A Model for CSCL Allowing Tailorability: Implementation in the "Electronic Schoolbag" Groupware

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Abstract. We describe in this paper a model for Computer Supported Collaborative Learning and the corresponding architecture. This model has been designed to take into account the variety of educational activities and cultures. It offers primitives to endusers, mainly the teachers, allowing them to describe a collaborative activity and to regulate it (i.e. modify it dynamycally). It has been implemented within a groupware based on the metaphor of electronic schoolbag, which is used today by more than 40000 users in both University and secondary french schools. Thanks to the model, the developed groupware is flexible and tailorable.

1 Introduction

Today, proposing technical frameworks to support educational activities can no longer be done without considering the relationships that each learner has with the knowledge, the teachers and the other learners in the learning process [1]. In the past, school favoured individual work, competition and personal merit to the detriment of co-operative activity and group work. For many years, the learner was considered as having an exclusive relationship with the teacher. Encouraged to work alone, to listen attentively to his/her teacher, and to compare his/her results with those of his/her peers, the learner can nowadays devote a part of his/her time to carrying out collective and collaborative work, evaluated as such.

This evolution is mainly due to the many works of psychologists, pedagogues, knowledge engineers and didacticians who have highlighted and stressed the importance of social interactions in building knowledge and in the construction by the learner him/herself of his/her knowledge and learning process [2–9].

By affirming that (a) the learning process depends more on the way the knowledge is built than on the nature of the knowledge itself [10], (b) methodological, metacognitive, relational and social capacities are constitutive of knowledge building [5, 6], (c) times and structures for analysis and auto-regulation are essential for the control of knowledge building [11, 12], (d) the practices of self-evaluation, formative evaluation with a teacher and co-evaluation with peers

are fundamental to the act of learning [13], these researchers have given a new legitimacy to co-operative learning. They have also given teachers the desire to explore new technical frameworks, in particular groupware [14]. These tools, designed to support group work, to facilitate exchanges, communication and information-sharing in organizations, have evolved little since their inception. Their introduction into the world of education was based on simplistic activity models. Educational tasks are more complex than they seem.

In this paper we propose a general framework for the construction of groupware in education. We illustrate this proposition with the description of the electronic schoolbag, which is the name given to the educational groupware used at the University of Savoie and in several French secondary schools.

2 Requirements

2.1 Requirements for CSCW

One of the clearest lessons of groupware research to date is probably the importance of taking into account the social context in which software is to be used. To get away from the traditional approach which consists in providing only tools to produce, communicate and coordinate, groupware developed at present tries to integrate this social dimension. This is done either in an ad hoc way or by basing the development on a theoretical model of group activity. In the latter case, constructing expressive, generic, instanciable and reusable models that can be implemented has become a challenge for groupware researchers.

These models are generally inspired by work in social sciences. They provide concepts which make it possible to describe what a group activity is and consequently to consider its instrumentation. Among the systems featuring such models, we find meta-groupware such as Worlds [15, 16] founded on the theory of "locales", Prospero [17] which is based on ethnomethodology [18] or DARE [19] which refers to the Activity Theory.

Our point of view about groupware is identical: we think that these systems must clearly be based on and integrate an explicit model of the activity of the group which allows the activity's co-construction (configuration of the workspace by the group members themselves) and which takes into account the phenomenon of co-evolution. This term was chosen by [20] in order to "express the fact that cooperative systems must be continuously evolutive, but not in an autonomous or auto-adaptive way, since they must consciously give an account of the evolutions of the needs, attitudes and skills of the users, individually or collectively". In a dual way, co-evolution also states that the system will have an influence on the users which will lead them to adapt.

Our approach is founded on the explicitation of such a model and on its being put at the users' disposal. As users have the primitives of the model at their disposal, they can manipulate them. The aim is first to allow them to build a description of what they think their activity is going to be within the framework of a group workspace, which amounts to building an initial configuration of that

group workspace. The second objective is to allow the regulation of the activity which is going to take place in the workspace. What we mean by regulation is the capacity given to a group or to a person managing a group (for example a teacher within the framework of a collaborative learning situation) to observe the ongoing activity and to influence it. Influencing the activity will here consist in changing its description and making it evolve dynamically, and thus the configuration of the workspace too: it amounts to changing the "rules of the game".

2.2 Requirements for CSCL

Taking into account various educational cultures and practices. In the field of Education the activities are complex to describe because of the variety which characterizes them. From one discipline to another, from one school to another, teachers vie with each other in imagination to create varied learning scenarios from scratch or to adapt existing ones. The educational practices which result from this are just as varied, being based in addition on teaching cultures which themselves also vary from one country to another. It is of primary importance that CSCL software allow for this variety and offer a framework making it possible to take this variety into account and to express it. That supposes that this software be conceived in a flexible and modular way: the teachers must be able to have functionalities which will enable them to configure the workspaces of the groups of pupils according to the educational methods that they wish to apply. These functionalities will however not be the prerogative of the teachers alone: the pupils will also have to be able to use them, within the framework of increasingly common practices which put them in the concrete situation of team work, and which require them to work in a group and to organize this work (e.g. collaborative knowledge building - see FLE in Itcole project [21] - or project based learning as used in the Netpro[1] project). These functionalities must therefore be simple to understand and use.

Configuring the workspaces starting from the teaching scenarios. Upstream of the work of the pupils, the teacher carries out preparatory work which consists in building learning situations adapted to the defined educational objective, situations described by the means of scenarios. The teacher imagines the activities that he/she wishes to implement during the situation, their sequencing, the way in which he/she and the pupils can intervene and interact, as well as the timing of these interventions. He/she then identifies the resources (content, material, tools, software) which are necessary to the situation created and searches for these resources. Once they have been found, he/she will install and arrange them in situ (in class). He/she will then be able to implement with the pupils the situation thus built, planned, organized and prepared, by distributing the tasks to realize and the roles that each person will have to play. Finally, he/she evaluates the progression of the activity, to rectify his/her initial vision, to modify it and to improve it.

[1] http://netpro.evtek.fi/team/.

This work, whether it takes place in the traditional context of classroom teaching or by means of Communication and Information Technologies, is a true representation of pedagogic situations. It consists in preparing and configuring the workspace according to the teaching scenario. In the same way, CSCL environments must in our opinion provide the means to create virtual group workspaces which, just like the class, must be able to be configured starting from the scenario and then populated with suitable material and tools. Once again, that highlights the need for flexibility and modularity.

Facilitating the exchanges of scenarios and resources. The development of varied teaching scenarios presupposes the availability of a great quantity and variety of material (educational resources and content, tools...) which can be regarded as the building blocks from which the scenarios will be built. Elementary scenarios can also form part of these bricks. The work then consists in assembling these resources, if they are available, to produce an original scenario, in creating the resources necessary if they are not available, or in adapting an existing scenario. Certain teachers engage readily and in a generally voluntary way in the process of constructing scenarios and resources; editors are also producers of content as are research laboratories in the field of Education sciences (see for example the work of the tecfa on "C3MS building blocks" within the framework of the European project SEED[2]).

The current tendency is for the mutualisation, sharing and exchange of the scenarios and resources produced. Testimony to this are the many initiatives, at the European Community level for example but also internationally, to define and build "learning objects" (e.g. CELEBRATE project), and description standards for resources and learning scenarios (IMS-LD), or to set up resource mutualisation systems (e.g. ARIADNE project). CSCL tools must accompany this effort at mutualisation and provide the means to exchange resources easily which will no longer merely be simple files but objects as complex as scenarios or the means to configure group spaces. The scenarios could thus be wholly or partially re-used from one group of pupils to another, from one workspace to another. That implies an approach "by components" of the CSCL environments, which must be designed in an open way and guarantee an interoperability making it possible to integrate existing pedagogic objects (scenario, resources...). That also presupposes the use of standards for interoperability.

Allowing the regulation of the activity. Once the activity has been set up in accordance with the chosen teaching scenario, the teacher is placed as an observer of this activity and can intervene if he/she or the pupils consider it necessary. His/her interventions can be anything from the simple contribution of specific help to the total or partial modification of the scenario considered, if he/she detects a problem or a situation which is not in accordance with what he/she expects, i.e. the pedagogic objectives laid down. Observing the activity, to then be able to intervene and possibly modify its parameters dynamically, during the activity itself, constitutes an activity in itself which we call "regulation". In the context of Education, the teacher regulates naturally: he/she

[2] http://tecfaseed.unige.ch/door/.

makes sure that the learning situations that he/she sets up succeed (i.e. the pedagogic objectives are reached) and works to this end. That presupposes having these scenarios to hand and being able to modify them dynamically. Within the framework of CSCL environments, that implies being able to modify dynamically the configuration of the workspaces of the groups of pupils and the way in which they are arranged. For that, it is necessary to have a formal description (a model) of the configuration of these spaces. That in addition implies the setting up in these environments of mechanisms which will allow the observation and the intervention of the teacher.

3 A model for CSCL

We have proposed an original theoretical model to model joint activity: the *participation model* [22, 23]. It had first been designed to take into account the requirements for CSCW presented above. It has then evolved by considering the educational context and its specific requirements to the architecture presented in section 3.3 below.

3.1 The participation model : modelling collaborative activities

This model is inspired by locales theory, ethnomethodology, linguistics, pragmatics and differential semantics. It is based on:

- the *arena* concept, which provides the spatial limits of collaboration: a collaborative activity will take place in an arena. This concept is for us a means to give concrete expression to the fact that group activities are situated;
- an analysis of group activity from the viewpoint of participation: The members of a group are thus considered as active participants in a joint activity in which they will define and negotiate the conditions of their commitment, before the activity starts and also and mainly during the activity itself. Negotiating means defining who is going to participate (who is an "actor" in the considered arena), who is going to do what, what the objects and tools needed to carry out the activity are and what the "rules of thumb" of the activity are. This is represented in the model by the concepts of *actor*, *thematic role*, *tool*, *object* and *scenario*.

An Actor has a thematic role in an arena. It corresponds to the main mission with which the group has entrusted him/her. It can change during the activity. A thematic role gives the actor some rights over the objects and tools which have been put in the arena. These rights are expressed by means of permissions regarding objects and tools.

The *scenarios* describe norms, constraints, recommendations, orders, rights, duties... that govern the interventions of the actors in the group. They constitute the "directions for use" of the group, a description of its functioning. They mainly describe the possible interactions between the actors in the group and their intertwining. Scenarios and roles are tightly linked as roles are used in scenarios to express the rules governing the activity.

3.2 Functionnalities needed to manipulate the model.

In this context, regulating means instantiating the participation model to create a first configuration of the shared workspace and then eventually acting upon the concepts of the model and modifying them to make the workspace evolve. From a static point of view, this implies providing the following functionalities:

- creation of a group workspace (i.e. creation of an arena),
- insertion of the required tools and objects in the created arena,
- social configuration of the created arena: defining who belongs to the arena (who the actors are, what their features are), attributing roles to the actors (and at least rights through the allocated roles), defining the rules of the game of the group (constructing the scenarios).

From a dynamic point of view, it implies developing mechanisms:

- to put the configuration into practise (the activity will take place in the arena according to the social configuration defined),
- allowing to dynamically modify the configuration and leading, as a consequence, to the modification of the on-going activity,
- allowing to observe the on-going activity.

3.3 An architecture for CSCL based on that model

A three-levelled architecture. To support the functionalities described above and the underlying participation model, we propose to structure a collaborative workspace (an arena in the participation model) according to the three-levelled architecture presented in fig.1.

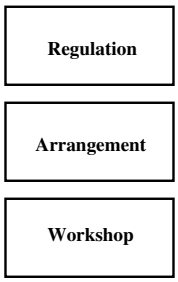
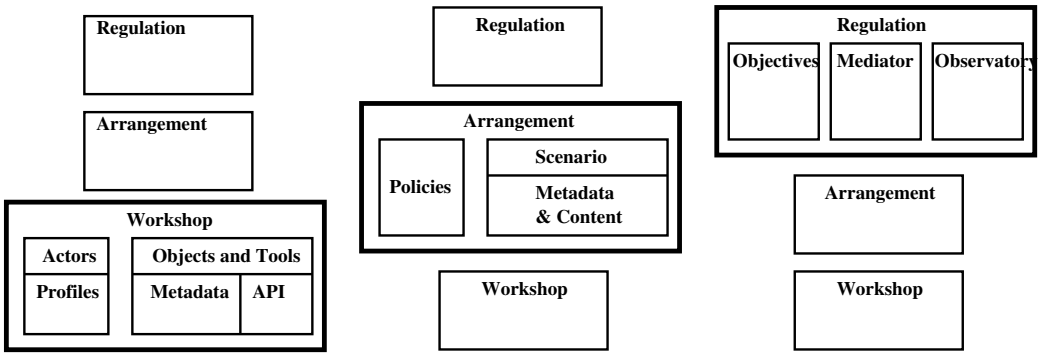


Fig. 1. A three-Levelled Architecture.

The first level, called a "workshop" (see fig.2(a)), is the space where the collaborative activity will actually take place. It is populated with the actors, objects and tools relevant to the activity. The actors will use the tools to produce new objects or even new tools.

The top level is the "regulation" one (see fig.2(c)): a particular actor, whose thematic role is as a *mediator*, will be in charge of regulating the activity, of "mediating" the interactions between actors. For that purpose, he/she will be aware of what is happening in the workshop by means of observations. Actually, he/she will have at his/her disposal a tool called an "observatory" that will provide a synthetic and pedagogically founded view of the on-going activity in the workshop. A description of the pedagogical objectives will also be available. Observations and pedagogical goals are information which will allow the mediator to decide if an intervention in the on-going activity is required. He/she will then be able to effectively intervene in this activity and to modify its functioning by acting on the configuration parameters and modifying them, or by modifying the configuration of the workshop (adding new tools and/or objects or suppressing some of them). The dynamics of the regulation activity are sketched out in fig.3. It is clear that, in most educational settings, the role of *mediator* will be attributed to the teacher.



(a) Workshop Level. (b) Arrangement Level. (c) Regulation Level.

Fig. 2. Description of the three levels.

The configuration parameters are stored in the mediate level: the "arrangement" one (see fig.2(b)). This level has been defined to store what corresponds to the *scenarios* and the *thematic roles* in the participation model. We have identified different kinds of scenarios regarding the various dimensions of collaboration. They may concern the rights of actors within the arena, the way tools and objects will be seen by the actors (the interface dedicated to each category of actors), the way awareness will be managed, the way observation will proceed (what to observe on which component of the workshop) and organisational and social features. We will call a set of scenarios concerning one of those dimensions a *policy*. For each category of actor, i.e. for each thematic role defined, there might be some scenarios concerning that category in each policy.

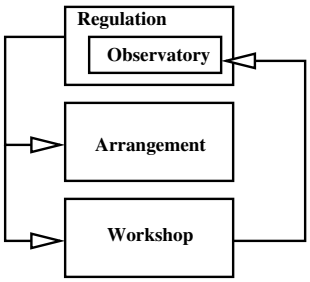


Fig. 3. Regulating the activity.

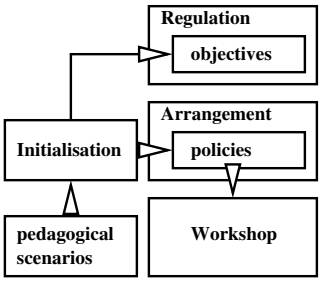


Fig. 4. Initial configuration of the arena by means of pedagogical scenarios.

Initial configuration by a pedagogical scenario. To complete the architecture, we propose to use pedagogical scenarios as inputs to build the first configuration of the arena (see fig.4). In this way, the teachers will be able to adapt the arena to any pedagogical activity. Actually these pedagogical scenarios will describe all the elements necessary for the pedagogical activity to take place. This implies defining a rich and expressive formal language to describe those pedagogical scenarios which will furthermore have the feature of being implementable within a CSCL framework. For us, this means that formal language to be based on the concepts of the participation model.

4 Implementation within the electronic schoolbag

4.1 Description of the electronic schoolbag project

Begun in 1999, the "Cartable Electronique®"[3] project has combined the efforts of the University of Savoie "SysCom" laboratory and "TICE" team, the Savoie General Council "Savoie R&D" team[4] and the National Education Institution's rectoral and departmental services. They have worked jointly on the definition, design and creation of new educational services intended first of all for schoolchildren and university students, but also for all of the actors in the Education field (teachers, administrators, sociocultural partners, etc.) and families.

The ambition of this project is to contribute to the development of new educational practices introducing information and communication technologies in the educational area, from school to university. For the schoolchildren, one of the objectives is also to increase the links between the institution and the children's families, and between the institution and its traditional sociocultural

[3] "electronic schoolbag" in English.

[4] The "TICE" team and the Savoie General Council "Savoie R&D" one don't exist any more. Computer engineers involved in the project since its beginning, who were members of those structures, and the researcher who originated the project, Christian Martel, have recently set up an enterprise to continue the development of the project, in collaboration with the laboratory.

partners. For the students, we are witnessing a mutation of education practices: students have quite different learning curricula, with a mixture of distance and traditional teaching. We have to take into account the different needs of each individual, their various backgrounds and the variety of courses they follow. Moreover, during the course of their scholarship, students belongs to different communities: institutional, cultural, sports, organizational, etc.

We have developed within this project a web-based system called "electronic schoolbag"[24] which can support collaborative activities as well as individual ones. It is a framework which gives access to many services and objects concerning basic group work functionalities and specific educational ones. It is intended to offer the learners a permanent access to the contents and the personal tools which are useful for them at home or at school.

This platform has been developed in accordance with the architecture and the underlying model described above, which are used as guides for its development. In what follows, we describe its current state, showing how the concepts presented in the architecture and the model have been implemented and thus putting emphasis on its tailorability and its flexibility.

The Electronic Schoolbag project is supported by the French National Education Ministry and its Technology Executive, the Savoie General Council, the University of Savoie and the Caisse des dépôts et consignations (State's Bank).

4.2 The model and architecture within the electronic schoolbag

Two kinds of arenas : the virtual "schoolbag" and group workspaces. A private arena is offered to each learner: the virtual *schoolbag*. It groups personal tools and objects accessible by several protocols (WebDAV, HTTP, HTPPS, ftp) through a desk. By extension, this object is also offered to the parents, to the teachers and to the technical and administrative staff of the schools. It enables them to have a single access point to their private data or to the services useful for the exercise of their profession or their responsibility. Obtaining such a virtual schoolbag is subordinated to the membership of an educational community organized around a school. An LDAP directory is used as a frame of reference for the delivery of the access authorizations.

Figure 5 shows a screenshot of one schoolbag. It is currently viewed as a folder which contains objects and tools. Objects can vary from simple documents of whatever type you want (html, simple text, .pdf, .doc, ..) to structured ones such as photo album, encyclopedia, school report, homework notebook,.... Tools are personalised services such as a webmail or an address book manager. One user has functionalities at his/her disposal to manage the contents of its schoolbag as he/she wants: adding objects or tools any time; copying/cutting/pasting those objects or tools; editing some of them; sending them to other users, even the structured objects (by means of a communication tool called a "dropbox" which saves the structure of the structured objects); organizing the contents by adding folders inside the schoolbag space;... These functionalities are for us the first degree of tailoring of the platform, at an individual level, as they allow users to be the masters of their private spaces and data.

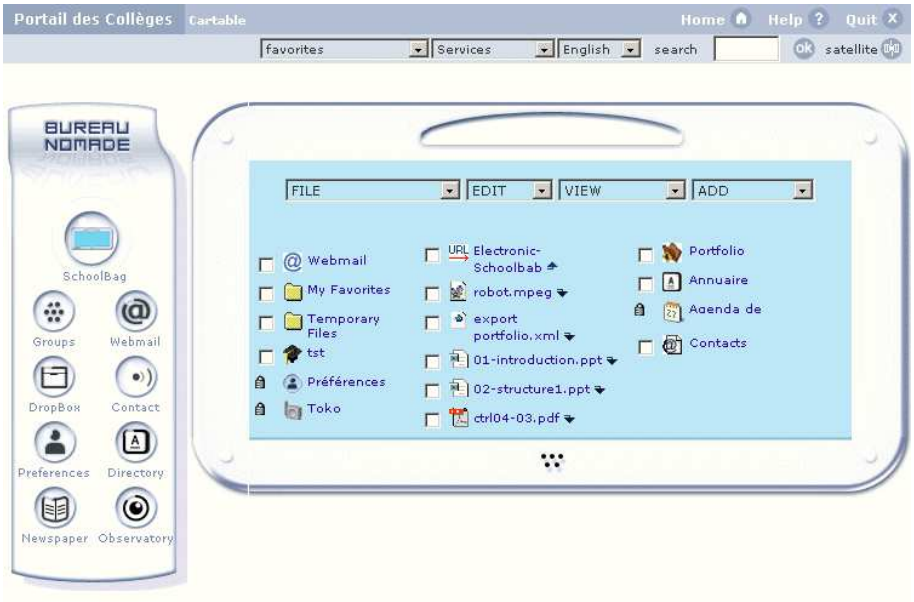


Fig. 5. A view of one virtual schoolbag.

As users belong to several institutional or interest groups within a school or a University (for example, one curriculum class, the group of the teachers, the teachers of History, the management staff,...) we have defined "workshops". They are arenas dedicated to group work support. They are described in the next section.

The workshop level. The workshop level is reified in the electronic schoolbag platform by means of workshops. They may contain the same objects and tools as a schoolbag arena does plus specific ones concerning collaborative work (for example, wikis, chat, forum, ...). Users may create and manipulate those objects and tools within a workshop as they do in their own schoolbag. However the distribution of functionalities depends on the role attributed to one person (see the next section).

Workshops are created automatically when they correspond to institutional groups (they match the organisational structure of the school described in its information system) or they may be created by users themselves whenever they want, to whatever purpose. This is the case for example when a group of students is involved in project-based pedagogy : they create a workshop to support the activity they will carry on during the project. This can also be the case for people who share a hobby and want to share something (for example, exchange ideas, photos, ...) about this hobby. Users here have great freedom in creating groups and in arranging their contents. So a teacher can create groups and associated workshops to support collaborative learning activities and populate them with

Fig. 6. A view of one workshop.

the tools and objects available in the platform. This is another way of tailoring the platform, at a collective level this time.

The arrangement level. The arrangement level is reified by the policies accessible via a menu in a workshop (see fig.6) describing the scenarios which will govern the entry into one workshop, the registration process, the distribution of roles and permissions and the display of the workshop itself.

The registration process is dedicated to one actor having the specific role of "group manager". The group manager will be able to choose, among the people registered in the LDAP, who will be a member of the group. He will also be able to assign a role to each member. There are some predefined roles such as "group manager", "member", "teacher", "learner", ... Some have been defined to control the basic functions of group management; others are dedicated to pedagogical purposes. A "group manager" can create as many roles as he wants and distribute them to group members. For each role, he also defines the *permissions* associated with this role. Permissions describe what a person having a particular role is allowed to do or not in a workshop (see fig.7). They are attached to each tool and object present in the workshop, to the workshop itself and also to the folders within a workshop as a feature of their API. So the matrix you can see in figure 7 is not static but is dynamically built according to the configuration of the workshop. That's why a dynamic definition and distribution of roles is possible.

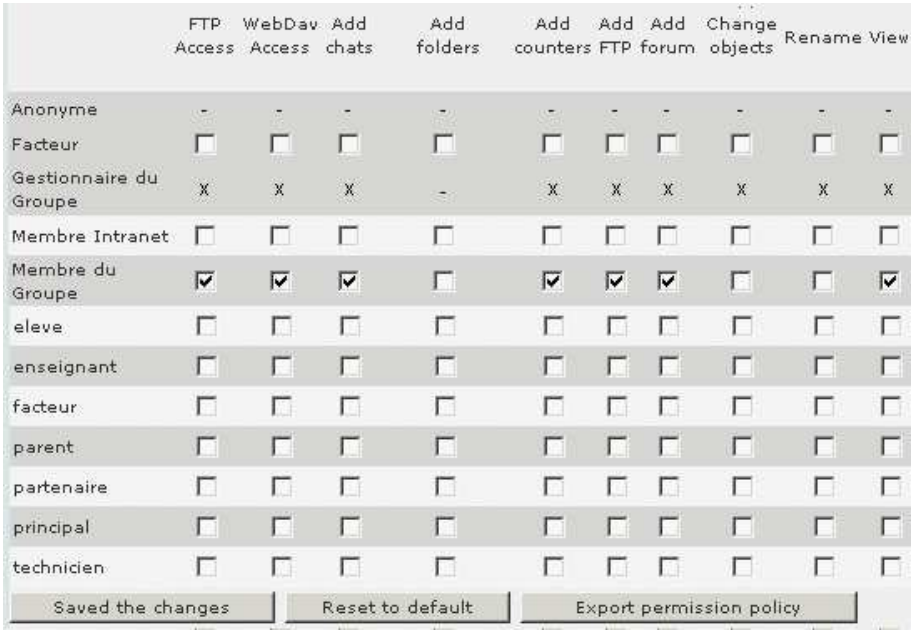


Fig. 7. The permission matrix.

When a person is a member of one group, he/she can enter the workshop associated with the group whenever he/she wants and manipulate its contents according to his/her role in the group. For a non-member, entry is subject to the *foreign policy*. This policy indicates how the group, its contents and its members will be accessible or available for non-members. If the group is " Public" (as opposed to "Private"), information will be accessible by non-members; if it is "open" (as opposed to "Closed"), everybody will be allowed to subscribe to the group and will be free to leave the group, if it "Can be reached" (as opposed to "cannot be reached"), the non-members will be allowed and able to send documents to the group.

Finally, the last remaining policy is the *display* one, which will allow the "group manager" to describe, for each existing role, a specific presentation of the workshop content. By default, a file system view such as the one presented in figure 6 will be used. An html file present in the workshop could be identified as being the entry page.

The policies are objects that can be manipulated by the members of the group like the others. This allows one to copy one policy from one workshop to another. It then becomes the actual policy in use, in the workshop in which it has been copied. As the policies will be one means of translating some aspects of pedagogical scenarios, this will be a means of reifying those scenarios and sharing them.

The regulation level. Regulation is handled within the electronic schoolbag platform by modifying the policies, roles and permissions described at the arrangement level as well as by acting upon the tools and objects present in the workshop. Modifying the policies is done by the group manager who has at his/her disposal a "satellite" to observe what has happened in the workshop. This is a basic tool which has been developed to capture the basic events concerning actions which have been done in the workshop. These events are not semantically and pedagogically founded information and work should be done to compute them into such information, which would have sense for a teacher managing a group activity. At the present time, this has not been done and we consider the "satellite" as a base on which something richer would be built during future work. Starting from the declaration of observables in an observation policy, the future satellite would be able to recover the corresponding events and to associate useful treatments with them for the production of the reports/ratios provided to the observer.

4.3 Advantages and limits of the current implementation.

At the University of Savoie, the platform is currently used every day by more than 15000 people[5] organized in 2300 working groups. Because of the technologies used for the development of the platform (Zope and Python) and the component-based approach adopted, new functionalities can be easily added. Because of the architecture and model presented above, we have a guide for the development and we can propose a more and more flexible and tailorable framework. Because of the ongoing experiments and actual use of the platform with a lot of users in a lot of diverse pedagogical situations, we have inputs to modify not only the platform itself but also the underlying model and architecture. This should lead to their constant evolution and improvement.

We here want to make a comparison between the implementation realised within the platform and the underlying model. The objective is to state explicitly what exists and what has not yet been implemented, in order to measure the completion of the implementation, and so the distance between the level of tailoring we want to reach within the model and the currently implemented one. We are thus going to see if the platform offers the functionnalities and mechanisms described in section 3 and if so, to what extent.

Static configuration of group workspaces. He have seen in the previous section that anybody can create a workshop. The creation functionnality is thus provided, with no restriction. So does the insertion of tools and objects one, with no restriction for objects (every kind of files can be added in a workshop), with a restriction for tools : only predefined tools, which have been integrated into the platform as a Zope "product", may currently be added. Three levels of integration for existing web applications or components have been defined and corresponding integration patterns have been designed. This, plus the

[5] The other 25000 users are people from secondary schools, who use a version of the platform dedicated to those schools : they have specific objects at their disposal, such as a homework book for example, that are not relevant in the University context.

component-based approach, makes it easy to integrate existing web-software but the intervention of a computer engineer is still required. We are presently exploring the way of providing extensible workshops, with no restriction for tools.

Social configuration of group workspaces. The social configuration of group workspaces mainly resides in the definition of roles, distribution to participants and definition of "scenarios" of whatever kind. In the platform, end-users can easily deal with roles and distribute them to who they want (restriction : they must have the role of "group manager", which is automatically attributed to the creator of a group).

What has been implemented for "scenarios" is quite far from the theory. We have chosen, for some kinds of scenarios and in a first approach, to consider a few predefined hard-coded policies. On the one side, this has the advantage of being easy to develop, easy to put at one user's disposal and easy to manipulate for end-users (they just have to select the suitable policy). It so offers a certain degree of tailorability. On the other, it is not possible for end-users to modify the existing policies or to create a new one. That's why we have continued the work on formalisation and implementation of scenarios begun in a previous work[23]. We have today at our disposal a formal description for scenarios (a grammar, an XML DTD and a UML formalisation) which has been improved for both social scenarios (concerning awareness or the group functionning, for example) and pedagogical scenarios (see section 4.3 below).

Dynamic evolution of group activity. On the dynamic point of view, we have seen that the users can manipulate and modify dynamically all the elements implemented (objects, tools, adding members to one group or suppression of members, policies, roles, etc.) present in one workshop, according to the workshop policies, of course, with no restriction. The development has here reached the highest level of tailorability and has met the regulation requirement for the part that concerns the intervention in activity.

As regards observation, we have already mentioned above that work remains to be done to improve the satellite and mainly define what can relevant observables be, how they can be computed from basic events and how they can be presented to a group manager or a teacher.

Initial configuration from pedagogical scenarios. The initial configuration from pedagogical scenarios is not achieved yet. Teachers, and other users, currently configure the workshops and policies at hand; there is also no way of enacting the current scenario and once again the teacher has to manage by himself.

From a theoretical point of view, we are currently working with the Arcade team from CLIPS-IMAG laboratory in Grenoble on the definition of a formal language to describe pedagogical scenarios. We are considering as references the IMS/LD metadata recommended to describe pedagogical scenarios, the approach of the TECFA laboratory within the European project SEED based on reusable educational blocks to build original scenarios[6] and the formal description of scenarios in the participation model. We are presently working on the

[6] http://tecfaseed.unige.ch/door/.

correspondence between the concepts proposed by both projects to structure pedagogical scenarios and the concepts of the participation model, to see if this model would be a good one to describe not only scenarios representing social or organisational features but also pedagogical scenarios formally. This has led us to define a first version of an XML-based language taking into account the common concepts from IMS/LD, TECFASEED and the participation model, completed by the ones useful for operationalization. We are currently improving this language on several scenarios in order to verify this result. We have also planned to prototype a engine for the enactment of one particular pedagogical scenario described with this language. The implementation should be finished in september and we would then be able to begin experiments and improvements.

5 Conclusion

We have presented in this paper a model of a collaborative activity and the architecture we proposed to structure group spaces in groupware according to that model. This architecture is used as a guide to the development of the electronic schoolbag platform, a tailorable groupware we have developed to provide support to both collaborative and individual pedagogical activities. This groupware is today commonly used at the University of Savoie and several secondary french schools by more than 40000 persons. It progressively evolves by taking into account the reactions and comments of these users (it is adapted to their needs and uses) and the evolution of our researches. It is so a real, great and very interesting experimentation ground for us. We are currently working on the modelling of pedagogical scenarios which should be used to initialize automatically the configuration of the group work spaces. We are also exploring different ways of enacting these scenarios by considering component based and workflow based technologies.

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