

# Virtual Collaboration Spaces: The EVE Community

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## Abstract

*An Educational Virtual Environment (EVE) is an instance of a Collaborative Virtual Environment (CVE), which focalises in providing collaborative, as well as educational, functionalities, such as synchronous and asynchronous e-learning services. This paper describes such an educational virtual community, which aims to meet the requirements of a virtual collaboration space and furthermore to support e-learning services. In particular, we are developing a web-based system, which allows users to communicate with the other members of the community through forums, chat, e-mail, to schedule events which take place in the learning environment and to join, and even create, courses, which are held in 3D multi-user worlds where users are represented by avatars. These characteristics offer extended functionalities such as support of application sharing and voice chat, transmission of the educational material as well as transmission of the users' profiles to the other community members. We describe the model of this community and the functionalities that it provides.*

## 1. Introduction

The constant expanding of the World Wide Web and the familiarization of its users with it generated all the necessary preconditions for a wide adaptation of electronic communication.

The maturation of the Internet and electronic communication formed the basis for the constitution of on-line communities. In particular, the software applications, which could allow the on line communication among users, have been expanded from e-mail and instant messaging to 3D multi-user spaces, where users interact with each other, as it happens in real communities. These virtual communities, whether two or three dimensional, offer a wide variety of functionalities and are supported by technological tools that are proven to be efficient for educational and instructional goals [7].

Regarding the educational aspect of the virtual collaboration spaces, this research area has been gaining increasing interest both from a technological perspective as well as from a pedagogical perspective. The technological challenge arises from the need to develop a learning environment, which, not only will not fall short compared with the real educational environment but in addition should be in position to offer extended functionalities to the users. On the pedagogical part, this concept raises questions on the educational models that can be used and how they can contribute in the most efficient way to the distribution of knowledge in an Educational Virtual Environment.

The efforts made, so far, haven't managed to provide an effective integrated system, which could fully satisfy the requirements of both perspectives. C-VISions [11] focuses on the implementation of a networked multi-user 3D environment for educational purposes. Mind Bridges [12] aims at the implementation of an environment, where users communicate through messages and are represented by their photo, in order to get the sense that they belong to a community. Socialized Collaborative Learning in Multimedia Virtual Worlds [9] aims at a multi-user 3D environment where users can meet, discuss and maintain knowledge. The above projects provide solutions that focus either on the technical implementation and representation of the 3D worlds that comprise the environment, as [11] and [9], or mainly emphasize on the exchange of ideas and the intellectual communication of the users involved, without paying so much attention on the representation of the means that are going to be used, as [12]. Consequently, research has not yet presented an integrated educational platform, which could provide both the material as well as the pedagogical features for the simulation of a real learning environment. This notation leads to the design and implementation of EVE Community. EVE Community focuses on the satisfaction of both aspects and is presented in this paper. EVE Community aims at providing a virtual learning environment, which can simulate in an efficient way the interactions, the educational material and the learning

process of a real educational environment as more realistic as possible.

This paper is structured as follows. We initially describe the terms Virtual Collaboration Spaces and Educational Virtual Environments. We then introduce the EVE community that we have designed and implemented in order to support Educational Virtual Environments. Afterwards, we describe EVE's community model, structural components and the hierarchy of roles and rights. Then the functionality, that our community provides, is presented in detail. Finally, we present some concluding remarks and our vision for the next steps.

## **2. Virtual Collaboration Spaces and Educational Virtual Environments**

The term "virtual collaboration space"(VCS) refers to systems, which develop environments that integrate collaborative tools and functionalities in order to provide to the users a sense of realism [4]. These spaces gain increasing interest, and efforts are made in order to be applied to more and more activities. virtual collaboration spaces can be used in order to support e-learning services [5]. However the virtual collaboration spaces cannot be used as they are for educational purposes [2]. For this reason we introduce the term Educational Virtual Environments (EVE) in order to define such places. As the term implies, it concerns environments and systems, which are developed in order to simulate and provide e-learning services through virtual spaces. The key word in these two definitions is the "collaboration" which is essential for learning applications and activities where students and tutors interact and collaborate in order to achieve a higher level of knowledge. As described above, an EVE goes beyond a VCS. Therefore an EVE should agree with the concept and the label of a VCS, satisfying its basic requirements, which are mentioned in [4], and furthermore it should extend these requirements in order to support the learning process. The main prerequisites and characteristics of EVEs are:

- The information space is well structured
- An educational virtual collaboration space is a social space
- The information/social space is explicitly represented
- Students are not only active, but also actors
- Virtual learning environments integrate heterogeneous technologies and multiple pedagogical approaches

## **3. EVE community**

EVE Community [6] is a prototype, which is developed in order to meet the previous described requirements of an Educational Virtual Environment. EVE Community aims

to provide the necessary, synchronous and asynchronous e-learning functionalities to its members, in order to simulate a real learning environment. In particular, and regarding the basic requirements mentioned in the previous section, EVE community forms a collaborative educational social space where members have the capability to gain knowledge through dynamic procedures and activities. The system focuses on the interaction between the users and encourages the communication among them by providing synchronous and asynchronous means of communication and collaboration. A critical factor for the educational virtual environments is the awareness of other users and the awareness of learning objects and material [2]. In order to enhance the awareness of the users, especially in the synchronous interaction, EVE community exploits multi-user 3D environments where the users are represented by 3D avatars [1]. Therefore, the community, based on the notation that users are influenced by the virtual representation, is supported by a 3D platform, which can facilitate the e-learning process and offers all the tools necessary to simulate a real classroom. Every course is held in a 3D world, which virtually consists of all the "physical" equipment that could be found in a real classroom. Thus, the platform supports a whiteboard, a presentation table and chairs, where the avatars, which represent the users, sit. In addition, as an educational collaboration space, EVE platform supports a variety of communication and collaboration tools, which actualize the interaction among the students and the tutor. Text chat and audio chat, brainstorming, and application sharing are some of the components that forward to this direction. Another important element that EVE community took into account is the role of the student in the community. The entity of students has advanced capabilities, which allow to the users of this role to contribute to the formation of the social and information space. More specifically, students can use all the asynchronous means of communication that are contained in their personal desk as well as the synchronous means of collaboration within the fields of the virtual classroom, when the tutor allows it. The most important functionality, which makes the student from an active entity to an actor, is the ability to add knowledge material through the uploading of files and his/her ability to create and form courses in the community as well as to become tutor in some courses. EVE community, stepping in the path that educational requirements specify, tries to exploit available standards and technologies in order to provide an integrated solution.

#### 4. Community model

When designing and implementing a Virtual Collaboration Space, there are two main issues that should be taken into account. The first one concerns the notation that the hosted users may not be computer experts neither have a great experience on how to act and navigate in such systems. Thus, the community architecture should offer a friendly to use interface and well-distinguished functionalities, which will guide the user through the learning process and will not spend much of his time on trying to figure out what each component is used for. EVE community is, therefore, structured in sections, where each user, depending on his/her role, can access and use the functionalities offered. The second issue concerns the consistency and efficiency of the hierarchy used in the framework of the community. In order to obtain and maintain a well-structured hierarchy, EVE stratified the involved entities and assigned to each of them rights of access. The main concepts that EVE community adopts are the concept of "Organization" and the concept of "Place". The first one is used for organizing the courses offered by the EVE community. The second one is used for the virtual areas that can be visited by the user. Therefore, we could describe EVE community as a set of Organizations, which provide e-learning courses and Places, which can be used privately of each member or concurrently by groups of users who attend a course. An Organization constitutes the entity, which can provide knowledge through courses and can be an educational institute, a University or even a company. Every Organization has the capability to develop and create categories and subcategories of on-line synchronous courses, which can be accompanied by e-learning material. These courses are available to all members of the community who can navigate in the system, through a friendly to use interface, and have the capability to view and choose from all the available courses those which meet their interests as well as view information about the courses for which are already registered as students or tutors. The model, for organizing the courses offered by the community, is hierarchical and their terms of reference for the levels of the hierarchy (organization-category-subcategory-course) contribute to the flexibility and easy scalability of the community. Also, from the developer point of view this hierarchy contributes to the consistency of the database schema and the organization of the learning material. EVE community adopts the concept of places in order to simulate and actualize the learning process. The community area is therefore distinguished in two places. The first one, called "Personal Desk" constitutes the user's personal workplace, which is enhanced with asynchronous features and the second one, called "Training area", constitutes the place where courses

are realized and the learning process is completed. These two types of Places are described in detail in the two following paragraphs.

**Personal Desk:** This term refers to a 2D place, which contains all the asynchronous features a user can access. The personal desk constitutes the unique, for each member, central place where they can administer their personal holdings. Regardless of the user's role in the system, every member can navigate through the available courses and join the classes in which s/he is registered as student, view details about all other courses, that s/he wishes to attend. In addition, the characteristic of the personal desk, as part of a virtual collaboration space, comprises of tools, which consent to the asynchronous communication between the members of the community and contribute to the expanding and sharing of knowledge. Therefore, every member can access his/her personal messages, manage his/her profile and view other users' profiles, view and add information on his/her private, as well as public, calendar, upload/download files to/from his/her personal directory in the system, view, post and reply to messages in the community's forum. Also a member can create a course and (if this course is approved) to become a tutor for this course. The access levels in this space are altered in proportion to the user's role in the community. Thus, the roles who maintain more privileges from others can view additional features when entering their personal desk. Therefore, the user interface diversifies according to each role. As it is obvious, the personal desk facilitates the support of different access levels of the community. Furthermore, it contributes to make the users active due to the fact that they are free to choose the courses that they wish to attend.

**Training Area:** This place constitutes the virtual classroom where the courses take place. In EVE community this place adopts a 3D representation based on the notation, that 3D environments reflect positively on users' performance by creating a sense of presence and realism. Therefore, just as in real classrooms, the virtual classrooms must obtain all the prerequisites necessary for the conduction of the learning courses. Thereby, every course disposes a dedicated tutor, who is responsible for the management and the organization of the learning material, of the students and the course, in general. In addition, the students that attend the class and are represented by avatars have the capability to view the other users in the 3D multi-user virtual classroom, and thus maintain a scene of a real course. Furthermore, the 3D Collaboration world offers tools, which contribute to the realization of a virtual course.

These features, which according to their functionality and the need for realism can either be 2D, as for example the text chat and the uploading and downloading of files, or 3D, as for example the whiteboard and the

brainstorming, as well as some extended functionalities, as application sharing, audio chat, and access to the content repository are some of the components that develop the environment for the simulation of the real classroom. These features are going to be presented in detail later in this paper.

#### 4.1 User roles and rights

An important factor to be taken into account is the definition of the users' roles in the community, as well as the levels of access that each role involves. More specifically, in EVE Community there are five, well defined, user roles each of which dispose certain privileges. These user roles are the following:

**Visitor:** This type refers to users who have not yet been registered to the system. The users of this category can only view information (mainly static) and demos about EVE community and what it can offer, without being able to navigate and test the systems' functionalities. In addition they have the capability to register to the system by completing a registration form, which will attach them to the member role.

**Member:** Members of the community are considered to be users who have not yet joined any of the available courses but are registered to the system, which means that each has a unique username and password, wherefrom they are recognized. These users have the capability to navigate through the available courses and post registrations for the courses that correspond to their interests. In addition, they have the capability to use all the asynchronous features that the community provides, that is the forum, a personal calendar, send and receive messages, maintain their personal profile and view other members' profile. However, these users, since are not registered for any class, cannot enter the 3D virtual world, the virtual classroom, where the courses take place.

**Student:** This user role corresponds to members that have registered for at least one class. Therefore, these users have all the capabilities mentioned above (forum, calendar, uploading/downloading of files) as well as some additional collaboration features that arise from their registration to a class. These features involve the insertion of the user in the 3D virtual classroom, his/her representation of avatars, his/her ability to communicate and collaborate with the other students of the course through collaborative tools, as the use of a whiteboard, the brainstorming, text and voice chat, the dynamic uploading and sharing of files.

**Tutor:** The tutor role is assigned to only one person per course. This user must be a member of EVE community, without being necessary to be registered for a course as a student. As the concept of the hierarchy implies, the users who are assigned to be tutors in a

certain course, conserve the capabilities of the student category but obtain some additional "privileges" in relation with the lower levels of the hierarchy. Regarding the tutor's role, it should be distinguished in two instances. The first one consists of the asynchronous components that this kind of role can manipulate. More specifically, the users assigned as tutors have the capability to manage the learning material of each course, create examinations and tests, view the users who have registered for the course, upload files in the course's directory. The second one is related with the existence of the tutor in the 3D virtual classroom. In this place, the tutor is the most privileged among the users, as the management of the course falls to his/her jurisdiction. In particular, the tutor can create groups of students, assign them tasks, which s/he supervises during the course, and decide what will be presented on the whiteboard. Furthermore, the tutor is the floor manager of the classroom, which means that every time a student wishes to speak, or pose a question, must get the tutor's approval. In general, this type of user is responsible for the efficient realization of the course and the management of the students, which s/he has the ability to expel in cases, though necessary.

**Course Manager:** Each organization appoints a course manager, a person who is responsible for the creation and management of the categories, the subcategories and the courses, in general. This entity is authorized to set a tutor for every course and decide which members, that displayed interest in the course, will become registered students. In addition, the course manager can view the users' profiles, consider their research areas and create new categories, sub categories and courses that correspond to the majority's interests. Alike the tutor's role, the course manager is responsible for the organization and management of all students and tutors who have subscribed to courses of the organization that the course manager represents. Thus, this user can add or delete users, accept or deny requests for the creation of courses by tutors and accept or deny requests for the attendance of a course by students. Furthermore, the course manager is responsible for the administration of the asynchronous means of communication and collaboration, such as the forum and the calendar of events. Regarding these components, the course manager is responsible for the selection of the topics that are going to be posted in the forum and the calendar. Through an administrative console, this user receives the submissions posted by the users (members, students, tutors) of the community and decides which of the received information can contribute to the community's facilitation as well as to the learning process, in order to be posted and become accessible by all members.

**EVE Administrator:** There is only one person who holds this role and s/he is the platform owner. Hierarchically, the administrator presents full access to the system, in which s/he can add, remove and modify functionalities, fix possible feeblednesses of the system, and create new organizations. In addition, s/he is responsible for the management of the course managers, and the users of the community in general.

Place	Rights	EVE Administrator	Course manager	Tutor	Student	Member
Organization	Create Organization	v				
	Delete Organization	v				
	Edit Organization's info	v	v			
	Assign course managers	v				
Course category/ subcategory	Create Course Categories		v			
	Delete Course Categories		v			
	Edit Course Categories info		v			
	Create Course Subcategories		v			
	Delete Course Subcategories		v			
	Edit Course Subcategories info		v			
Courses	Create Courses		v	v		
	Delete Courses		v			
	Assign Tutors		v			
	Validate Course creation		v			
	Edit Courses' info		v	v		
	Accept / Delete Students		v			
	Register for Course				v	v
	Attend Course				v	v

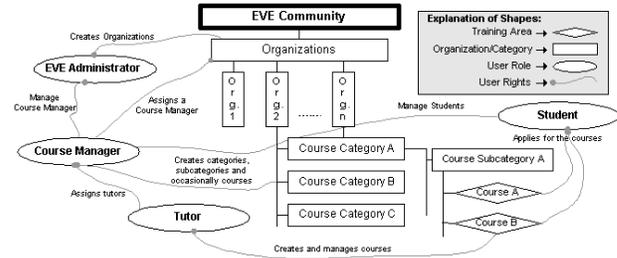
**Table 1: Table of rights and roles**

In Table 1 the access rights of each role are presented. Also Figure 1 depicts the hierarchy of courses in the EVE community according to organization concept, and their relation to the roles and rights that EVE community supports.

What should be significantly emphasized is that the privileges that accompany the role of the tutor stand only for the courses this user is assigned to. Similarly, the attributes of the course manager stand for the organization that this user represents. For every other entity these users are treated by the system as members.

## 5. Functionality

The main goal of an Educational Virtual Environment is to provide all the tools, applications and conditions necessary, which will constitute an efficient space where communication and collaboration can be used for the maintenance and exchange of rich knowledge. Thus, EVE community, trying to simulate the learning process from its very beginning until its completion, is enhanced with the tools necessary for the advising, the notification, the encouragement and interaction of the users, as it would happen in real educational communities.



**Figure 1: Roles and rights in EVE Community**

### 5.1 Personal desk services

These services constitute, in a way, the anteroom, which prepares the users before attending a class and is mainly comprised of asynchronous features. This space and the information provided are always available for the users, even if no courses are taking place at that time, and contribute to his/her advising, notification, reminding and troubleshooting in the scope of the community.

**Forum:** One of the main services of the EVE's personal desk, as well as of every virtual community [7], is a forum, which comprises a mean of asynchronous communication. Every registered member can post a topic to the forum with information, that s/he thinks that are important, and this message is posted to the administrator who decides whether this message could contribute to the community or not.

**Calendar of Events:** The calendar of events is a timetable that stores a collection of events and lists them in chronological order. It's an asynchronous mean of communication, which can be used for the scheduling of events that take place in the virtual learning community. Each registered user can dispose a private calendar of events, which means that only this user can see the contents and posts in this calendar. The calendar provided by EVE community can support three types of events: public, private and related to each course. In the public calendar of events the members can post their announcements to the administrator, who in turn, will decide if the announcement is "qualified" to be posted. Furthermore, there can be a course calendar that includes class schedules and venues, schedules assignments, examinations and topics to be covered. The calendar consists of three views. The day view, which is also time scheduled, the month view and the year view.

**Text Chat:** This feature allows to participants to communicate in a synchronous mode. It is important to notice, that text, as well as voice chat, are also supported in the 3D worlds where the students communicate with each other and with the tutor. Though, the text chat described in this section can take place among members, which do not join the same courses, and without being bound to insert into a 3D world. In the framework of

collaborative learning environments, text chat can be proven to be extremely helpful for members who can meet out of the virtual classroom and discuss issues that concern them, pose questions, and generally interact without being supervised and rated. In addition, a group, of people who share common interests, can create its own chat rooms. Also, this component allows to users to send private messages in the chat room, which cannot be seen by the other members.

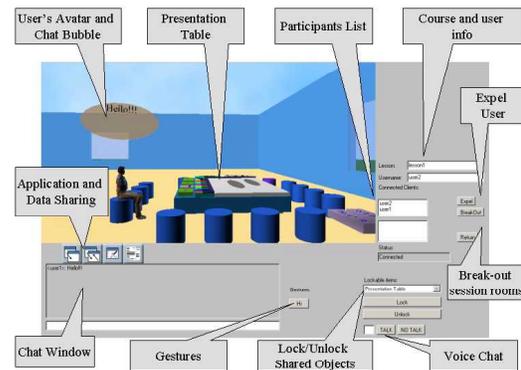
**User Profiling:** As the term indicates, a collaborative learning environment should motivate the communication between its members. In particular, better communication can be achieved between members who share common ideas and interests. Therefore, every member of the community, at the time of his/her subscription to the system enters personal information, which include his/her interests, hobbies, the research areas, which s/he prefers, etc. Thereby, a profile for each user is created which is constantly enriched with additional information, which arises from the selection of courses that s/he decides to attend. An intelligent collaborative environment should be able to match users with common interests and encourage the communication between them. This functionality could be achieved with multiple queries in the users' profiles and selections of courses in order to be tracked down areas of mutual interest, which will contribute to the distribution and extension of knowledge. In addition, a system should be able to compare the users' profiles, and especially the fields of research interests, with the available courses and suggest some possible alternatives. These functionalities could contribute to an interplay between the community members and the system, which, in turn, could result in effective distribution of knowledge.

**Manipulation of e-learning content:** A simulation of a real classroom presupposes that the tutor of the class has the capability to add and manage learning content, which should be dynamically changed, and dispose knowledge to the students, providing them the capability to have and process this learning material. In addition, there could be no efficient simulation if the students did not have the capability to maintain their own notebook, which in terms of an e-learning environment means a directory with files and folders for personal use. Such functionality can be supported of two basic operations, the uploading and downloading of files, in the framework of the collaborative virtual environment.

## 5.2 Training area services

The training area is exploited in order to host synchronous e-learning sessions. It combines 2D and 3D features in order to provide the users with communication and collaboration capabilities and necessary tools for realizing collaborative e-learning scenarios. There is one

training area per course. The main feature of the training area is the 3D representation of a multi-user virtual classroom. This virtual classroom is the central place for realizing the learning process. The participants in the virtual classroom could have two different roles: tutor (only one participant) and students according to its privileges in the EVE Community.



**Figure 2: User interface of the training area**

The users that participate in the virtual classroom are represented by avatars. The users' avatars are able to make various types of gestures: expressing opinions (e.g. agree, disagree), expressing feelings, mimics (e.g. happy, sad), as well as showing actions (e.g. move learning content, pick learning content). The virtual classroom is supported by audio collaboration, application sharing and text chat functionality. Also, it provides a specific place where the users can upload their content and show it to other participants in the course. This space is a 3D presentation table. Moreover this table offers more functionality such as shared whiteboard, or simulation of a brainstorming board. The user interface of the training area is depicted in the Figure 2. The functionalities supported by EVE prototype are described in detail in the following paragraphs.

**Communication Channels:** The easy and effective users' interaction is one of the main goals in the educational virtual environments. EVE prototype supports the following ways of interaction among users: (a) audio chat, which is the main interaction channel, (b) 3D text/bubble chat, (c) Non verbal communication using avatar gestures in order to provide a more realistic interaction among users, expressing when needed the emotion of each one to the others [3].

**User's Representation and Awareness:** The users are represented by human like articulated avatars, which are compatible to H-anim standard [10]. The avatars can support animations (such as walking and sit down) and gestures in order to support non-verbal interaction between the users. We not only focus on functions for representing oneself but also on visualizing his/her actions to others participants in the course. Available functions in

our prototype are: Perception (the ability of a participant to see if anyone is around); Localization (the ability of a participant to see where the other person is located); Gestures (representation and visualization of others' actions and feeling. Examples are: "Hi", "Bye", "Agree", "Disagree", and "Applause"); Bubble chat (when a user sends a text message, a bubble containing the message appears over his/her avatar); Who is talking (When a user speaks using the audio channel, a specific icon appears on his/her avatar).

**Manipulation of Users and Shared Objects:** The EVE prototype integrates two main tools for creating supporting the manipulation of participants in the multi-user virtual environments and the shared objects. These tools are: (a) Expelling learner/participant: Sometimes, a learner/participant can become annoying, preventing the smooth completion of a lecture. In these cases, the tutor has the ability to expel this user. An expelled user is automatically disconnected from the system. (b) Locking / Unlocking objects: There are cases where we need a certain object to be accessed only by one user at a time. For example when a user writes on the whiteboard nobody else must be able to write or delete something on it. For this reason we offer the capability to lock/unlock a shared object. When a user, who locked one or more objects in a world, leaves the scene without releasing the lock, the objects are automatically unlocked. Moreover, a user with higher access level (e.g. the tutor), than the one that possesses the lock of an object, can obtain the lock of that object from the other user. Using this functionality the tutor can have explicit control on the shared objects.

**Presentation Table:** As stated before, the most important feature an educational virtual environment should have is to a way to provide tools, which support the e-learning process. In our prototype we have implemented a presentation table, which is the central point in the training room. Using the functionality of this table the users can present their slides, ideas, to comment on slides, upload and view learning material as well as to view streaming video. The avatars of all participants in the course can have a sit next to this table, viewing not only what is presented on the table but also the other participants. Furthermore, the user can change his/her viewpoint in order to zoom in and out on the presented material. The presentation table has the following functionality:

- 3D Whiteboard: The 3D whiteboard supports slide projection, line, circle and ellipsis drawing in a wide range of colors and text input in many sizes and colors. It also offers undo last action capability as well the erasure of all previous actions on the whiteboard.
- Brainstorming Board: The brainstorming board can be used in a range of collaborative learning

techniques in order for the learners to present their ideas in a structured way. The users can create cards in three shapes (rectangle, circle and hexagon) and five colors attaching text on them. They also can move and delete a card.

- Video presenter: Video presenter is used in order for the user to attend streaming video presentation/movies inside the 3D environment. The users have the capability to start and stop the movie. Supported formats are rm mpeg, and avi.
- Library with drag and drop support: The users have the capability to drag and drop learning material on the table. This material is represented as a small icon on the backside of the table. When the user clicks on the icon and the corresponding file is opened either on the whiteboard (if the corresponding file is picture or VRML object), on the video presenter (if the corresponding file is a rm, mpeg or avi) or on a new pop-up window (if the corresponding file is not supported by the VRML format). The participants can share this pop-up window using the application sharing functionality offered by EVE prototype and described in the following paragraph.

**Application Sharing:** Except for the use of the presentation table the users in a course can present material, which is located in their local desktops using application and data sharing. Furthermore, they can collaborate on documents and use 2D Whiteboard. This whiteboard is based on the Microsoft's NetMeeting whiteboard. It has similar functionality with the 3D whiteboard and is also shared between the participants of the course.

**Break-out session rooms:** An innovative feature that is offered by the training area is the break-out session rooms. These rooms are small rooms containing a presentation table and have only 4 seats in order to host sub-groups of the students that participate in the virtual classroom. The break-out session rooms are used for supporting collaborative e-learning techniques that require students' separation during the learning process [8]. Examples are think pair share and jigsaw [2]. The tutor can assign the students to the break-out session rooms on the fly during the e-learning session. Then, the students automatically are moved to the corresponding breakout room. Furthermore the tutor can return the students back to the main classroom area. The tutor can also monitor the text chat sessions of all break-out session rooms even if s/he is located in the main classroom area.

## 6. Conclusions

This paper describes an educational community, which was based on virtual collaboration spaces. EVE Community aims to provide an integrated learning

environment, giving emphasis in both pedagogical as well as technological texture of the educational place. Furthermore, this Community is identified by the fact that it is comprised of well-distinguished roles and rights, which simulate in an efficient manner the learning process. The variety of learning tools, both in the asynchronous and synchronous mode create the sense to the students and participants of the environment that are members of a community and form the basis for the realization of the virtual courses, which fundamentally provide all the functionalities of a real classroom. Thus, through a friendly to use and navigate environment, the members of EVE Community have the capability to maintain their personal profile and a private space with all their personal holdings and interests, have the potentiality to communicate and interact with other members of the community and participate in virtual courses, either as students or tutors, in order to obtain rich knowledge. From a pedagogical scope, EVE has defined mindfully the roles and rights of the involved users, providing the capability to all of the users to become equally transmitters as well as receivers of knowledge. These roles and the rights that each of them implies, form the basis for a learning environment which relies in the communication and interaction of its members, the mutual respect and their active participation on the way to collaboration and knowledge. From the technological scope, EVE manages to provide all the functionalities necessary for the asynchronous communication and support of its members as well as for the simulation of a real training area. Therefore, EVE used the technologies and standards available, for the implementation and integration of the necessary 2D and 3D tools, and created a platform, which is characterized by operability and scalability.

## 7. Future work

In its current form, EVE Community manages to create an educational virtual environment which can offer all the necessary tools for the communication, interaction between the members involved as well as the prerequisites for the simulation of a real classroom, providing all the “material” features that could be found in a real classroom, i.e. whiteboard, library, brainstorming, chat, etc. However, EVE has the potentiality to be enriched with new features and tools, which will exploit the capabilities of Virtual Reality’s technologies and standards. Therefore, the graphical representation of the 3D virtual worlds could be enhanced in order to provide a more friendly and efficient for knowledge environment. Furthermore, concerning the pedagogical aspect of the community, some emphasis should be given on the composition and organization of the learning material, in

order to correspond and deal with multiple learning scenarios. Finally, an important step for the fulfilment of this Community is its evaluation by users, which will bring to the surface any possible deficiencies that EVE may have. The incorporation of all these characteristics will lead to an integrated, from both pedagogical as well as technological aspect, Educational Virtual Environment.

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