedded system for formation in which the theoretical and practical teaching is provided partially or totally by a trainer remote from the learner in space and / or time so that the communication in its entirety or essentially between teacher and student is done indirectly through an artificial medium, it is an institutional means of providing pedagogical and technical support to students who are thus relocated from the university, in order to help them to optimize their learning. Distance education consists of coaching psychological learners by tutors. It is the mediatisation of human relations via a foad / Elearning device between the tutors and the learners. So E@lab provides real-time application of sharing audio, video, chat, and screen and the most important is sharing the same electrical scheme of a practical work and the same workspace between students for control and command commun [5, 6].

The world outside E@Lab : it is important to identify how E@Lab works with other components in order to develop and maintain the software. The external entities that are connected to E@Lab are displayed in Figure 1.

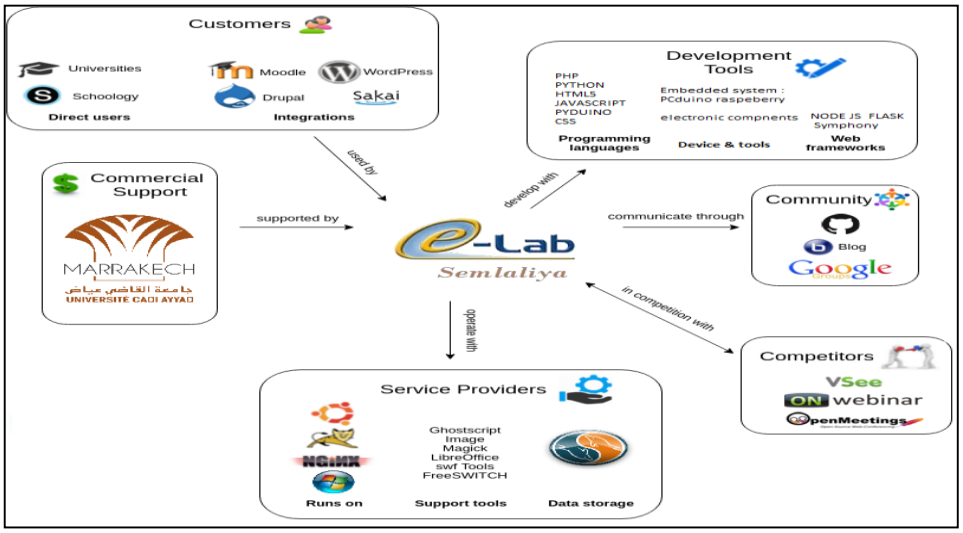


Figure 1. Outside E@Lab

2.1. Architecture and Technology of System

Implemented laboratory architecture is centered on a main server and uses many other types of equipment to be correctly connected . The server2 is connected to several measuring devices and instruments. In the diagram of Figure 1, there are two perimeters. The first is the web (Internet) and the second is the perimeter of the university (specifically the local school network LAN). In the perimeter of LAN, we have two web servers, one containing the learning platform that represents the central faculty information system, where all information is found. The second server is a pcduino or raspebery that contains the application that will allow students to handle the practical work. The process would work as follows: a teacher or teachers connect either using the Web or the local network; each teacher defines one or more TP, puts the theoretical part and the sce-nario after having made the TP reservation for all students. On the other side, students connect using either the Web or the local network (Most of the time, students will use the web, because the use of web was among our goals from the begin-ning). If the student has a appointment for Travel work, he consults and reads the scenario, then he checks the reservation. If the reservation time arrives, he manipulates and remote the travel work; during this stage each reservation is destined towards the server 2 (pcduino card). If the reservation time elapses, the TP ends and the material resources are released for a future reservation [7, 8]. Figure 2 display the architecture and technologies system.

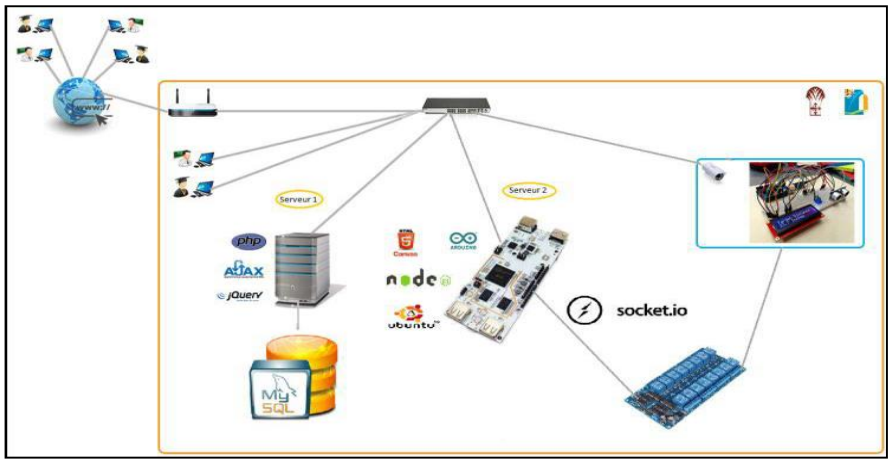


Figure 2. Architecture and technologies system

3. COLLABORATION IN THE PRACTICAL WORK OF ELECTRONICS ONLINE

Collaborative learning is defined as any learning activity carried out by a group of learners with a common purpose, each being a source of information, motivation, interaction, mutual help and benefiting each of the contributions of others. the synergy of the group and the help of a trainer facilitating individual and collective learning [9,10].

3.1. The actors of an online collaborative work

3.1.1. The tutor

It is the one who has a coaching function for all teams during their training [11, 12]. It plays a driving role, it can intervene at different levels, with various functions: in the conception and in the elaboration of the contents, in the correction, where it is a matter of making the link between the content and the learner and to build an evaluation from the productions of the latter, etc. The tutor is a mediator between the learner and the tool, it gives the basic tools (method, rules of work) necessary for any task [13]. It is an intermediary between the learner and the content of the course, it must be attentive to the working arrangements of the learner and lead gradually to independent intellectual activity [14]. It helps the learner to act and decide, he pushes him to find the keys to the situation and he guides him [15].

3.1.2. The learner

In the context of online collaborative work [16, 17], the learner is no longer the traditional learner whose role is to memorize the knowledge transmitted by his teacher for a restitution on the day of the exam, but he governs his teaching process [18]. learning by transforming information into knowledge and creating interactions with other members of the group [19] . During the communication, the learner can be either a

transmitter who must: to be listened to and to be understood: to express himself as succinctly as possible in order to avoid encroaching on the expression time of the other members of the team, express yourself clearly and accurately and use accessible language. He must also be a receiver who must, to listen well and understand what the transmitter. Communicates: adopt a comprehensive attitude, let the other person express themselves to the end, ensure the good understanding of the ideas emitted by the issuer by asking questions or reformulating the ideas he has expressed and be sensitive to the issuer by trying to understand its reality and perception of things [20, 21].

3.1.3. The moderator

The moderator is a person responsible, among other things, for coordinating tasks and assigning responsibilities [22]. This actor has the power to influence the members of his team by his personal characteristics: his qualities, his talents, his previous experiences, the type of personality that he possesses, the beliefs to which he adheres and the attitude that he maintains to other members or to the work of the group.He participates in the task and tries to maintain a good climate within the group, he strives to influencepositively negative people, he frequently brings examples related to the purpose of work, he puts a lot of effort to try to reconcile two people who adopt different points of view of each other [23].

3.1.4. The Secretary

As for the secretary, he must objectively note the words and ideas discussed during the meetings and which will be used for the drafting of documents. Some teams feel that the secretary must produce a report that is to say a summary or a detailed summary of each meeting. Other teams feel that this procedure is too long and not very useful in view of the objectives pursued. In this respect, it is up to each team to establish a modality that suits them according to their needs. Like the other members of the group (moderator, learner), the secretary must actively participate in the group's discussion and work [24].

3.2. Elements of a collaborative work:

The three elements of collaborative work are: coordination, communication and the sharing [25].

3.2.1. The coordination

Coordination is about the effective organization of activities, people and resources to achieve a goal. To better channel and coordinate the energies and activities of the group, three variables are to be controlled by the teacher or by the learners: the task, the composition of the group and the animation

1. The task: Achieving a collaborative task means working together and helping each other to achieve the goal that the group has set for itself by negotiating and taking into account everyone's expectations. The composition of the group: It is a question of answering the following questions: what will be the size of the group? Should we create homogeneous or heterogeneous groups? Which method should to use to divide learners into groups?
2. Animation: In a collaboration in virtual mode, the animation of the collaboration activity is done mainly through the forums: privileged places for discussion, work, socialization and coordination. It is usually the guardian who is primarily responsible for the decisions to be made in animation matter.

3.2.2. Communication

It brings the learner to express ideas in order to share them with the group, to make connections between the ideas expressed to allow the emergence of new ideas and to structure the ideas to give them meaning and build knowledge.Coordination, together with communication, is one of the two cornerstones of collaboration.

3.2.3. The sharing

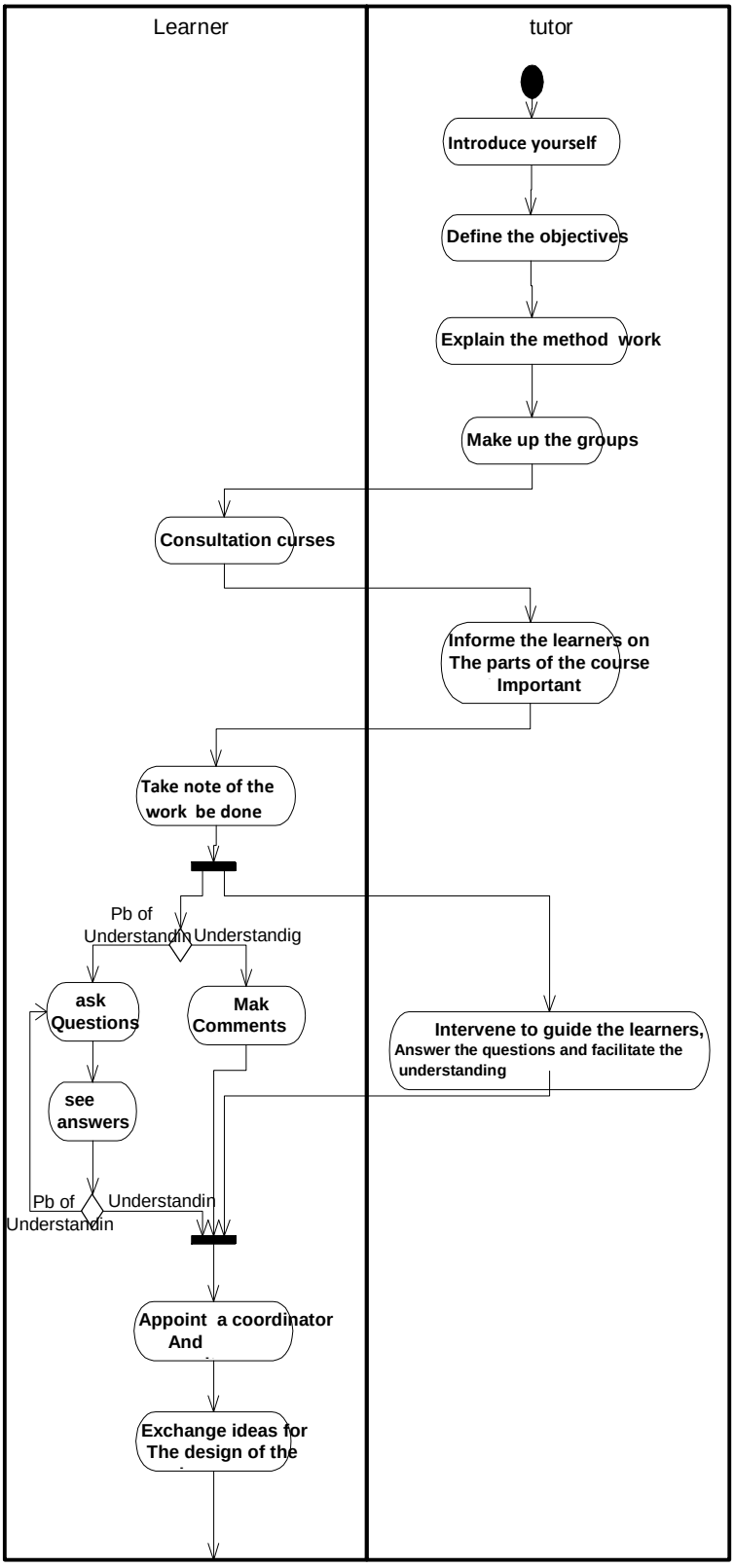
Collaborative learning invites students to share, to build positive interdependencies and to engage in common productions. Pedagogical sharing can take many forms: sharing of ideas, activities (learning, teaching, evaluation of learning), teaching materials or pedagogical knowledge

4. MODELING WITH UML

Modeling is of great importance in understanding and analyzing a process [26]. Thus, we proceed to the modeling of the activities of the actors: tutor, learner, moderator and secretary. More specifically, three models could be developed: tutor model, moderator model secretary member and moderator member model. It is 3 models respect the general modeling to write in Figure 3. The difference will be in the actors and the relation between them.

4.1. Learner tutor model (Figure 3)

As shown in Figure 1, this model corresponds to a UML (Unified Modeling Language) activity diagram showing two actors: the learner and the tutor. The main activities that this model uses are:



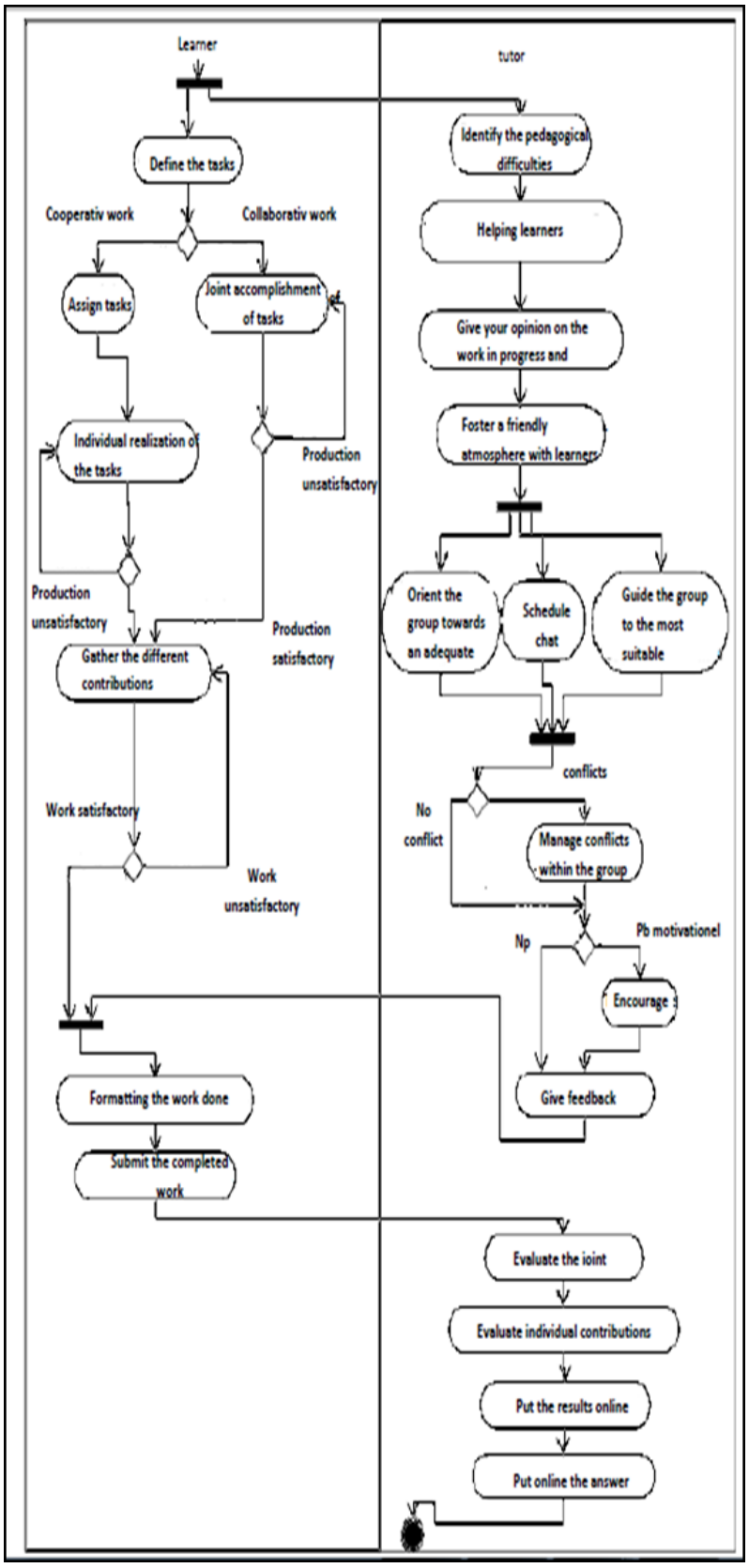
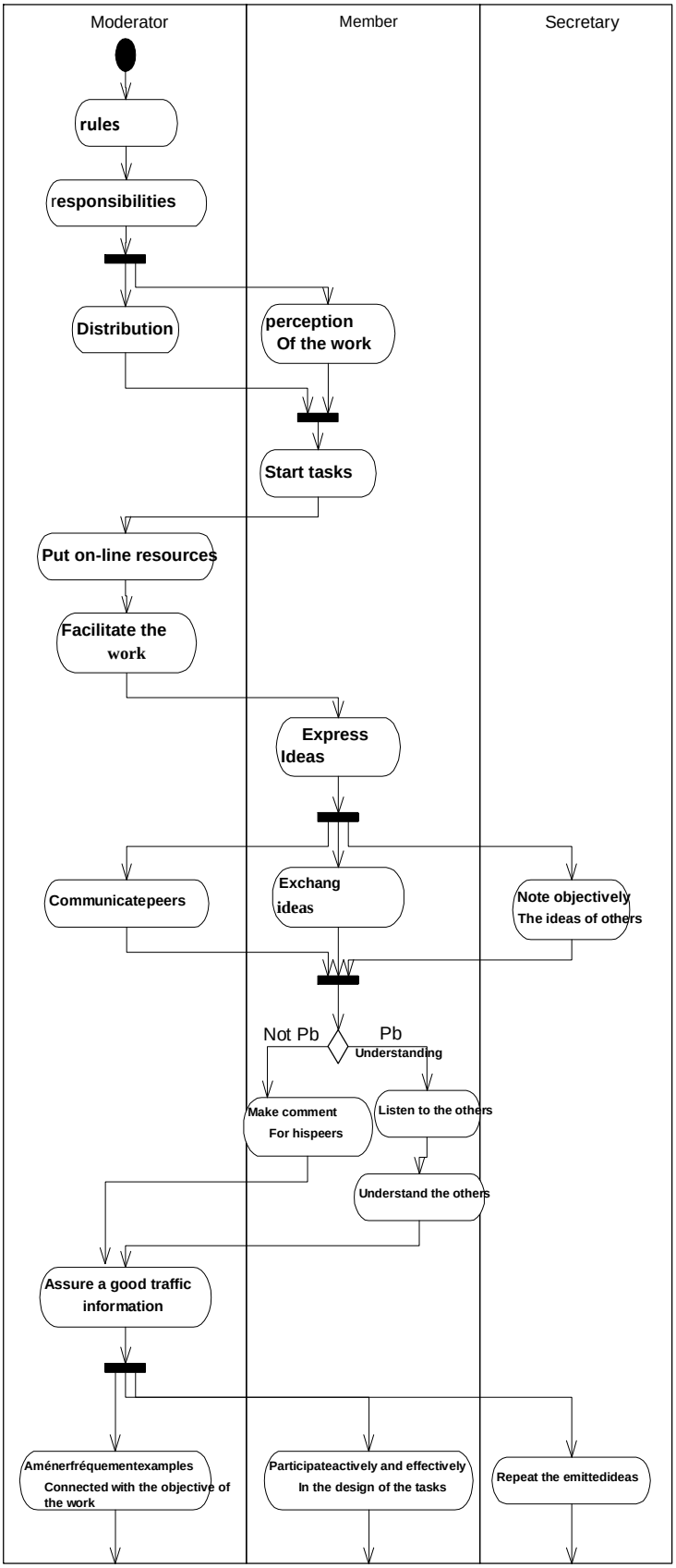


Figure 3. Learner tutor model

4.2. Model moderator secretary member (Figure 4)



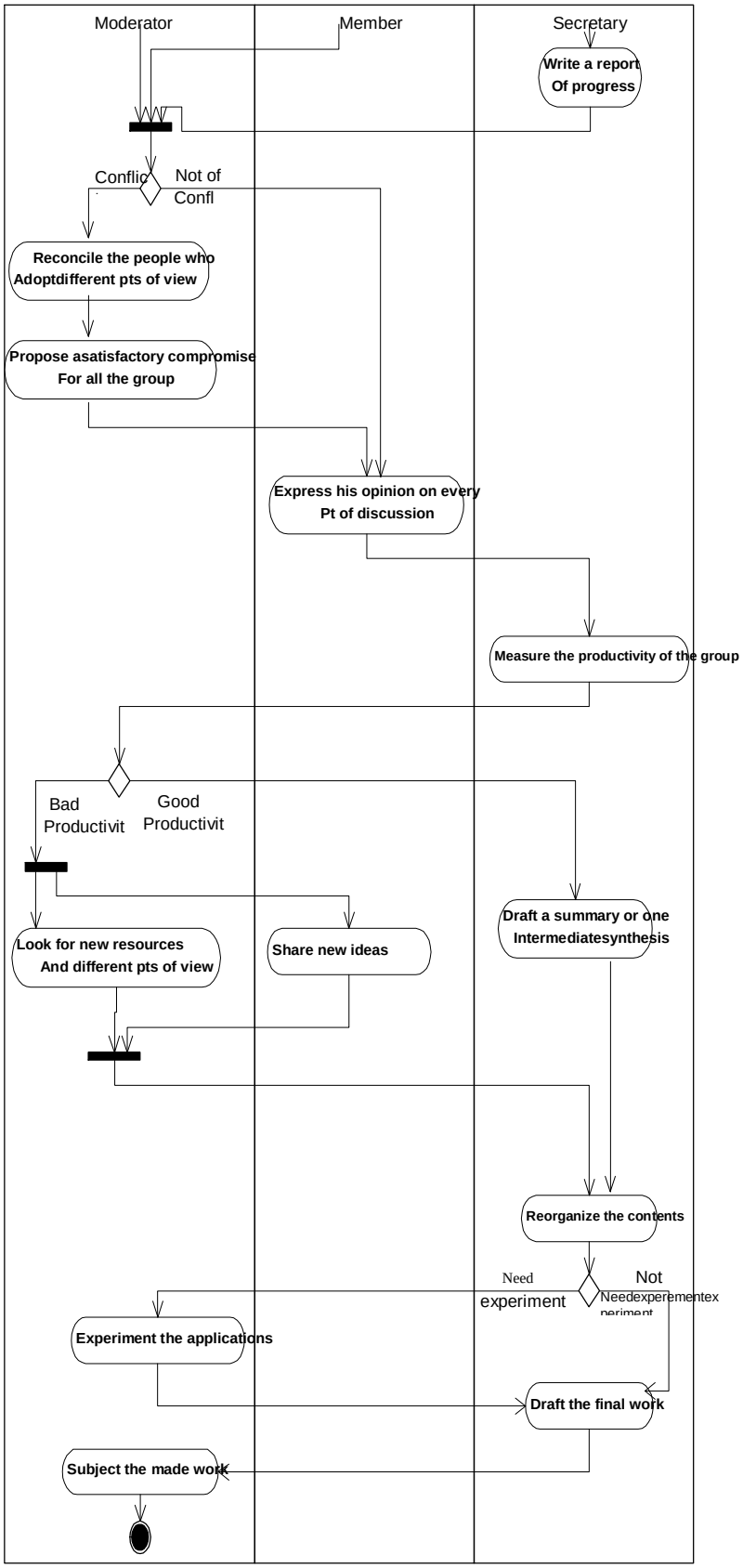


Figure 4. Model moderator secretary member

5. DIFFICULTIES MET IN THE FULFILLMENT OF THESE PROCESSES

The models presented in the previous section bring in as actors the guardian and the learner who can be a simple member of the group, the moderator or the secretary. These various actors can meet certain problems during the fulfillment of the processes such as:

a) Accelerated rhythm of the work so that the learner must every day be informed about what takes place in the forum and to intervene there.
b) Necessity of an enormous work in an online training, asking for a big availability and not only for a half-time work.
c) Technical problems for certain learners, such as the bad control of the computing tools and the sciences of the information and the communication in a general way.
d) Bad choice of the coordinator in certain cases .
e) Conflicts at the level of the on-line collaborative work which can have because of the differences of ideas and points of view or the imbalance of the supplied efforts. They are a source of abandonment.
f) The isolation of the learner: in certain cases, the learner is alone and has practically no direct contact with the other learners.
g) Lack of training of certain guardians or lack of coordination between them.
h) Problems of connection: it is the most important problem; he concerns the impossibility of connection, the interruptions, the low flow, etc. Such problems can cause several discouragements.
i) Equipments no always available: the learners sometimes meet the problem of no availability of a computer at their disposal in their workplace or at their home .
j) Deadlines granted for the discount of the works: for certain learners the duration assigned to the design of the works can seem too short.
k) Complexity and volume importing certain courses which ask for many efforts in a very limited time.
l) Problem of groups: certain learners complain about the lack of dynamism within their group.
m) Presence of passive members within the groups.
n) Absence of synchronous tools in certain trainings.
o) Sometimes raised costs of training.

6. CONCLUSIONS AND PERSPECTIVES

In conclusion, the modelling of the processes of collaborative work in the context of e-learning, through diagrams of activities of UML, allowed to specify the roles played by the guardian, the learner, the moderator and the secretary and to discover the various problems met during the fulfillment of these processes such as educational problems and others of order technical. It seems interesting to spread the type of study whom we made, by deepening the reflections made in the field of the distance teaching and that of the on-line collaborative work, to model other educational or administrative processes. This work could be even completed and enriched by the search for solutions to the various problems met during a collaborative approach in a context of e-learning.

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