

Using CoPe_it! in a community of educators

The layout of the tool's main user interface is shown in Figure 1. Upon having the appropriate permissions, users may either create a new workspace for the needs of their community or collaborate with their peers in existing ones (there is also the option of maintaining private or public workspaces). The left hand side bar of the interface enables users to open a new browser, quickly search for related information (through Google and Wikipedia, or in the local repository), subscribe to RSS feeds, maintain a list of bookmarks, and be aware of other online members of their community.

Users may easily create and upload various types of knowledge items; these can be either existing multimedia resources (the content of which can be displayed upon request or can be directly embedded in the workspace) or dedicated item types such as *ideas*, *notes* and *comments*. Ideas stand for items that deserve further exploitation; they may correspond to an alternative solution to the issue under consideration and they usually trigger the evolution of the collaboration. Notes are generally considered as items expressing one's knowledge about the overall issue, an already asserted idea or note. Finally, comments are items that usually express less strong statements and are uploaded to express some explanatory text or point to some potentially useful information. Knowledge item types may change upon the evolution of the collaboration (e.g. a user that has asserted a particular comment may – at some point of the collaboration – elaborate it further and change its type to an idea).

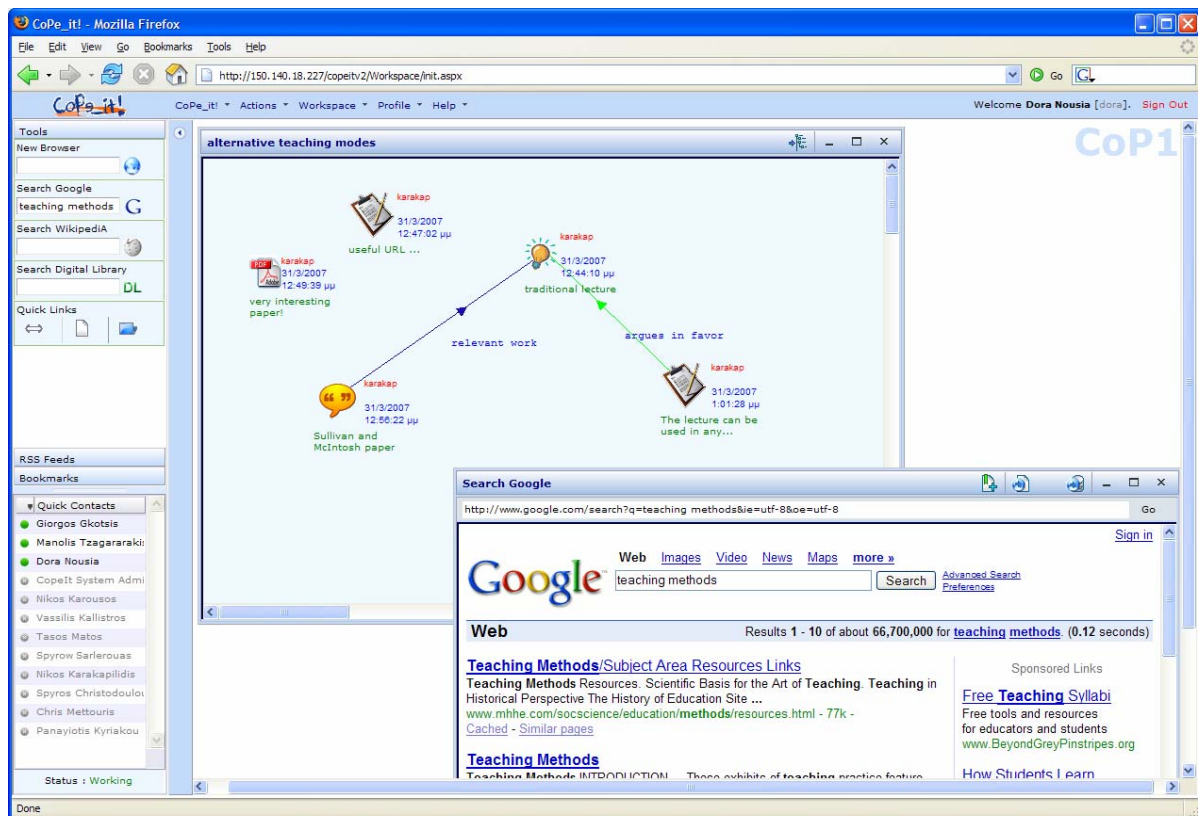


Fig. 1. A first instance of the collaborative workspace.

All the above items can be interrelated by trouble-free user actions (as in the case of their creation and uploading, such actions are performed through the mouse). When interrelating items, users may select the color of the connecting arrow and provide (if they wish) a legend describing the interrelationship they conceive. These legends are

intentionally arbitrary. An interesting feature of the tool is that it enables users to spatially arrange the uploaded items and cluster them in a meaningful way. Examples of such actions are given below; the spatial arrangement of items is also an easy task (users have just to click on an item and drag it to the desired position).

To better present the features and functionalities of our approach, this document presents an illustrative example concerning real collaboration between members of a community of educators, aiming on considering *alternative teaching modes* to (potentially) reach a decision on which is the most appropriate one. Figure 1 illustrates an early instance of the collaborative workspace created for the needs of the above community (for the particular issue under consideration). As shown, only one user has contributed so far (nickname: karakap) by: (i) uploading on the workspace some useful resources (a "very interesting paper" and a "useful URL"), (ii) proposing the idea "traditional lecture" (as an alternative of teaching modes), and (iii) interrelating his idea with two additional items, one that clearly (according to him) argues in favor of the abovementioned proposal (to do so, he has uploaded the argument "The lecture can be used in any size class and is often the only option in large classes", and has related it - with a green arrow - to the idea "traditional lecture"), and a second one corresponding to related work ("Sullivan and McIntosh paper", which has been also related to his proposal).

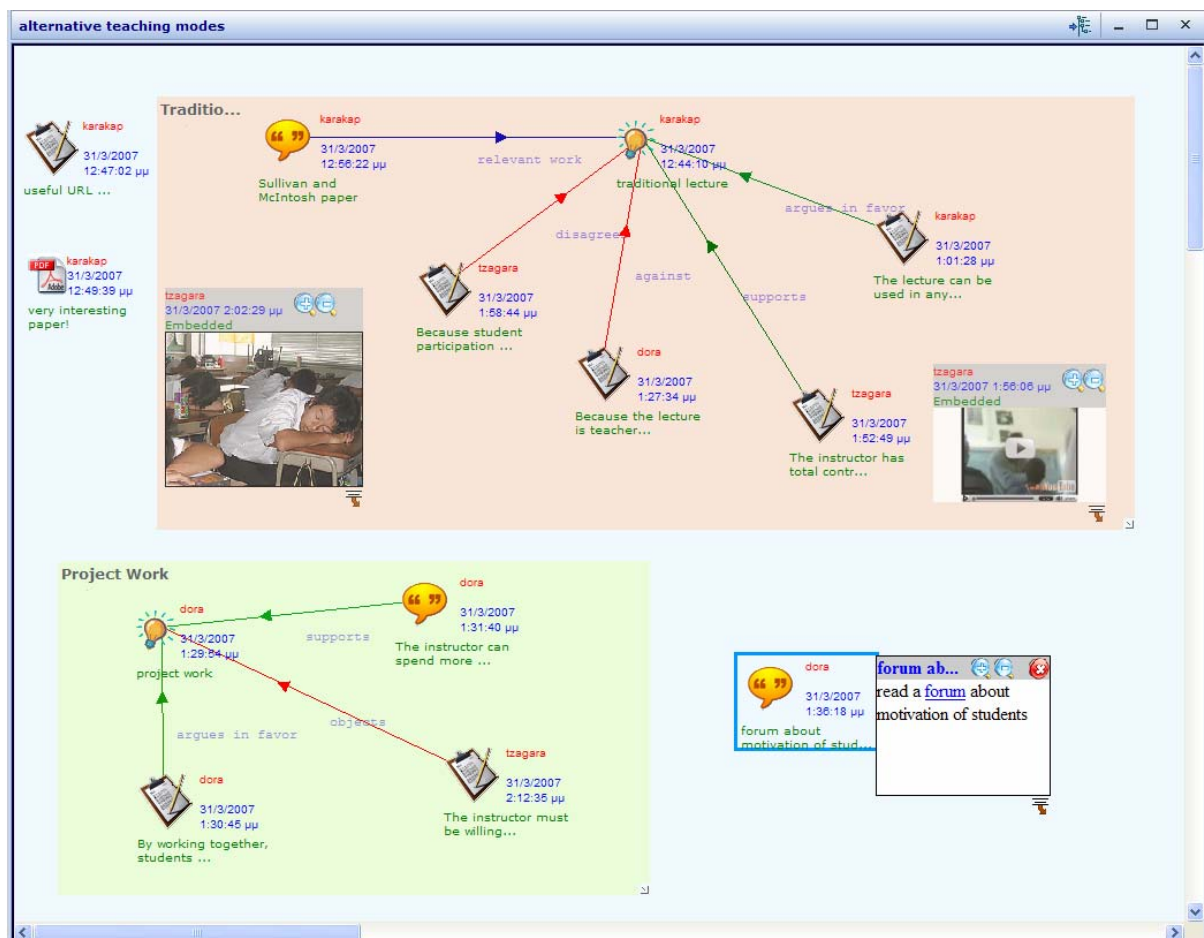


Fig. 2. A second instance of the collaborative workspace.

Figure 2 illustrates a second instance of the collaborative workspace under consideration (the screenshot depicts only the workspace area). As shown, two more users (nicknames: dora and tzagara) have been contributed to the collaboration by: (i) proposing a second idea ("project work", asserted by dora), (ii) uploading additional related resources (e.g. a comment pointing to a "forum about motivation of students", a

comment stating that “The instructor can spend more time with those students or groups who need attention”, a note stating that “Because student participation is minimal, lecturing promotes passivity in students”), (iii) interrelating knowledge items (e.g. the note “By working together, students learn from one another and become less dependent on the instructor” to the idea about “project work”, declaring that the former is an item that “argues in favor” of the latter, or the note “Because the lecture is teacher-centered, it tends to promote one-way communication and the notion that truth resides in the instructor” to the previously asserted idea about “traditional learning”, also declaring that the former is “against” the latter), and (iv) uploading multimedia resources that are relevant to some knowledge items (in the instance shown, a video and an image have been embedded and placed intentionally close to the related items).

Beyond coloring of the arrows that interrelate knowledge items (in the example given, green arrows declare support whereas red ones declare opposition for the specific community), another visual cue that appears in Figure 2 concerns the colored rectangles that have been created by users to cluster related items (the two rectangles shown correspond to the two alternative ideas proposed so far). Although - at this instance - these rectangles are simply visual conveniences, they may play an important role during the switch to a more formal projection, enabling the implementation of appropriate abstraction mechanisms. Other visual cues supported in this projection may bear additional semantics (e.g. the thickness of an edge may express how strong a resource/idea may object or approve a teaching mode).

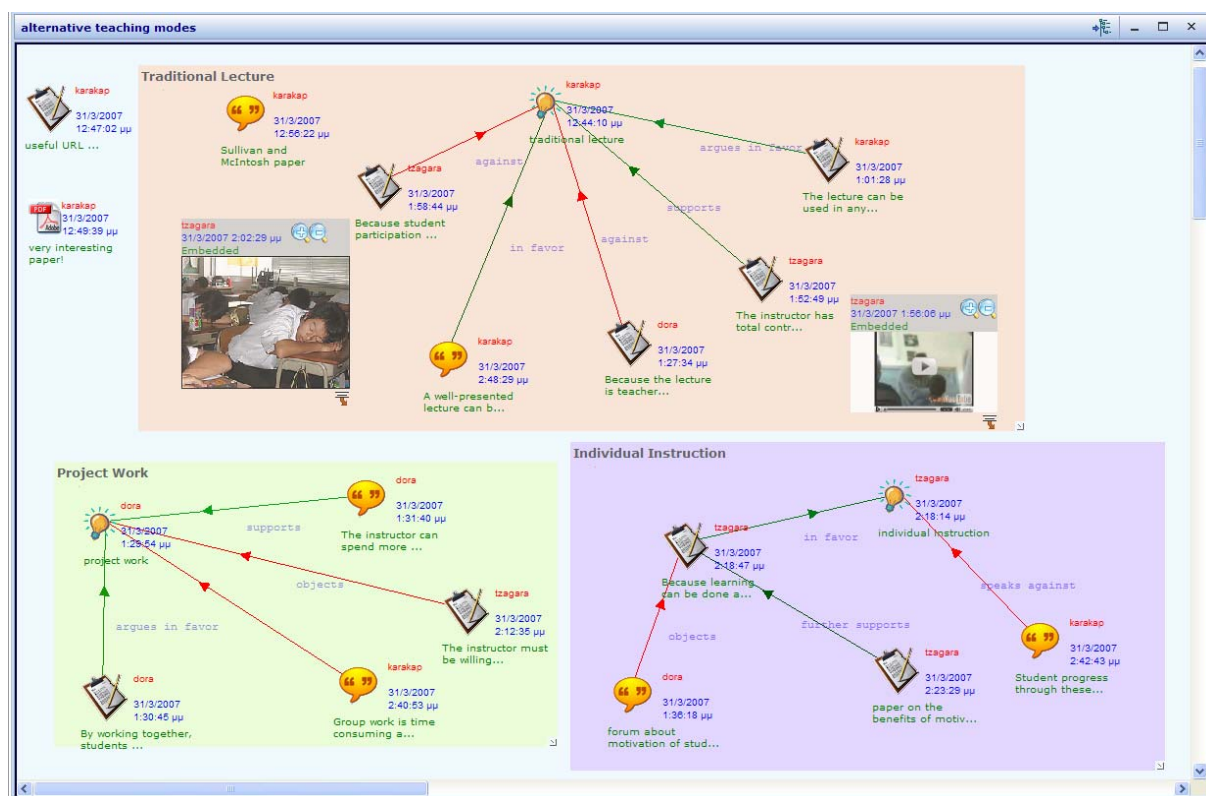


Fig. 3. The final state of the collaborative workspace.

Figure 3 illustrates the final state of the collaborative workspace under consideration. As shown, a third idea has come up (“individual instruction”, asserted by tzagara), while additional items have been uploaded and interrelated. The three color rectangles constructed aid users have a neat and quick view of the alternatives considered as well as the underlying argumentation. Since initially the process of gathering and sharing resources about the available teaching modes is unstructured, highly dynamic and thus rapidly evolving, the projection presented so far provides the most appropriate

environment to support collaboration at this stage. The aim is to bring the session to a point where main trends crystallize, thus enabling the switch to a more formal projection (upon the participants' wish).

Switching Projections

The collaboration instances discussed above correspond to a projection that complies with information triage principles and allows incremental formalization (from a mere collection and sharing of knowledge items to exploitation of legacy resources, interrelation and evolution of knowledge items, and informal/semiformal argumentation and aggregation of knowledge items)*. Such a projection could perfectly serve the needs of a particular community (for a specific context). However, some communities may have the need to further elaborate the knowledge items considered so far, and exploit additional functionalities to advance their argumentative collaboration. Such functionalities can be provided by other (more formal) projections that may enable the semantic annotation of knowledge items, the formal exploitation of collaboration items patterns, and the deployment of appropriate formal argumentation and reasoning mechanisms. As highlighted above, while an informal projection of the collaboration space aids the exploitation of information by users (user-interpretable view), a formal projection aims mainly at the exploitation of information by the machine (machine-interpretable view). Formal projections provide a fixed set of discourse element and relationship types, with predetermined, system-interpretable semantics.

Further elaborating the example of the previous subsection, let us assume that, at some point of the collaboration, an increase of the formality level is decided (e.g. by an individual user or the session's facilitator). In this case, there is the need to switch to a more formal projection, where knowledge items' and relationships' types have to be transformed, filtered out, or kept "as-is". The above are determined by the underlying visualization and reasoning model of the formal projection (consequently, this process can be partially automated and partially semi-automated). An instance of a projection enabling formal argumentation and group decision making is shown in Figure 4 (the screenshot depicts only the formal projection, which now appears in a separate window; the previous projection is still accessible). This formal projection adopts an IBIS-like formalism [1] and exploits functionalities of a previously developed argumentation support system [2]. It provides a structured language for argumentative discourse and a mechanism for the evaluation of alternatives. Taking into account the input provided by users, this projection constructs an illustrative discourse-based knowledge graph.

The knowledge items allowed in this projection are *issues*, *alternatives*, *positions*, and *preferences*. Issues correspond to problems to be solved, decisions to be made, or goals to be achieved. For each issue, users may propose alternatives (i.e. solutions to the problem under consideration) that correspond to potential choices. Positions are asserted in order to support the selection of a specific course of action (alternative), or avert the users' interest from it by expressing some objection. A position may also refer to another (previously asserted) position, thus arguing in favor or against it. Finally, preferences provide individuals with a qualitative way to weigh reasons for and against the selection of a certain course of action. A preference is a tuple of the form $[position, relation, position]$, where the relation can be "more important than" or "of equal importance to" or "less important than". The use of preferences results in the assignment of various levels of importance to the alternatives in hand. Like the other discourse elements, they are subject to further argumentative discourse. The above four types of items enable users to contribute their knowledge on the particular problem or need (by entering issues, alternatives and positions) and also to express their relevant values, interests and expectations (by entering positions and preferences). Moreover, the projection continuously processes the elements entered by the users (by triggering its reasoning

* The projection presented also allows for easy exploitation of existing web forums (items of a forum can be inserted in the workspace and further manipulated by users).

mechanisms each time a new element is entered in the graph), thus facilitating users to become aware of the elements for which there is (or there is not) sufficient (positive or negative) evidence, and accordingly conduct the discussion in order to reach consensus.

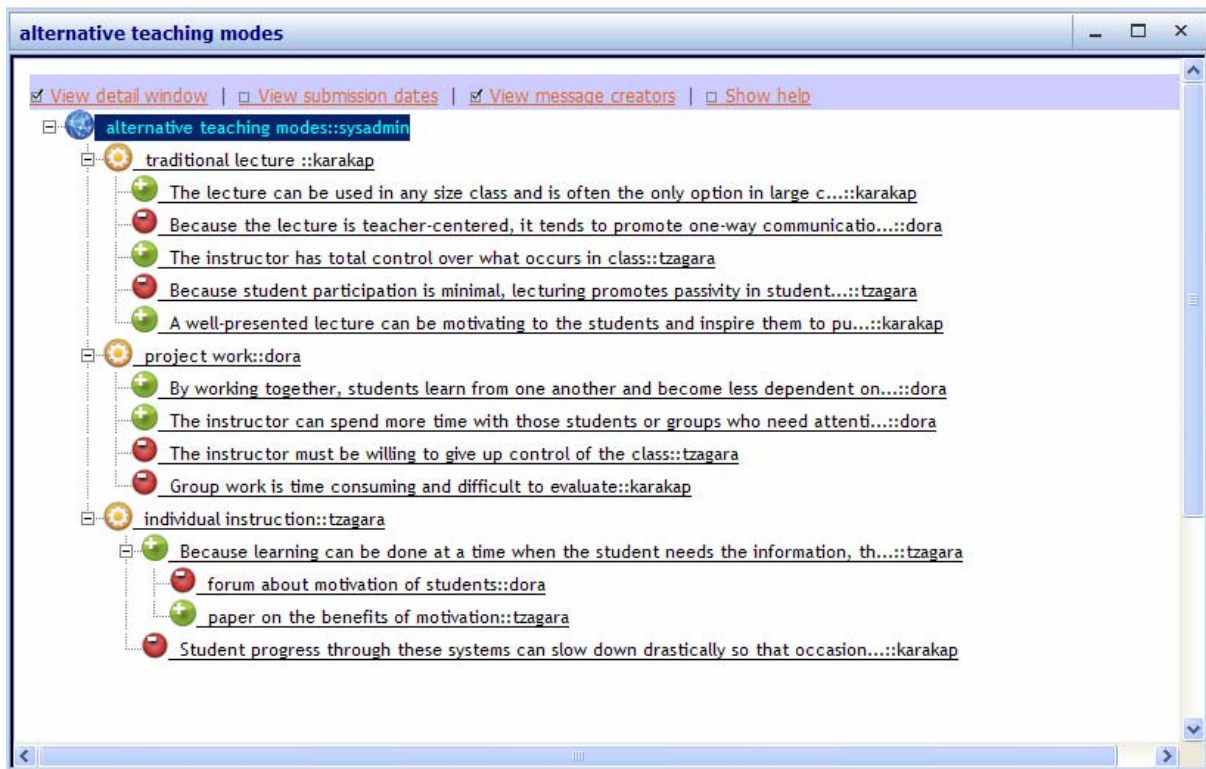


Fig. 4. Instance of a more formal projection.

The instance shown in Figure 4 has been automatically built by transforming the projection instance of Figure 3 (the switching to this, more formal, projection has been initiated by the session's facilitator by requesting the related service from the tool). More specifically, the 'ideas' of Figure 3 have been transformed to the 'alternatives' of Figure 4. Other knowledge items have been transformed to positions in favor or against (exploiting the coloring and the legends of the interrelating arrows – for more details see the tools Quick Guide: <http://copeit.cti.gr/site/quickguide.html>).

It is noted that, after the above transformation, the collaboration may continue at this projection, where users are able to exploit a richer set of features and functionalities that is associated to a higher formality level. For instance, further to the argumentation-based structuring of a collaborative session, this projection integrates a reasoning mechanism that determines the status of each discourse entry, the ultimate aim being to keep users aware of the discourse outcome. More specifically, alternatives, positions and preferences of a graph have an activation label (it can be "active" or "inactive") indicating their current status. This label is calculated according to the argumentation underneath and the type of evidence specified for them ("burden of proof"). Activation in this projection is a recursive procedure; a change of the activation label of an element is propagated upwards in the discussion graph. Depending on the status of positions and preferences, the mechanism goes through a scoring procedure for the alternatives of the issue (for a detailed description of the projection's reasoning mechanisms, see [2]). At each discussion instance, users are informed about what is the most prominent (according to the underlying argumentation) alternative solution.

Alternative projections of a particular workspace should be considered (and exploited) jointly, in that a switch from one to the other can better facilitate the argumentative collaboration process. One may also consider a particular collaboration case, where

decrease of formality is desirable. For instance, while collaboration proceeds through a formal projection, some discourse elements need to be further justified, refined and elucidated. It is at this point that the collaboration session could switch to a more informal view in order to provide participants with the appropriate environment to better shape their minds (before possibly switching back to the formal projection). Switching from a formal to an informal projection is also supported by our approach.

References

1. Conklin, J. and Begeman, M. (1989). gIBIS: A tool for all reasons, *Journal of the American Society for Information Science* 40(3), pp. 200-213.
2. Karacapilidis, N. and Papadias, D. (2001). Computer Supported Argumentation and Collaborative Decision Making: The HERMES system. *Information Systems* 26(4), pp. 259-277.