

Face to Face Cooperation with CoFFEE

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Abstract. Co-located collaboration in classroom is the topic we tackle in this paper. In particular we will describe how CoFFEE implements this kind of collaboration. CoFFEE is an extensible platform on which to implement different collaborative tools. Every tool renders a different kind cooperation between users. In this paper we will also provide further details in about the newly implemented tools for collaboration, the Repository, the Positionometer and the Co-Writer.

1 Introduction

Cooperative learning refers to those situations where students work together in a group on a collective task. Cooperative learning has traditionally been studied in classroom settings where students meet face-to-face (for an overview, see e.g. [16,13]). The introduction of the use of personal computers in the classroom has led to a variety of technology-enhanced cooperative learning activities, inside as well as outside the traditional classroom context. Technology-enhanced learning in the classroom mainly concerns:

- ‘Single display groupware’ [15] where students collaborate through a single, shared computer screen,
- Tutor-student dialogue,
- The manipulations of visual objects or models in a shared workspace,
- The use of new technologies like handheld computers or table-top interactive displays.

In this paper we present a collaborative technology that is designed to support face-to-face group discussions in the classroom. A group discussion consists of one or more meetings between a group of students who communicate with each other, often face-to-face, in order to achieve some interdependent goal, such as increased understanding or the solution to a shared problem [2,8].

The CoFFEE system [3], the collaborative technology that is discussed in this paper, is specifically designed to mediate (part of) the interaction of face-to-face group discussions in the classroom. The computer-mediated part of the communication occurs in a shared digital workspace of the CoFFEE system that can be accessed by all the students simultaneously. When the students work with the collaborative tool, their interactions will be distributed between the two modes of communication, i.e. an oral, face-to-face and an electronic, computer mediated part. We assume that a carefully tools may offer additional structural features that will change the nature of the communication and learning within a student group. The aim of the CoFFEE system is to support the task-related interactions that are associated with learning. Task-related interactions refer to knowledge and information that is shared and used by the students and that relates directly to task performance [12]. These interactions lead to cognitive activities often referred to as knowledge elaborations, which, in turn, are responsible for knowledge acquisition [5]. The task-related interactions are used as the main reference for the design.

2 Tools for Cooperation

CoFFEE [11,4,1] is an extensible platform on which to implement different collaborative tools. In Figure 1 we represented the currently implemented tools classifying them in three categories: *service tools*, *collaboration tools* and *private tools*. Every tool implements a different way of cooperation (see Figure 2).

Side by side with collaborative tools the CoFFEE system, some *service tools* are offered in order to better support the cooperative activities: the Presence tool that reports the members of the group the learner belongs to and a Quick Communication tool that lets the learner to share private channel for a quick chat. Following there is a short description of the tools Threaded Discussion, Graphical Discussion which are described in [11] and that implement some basic ways of collaboration.

Threaded Discussion. The Threaded Discussion tool allows synchronous messaging between the users, structuring the contribution in threads. As reported in literature (see, e.g. [14] for a detailed description) the standard chats have limitations at managing the discussion flow and organizing turn taking, making sometimes the whole discussion comprehension difficult. The usage of a threaded discussion aims to address the lack of control over discussion structure in the standard chat. It must be said, that the threaded discussion shows also some limitations due mainly to the lack of awareness about the location of new contribution. We addressed this issue by providing a simple (and configurable) awareness mechanism that highlights the most recently added nodes (or branches) in the threaded view.

Graphical Discussion. The Graphical Discussion tool allows synchronous messaging between users, representing the contributions as boxes in a graphical space, eventually linked by arrows. This tool is designed to support brainstorming processes and conceptual maps creation, but it is enough generic

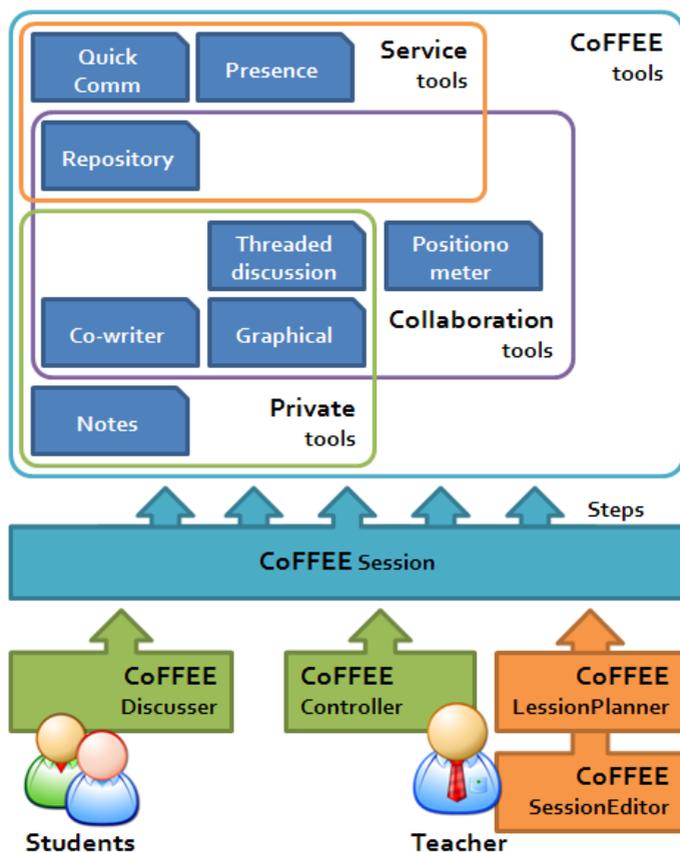


Fig. 1. A diagram showing the tools currently implemented in CoFFEE

and malleable [10] to satisfy other usage scenarios. The boxes can contain maximum 100 characters, and they have all the same size, so that any box can not “dominate” graphically the others on the screen. They can be configured to represent the contribution type through a label and a color.

Both the Threaded Discussion and the Graphical Discussion tool can be configured so that each contribution is tagged by the user according to a notation system, e.g., contributions are tagged as **Q** for Question, **A** for Answer and **C** for Comment. The notation system for each tool is fully configurable: for each tag we can define name, label, color. Moreover, for the Graphical Discussion tool also the shape and connections can be configured (color, linestyle, arrowheads, text label, number of allowed bendpoints, etc.), being part of the notation system.

2.1 Co-writer

This tool offers to the learners a shared text editor with turn-taking, so that only one learner is allowed to write into the editor and the others can only see

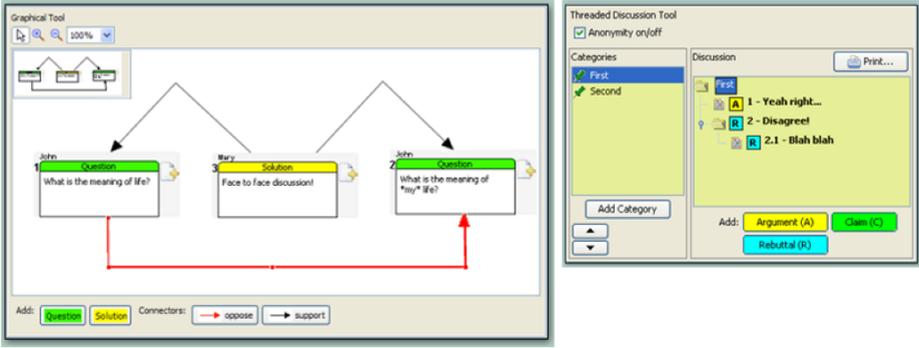


Fig. 2. Two basic cooperation tools Graphical Discussion (left) Threaded Discussion (right)

what he/she writes. The writer is selected by the teacher and each learner is informed about who is currently able to write into the text editor. The teacher is also offered the possibility to load a new document from the file system (that replaces anything that was written at that time) and to save the document written into a text file by using the two buttons above the droplist. The list shows who is the writer, i.e. who owns the “token” and is allowed to write.

2.2 Repository

The Repository tool provides file sharing functionalities among teacher and learners. The teacher manages a shared folder where each learner can get files (by saving them on his/her computer). Each learner, also, has a private folder where documents that he/she thinks can be useful to the activities are placed. The teacher can access all the private folders of the learners and can select a file to be placed in the shared folder to be accessible by the other learners. Each file can be associated with a note containing a description. The tool, then, shows to the teacher a “Shared Files” section and a section of the private files of each learner in the classroom.

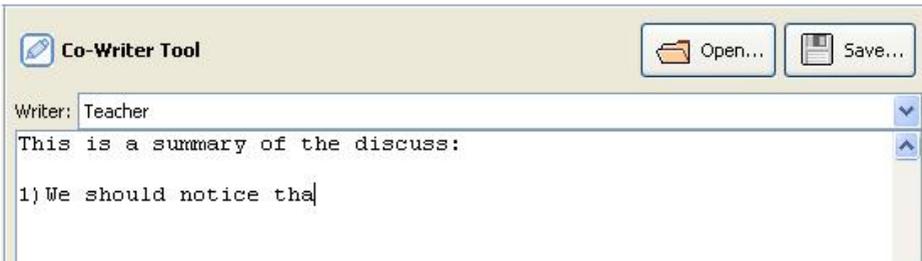


Fig. 3. A screenshot of the Co-writer tool

2.3 Positionometer

This tool provides voting functionalities. A student can express his/her position about an argument proposed by the teacher. It is possible to perform multiple voting operations within the same step, and it is possible to configure voting operations at run-time. In Figure 4 is shown the Positionometer view for the teacher. The slider allows the student to express his/her position in a discrete scale.

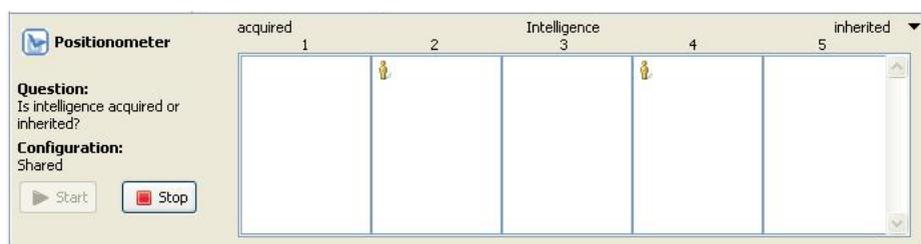


Fig. 4. A screenshot of the Positionometer tool running on the CoFFEE controller: a button is available to stop the votation

Vote visibility. The position expressed by the student can be “Shared by all” (the vote is seen by everyone) or “Personal” (the vote is seen only by himself and the teacher, during the votation, and at the end shown to everybody). In both cases, the teacher, on the CoFFEE Controller, can see everybody’s vote. By clicking the Stop button, the teacher stops the voting operation. The clients’ sliders are disabled, and the vote is saved (it will be shown when printing the session). If the vote was Personal the results (i.e. everybody’s position) is shown to all the learners. For each voting operation, the teacher can specify the number of columns for the scale, as well as the information shown to the students: Question, Argument, Labels for bottom and top value of the scale.

Anonimity. If the vote is not set as “Anonymous”, the avatar’s name can be seen in a tooltip in every moment. The identities are hidden to the other students when the vote is set as “Anonymous”. In this case the background colour is set to yellow. This setting has been shown to be important in classroom setting [9].

2.4 Tools Configuration

Every tool can be used in two different modes, *group* mode and *private* mode. In group mode tools can be used for dyads, small groups and class discussions. In private mode tools provide their functionalities within a private space where any single learner is able to collect ideas, organize a contribution before posting it to the cooperative space, take notes.

This vast amount of possible configurations for every single tool is summarized in Figure 1 using a diagram. Every tool belongs to different categories: for example the Repository tool is a service tool because it lets the teacher to distribute material for a particular lesson, but is also a collaborative tool when learners suggest documents relevant to a particular topic.

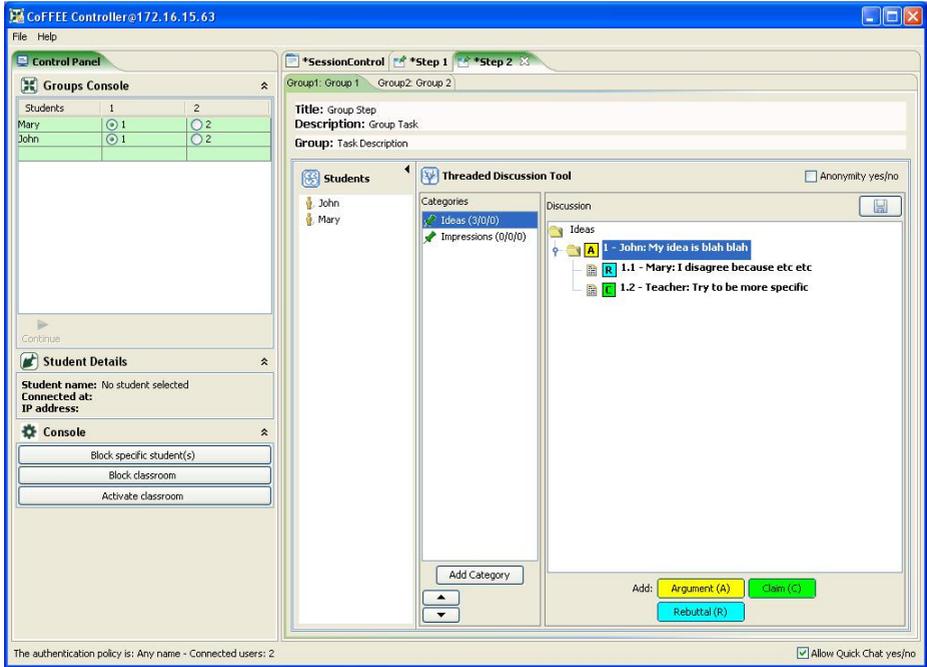


Fig. 5. A screenshot of the CoFFEE Controller. The notation system can be seen in the Threaded Discussion tool: each contribution is tagged by the owner and, if configured properly, it can be later changed by the owner/anybody.

2.5 Sessions and Steps

The activities with CoFFEE are organized in *Sessions* [1]. A session can be a part of a whole lesson in the class or span several lessons over a period of several weeks. Every session is composed by *Steps*. A step is the unit of activity and is composed by a combination of tools. The tools in a single step are active and can be used simultaneously by the learners. Passing from a step to the successive ones is decided by the teacher and the tools present in every previous step are frozen. During the lesson, both the teacher and learners can navigate through previous steps in order to read artifacts.

3 CoFFEE System Details

3.1 CoFFEE Functional Components

CoFFEE is implemented in four separate components (see Figure 1): Discusser, Controller, Session Editor and Lesson Planner. Discusser and Controller match the roles of the users they are designed for, respectively, learners and teacher. The Controller is in charge to host a session and to provide the necessary network infrastructure for the activities. The Discusser is designed to be run one per

computer and is the interface that will be used to interact within the system. The Controller allows the teacher to load a session, run it step by step, manage groups, block and unblock learners and of course access each group's tools (except private tools) in order to monitor, facilitate or participate in the discussions. The third component is the Session Editor, it enables the teacher to design the session's steps and assigning for every step the tools[1]. Planning a session can begin from editing a pre-configured template to creating everything from scratch. The last component is the Lesson Planner and is designed to enable the teacher to customize the session without changing its structure. It is useful when a teacher intends to re-use the same session template.

3.2 Latecomer Users Management

CoFFEE provides native support for managing latecomers. A latecomer is a user that connect to the system after the cooperative session has started and some work has been carried out by users. This is an important issue that needs efficient solutions because it strongly influences the interactivity and the usability of the whole system. In fact, managing latecomers in a synchronous session, while difficult, it is an important requirements in a real setting, where latecomers or accidental disconnections and reconnections are possible.

The efficiency of the solution is compared with the settings of the problem, since a latecomer needs a snapshot of the whole system state to start collaboration with other users, and the state size is influenced by several factors like the number of connected users, the frequency of contribution and the average memory occupation of the contributions. Of course, the "later" is the latecomer, the larger is the state.

3.3 Software Technology

CoFFEE architecture is based on a foundational component-based framework Eclipse Rich Client Platform [7]. The network communication between the distributed components is based on the Eclipse Communication Framework [6]; it is a subproject of Eclipse community and provides framework for supporting the development of distributed Eclipse-based tools and applications by using asynchronous point-to-point or publish-and-subscribe messaging functionalities.

4 Conclusion

In this paper we describe the different ways of cooperation provided by CoFFEE for co-located collaboration in classroom. CoFFEE is an extensible platform on which to implement different collaborative tools. Every tool renders a different kind cooperation between users. The CoFFEE version currently available can be downloaded at the Lead project web site <http://www.lead2learning.org> and is available for different operating systems and in 4 different languages.

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