Moderation of students' activities in co-located computer-supported collaborative learning using *Digalo*.

Einat Lotan-Kochan[1], Raul Drachman[1], Baruch Schwarz[1] & Amnon Glassner[2]

[1] School of Education, Hebrew University of Jerusalem, Israel
[2] School of Education, Ben Gurion University, Israel

Introduction

Digalo is a graphic-based software tool for supporting collaborative argumentation and structured discussion. It has been developed in the framework of the DUNES project (IST-2001-34153, http://www.dunes.gr). Using *Digalo* consists of synchronously co-creating maps built of written notes inside different cards (represented by diverse geometrical shapes), as well as using different arrows to represent various types of connections between the cards or contributions. These 'cards' and 'arrows' represent the ontology or the "grammar" of the discussion, which constrains but also facilitates and promotes the discourse [1,2] by guiding the learners to use specific speech acts and raising their awareness to their discursive roles, thus encouraging a certain type of discussion, such as critical dialogue.

Digalo in face-to-face settings

Although *Digalo* was designed to be integrated both in distance-learning settings and face-to-face settings, our experience in schools revealed that teachers and instructors prefer using it in face-to-face collaborative learning settings. We found that teachers use *Digalo* in three main ways:
1. for running an "opening discussion" as a first step of an inquiry process (e.g., brain storming, formulating and communicating opinions);
2. Co-constructing argumentative maps (in any stage of the learning process); and
3. for summarizing discussions (e.g. making group decisions, graphically presenting the structure of a problem/solution).

In other words, *Digalo* supports various types of face-to-face collaborative learning activities during the learning process. We also learned that it is of great importance to integrate *Digalo* activities in face-to-face collaborative learning settings, where the lesson design is as follows:
(A) face-to-face preparation activity (either teacher-led or small groups work);

(B) *Digalo* activity;
(C) face-to-face summarizing activity (teacher led and/or small groups work).

This design has proved to be most effective in terms of students' learning and structuring a whole inquiry process into one lesson unit. The oral face-to-face activities in A and C were found to contribute significantly to this learning.

During the last few years our research efforts focused mainly on students' learning and use of *Digalo*[1]. However, we became more and more aware of the central role of the teacher or moderator in the implementation of the tool and its accompanying pedagogical method (argumentative-dialogue) on the one hand, and to the difficulties in facilitating students' group work in synchronous co-located *Digalo*-based discussions, on the other hand. These understandings led to a new research endeavor towards a better understanding of the teacher's role, in order to design a computational support for the moderation of *Digalo* activities. This is the focus of ARGUNAUT (IST-027728, http://argunaut.org/), a new R&D EU-funded project.

In this workshop we would like to reflect on the difficulties encountered by teachers in moderating *Digalo* activities, focusing on those related to it being a "networked-computing support for face to face [or co-located] collaborative learning situations". It is important to point out, again, that we see such difficulties as essential sources for further development and improvement of both the technological and the pedagogical aspects of *Digalo*'s implementation.

In a recent experiment, we found that teachers consider the following as key tasks (or roles) of the moderator of a *Digalo* activity:
1. Discipline and management of the activity,
2. Planning and organizing the lesson in which the *Digalo* activity is incorporated,
3. Encouraging participation,
4. Encouraging interaction and collaboration,
5. Presenting questions, asking for clarifications and explanations or playing the "Devil's Advocate" (in order to promote a dialectic argumentative dialogue),
6. Keeping the students focused on-task,
7. Emphasizing important contributions, aspects and ideas,
8. Making sure students use the ontology properly (i.e. encouraging an argumentative dialogue),
9. Providing technical support and making sure the application can be used easily in the classroom (steady infrastructure), and
10. Providing affective support and promoting students' motivation.

Obviously, these roles could refer to many face-to-face educational situations, and are not particularly unique to *Digalo*-based activities. What makes the difficulties encountered by these teachers in using *Digalo* in their instruction unique, then? We believe that the answer is in the integration of *Digalo* as a networked-computerized

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[1] The results are reported in various publications of the DUNES project members (e.g. Johnson, Morgan & Simon [3]; van Diggelen, Overdijk & De Groot [1]; Glassner & Schwarz [2].

tool for learning in a co-located environment. Such a setting means running a "double-mode" activity, where written-electronic interaction and spoken-oral interaction, take place at the same time. This means a heavier cognitive-load for the teacher or moderator of the activity – who has to follow both modes of interaction between students and within groups. Apparently, it is impossible to moderate students' activity while monitoring both modes of interaction, and at the same time trying to fulfill any of the above mentioned roles.

Our group is currently handling this challenge on two planes: on the pedagogical plane, teachers developed two partial solutions:
1. Assigning a student the role of "head of the group". These students received instructions as to how to handle their group's work, but mainly – how to manage the group discussion using *Digalo* (roles #3 through #8, above). In some of the activities the group leader had to lead the group to make a final shared decision or reach agreement. The group leader was also responsible of presenting his/her group work to the whole class, in the summarizing activity.
2. Another partial solution can be found in the lesson design described earlier. Using this design the teacher can both guide the students (during the preparation activity) and get a limited picture of the groups work (in the summarizing activity).

On the technological plane, we are currently co-developing two possible solutions:
1. A moderator-assisting tool (ARGUNAUT) that will collect and process the data in real time and present them to the teacher in a way that decreases the cognitive load associated with the "double mode" interaction, by facilitating the monitoring of the written-electronic channel.
2. Another discussion-support tool – "Mapit" - is currently being developed within the KP-Lab project (IST-27490 (IP), http://kp-lab.org). This will enable both channels (written and spoken) to take place simultaneously through the "electronic mode", hence reducing the need to split attention and other cognitive resources in monitoring the group work and interaction.

We expect this workshop will contribute further to these endeavors.

References

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