

COLEGA: A Collaborative Learning Environment based on Individual and Group Memory Building

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Abstract: Collaborative learning systems offer common virtual spaces where different users (i.e. teachers, students, school directors, parents, researchers, and experts) can interact. Participants can share their pedagogical, technical and administrative knowledge. CONEXIONES project, a research group that has been enhancing the learning process in Colombian schools through the use of new technologies, has developed COLEGA, a collaborative and learning tool to support knowledge evolution processes within learning communities.

This paper presents COLEGA, a collaborative and learning tool that integrates retrieval document algorithms based on keyphrases, synchronous and asynchronous communication tools, and support for evolving individual and group memory. Results of a usability study are also presented in this paper.

Introduction

CONEXIONES project is part of the R+D Group in Computers in Education at EAFIT University - Colombia. CONEXIONES aims to improve Colombian education by developing and implementing new learning environments in real schools and community centers (Zea et al. 2000). More than one hundred schools (urban and rural, private and public) from five provinces of Colombia form part of CONEXIONES. There are strong cultural differences and social-economical levels among schools. Every month approximately 12.000 users interact in a virtual space. Users are students, teachers, parents, researchers, educational agents, and family members of the community centers.

COLEGA facilitates communication among users. Researchers and technical staff need to be in constant communication with teachers, students and family members within CONEXIONES. COLEGA provides users with synchronous and asynchronous communication tools where they will be able to solve their problems, share ideas, and express their pedagogical and technical doubts about CONEXIONES. COLEGA has been proposed as a new alternative to support communities within CONEXIONES.

Different groups can create their own learning spaces. For example, teachers in COLEGA use a learning space to discuss about topics related to collaborative projects. A teacher can create a learning space to interact with their students and an invited expert. Family members can be also involved on different groups in order to share their ideas with students and teachers. Students and teachers from several schools working on similar collaborative projects are able to share ideas and knowledge. Students from low-income and rural areas have the opportunity to interact with students, teachers, researchers, and experts from different regions and countries. Thus, COLEGA is instrumental in integrating educational communities.

Related Work

Learning communities have been supported using a variety of technologies. From simple electronic mail, multi-user environments (MUDs and MOOs) to collaborative virtual spaces. CSILE - Computer Supported Intentional Learning (Scardamalia and Bereiter 1991 1996 1999), for example, uses new technologies to support decentralized forms of discourse, and knowledge building within a discipline. CSILE is an asynchronous discourse tool that supports knowledge building providing thinking-type labels, scaffolding of notes, and different views of notes. CSILE has demonstrated how such technology produces positive

effects in learning. CaMILE (Guzdial et al. 1995) offers a collaborative environment in which participants can share their ideas through the use of notes. Students in CaMILE can classify their interactions and change accessibility privileges to their notes. The IHMC Concept Mapping Software - CMaps (Cañas et al. 2001) empowers users to construct, navigate, share, and criticize knowledge models represented as Concept Maps. The toolkit allows the users to build, and collaborate during the construction of concept maps, as well as, share and navigate through others' models distributed on servers throughout Internet. COLEGA distinguishes from existing software by its particular use of keyphrases-based technology and participants' annotations to categorize and organize documents and interactions, that makes it possible to manipulate individual and group memories in benefit of the participants.

COLEGA

“In classrooms that adopt the collaborative knowledge building approach, the basic job to be done shifts from learning to the construction of collective knowledge. The nature of the work is essentially the same as that of a professional research group, with the students being the principal doers of the work. Thus, in the ideal case, there is a complete shift from students as clients to students as participants in a learning organization.” (Scardamalia and Bereiter 1999).

COLEGA supports users working in a learning activity by offering collaborative learning spaces in which they can learn from each other, solve their problems, learn about collaboration, and learn the appropriate use of this technology in their own context.

Fig. 1 presents a general view of COLEGA. Users can interact with synchronous and asynchronous communication tools to create documents and/or interact with other users based on previous documents. Users classify each interaction as a document, an idea, an alert, an attention, a question, an agreement, or a disagreement. Automatic key-phrase techniques are used to classify each document with in a list of domain categories. This facilitates organization of documents with in individual and group memories.

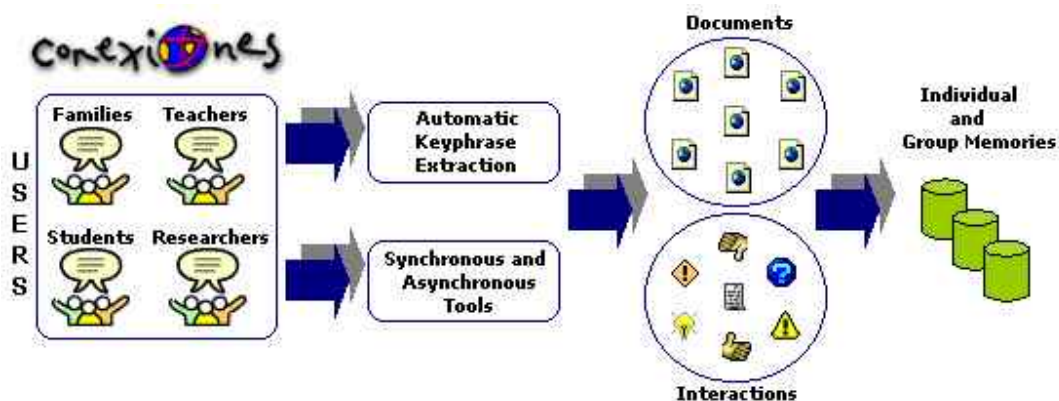


Figure 1: COLEGA Architecture

Participants can maintain their own knowledge space (individual memory) and share it later with their group. Students can decide with whom they want to share their questions and new ideas. Teachers can monitor individual and group memories to be able to guide students with their learning processes. Teachers can generate a list of topics of interest and use this information in their class. In that sense, COLEGA becomes an assessment tool for teachers. Furthermore, students and teachers in COLEGA can make the group memory available for other users to start a discussion based on an existing document or interaction. These users will create their own individual and group memories by including their own questions, ideas, or answers. As individual and group memories evolve, CONEXIONES' project memory evolves.

Participants have three different ways to interact within COLEGA: by participating based on an existing document, by participating based on a previous interaction, or by adding a completely new document or interaction. In the first two cases, participants can use synchronous or asynchronous communication tools to add their interaction or document. When participants are not satisfied with the search results or there are not documents or interactions related to a particular keyphrase, users can start their own discussion.

COLEGA will automatically extract keyphrases from the new document and will make it available for others to participate. See Fig 2.

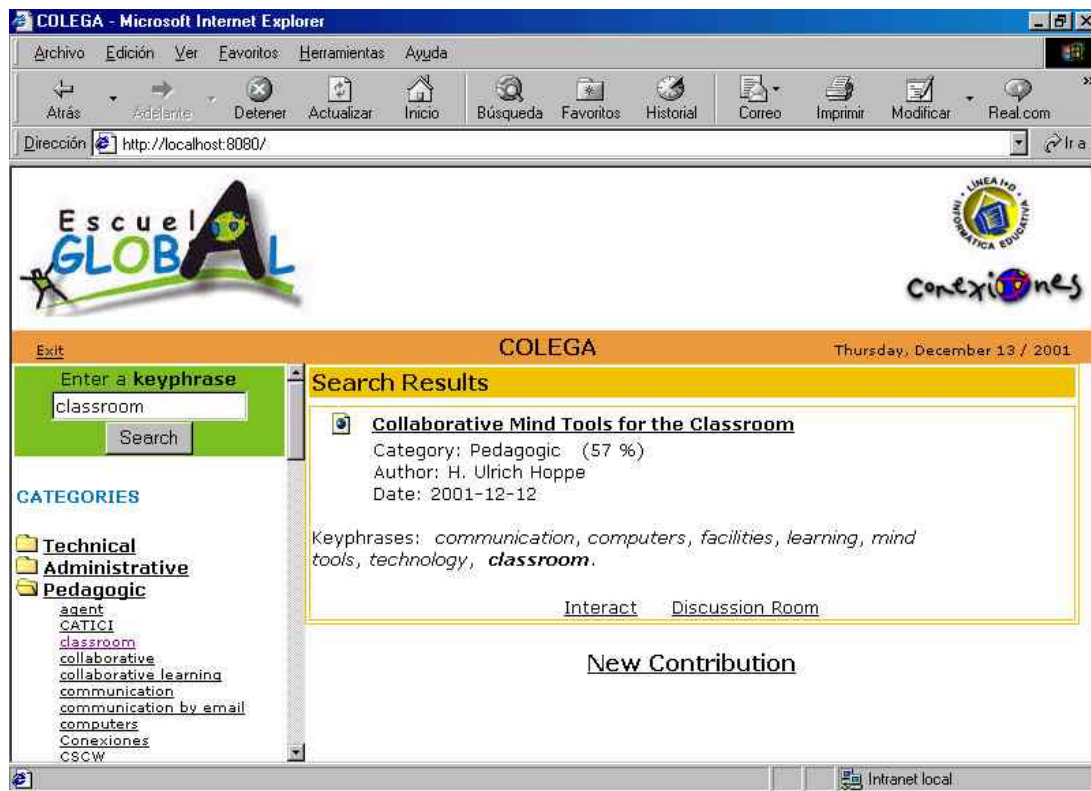


Figure 2: Interacting with COLEGA. Participants can use keyphrases or choose a topic from list of categories to retrieve information from available group and individual memories. Once the participant has found an interesting topic, he/she can use it to start a new discussion.

Asynchronous and synchronous communication tools allow users to interact with others in a variety of settings. Participants can use an initial document to work with and generate a final document with the contributions of the group. This process can be done on-line during a face to face meeting (synchronous tools) or it can be based on messages posted by the participants in a group memory (asynchronous tools). Fig 3. shows a screenshot of the asynchronous communication tool in COLEGA. the user can select the user(s) to which the interaction is for, specify to whom a copy should be sent, classify the interaction according to one of the types COLEGA offer, type or import the document/interaction content, and send it. If the user desires to get help about how to classify the interaction, there is a help option available. A group of participants can witness how their 'group memory' evolves through their interactions. New users can inspect group memories to learn about different topics. In fact, new participants can select an existing document to start a conversation with his/her own group. COLEGA provides methods to create and maintain knowledge spaces. Moreover, several search facilities have been implemented using *automatic keyphrase extraction techniques* (Turney, 2000) to automatically extract keyphrases and classify information into categories previously generated based on existing documents. Using automatic extraction of keyphrases, documents can be classified into meaningful categories that will make simple searching processes. This in conjunction with participants' classification of their interactions within COLEGA makes individual and group memories easy to be accessed. COLEGA supports keyphrase based queries, which opens up existing documents to participants interested in a particular topic.

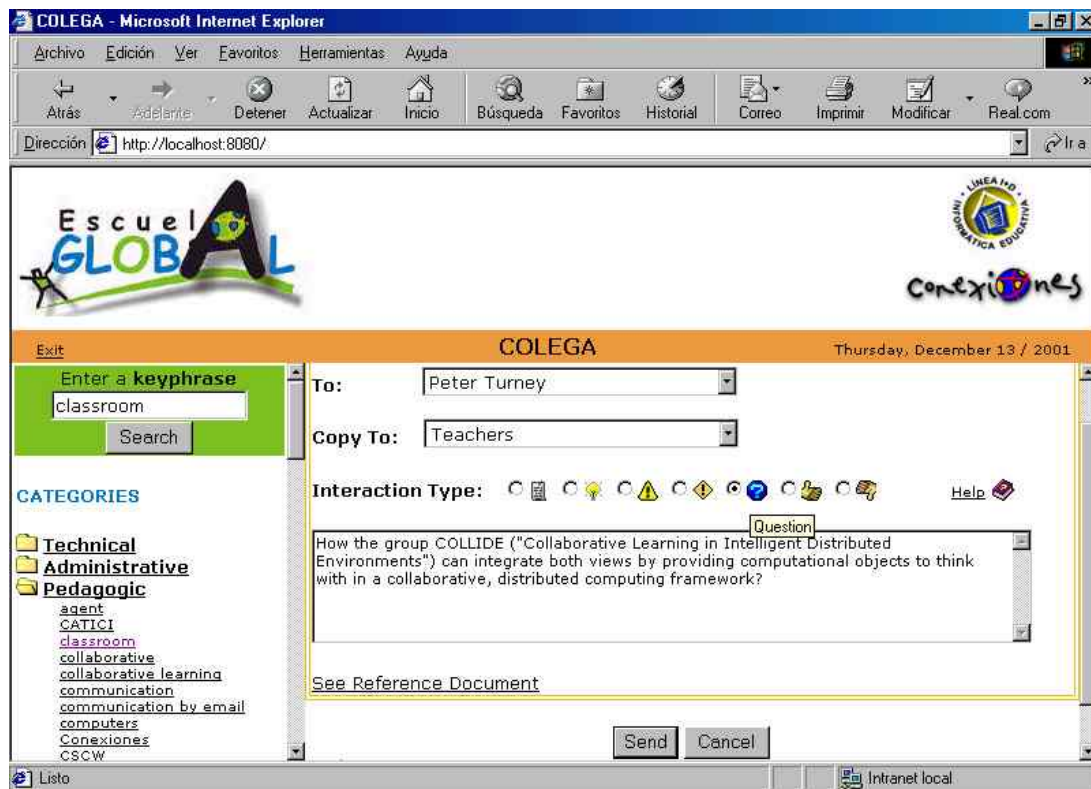


Figure 3: Asynchronous Communication Tool.

Usability Study

In this study, teachers, students and researchers had the opportunity to use COLEGA to solve some common tasks, such as: searching individual and group memories using keyphrases, searching by using categories from a proposed tree of initial categories, reading existing documents and generating new interactions using asynchronous communication tools mainly. Initial documents were consistent with real CONEXIONES messages (i.e. emails, teachers' and students' reports, and papers and technical documents). Participants solved a final questionnaire and observers were taking note of their reactions towards COLEGA. Each task was carefully designed taking into consideration the participant's language and probable topics according to the type of participants (i.e. student, teacher, researcher, etc.). Some of the initial results are as follows:

- ✓ Teachers considered COLEGA to be a helpful tool in their teaching both as a learning and as an assessment tool. Teachers were able to use keyphrase based searching facilities to monitor students' work and to find information about their topics of interest. Teachers liked the idea of been able to keep in touch with researchers, teachers, and students from different places.
 - “COLEGA is an interesting pedagogical tool because I can keep in touch with other users of CONEXIONES. Besides, it is possible to give your opinions and engage in the construction of knowledge. it provides a great opportunity to generate knowledge and increase the one we already have” Teacher comment.
 - “COLEGA provides a searching and interactive method to helps us to solve doubts with students, partners and experts.” School director opinion.
 - “I think COLEGA is easy to use. I can find answers to the questions I have. I can also ask people who know about my questions.” Student comment.
- ✓ The Discussion Room – synchronous tool- generated a lot of interest. Participants considered that it will give them another way of interacting and building knowledge collaboratively.
 - “I think is a great tool that will give a lot of support to the CONEXIONES Project. It will allow us to have more contact with teachers.” Researcher comment.

- ✓ Teachers and students considered COLEGA as an innovative tool, that will increase their confidence in new technologies. COLEGA reduces their fear to computers and encourages interaction among participants.
- ✓ Participants felt that the instructions were clear and enough to understand the way they were supposed to interact with COLEGA.
“This system (COLEGA) seems to be useful for CONEXIONES’ schools. It is a way to share experiences and to search for information related to different topics. It presents an attractive and an easy way to handle information. It motivates the members of CONEXIONES and increases their ability to share experiences.” Teacher comment.

According to the initial results and the comments by participants, COLEGA was accepted and considered as a useful tool that supports their learning activities. COLEGA combines collaborative learning tools, group and individual memory, human-computer interaction and document retrieval techniques. COLEGA uses of keyphrase based technology and participants’ annotations to facilitate access to individual and group memories. Learning communities can benefit by inspecting and interacting with information maintained by COLEGA.

Conclusions

COLEGA is instrumental in providing a collaborative solution for managing group and individual memories. It promotes the generation of learning communities and learning spaces according to current participants' interests. This collaborative and learning tool aims to support participants of CONEXIONES with learning about a particular topic. In addition, participants can learn about group interaction, leadership, and collaboration while using the system.

COLEGA breaks geographic barriers in order to support modern learning communities. COLEGA was accepted by members of CONEXIONES who understood their potential and advantages to support learning in different settings. Future work includes a formal evaluation of the synchronous discussion room and integration of new tools to handle conceptual maps and learner models such as CMaps (Cañas et al. 2001) and ViSMod (Zapata-Rivera & Greer 2000).

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