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E-moderation of synchronous discussions in educational settings: A nascent practice

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Abstract

E-moderation has been a common practice in a-synchronous discussions of post-secondary courses. We consider here e-moderation of synchronous discussions in the school context. We adopt a design research approach to elaborate an environment, the Argunaut system that fits the reality of classrooms in which moderation of several small group synchronous discussions in parallel is desirable. We describe the Argunaut system, and then describe an experiment in which a moderator could elaborate several strategies in two synchronous discussions (one with two groups in parallel, and one with four groups in parallel). Through the technique of cued retrospective reporting, we could identify those strategies and could show how technology and moderation are interwoven. We then assessed whether the actions of the moderator had some positive impact on the flow of the discussions. The positive findings that emerge from this study indicate that teachers can enact this novel practice in classrooms, enabling by such proper guidance for productive engagement in synchronous discussions of many students in the same class.

The goal of this paper is to understand e-moderation in multiple synchronous discussions aimed at promoting collaborative reasoning. E-moderation is the caring, but non-intrusive, electronic guidance of multiple discussions. E-moderation is an enormously difficult task because of the temporal and cognitive demands on the moderator. To be effective, e-moderation of collaborative discussion requires technological support for the moderator. In this article, a design research approach was adopted to create and study an environment, the Argunaut system, that fits the reality of classrooms with multiple small groups and which provides real-time support for a human moderator to facilitate group functioning. We adopted a phenomenological approach and describe the process of moderation, moderation tactics, and the interactions between the moderator, discussants, and system features. Towards this goal, we provide a general framework for facilitation of small-group work that focuses on the promotion of critical reasoning through small group discussions. We stress the potential of technology, but show that it is not sufficient by itself. These theoretical underpinnings constitute the starting point for the design research program described in this paper.

Facilitation of small-group work

Small group methods can have positive effects on student achievement, especially compared to other forms of instruction involving less interaction between students (e.g., O'Donnell, 2006; Slavin, 1995). However, simply placing students in small groups does not guarantee productive collaboration. Learning gains depend on the quality and depth of discussions, such as the extent to which students give and receive help, share knowledge, build on each others' ideas, provide justifications, and recognize and resolve contradictions between perspectives (e.g., Asterhan & Schwarz, 2007, 2009a; Chin & Osborne, 2010; Schwarz, Neuman & Biezuner, 2000; Webb &

Palinscar, 1996). Instructors often must play an important role in eliciting and sustaining the quality of discussions in classrooms to avoid detrimental practices and to facilitate beneficial ones (Webb, 2009).

Despite increasing knowledge about peer learning and the recognition of the importance of guidance, little is known about how teachers facilitate student dialogue during group work (Webb, 2009). In one of the few systematic studies of discourse facilitation, Chiu (2004) investigated whether the teacher's explicit content-related help improved group performance. Chiu found that explicit content-related help was ineffective. He showed that teachers did not evaluate the group progression of ideas before giving help, and that when they provided content-related help they consequently lost students' thread of thought. Chiu concluded that a key element in determining the effectiveness of teacher interventions in group work in general is whether teachers tie their help to the progress of the group. For most teachers, this is not an easy task (Yackel, 2002).

Some researchers adopted a phenomenological approach and observed how expert teachers facilitate group learning in specific contexts. For example, Hmelo-Silver and Barrows (2006, 2008) described the different strategies an expert physician adopted to help medical students explain a patient's disease in a Problem-Based Learning (PBL) context. The physician supported knowledge construction though asking open-ended, meta-cognitive questions and catalyzing group processes. His questions served meta-functions (e.g., definition and interpretation questions), helped students to focus on the relevant conceptual space, and elicited knowledge displays that helped students recognize what content required the most focus. For students, questions were central for understanding the problem, for initiating the generation of

new ideas, and for further building upon these ideas. The physician and his students co-constructed an agenda building upon group thinking and facilitation.

In another study, Zhang, Scardamalia, Reeve and Messina (2009) studied facilitation of small groups of grade four students learning optics using Knowledge Forum software (Scardamalia & Bereiter, 2006). The teacher progressively delegated control to the students, who took initiative in reading other groups' notes, engaging in knowledge advancement, summarizing and elaborating on knowledge advances, and even forming groups for group work. Given that the teacher in Zhang et al. (2008) could learn over the three years of the study how to be less dominant in classroom talk, and to progressively delegate responsibilities to learners suggests how sophisticated he was fading out his interventions, and yet was always aware of students' advancements through Knowledge Forum.

These studies are important as they show the complexity of small-group facilitation, but also that such facilitation is possible. They open new directions for research on small-group facilitation within school contexts. A natural direction is to explore how non-expert teachers can approach the challenges of ascertaining student thinking during small group work. Another direction is that, given that in most learning contexts several groups are active concurrently, research should explore how teachers can simultaneously facilitate several discussion groups. Hmelo-Silver and Barrows (2008) see this scaling up as a challenge. Zhang and his colleagues (2009) suggest that tools such as Knowledge Forum may help in this facilitation. Our goal in the present article is to show that it is possible to develop a suitable environment that tackles both of these challenges.

Promoting Collaborative Reasoning Practices in Classrooms

Many programs have been developed to foster productive dialogue. Research examining the benefits of such programs has revealed the importance of structured verbal interactions for individual development of reasoning (Mercer, Wegerif & Dawes, 1999), argumentation skills (Kuhn, Shaw & Felton, 1997; Reznitskaya, Anderson, McNurlen, Nguyen-Jahiel, Archodidou & Kim, 2001; Schwarz, Neuman, Gil & Iliya, 2003), collaboration (Tolmie, Topping, Christie, Donaldson, Howe, Jessiman, Livingston & Thurston, 2010) and understanding of complex academic content (Asterhan & Schwarz, 2007, 2009a; Chin & Osborne, 2010).

The tools that are used to promote and realize productive discussion practices in classroom vary. Some approaches focus on teacher techniques to guide whole classroom discussion (e.g., Alexander, 2008; Wells, 2007; Resnick, Michaels & O'Connor, 2010). Others use communication skill training to improve dialogue practices (e.g., Gillies, 2004; Gillies & Khan, 2009), the use of *ground rules* for peer-to-peer talk (Mercer, 1995; 2000; Schwarz & de Groot, 2007), or basic elements of argumentation (e.g., Reznitskaya, Anderson & Kuo, 2007; Reznitskaya et al, 2001; Kuhn et al, 1997).

Extrapolating from these approaches, we have identified a common set of three basic criteria for promoting productive dialogue practices for small-group work: (a) active and egalitarian participation in discussions, (b) reasoning and argumentation (that is, providing justifications, arguments, challenges, and so forth toward the development of ideas[1]), and (c) interactive co-construction (that is, referring to and building the others' contributions in a civil manner). In this paper, we borrow the

[1] The development of ideas or of arguments is not mentioned in many programs especially when argumentative skills are stressed. Like Mercer and colleagues, we regard argumentation as an activity that aims at both progressive elaboration and construction of knowledge, as well as critical reasoning (Asterhan & Schwarz, 2009b).

term *collaborative reasoning* from Richard Anderson and his colleagues (e.g., Clark, Anderson, Archodidiou, Nguyen-Jahiel, Kuo & Kim, 2003) to refer to verbal interactions between equal-status peers that meet these three criteria for productive peer talk in classrooms.

The Potentialities of CMC Tools for Promoting Collaborative reasoning

There are a number of affordances associated with using computer-mediated communication for promoting critical discourse in general (including collaborative reasoning). First, the ability to re-read and re-vise contributions and increased time to consider response encourages reflection (e.g., Guiller, Durndell, & Ross, 2008). Second, while in face-to-face conversation verbal cues can be used to assess social status, in CMC these verbal cues are absent, thus allowing for more democratic and less inhibited participation (Herring, 2004; Suler, 2004). Third, the ability to post messages simultaneously may promote egalitarian participation, especially of more reserved students (Asterhan & Eisenmann, 2009). Fourth, the lack of non-verbal cues may force discussants to become more explicit and provide more reasoned arguments (Kim et al, 2007; Newman, Webb, & Cochrane, 1995). Finally, visual representations of co-actors' actions may support awareness of important features of collaboration (Suthers, 2003).

Many scaffolds have been developed to support collaborative reasoning in CMC environments. One possibility is to provide sentence openers. Results on their effectiveness are mixed (Cho & Jonassen, 2002; Jeong & Joung (2007), sentence openers helping or disturbing depending on the design of the activity. Diagram-based interfaces are another tool for promoting knowledge building (Scardamalia, 2004) or argumentation (Andriessen, Baker & Suthers, 2003).The Knowledge Forum environment (Scardamalia, 2004; Zhang et al, 2009) provides a shared space in which

students' ideas can be arranged in diagrams with several layers and hence shared, examined, improved, synthesized and used as thinking devices. Other environments like Belvedere (Suthers, 2003) support argumentation by providing specific categories of argumentative moves and sentence openers in a shared graphical space.

Our research and development group Kishurim is dedicated to promoting collaborative reasoning in schools (Schwarz & de Groot, 2007). Teachers in the group aim to instill ground rules for participation, commitment to argumentation, and commitment to the discourse norms described above. To scaffold the development of collaborative reasoning, the Kishurim group initiated the development of a shared, computer-supported discussion space called Digalo. In Digalo, discourse moves are represented by geometrical shapes and organized in diagrams, in order to help students recognize key distinctions between argument moves and participation structures. Figure 1 shows a discussion (Digalo) map produced by four discussants. The upper row displays the argument ontologies used, including claim, argument, explanation, and question. In addition, three types of links were used: reference, support, and opposition. The lower left window lists the icons of each discussant tagged to all shapes.

In this article, we report on part of a design-based research program build on and around the use of Digalo for small-group argumentation in classrooms. As part of this program of design research, Schwarz and Glassner (2007) examined the effects of categories of argumentative moves and of synchronicity in students that engage in e-discussions with Digalo. They found that by providing both informal category tags for each contribution and control over turn-taking, students expressed less off-topic chat-like expressions and more relevant claims and arguments. In addition, unconstrained synchronous discussions often went astray from the topic to be discussed and were

less favorable for productive group reasoning, than controlled turn-taking. However, students in that study preferred unconstrained synchronicity to controlled turn-taking in further activities since remaining idle during a discussion, was often unbearable for them. In another study (Schwarz & de Groot, 2007), students participated in successive synchronous Digalo discussions alternating with individual essays and demonstrated advanced and critical discussion.

Given the complexity of synchronous discussion, the question is whether the goal of promoting collaborative reasoning can be supported through synchronous discussions tools. The contradictory findings reported above suggest that this communication mode has the potential of supporting argumentative peer dialogue, but that some form of guidance is necessary to address the pitfalls of unguided discussions. The question is what type of guidance?

The Challenges of Real-Time Guidance during Synchronous Discussions

Research has focused on two approaches to supporting real-time e-discussion, computer-supported collaboration scripts and human facilitation. *Computer-supported collaboration scripts* aim to directly influence the interaction patterns of collaborative learners with software-embedded guidance, rather than train or instruct learners prior to the actual collaboration (Rummel & Spada, 2005). In a series of studies, Weinberger and colleagues (Weinberger, Ertl, Fischer, & Mandl, 2005; Weinberger, Stegmann, & Fischer, 2005) examined how collaboration script components embedded within asynchronous discussion environments facilitate collective peer argumentation. They found that different kinds of collaboration scripts (epistemic, argumentative, or social) improved student interactions during problem solving. However, collaboration scripts have also been criticized: One critical issue is the coercive way in which scripts often dictate interaction. This coercion may dampen

student motivation (Rummel et al, 2009), it may interfere with their personal, possibly highly functioning collaboration scripts (Hesse, 2007) and may prevent their independent, playful and exploratory thinking (Dillenbourg, 2002). Also, software-embedded scripts are not well adapted to the immediate, dynamic and simultaneous nature of *synchronous* CMC (Schwarz, Asterhan & Gil, 2009).

Human guidance during discussion has been primarily studied in the context of asynchronous discussion boards in adult on-line courses in which almost all instructor-learner and learner-learner communication is computer-mediated (Salmon, 2004). Several pedagogical approaches have been developed which describe the desirable roles of instructors in these environments (e.g., Goodyear, Salmon, Spector, Steeples & Tickner, 2001; Salmon, 2004). Salmon (2004), for example, proposed a model of e-courses and e-moderation based on different stages with different goals, such as for example preliminary stages of *Access & Motivation* and *Socialization*, which are considered crucial for the formation of a community of learners and sustainment of active participation.

In blended learning environments in which students and instructors meet regularly in both face-to-face and computer mediated settings, moderating actions that aim at socialization and motivation seem to be less necessary (Asterhan & Schwarz, 2010). Moreover, e-moderation of synchronous classroom discussions cannot be framed in advanced-planned stages, as it can be for asynchronous on-line courses. Studying direct guidance of synchronous discussions is then new territory. Even so, two seemingly conflicting ideas in the moderation of e-courses are relevant to co-located, synchronous discussions: First, moderators are not intrusive or directive, rather they facilitate and scaffold group processes. Second, moderators aim to provide supportive and caring environment in which students feel comfortable generating,

expressing, and criticizing ideas. Because we are interested in finding the balance between these two goals in synchronous classroom discussions, we used the term *e-moderation* for the kind of guidance we envision.

Our goal in this paper is to study moderation strategies used in multiple synchronous small group discussions that are geared towards the promotion of collaborative reasoning. In synchronous environments, the communication patterns are dynamic, the timeframe is significantly shorter, multiple messages are written and posted simultaneously, and moderation must be accomplished in real-time. Moderating collaborative reasoning or argumentation is particularly demanding because it requires both monitoring argumentative moves and following the development of ideas. Therefore, moderating a single discussion is demanding in terms of both time pressure and cognitive load (Packham, Jones, Thomas, & Miller, 2006). Moderating *multiple* synchronous discussions is likely an enormous challenge. These challenges led us to adopt a design research approach for developing an environment to support teachers in their effort to guide multiple synchronous discussions.

A Program for Enabling E-moderation of Multiple Synchronous Discussions

The present study is part of a larger design research program. It included the elaboration of an environment in several iterations of design, formative assessments in ecologically valid settings, and implementation of changes and improvements (Collins, Joseph & Bielaczyc, 2004). The study focuses on one of the final iterations in which the near final product was implemented in a two-day workshop with moderators guiding several discussions simultaneously. To provide context, we briefly describe the first design iterations:

The first step: Studies on synchronous e-moderation with Digalo. To envision characteristics of a tool for supporting e-moderation, our first step was to observe e-moderation with Digalo without a moderation support component. In our first study, we analyzed both moderators' facilitation strategies and discussants' expectations and evaluations. We observed e-moderators who each presided over a single group of three to four discussants (Gil, Schwarz, & Asterhan, 2007). We found that moderators often distanced themselves from the flow of ideas developed: they orchestrate the discussion superficially, they observe, they participate as regular discussants, or they adopt an authoritative but detached style. However, they don't fully endorse their role of moderators to consider the set of all ideas as a whole for helping in their advancement. Such behaviors resemble the findings of previous research examining the difficulties teachers experienced in following individual and group processes (e.g. Chiu, 2004).

In a second study (Asterhan & Schwarz, 2010), we considered relationships between characteristics of moderator interventions, discussant responsiveness, and discussants' subsequent evaluations (still with a single group of three to four discussants for each moderator). We found that discussants expected active involvement of the moderator and did not respond to, nor appreciate, when the moderator adopted a detached 'guide-on-the-side' style of moderation. Students also did not appreciate when the moderator used generic prompts (such as, "Why do you think that?", "Can you think of another reason?") to scaffold their reasoning. Content-specific prompts (such as paraphrasing the contribution of a discussant and elaborating on it) were more effective at eliciting responses and were appreciated by discussants. Discussants appreciated and were most responsive to moderators' when there was a blend of involved and content -specific scaffolding.

This study provided both theoretical insights and design recommendations. First, the results of this study, suggested that findings concerning effective support for student reasoning within asynchronous and face-to-face settings (Chi, Siler, Jeong, Yamauchi, & Hausmann, 2001; Mercer, 1995; Wegerif, 1996; Yackel, 2002) cannot simply be transferred to synchronous CMC formats of communication. We have suggested two different explanations for why the type of generic scaffolding prompts that have been found to be very effective in other communication formats do not work in synchronous environments (Asterhan & Schwarz, 2010). First, the lack of non-verbal cues, in combination with the scattered and non-chronological organization of a discussion in asynchronous environments may create a temporal schism in inter-subjectivity between the interlocutors of two adjacent discussion contributions. As a result, moderators have to be more explicit and specific to re-establish this inter-subjectivity. Also, as discussants and moderators shared the same end-user environment (EUE) in this study, the moderator comments appeared and persisted side-by-side with the discussants' and were not spatially or graphically distinguished from them. The discussants' evaluations of moderation practices revealed that generic prompting was perceived as annoying, since it was interpreted to indicate detachment and a lack of interest. Visually, the moderator's postings were an integral part of the discussion map and therefore were regarded as part of the common product constructed by all participants, for which all shared a common responsibility. Generic scaffolding prompts (such as, "Could you elaborate some more?") were then simply out of place. Thus, by not actively participating in the discussion, the moderator may not have been perceived as contributing to the discussion.

Articulating design recommendations. First, the difficulty moderators encountered in tracing students' ideas and actions and to tie interventions to these

ideas and actions suggest that moderators needed awareness tools for overcoming these shortcomings. Because the moderator is committed to facilitating collaborative reasoning, this means that the awareness tools should display information on (a) participation, (b) argumentative moves and development and (c) reference to the contributions of the other discussants.

Second, to allow for less intrusive moderation styles to be effective, separate channels for moderator-discussant communication should be created through which the moderator may send messages to target students. This recommendation is consistent with our theoretical vision of e-moderation as caring, but non-intrusive.

Step 2: A participatory design approach for designing tools to support e-moderation. With these insights, the Argunaut project was created to develop a system that enhances the Digalo tool to enable moderation practices by providing moderators with awareness indicators and alerts, a remote control intervention panel, and classifications of important dialogue features. These aids were envisioned to help moderators monitor, evaluate, and guide discussion without disrupting the flow of the on-going collective argumentation. The design of the tools was based on a participatory, user-centered approach. Teachers experienced in conducting or moderating Digalo discussions in classrooms were asked to evaluate screenshots of different awareness displays. Teachers were also asked to evaluate discussion maps to identify critical moments during which they would like to intervene. They also participated in a focus group discussion (for a complete description, see Asterhan, Wichmann, Mansour, Wegerif, Hever, Schwarz, & Williams, 2008). This led to the identification of different categories of information sources that would be potentially helpful in supporting in-line moderation, such as information on discussant

participation rate, reactions between discussants, and information on information about the quality of reasoning at the a local and global level:

Most teachers focused on tracking the performance and development of individual students within the group discussion (e.g., they assessed whether individual students provided adequate reasons for their claims, responded to their classmates and demonstrated improved reasoning over the course of the discussion). The focus group discussion further revealed that the scattering over a screen of individual contributions made e-moderation a very difficult task, given the time pressure of synchronous discussions, and that teachers had doubts about their ability to be good moderators. We took these requests and beliefs into consideration in the next step of the design research –the design of the Argunaut system.

Supporting the moderator: Argunaut's Moderators Interface

The Argunaut system (De Groot et al, 2007; http://www.argunaut.org) is a platform, which combines two graphical discussion environments, Digalo (Schwarz & Glassner, 2007) and FreeStyler (Hoppe & Gaßner, 2002) a separate moderation environment and a module for user and session management. In this paper we refer to two of these components: (a) the Digalo v.2 discussion environment, in which students log in to and participate in pre-assigned discussion sessions (see Fig. 1); and (b) the Moderator's Interface, from which teachers or tutors can monitor discussions and intervene when necessary. The Moderator's Interface (MI) is a multipurpose tool that can be used for real-time moderation of ongoing discussions as well as offline analysis of completed discussions. Despite these multiple uses, the main design goal was to generate a user interface for real-time moderation. The MI is capable of supporting simultaneous moderation of parallel discussions. It was designed in a

collaborative, iterative design process involving pedagogical experts, technological experts, and teachers from five different countries (Hoppe, de Groot & Hever, 2009).

The main user interface is a single window with a predefined layout. A typical view is shown in Figure 2. The window contains four main components: the session and user list (left column), the main focus view (center), remote control panel (bottom center, collapsed to a button), and aggregated miniature views (right column). We will describe the first three in the next sections.

The Session and User list: Who's Present and Who is Selected?

This list includes tools for monitoring presence and for selecting groups or individuals within groups to be shown in the main focus view. Switching between different group discussions is executed through this list. This list also alerts users of important events occurring in other groups' sessions (Hever, De Groot, De Laat, Harrer, Hoppe, McLaren, & Scheuer, 2007).[2]

The main focus view: Obtaining Detailed Information Quickly

This focus view shows detailed information on the selected discussion with the help of a range of awareness displays. The displays concern participation, argumentation, and references to the other actors. They are designed to provide quick and accurate updates on group and individual processes. By default it shows the session's discussion graph, which is almost identical to the discussants' Digalo interface. Navigation through the main discussion graph enables the moderator to read the content of contribution (tooltip) and see how they are arranged. The moderator can

[2] The alerting options that the MI offers range from the detection of superficial discussion features (based on keywords, inactivity, participation, responsiveness, etceteras) to alerts based on content-related dialogue analyses (e.g., patterns of reasoning, of interaction), implemented by Artificial Intelligence (a/o, McLaren et al, 2007). Since the Alerting features were not operated in this study, we will not further report on it here.

resize and rearrange maps to follow the discussion as well as make patterns in the discussion appear clearer, all without affecting the discussants' environment.

Because it is difficult to rely exclusively on the discussion graph to get a quick but detailed idea of what is going on in discussions, the moderator may choose from an array of different awareness displays which highlight different aspects of the interaction. A switch bar at the top of the focus view is used to select the display. These displays provide a broad range of visualizations with detailed information, which are continuously updated in real-time. We briefly describe the four main Awareness Display tabs (see Figure 3).

The *Group relations* tab (see Figure 3a) shows a Social Network diagram, which depicts the *relationships* or linking patterns between users. The moderator can use this tab to assess the extent to which discussants referred to each other, and to easily locate *ignored* users, focal users, or subgroups.

The *User activity* tab (see Figure 3b) displays a histogram-based representation that reflects the frequency of different discussion operations (e.g., posting / deleting contribution, creating links) by group or by individual. This tab allows the moderator to get a general idea of the level of participation among on-line discussants, easily finding users that are either not participating enough or are overly dominating the discussion.

The *Ontology Use* tab (see Figure 3c) contains two pie charts. One pie chart describes the relative distribution of the different dialogue shapes used in a Digalo discussion (e.g., argument, question, or clarification) and second pie chart describes the distribution of the use of different types of links (e.g., opposition, support or neutral). These provide the moderator with information on whether students use all

different dialogue shapes and whether the extent of agreement or disagreements is consistent with the expectations of acceptable group reasoning.

The *Chat Table* (see Figure 3d) gives a textual, chronological representation of the contributions of each discussant in a separate column and can be used to track the course of the discussion over time, as well as the development of each participant's reasoning over the course of the discussion. It also allows the moderator to quickly read the most recent contributions. Each Awareness Display tab may be configured by the moderator (e.g., display by group or by individual). Guidance and more detailed information can be obtained with the help of tool tips.

The Remote Control Panel: Moderating from Behind the Curtains

The remote control panel enables real-time moderation of discussions (see bottom column in Figure 2). It offers a collection of tools to intervene in the discussion without actually being defined as one of the map's discussants and without acting from within the discussion map. The moderator can choose to send these interventions to all groups, selected groups or selected individuals. This enables both private and public communication, since the interventions are shown on the screens of selected users only.

There are three particularly relevant interventions. First, the moderator can send *pop-up messages* with graphical or textual content to selected users. Pop-up windows do not disappear from the discussant's screen until the discussant clicks the "OK" button (see Figure 4a for an example). Second, the moderator may also *attach annotated notes* to one or more selected contribution shapes, so that selected students will see the notes on their own discussion map (see Figure 4b for an example). The notes are visually distinguishable from the discussants contributions. Third, the

moderator may *highlight shapes* in order to draw the attention of discussants to a specific shape or group of shapes in the discussion environment.

Description of the Study

The research questions reflected our design research approach aimed at exploring new practices induced by the environment we designed:

- What are the strategies of e-moderation in parallel synchronous discussions?
- What are the Argunaut functionalities that mediate the enactment of these strategies?
- Do the e-moderation strategies have some impact on the flow of discussions?

A phenomenological approach was adopted to gather in-depth insights into the processes and characteristics of this new practice. To achieve these goals, we chose to apply the technique of cued retrospective reporting[3] (Van Gog, Kester, Nievelstein, Giesbers & Paas, 2009) to the study of e-moderation. Accordingly, the actions of moderators and discussants were recorded with the help of screen-recordings which showed how participants navigated through the system, as well as all their mouse and keyboard actions. Following a short time period (one or two weeks), all moderators and some students were asked to retrospectively report on their thoughts during physical actions of moderation, while looking at the screen-recording of their behavior in that session.

Participants

Twelve students at the Hebrew University and three moderators participated in the study. Ten of the students had recently participated in an undergraduate course addressing dialogical and critical reasoning in education. A major focus of the course was on discourse norms of collaborative reasoning. One student was a graduate

[3] This technique has also been referred to as *auto-confrontation* (Mollo & Falzon, 2004).

student in philosophy with background in critical reasoning and one student was an undergraduate in political sciences. The students received a monetary reward for their participation. The 12 students belonged to three different demographic groups: 6 were secular Jews, 5 were religious Jews and one was Christian Arab, Sohier, a 25 years old female student in Education on which we will focus in the analyses of the discussions.

The three moderators had been previously trained in moderating one or two parallel discussions with Argunaut. One of the moderators, Rhonna, had been involved in the design of the Argunaut tool. Rhonna was not an expert teacher in formal education but had been involved in informal education and was very fluent in the use of ICT tools. Because we were investigating a new practice with a complex tool, we decided to focus our observations on Rhonna's moderation, also because she was familiar with the Argunaut environment (and in particular the MI) and had some prior experience with single-group e-moderation of peer discussions. It was the first time she experienced simultaneous multi-group moderation with groups of students.

Procedure

All discussion sessions were completed during two separate 4 *hr* meetings held one week apart at the computer lab of a local secondary school. The discussants and moderators shared the same room and each individual had one computer at his or her disposal. At the start of the first meeting, the first author presented principles of collaborative reasoning to moderators and students. These included a commitment to (a) active and egalitarian participation in discussions, (b) reasoning and argumentation, and (c) interactive co-construction. The participants were also explained argumentative structures such as claims, arguments, challenges and refutations. This introduction recapitulated what the students already learned in their

university course. Then, Rhonna briefly presented Digalo – Argunaut without the Moderator Interface. This introductory stage lasted about 25 minutes in all.

Students were then arranged in four groups of three and participated in a warm-up discussion to get acquainted with the discussion environment. Students quickly mastered the Digalo tool. Following the warm-up session, each discussant participated in seven discussions on seven different topics (three discussions were completed during the first meeting and four discussions were completed during the second meeting). During the first three sessions, group formation was not changed. For the remainder of the sessions (sessions three through seven), group composition was altered so that each discussant worked with each of the other eleven discussants at least twice. The two first moderators moderated two sessions with Digalo (single group), three sessions of a single group using the Moderator's Interface and one session in which they moderated two groups simultaneously with the Moderator's Interface. The third moderator, Rhonna, moderated two sessions with two groups working simultaneously (sessions 5 and 6), and one group with four groups simultaneously (session 8). The different discussion topics are summarized in the third column of Table 1:

Sessions 2-4: Students participated in three different discussions: One dilemma concerning vaccination, one concerning the rights of handicapped people and one concerned censoring the Internet. In each session, moderators moderated a single discussion at a time, resulting in two moderated and two un-moderated discussions in a session. In sessions 2 and 3, moderation was accomplished directly within the Digalo discussion environment. In other words, the moderators were defined in the environment as a fourth participant, but identified with a different name ("the moderator"). In session 4, however, each moderator moderated one group each

through the MI, for the first time. By doing so, students got used to the fact that moderators might intervene in their discussions.

Sessions 5-8: One week later, the same participants participated in four additional sessions, resulting in a total of 16 different discussion maps (4 sessions, four discussions each). In all discussions a moderator was present and all moderation was mediated through the MI. The four discussion topics were (1) Explanations for bystander effect (2) Whether to encourage production of GMO crops; (3) The worthiness of organized holocaust education trips in Poland (places of Jewish culture, concentration camps) for teenagers; and (4) The legitimacy of Gay Parade in Jerusalem. In sessions 5 and 6 Rhonna moderated two simultaneous discussions each on the value of holocaust education trips to Poland. In session 8, she moderated all four discussions simultaneously on the legitimacy of Gay Parade in Jerusalem.

In the majority of sessions, the topics concerned ethical-societal dilemmas that were part of the public discourse in Israel. These topics were chosen because they would ensure high levels of motivation and prior knowledge could be assumed and therefore intensive instruction on the topic was not required[4]. The topics were developed in collaboration with the three moderators. In most sessions, participants were given written background information on the topic of discussion.

Our general instruction to the moderators was to intervene whenever participation was not satisfactory, discussants were not critical enough and/or discussants did not refer to the ideas of their peers. No further instructions were given,

[4] One may argue that the context of social dilemmas is too specific to enable generalization for moderating different kinds of discussions. However, our aim was to enable the development of a practice – e-moderation of multiple discussions. We had to make a choice. Our choice originated from the fact that we aimed at fostering critical reasoning, and leading thinkers have claimed that critical reasoning should be developed through socio-ethical issues (Lipman, 1991).

not with regard to the different system functions, to the content of moderation interventions or to moderation style.

Data Collection

Two moderation sessions (one two-group and one four-group) by Rhonna were recorded with screen-recording software and converted to video-files. These video files then displayed all the moderator actions and all the information received by the moderator within a given session. In addition, the actions of several discussants were videotaped with the same screen-recording technique. Immediately after the experiment, Rhonna wrote a self-report in her notebook (although she was not asked to do so). Two weeks following the experiment we interviewed Rhonna, and asked her to retrospectively comment on her actions while looking at the video files of her sessions. Rhonna's comments were audio-recorded in synchronization with the screen-recording files.

Analysis of data

We focus on Rhonna's moderation of two sessions concerning the advantages and disadvantages of organized Holocaust Education trips for teenagers to Poland (referred to as TP onward) and whether the Gay Parade should be held in Jerusalem (referred to as GP onward). We looked at the two video files (screen-recordings and verbal comments by Rhonna). The duration of these two files was 35 *min* for TP and 32 *min* for GP. We first transcribed them and identified critical moments. We adopted both a top-down and a bottom-up approach for identifying the critical moments. Concerning the top-down approach, we searched for moments of collaborative reasoning, such as moments in which Rhonna encouraged participation, fostered the enactment of argumentative moves and the development of arguments, and made reference to peers' arguments. From a bottom-up approach, we searched for moments

in which it was possible to identify sequences of moderation actions in the video-screen which were explicitly mentioned by Rhonna in her *cued retrospective reporting* sessions to help discussants in attaining a specific goal. We then invited students who were part of these critical e-moderation moments for follow-up interviews. We present our analysis of TP (which involved two groups) and of GP (which involved four groups), in two separate analyses.

E-moderation of Multiple Synchronous Discussions: Insights from Cued Retrospective Reporting and Dialogue Analyses

Two discussions in Parallel: the Case of Educational Trips in Poland

In this section, we examine whether the Argunaut system is viable for moderating two groups in parallel. We show how Rhonna moderated two groups (marked as polin group3 and polin group4) on TP. We adopt a narrative style to describe Rhonna's course of actions until we reach a critical moment for which we analyze her comments.

Following a few minutes after students had started to type their first reactions, Rhonna began the multiple discussion session by clicking the icons of the two groups on the session and user list and then opened the on-going session's discussion graph. Rhonna read the content within each of the shapes that were already posted by the discussants. During her interview, Rhonna commented that she intentionally refrained from intervening at the beginning to give discussants the opportunity to open the discussion freely. After a little more than one minute, Rhonna noticed that one of the students, Sohier, who is a Christian Arab, had difficulties engaging in the discussion. Rhonna made an effort to include her through a *private care* strategy.

Inclusion of one student in a group discussion through private care. We present the protocol of Rhonna's retrospective report in Table 2; the first column

contains Rhonna's comments from the retrospective report and the second column presents her observed screen-recorded actions. Relative position of texts on the two columns represents the timing of recorded actions relative to comments. Numbers and letters in parentheses serve as labels to ease the comprehension of our interpretation. The subscript number "2" indicates reference to Table 2.

In her retrospective report, Rhonna said that she was not sure whether Sohier (from group 4) understood the issue (1_2). To clarify Sohier's behavior (2_2), she used the private channel of the MI (a_2) (3_2). From the clear position in favor of trips to Poland that Sohier expressed right after Rhonna's clarification (b_2), it is clear that the question Sohier asked did not originate from a lack of understanding (4_2) but from social motives (and indeed, in an interview we do not report here, Sohier reported that she knew about educational trips in Poland). We will see later that Rhonna understood this very well.

However, Rhonna needed to take care of other students. She did not wait to see how Sohier's participation developed in the discussion, but turned to group3. She continued hovering her mouse over the contributions of all the discussants. She read their contributions without looking at other awareness tools. Her next actions revealed a new strategy.

Encouraging groups to open new perspectives with generic prompts. The new strategy that developed is described in Table 3. It emerged from the impression that Rhonna developed while quickly skimming over the discussion graph of group3 (a_3). She saw that the color of the links were black (1_3), something that suggested that discussants were referring to others to further elaborate on their own ideas, but that they were not confronting their peer's ideas. She then decided to send a popup message to all the discussants in the group to invite them to be more dialectic (b_3).

Before sending the message, she confirmed her impression through hovering over the contributions in the discussion map (c_3) only to recognize that the participants of this group had already dealt with solutions and concessions around the contribution of Guy – a secular and liberal student (2_3), instead of really discussing the issue. Since Rhonna had participated in parallel discussions, she turned to group4 without waiting to see whether discussants were responsive to her invitation. As in group3, she quickly recognized a global characteristic of the discussion – in this case, premature agreement (3_3), and arguments exclusively relying on the value of memory to commemorate the Holocaust (4_3). Here also she estimated that the discussion was not dialectical enough, and intervened in a generic and general way to ask for more perspectives using a popup message sent to all discussants (d_3).

Rhonna then turned back to group3 and noticed that the discussants were still focused on solutions and that they had not been responsive to her invitation to weigh different perspectives. However, since Rhonna did not want to 'impose on them what to do' (sic) she decided to use an indirect strategy, she pointed at one contribution in which there was a beginning consideration of new perspectives. She decided to highlight it and append an annotated message visible to all discussants. The content of the annotation was: *'worthwhile to refer to.*. She then decided to return to group4.

Her first care was to look at Sohier's engagement in the discussion. Again, she made an effort to include Sohier in the discussion, as shown in Table 4. Rhonna realized that Sohier still did not really engage in the discussion (a_4). She also realized that although the MI was not designed to enable *interactions* between the moderator and discussants, Sohier found a way to respond to her (1_4). Sohier created a shape that she did not link to other shapes in the discussion and wrote that she could not respond to Rhonna's request (a_4). Rhonna immediately noticed this message and continued to

interact with her through a private conduit (2_4). This time, Rhonna did not use general terms but was more specific. She stressed that the fact that because she is different is an asset to the discussion (3_4); she carefully articulated a question (4_4) that suggested to her how she might capitalize on her Palestinian identity to relate to the issue (5_4, b_4). However, she was aware of Sohier's delicate position in this discussion. But as usual, Rhonna needed to turn her attention to other discussants in both groups.

Helping deepen the discussion space with the help of awareness tools. The complexity of the discussion was growing rapidly with more contributions, and more links between them. Rhonna faced a difficult challenge especially as she intermittently traced the development of each discussion. However, as shown in Table 5, the different awareness tools helped at that point of the discussion to deepen the discussion space: Rhonna, who had initially gotten an impression of the course of the discussion by hovering over shapes of the discussion map, now used other awareness tools. She scrolled the chat table (a_5) to cope with the increasing complexity involved in grasping the development of ideas (1_5) for each discussant. In her interview, the terms she used to explain this way to browse the discussion was "to see what's going on" (1_5), "to confirm my impression" (2_5), "let's see in depth" (3_5). This shows that she intended to work in depth, to understand the ideas developed in the discussions and to intervene in relation to those ideas. Since the map became quite complex at that stage, these general indications can be produced through the information provided by the awareness tools. As discussed above, the Chat Table offers a chronological representation of the textual discussion contributions in a separate column. The representation provided a quick overview of the development of opinions at a personal level. She looks at the shape and ontology use (b_5), then at the Link Pie Chart which shows the distribution of the different types of links (arrows) (c_5). She sees that

the largest part of Link Pie Chart is black – suggesting that there is too much cumulative talk without decision, and with her initial impressions of the discussion obtained with the Chat Table, Rhonna proposed an intervention with a *generic* flavor – "You should use the right arrows: whether you agree or oppose" (d_5) to refer to a *specific* weakness she observed in the discussion, namely the lack of critical argumentation suggested by the paucity of colored arrows (5_5).

Rhonna turned her attention back to Sohier and used the session list to trace all her contributions in the discussion map and realized that she still did not really interact with the other students. She confirmed her impression through the use of the Group Relations awareness tool where Sohier's vertex appears isolated from the other vertices. But then, Rhonna noticed that Sohier had begun to write something. She decided to not wait until she finished, but turned to the other group, group3.

Helping to deepen the discussion space through content-specific hints. Rhonna quickly saw that her previous interventions did not help deepen the discussion space which continued to be one-sided in group3. She decided to stop being general and to enter more deeply into the discussion. Table 6 shows that Rhonna decided to challenge the one-sided nature of the discussion (1_6) by introducing an embarrassing event, the fact that some teenagers who travelled to Poland for an educational trip visited a strip-tease show (a_6). This is a specific hint for deepening the discussion space. The second hint she used (as a reaction to the argument that trips are important because "soon there will not be survivors") (b_6) came from Sohier in the other group (3_6) in which she claimed that this argument would not be valid to the next generation (c_6). These interventions were specific, challenging, but not too intrusive. In her interview, Rhonna said that she thought they would stir the discussion (2_6).

This critical moment exemplifies the fact that the MI enables highlighting and annotating, but leaves the discussion map intact, allows for a distance between the moderator and discussants which is midway between not intruding and caring.

Socializing a student willing to be included in a discussion. Rhonna observed group3 and found out that the discussants focused on an interesting question, namely the goal of the Poland trips. Since the discussion seemed of good quality, Rhonna did not intervene but rather, turned back to her private care of Sohier. As shown in Table 7, Rhonna checked once more with Sohier (1_7; a_7) and soon realized that Sohier had begun to express herself (2_7). Sohier's positive opinion towards trips to Poland (a_7 – "It's impossible to get disconnected from the past of the Shoah, even if there were will not be any survivor at all because it's linked to the existence of the State of Israel") pleased Rhonna (3_7). She wanted to encourage Sohier to be critical of her own view (4_7) and to praise her participation but was worried that this appraisal may sound patronizing (5_7). Her use of the edit mode when asking Sohier to be critical towards her own positive position (b_7) showed that Rhonna was in a delicate position and therefore carefully chose her wording. She also realized that other discussants did not refer to Sohier's contributions. She then searched for a contribution that was relevant to Sohier's posting (the one with the statement on that it [holocaust] would not happen again) to encourage people to refer to her (6_7). Once more, this was not done explicitly, because it could have been interpreted as a patronizing act. By annotating a specific contribution expressed by Sarit, another student (c_7), which seemed to be naturally relevant to Sohier's posting, she indirectly invited Sohier and Sarit to refer to each other (d_7) (7_7). In that way, Rhonna socialized Sohier in the discussion in a comfortable way.

Putting public focus on problematic or substantial contributions. At this time the discussions progressed and all students participated, Rhonna shared with all discussants their specific contributions. This interplay between specific interventions and public reference particularly fit advanced discussions, when all discussants are aware of all the ideas raised. The moderation strategy Rhonna adopts here consists of choosing a particular contribution that can be contested and by such, can change direction of the further development of the whole discussion. As shown in Table 8, the first ”pivotal” contribution is expressed by the student Efrat, a religious Jew – “why not improve the organization of the trips?” (a_8) which was judiciously recognized by Rhonna as vague (1_8) , which moved the discussion away from the issue at stake and which was thus considered as unacceptable by Rhonna (2_8) (b_8). The second concerned a contribution (c_8), (3_8) from which one can infer that remembering important events is always good (4_8). This was a pivotal argument that Rhonna wanted to challenge, and to do so, she used all means for drawing attention: She annotated, and highlighted to everybody (d_8). The fact that the Link Representation Pie did not show disagreement (e_8), hinted to uniformity, to a lack of ideas, and she selected one student in the map view to skim quickly over her contribution and to decide how to react to a local contribution at a public level.

Monitoring effectiveness of previous moderation actions on discussion. The next step in Rhonna's moderation was to check that her actions had been effective. Such an action is natural when a teacher leads face-to-face discussions. But checking effectiveness is a complicated endeavor in multiple synchronous discussions because jumping from one discussion to the other creates natural discontinuities in the teacher's monitoring of single discussions, and synchronicity makes it difficult to trace the development of even a single discussion because of overlaps and

independent contributions. In the more advanced stage of the TP discussions we see how Rhonna managed to trace the effectiveness of her interventions. Table 9 shows that Rhonna was aware of her previous monitoring actions (1_9). She used different awareness tools extensively (a_9) to get a quick impression of effectiveness. Within the Discussion Graph tab, she selected particular discussants from the discussion list so that their contributions were highlighted and easily found (b_9). In this way, she quickly made up her mind about the development of discussion – its one-sidedness around the memory perspective – the fact that trips to Poland are necessary to maintain the memory of the Holocaust (3_9). She then wrote an explicit hint to all discussants about two other perspectives: the economic perspective and the influence of the participation on the Polish population (c_9) (4_9). She checked whether her recommendation to refer to Sohier was taken into account (5_9) by using the Group Relation Map (d_9). She checked whether students broadened their space of discussion to bring new perspectives (6_9). As she located such a contribution (e_9) she realized that it was underdeveloped (7_9), and highlighted it for discussants to view (8_9) (f_9). She jumped from one group to the other, checked for the last time that Sohier expressed herself very well (9_9). She also checked whether the discussion had become more dialectical, by comparing the present stage pie chart Awareness Display Tab of students' link use (g_9) (10_9) with that of earlier stages. In sum, her interventions were more intrusive and explicit than she had intended at this advanced stage in the session. She sent explicit pop-ups all discussants when she felt that her previous interventions were not taken into consideration. She highlighted postings that were aligned with her previous suggestions, but had not been heard enough. She also checked that private interventions had been fruitful. She seemed quite comfortable at this midway level of

intervention – caring but not intrusive, jumping between the two discussion groups through the extensive use of the Moderator Interface.

E-moderation of Four Discussions in Parallel: The Case of the Jerusalem Gay Parade

In the previous section, we reported on moderating two groups in parallel; in this section, we describe how Rhonna dealt with the more complex task of moderating four groups in parallel as the groups discuss another controversial topic. The question of whether organizing a Gay Parade in the city of Jerusalem is a very controversial issue in Israel. Tel Aviv (a mainly secular, large city in Israel) has a yearly Gay Parade, which has been never met with any serious opposition in the last decade. In contrast, in Jerusalem it is the subject of heated discussions and has led to violence in isolated cases. The controversy is still vivid since every year the decision to hold the parade is undertaken ad hoc, depending on the identity of the mayor and the political composition of the municipal council. Attitudes toward a Gay Parade in Jerusalem are different among the different demographic groups that make up the Jerusalem population (from ultra-orthodox to secular Jews, Muslims and Christians). Because the 12 students that participated in the discussions belonged to three of these populations (secular Jewish, religious Jewish and Christian Arab), we expected the discussion to be engaging.

Describing the moderation of the four synchronous discussions in parallel is a complex endeavor. Even choosing to describe critical moments only, would have been impossible because of space limitations. Also, describing critical moments has, by definition, a local character which cannot render the passage between different discussion groups. It was therefore decided to describe this complex activity by using a graphical representation displaying global features. The graphical representation

appears in Figure 5. It is organized in four bars, where each bar represents a particular discussion group. The vertical axis represents time. Each rectangle within the bars represents a category of certain moderator actions. The list of action categories and their distinctive graphical displays appears in the legend of Figure 5. To simplify the list, we often gathered several actions within the same category. For example, the category *Skimming over a map view* includes, among others, scrolling the map view up and down, selecting a (group of) discussant(s) in the from the User list, skimming over the contributions of the selected discussants in the map view, and hovering over shapes to read the content of the contributions belong to the same category. We also gathered all uses of all graphical Awareness Display tabs (Group relations, User activity, Ontology use) under the same category. The extent of intrusion reflected in the moderator's actions is expressed by the degree of darkness inside the rectangle. For example, skimming over a map, scrolling up and down a Chat Table, or using graphical Awareness tools are actions without any intrusive character, and are therefore white. Interventions such as highlighting, sending a popup, sending an annotated message and combining a message with highlighting are colored with increasingly darker grey tones, in that order. The thickness of the borders expresses the degree to which an awareness tab is able to explicitly display the content and development of ideas. The Chat Table is the most explicit and has therefore the thickest border, followed (in decreasing order) by the Discussion Graph tab and the Ontology (pie charts) and Group relation tabs, which display only global discussion characteristics.

With these conventions, it is possible to describe the moderation of four parallel discussions in a summarizing way, as displayed in Figure 5: Rhonna began with a quick look at the discussion maps without undertaking any type of intervention

(00:00-03:18). It is only after that orienting stage that Rhonna began to intervene. Interestingly, her interventions related to isolated discussants and this tendency went on almost until the end of the discussion (19:42). In addition, she mostly relied on the Discussion graph tab and the two least explicit awareness tabs until very late in the discussion, and did not capitalize on the explicitness of the Chat table tab until the final third of the session. At the end of the discussions, she prompted all discussants to converge on an agreed solution (19:46-20:12), and then checked that the discussants complied with her invitation (20:20-23:03). Figure 5 shows that Rhonna was very active during the discussions. She jumped from one group to the other, and capitalized on many of the tools provided by the Moderator Interface.

In her written self-report immediately following the session, Rhonna completed the global picture that is conveyed through Figure 5: She confessed that moderation was much more difficult with four parallel synchronous discussions. She also noted that she had begun to use the Chat Table only when she realized that she got lost in the complexity of the four different maps. She affirmed that she should have had more experience with moderation of multiple discussions and she should have begun using the Chat table much earlier in the discussions. She also pointed at a problem of design to which she already hinted at with TP, but which was critical in the case of four discussions: When looking at the Discussion Graph view and the Chat Table in different stages of the discussion, there was no distinction in the Moderator Interface between what students had added during the absence of the moderator. As a result, Rhonna incessantly had to skim over the contents of the Chat Table and the Discussion Graph view to reconstitute what had been already discussed and what were the later developments.

As for the strategies adopted by Rhonna, most were identified in TP, but their frequency was different in GP. For example, she almost did not invite discussants to be included, and did not encourage them to broaden the discussion space. This may well have been to the fact that the issue was very controversial and a large variety of perspectives from different sides of the discussion were represented. She adopted a new strategy, which consisted of *tempering certain explicit student postings* that might have been offensive (e.g., "The religious have the nerve of imposing their views on secular citizens") or unfounded overgeneralizations (e.g., "Most people in Jerusalem are against the Gay Parade"). For this purpose, she capitalized on the personal one-to-one communication channels that the MI offered. Such a strategy cooled down the discussion and directed energies towards critical, yet constructive thinking. It is remarkable that Rhonna did not disclose her personal opinion on the issue and functioned as a *moderator*. This strategy and the other strategies enacted for TP helped handling a very hot issue in the Israeli society. Rhonna also faced arguments such as: "Discussing the Gay Parade in Jerusalem brings unity among Muslims, Christians and Jews" or "Jerusalem is a Holy city" which were a priori valuable and relevant for productive argumentation on the Gay Parade in Jerusalem but which were used as clichés and repeated again and again as closing arguments by discussants that are not interested in getting reactions for them.

Discussion

We observed two different cases in which one moderator simultaneously moderated multiple synchronous group discussions. From Rhonna's sessions of cued retrospective reporting, it appears that e-moderation of parallel synchronous discussions is feasible. In spite of the difficulties Rhonna encountered, she was able to move between discussions and to function as a moderator who guided and cared for

the discussion groups and their members, without being too intrusive. A new practice is then born. We ground our overall positive impression about the feasibility of moderation of multiple synchronous e-discussions through the answers to the three research questions that the data provided.

Questions 1 and 2: What are the strategies of e-moderation in parallel discussions and what are the functionalities that mediate the enactment of these strategies?

Although the two research questions have been posed separately, the general impression that arises from the parallel discussions we described is an impression of *synergy between the moderator and the Argunaut system* in the enactment of moderation strategies. As we will retrospectively list the strategies enacted by Rhonna, we will show this synergy. But we should say that an aspect of this synergy is self-evident: The Moderator Interface is central in all the strategies deployed by Rhonna in her two multiple discussions. The trivial function afforded by the Moderator Interface – the ability to smoothly move between groups instantly combined with the persistence of previous contributions is the context of all acts of moderation. Another leitmotiv in our review of moderation strategies is that those strategies reflect our design decisions – developing a system to support e-moderation of *collaborative reasoning* in its three dimensions (egalitarian participation, interactional co-construction and dialectical argumentation). Similarly to synergy, the use of the Argunaut system conveys the fact the design research program helped the moderator facilitating collaborative reasoning. For example, reference to peers was fostered through the use of the Ontology tab which afforded the facilitation of collaborative reasoning as it assisted Rhonna in identifying deficiencies in reference to peer contributions. Also, Rhonna identified deficiencies in dialectical

argumentation through the links Pie Chart in which she noticed that only (green) arrows of agreement had been used. This identification led her to open new perspectives in students by the help of generic prompts. Specificity, we believe, is nevertheless necessary to evidence more clearly that the e-moderation strategies deployed realized a synergy between the moderator and the Argunaut system, and were aimed at promoting collaborative reasoning.

To begin with, Rhonna's first strategy was to *observe contributions across groups without intervening*. This observation led her to identify the development of ideas and the contributions of respective students in this development. This ubiquitous meta-strategy was embedded in the system functionalities. Because the teacher could hover over postings to quickly read their content in the Discussion Graph tab, or scrolling up and down the Chat Table tab, help grasping the development of ideas – their history, she could intervene when she saw a need.

The first strategy enabled Rhonna to notice particular behaviours that need care, and naturally led to a second strategy, *including students in their group discussion through private care*. This kind of communication is only possible when two channels, public and private are open at the same time. It conveys one of the three pillars of collective reasoning – egalitarian participation.

We saw that Rhonna then *encouraged groups to broaden the discussion space through generic interventions*. Like the previous strategy, the use of this strategy is made possible because Rhonna is able to monitor the development of one discussion at a glance with the help of awareness and communication tools. And also like the previous strategy, it conveys Rhonna's aim to promote collective reasoning, here through promotion of interactional co-construction.

Rhonna helped in *deepening the discussion space*, either by *generic prompts* (in early stages of the discussions) and *with content-specific hints* (later on in the discussions). Rhonna first noticed its lack of depth. This monitoring action was again achieved through the Discussion Graph and the Chat Table. The Chat Table was particularly handy for quickly checking ideas. Rhonna also used the distribution of links to find out that links were almost uniformly black, indicating a lack of distinctive and different standpoints. She used the Remote Control panel through alternation and combination of different intervention formats to encourage the deepening of the discussion space: She drew the discussants' attention to specific contributions or groups of contributions (through highlighting), she referred to a specific contribution through a question or a challenge (with annotations), and she pointed to a general lack of depth in the discussion (with the pop-ups). These moderation actions mediated by the Argunaut system are clearly aimed at promoting another constituent of collaborative reasoning – dialectical argumentation.

The other moderation strategies, *putting public focus on problematic or substantial contributions* and *checking the effectiveness of previous moderation actions and possibly acting if needed* are unconceivable in face-to-face teacher-led discussions without bringing to a halt the discussion. The different functions of Argunaut that allow highlighting specific contributions and directing the attention of group members, to potentially pivotal contributions afford these strategies and concretize principles of dialectical argumentation and interactional co-construction.

Beyond the fact the idea of synergy and of the evidence that the moderator aimed at promoting collective reasoning, the description of the strategies shows an important idea, the fact that *good moderators realize a balance between care and non-intrusiveness*. This balance was at the center of Rhonna's activities, as exhibited

in her decisions to use open public or personal communication, use of generic or specific prompts, or whether to refer to a specific contribution in a moderating action. These decisions are not easy precisely because good moderators know that the balance between care and non-intrusiveness should be maintained. Our design research program currently focuses on what discussants expect from moderators in synchronous discussions. This issue is complex and exciting (what moderators conceive as intrusive/caring is often perceived very differently by discussants) and impinges on the ways moderators can maintain the right balance between care and non-intrusiveness.

We showed schematically only how Rhonna moderated four discussions, but the strategies she enacted were quite similar: She observed first how discussions developed without intervening, then put public focus on specific issues and checked how her actions were effective. Instead of putting efforts on inclusion, she toned down and tempered heated and emotional contributions. The synergy between Rhonna and the tools was even more important for four discussions than with two discussions. Rhonna's achievements were quite remarkable even if she could not always optimize the use of awareness tools and of the Chat Table.

Scrutiny over the strategies enacted by Rhonna conveys the impression that the strategies are aimed to assist the students in the development of their ideas. The moderator, who cares both about ideas and about good collective reasoning, observes, waits, ponders whether and when to be explicit or not, whether and when to help, and whether to turn to a whole group, to a sub-group or to one discussant. We are far from the usual image of teachers overwhelmed by the complexity of classroom discussions without being able to consider and analyze the history of the discussion and its quality. Rhonna is doing another job. In the remainder of the section we answer the

third research question, which checks whether this effort of moderation is worthy, whether it is effective.

Question 3: Do e-moderation actions have some impact on the flow of synchronous discussions?

This question of impact on the flow of discussion is complicated. A preliminary question – *whether Rhonna tied her interventions to students' ideas* can be answered more easily. As shown by Chiu (2004), this is a key for effective facilitation. In all critical moments we described, Rhonna carefully looked at student's previous actions through the Discussion Graph and the Chat Table that represented students' ideas, before intervening. Also, in Rhonna's cued retrospective reporting session, she always justified her actions in light of the preceding ideas that were developed by the students. We presented many examples showing that Rhonna continually checked whether her actions were effective and whether she needed to modify their character. The passage from generic prompts (to broaden the discussion space) to specific ones (to deepen the discussion space) reflected a modification to tune the flow of the discussion.

Therefore, the protocols showed that Rhonna incessantly checked whether her past interventions had a further impact on the current development of the discussion. Some cases showed clear evidence of success. For example, the progressive inclusion of Sohier in the discussion or the fact that one student raised an argument on TP which was not linked to collective memory. Some cases showed failures, such as students' persistent agreement in spite of Rhonna's injections to consider new perspectives. Paradoxically, it seemed that the intermittence of her monitoring led her to be attentive to the impact of her interventions. We can conclude that, although we showed on several occasions that the e-moderation actions did not affect the flow of

discussions, on all occasions her actions were tied to the students' ideas and she always monitored the impact of her moderation.

In contrast, on several occasions, the impact on the flow of discussion was decisive. For example, as aforementioned, in her interview, Sohier, who was quite central in interpreting the strategies involving inclusion, reported that she knew about educational trips in Poland). However, because she knew that the Holocaust is a highly sensitive topic for Jews, she declared that she did not know how to talk about it. She also stated that Rhonna convinced her to engage in the discussion as she told her that she had the advantage of being less emotional and more objective than others. She also said that when she declared that disconnecting from the past means disconnecting from the future, and was positive towards educational trips in Poland, her arguments aligned very well with her Arab identity in Israel. She mentioned she appreciated Rhonna's actions to enable her to express herself in this uncomfortable situation.

General discussion

Although the present study was done with a specific environment, and for a specific goal – promoting collaborative reasoning, it opens new perspectives in the facilitation of group work in general. Of course synchronous group communication is, in multiple ways, different from asynchronous CMC (e.g., Cress Kimmerle & Hesse, 2009): Among other differences, the time frame is significantly shorter, discussants are concurrently receiving and sending multiple messages at a high pace, individual contributions are usually shorter, the dynamics of communication are more similar to F2F formats, the communication is usually not threaded by default, and moderation has to be accomplished in real time. Not only is the role of the moderator more demanding in terms of time pressure and cognitive load (Packham et al. 2006),

differences in software affordances and the very nature of synchronous group communication may also change the definition of what constitutes effective support in such environments, and what is expected from a discussion moderator. However, some of the conclusions we list here may help for the facilitation of a-synchronous discussions, although most of them are relate to the facilitation of synchronous ones.

The first lesson that we can draw from the present study is indeed relevant to a-synchronous discussions too: we documented on a nascent practice, the moderation of multiple synchronous discussions in educational settings. We showed that it is possible to enact sophisticated strategies of moderation in multiple discussions with the help of tools that provide awareness of several crucial features of discussions, and various ways to communicate and intervene in groups and individuals in a caring but non-intrusive manner. This existence proof may have important consequences in the organization of learning settings in classrooms: One teacher can moderate four groups of three to four students. We envision that with the complete scope of different Argunaut functionalities we will be able to support whole classes. We envision that in the next round of the design research cycle, teachers will be able to work with up to 8 groups of 3-4 students and that e-moderation would be partly triggered by alerts such as "X has not been active for 5 min.", "Discussants seem not to challenge each other", or "the discussion is off-topic". This further step, including AI-techniques enabling the alerts (McLaren Scheuer, & Mikšátko, in press), is beyond the scope of this article.

Such an achievement is not just technical, though. Scrutiny over the two parallel discussions uncovers an unusual variety of moderation strategies. Rhonna's interventions were at times content-related, whereas in others they were not, sometimes directed to an entire group and sometimes to one discussant only. On

certain occasions she related to the development of ideas and on others to the quality of the discussion. She sometimes aimed for broadening the discussion space, and sometimes for deepening it. Deploying such a variety of strategies is not totally new and has also been observed by Hmelo-Silver and Barrows (2006; 2008). It characterizes environments in which the moderator can observe the past actions of the student. In such environments, facilitators have the ability to follow (and to build on) students thinking in order to tailor facilitation strategies – on the fly for synchronous discussions, and *a fortiori* for a-synchronous ones. With Argunaut and its different functionalities and tools to observe the development of ideas (e.g., with the Discussion Graph or the Chat Table) or the quality of discussion (e.g., with the Group relations, or the Ontology use), the moderator can precede his interventions with a careful evaluation of the discussion that has developed thus far. Quite naturally, the interventions are then tied to the discussants' contributions. This fundamental property of what we would call *approximate attunement* of the moderator's actions to the discussants' ideas, which has been reported to be so difficult to achieve (Yackel, 2002) yet fundamental for effective support of group work (Chiu, 2004), characterizes the potential of moderator support systems, such as Argunaut.

When this approximate attunement is attained, when the moderator's interventions are tied to student's work, it is not surprising that moderators are found to use a range of different facilitation strategies. The issue is no longer whether to use content-related interventions or not, or whether to use specific or implicit directives, for strategies. The question becomes an issue of timing – *when* to use one strategy or another, instead of consistently sticking to one fixed strategy. Content-related prompts, general encouragement to participation or to critical reasoning, are all examples of teaching actions that are all eventually useful, as long as they are attuned

to the needs of the group and its individual members at that time. Even when teachers are dedicated to non-intrusive moderation, such as is the case in the Kishurim program, it is sometimes imperative to focus explicitly on a contribution, to challenge it explicitly and to encourage all discussants to react to this challenge in order to move the discussion to deeper investigations. At times, generic prompts will do the job, in others these may not be sufficient and call for other, more direct strategies.

We have carefully added the term "approximate" to the more commonly used "attunement". The latter has good press in cultural and developmental psychology to describe the relations between caregivers and infants in their development (e.g., Rogoff, 1998). Attunement refers to a coordination of actions and to mutuality. It is usually reserved to describing one-on-one interactions with caregivers, and is not often used to refer to teacher-led classroom discussions. Teachers supporting small-group student talk cannot monitor and take into consideration the full complexity of group and individual functioning at the same time. They then often enact strategies as ready-to-use scripts which cannot fit the needs of all students. The affordances in systems such as Argunaut allow teachers to attain an approximate form of attunement: They may not be able to attain perfect attunement that is possible in one-on-one interactions, but they can accompany students in the development of their ideas. They can observe, wait, ponder whether to be explicit or not, whether and when to help, and whether to turn to a whole group, to a sub-group or to one discussant.

At this point, it is timely to mention one interesting study on which we did not report so far because its importance resides in the details of the experimentation and is highly relevant to the present study. In a study that compared student-to-student dialogue with and without teacher intervention, Hogan, Nastasi and Pressley (2000) found that the teachers in this study used a variety of questions that aimed at eliciting

students' thinking about how to create a mental model of the nature of matter. When teachers did make statements, they were repetitions or restatements of students' ideas and were meant to clarify students' proposals or to emphasize certain points in students' statements. Hogan and colleagues found that the benefits of this intense probing of students' ideas for their scientific reasoning were dependent on the groups' collaborative practices when the teacher was not present: While all groups exhibited a moderate level of scientific reasoning when the teacher intervened, the groups that produced a higher level of reasoning when the teacher was not present were those who benefited from the teacher's intervention in their further reasoning.

As aforementioned, the students who participated in the present study were trained in a university course to participate in collaborative reasoning. At the beginning of the experiment, they learned to use Digalo, a tool designed to support collaborative reasoning too. In such a situation, it is less surprising that even with intermittent moderation (caused by multiplicity of parallel discussions), students were able to take into consideration the teacher's interventions both during periods of her intermittent presence or absence. More generally, we should emphasize that in light of the Hogan et al and the present study that the moderation of parallel discussions should be expected to be especially effective for students that have been trained to collaborate in learning tasks.

A last general lesson that can be drawn from our experience concerns the interplay between private and public communication that the system enables. Face-to-face classroom interactions often expose students to challenging events in which lack of knowledge, competence, or motivation become publicly apparent. This may lead to loss of face or undesirable reactions motivated by avoidance of this loss. The Argunaut system provides a new space for supporting classroom group work in which

the flexibility in using both private and public communication channels enables instructors to avoid the potential pitfalls of each and to gain from their respective advantages: To capitalize on ideas from a vivid brainstorming or critical discussions, to capitalize on the public space to broadcast positive appraisal, to convey managerial communication and to highlight critical aspects of argumentation, on the one hand, and to give, receive and take advantage of personally-tailored teacher support without public exposure and potential loss of face, on the other. Also, it seems that this flexibility may aid in the delegation of sense-making responsibilities: Rhonna helped boosting the commitment of the individual to the collective through the private channel. She also committed the collective to selected particular individual contributions because they included worthy ideas or because of their author.

We hope we have shown that the present study with the Argunaut system opens new perspectives for supporting facilitation of the group work in various contexts. There are a multitude of research questions that can be generated and studied in future studies, such as: how teachers learn to moderate multiple small group discussions, whether students consider the moderation practices as desirable from their point of view, or how moderation of small group work with its non-intrusive but caring character is regarded by teachers, etc. We leave these exciting questions for future investigations. But what is certain for now is that a new practice is born and that this practice may have a considerable impact on classroom activity and on teaching as a profession.

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Table 1. *Moderation arrangements for the issues discussed*

Session #	Number of groups	Discussion topic	Moderation tool
1	4	Eating a Mallomar	none
2	2	Vaccination	Within Digalo EUE
	2	Vaccination	none
3	2	Censoring the Internet	Within Digalo EUE
	2	Censoring the Internet	none
4	2	Rights of handicapped people	MI (single group)
	2	Rights of handicapped people	none
5	2	Holocaust education trips	MI (two groups, simultaneous)
	1	Bystander effect	MI (single group)
	1	GMO crops	MI (single group)
6	2	Holocaust education trips	MI (two groups, simultaneous)
	1	Bystander effect	MI (single group)
	1	GMO crops	MI (single group)
7	2	Bystander effect	MI (two groups, simultaneous)
	2	GMO crops	MI (two groups, simultaneous)
8	4	Gay parade in Jerusalem	MI (four groups, simultaneous)

Table 2. *Inclusion of one student in a group discussion through private care*

Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
R: …So I saw that she wrote that the question is not clear for her… She was not sure at all how this stuff will be, because she probably felt she was not personally involved (1_2). So I wanted to see (2_2). And she did not understand the question. And I didn't understand so much her question so I reworded the question…I thought that she doesn't understand what trips in Poland are. But it's written there. In this discussion, I remember that I had very personal interactions with her (3_2), and that I followed her meticulously. Now, I pay attention that it goes only to her. And I sent it as an annotation to be directly linked to the shape (also 3_2). Aha, yeah, she wrote from nowhere that she knows that people go to trips [to Poland] (4_2)	R hovers on Sohier2 and sees "Is it possible to explain?" R. writes a comment in a message annotation box [To explain the question: whether it is worthy to organize trips or not] R. clicks on polin-group4 and selects Sohier only then sends it to her (a_2) R. looks at Sohier's intervention [Yes, I think that people should go to Poland] (b_2)

Table 3: Encouraging groups to broaden the discussion space with generic prompts

Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
They used a lot of black [neutral] links and not other kinds of links… (1_3)	R. hovers over shapes in the map (a_3)
And this is something that should go to everybody…	R. chooses a pop-up in a message annotation: [I suggest you to raise more general arguments, pro and con arguments] (b_3)
Yeah, because the one [Guy] that gave this shape, the "to allow but in a different setting", he already provided something that fits a concession or an idea that people reach only at the end. So everybody began to join him and began to tell which kind of setting one should opt for…So I told them "Perhaps you could begin to raise pros and cons" in order to draw them back to the question because the discussion turned around the end…and pro and con arguments were missing […] (2_3)	R. continues hovering on the shapes (c_3) and focuses on Guy's intervention in the discussion graph and to all interventions that refer to Guy R. sends her popup message to all group3 discussants
	R. turns to group 4
Here I saw that everything was green [all the arrows showed support only]…perhaps all the perspectives were the same (3_3) [she reads what she wrote in her message]. Apparently, it's because they progressed on the perspective of memory, of learning about own history, and about people's link to their history (4_3). So I said to myself, OK, try to think about another perspective. And I sent this as a pop up. It's not linked to a specific form, and I wanted it to be very salient. And I remember that it worked for some discussions. Especially when I raised a new perspective. When I raised the economic perspective in a general way	R. looks at the discussion graph view without hovering on the shapes R. writes a popup message: [there are other perspectives according to which to organize the trip] (d_3) R. sends it to all participants

Table 4. *Repeated efforts to include one student in a group discussion through private care*

Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
	R. hovers over the discussion graph. And notices a shape in which Sohier writes [I cannot answer your question since I'm not sure that it's linked to the Holocaust] (a_4)
…and then, I turned back to the previous discussion […] to check what's up with Sohier […] and she answered (1_4) that she couldn't answer to my annotation because she wasn't sure that this relates to the Holocaust […] and I also told her that I didn't understand her question … and I sent the message only to her (2_4), I paid attention, things that should not go to everybody, that should go to the one to whom it belongs. Also not to embarrass, overwhelm or confuse, I thought very much about to whom everything should be directed. And I think that many people thought that in their discussion there was no moderation at all	R. sends an annotation: [I don't understand your question] to Sohier only
OK, I suddenly saw that she doesn't know to express herself on that topic, and I felt that this is the stuff I have to do. Because the others didn't refer to her, especially because she is out-group and I couldn't expect that they would refer to her and I said that this is precisely because she has not the same frame of mind and because she comes from a different culture and this is not about a personal opinion or something else, so I told to myself that she is more objective (3_4). In that way I wanted also to tempt her to express herself. And I told her what it is about just in case she misses some background. This is in order to give her some background on the memory and identity background. Here I was very careful about my wording (4_4). I mean that for Palestinians, this isn't the most comfortable issue to discuss (5_4). So, I said, maybe something [interesting] will come out of it. This is interesting because she said that one should go to Poland because the past is a part of the future. Somehow, it sounds like a cliché, does she really thinks so? I tried to challenge her real opinion, and perhaps arrows will be more colorful here.	R. clicks on the Current Discussion list and selects 'Sohier'. All Sohier's interventions, colored in blue in the discussion graph, are isolated. R. writes a comment in a message annotation: [in my opinion, it will be very interesting to get your point of view, you are perhaps more objective than others. Because of that would it be better to send students to Poland, in order to learn about the Holocaust in order to strengthen their memory and their identity? Do you think that this is positive?] (b_4) R. sends the message to Sohier only.

Table 5. *Helping to deepen the discussion space with the help of awareness tools*

Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
Here I wanted to see the last steps that were taken and I opened the Chat Table to see things and this is my feeling when the map gets too complex, and we need some help to see what's going on […] (1_5)	R. opens the Chat Table of group4 She scrolls up and down the Chat Table (a_5)
And I did the same for the other group […] and this confirmed my impression (2_5) that they always talk about strengthening memory as a real event. But does this really strengthen memory? And all these stories about getting drunk? But where is there any challenge to this argument. It was handy to see that with the Chat Table.	**R. turns to group3** R. opens the Chat Table of group3 She scrolls up and down the Chat Table
Now I turn more to the different awareness windows. As I said, I didn't open them right away. Now I said, "well I already made necessary interventions, now let's see in depth (3_5). And the stuff about arrows is immediately obvious. There are many black arrows, one pitiful opposition and few green arrows. And […] on this I want to react. I understand that people ask for clarifications and these are black arrows, but it's not all. At this stage we reached a point where people should take positions and there needs to be some argumentation. Fellas, go ahead! Either they don't use arrows properly or they don't say the right things. So I intervened. I used a pop-up. And also, not to impose (4_5), to tell them "Think about it, be aware that if you can categorize something as an agreement or a disagreement, use the green or red arrow and not the black one because it's a way to escape conflicts (5_5)	R. opens the awareness tools bar and chooses as miniature shapes (like in Fig. 2) the shape and the ontology use (as pie representations) (b_5). R. hovers over the Link Pie Chart in which the black portion is the largest (c_5). R. writes a popup to all discussants in group3: [You should use the right arrows: whether you agree or oppose]. (d_5)

Table 6. *Helping to deepen the discussion space through content-specific hints*

Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
This piece with the striptease girls that I highlighted to them as worthy reference. I wanted to know how they would react to this blinking. I saw that they are still stuck with the memory perspective (1_6). […] And I saw that when I say general things, this doesn't help that much, so that I gave them a specific example. Yet, I didn't want to say too much, to tell them what to say (2_6). I guess that if I would have told them "economic perspective", they would have raised relevant stuff. Although there are quite different things here, money from families with low income and who gets the money […]. And this argument raised somewhere else, the fact that the trip to Poland should be central because soon there will not be any survivors left. Sohier said [in the other group] "I think that the trip to Poland should not be the central solution" (3_6). And I use this argument [about survivors] and ask Efrat whether her answer would be the same when it concerns the next generation. […] I wouldn't have thought of this argument by myself but took it from the other session	R. opens the Chat Table and scrolls it up and down. R. turns to the map view and writes: [A few students that went to Poland came out to visit a striptease show]. She highlights it and sends it. (a_6) R. goes on skimming over the map view. R. reads: [The trip to Poland should be central because soon there will not be survivors anymore] (b_6) R. writes an annotation to the author of the above contribution: [Will your answer be the same when it concerns the next generation?] (c_6)

Table 7. *Socializing a student willing to be included in a discussion*

Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
And I turn back to Sohier. I didn't forget her (1_7), and I see the posting which was previously empty, in which there is now something [reads contribution] (2_7). Many people used this as a justification, but I liked what she wrote (3_7) and I wanted to encourage her and to give her a positive feedback. I didn't do that with anybody else [reads] and I wanted to know what she has to say against it (4_7). And I thought that she would feel uncomfortable to express herself against. Now it's possible that she is really pro, because the historical past is important for her and I was very careful about my wording and I wrote "If you have any idea about why not […] I see that here I did some editing again.[…] It sounded to be very patronizing (5_7). On the other hand, now I read that, and it really sounds patronizing but I added the smiley face, that she knows how to participate in a discussion about it, and she can, because I am very happy you could participate. I was very bothersome. Yet I am not sure whether I was not patronizing. I identified a possible problem because she is out of the group without the same perspective, the same relation to the topic. And I don't see that people link to her (6_7). I waited a bit. It's interesting that she said that it will not be repeated. And now I think that she means in our context. But you know she is not in a simple position. As soon as she will say something, she risks that everyone will be all over her […]. Now I identified some relation between what Sarit wrote and [what Sohier wrote]. I marked Sarit only and not Ygal who is a discussant too. OK. So why I didn't choose Ygal? Maybe it's because I saw that he links properly […]. This was an elegant way to say implicitly: "fellas, refer to Sohier (7_7) […]	R. hovers for a long time on Sohier's posting [It's impossible to get disconnected from the past of the Shoah, even if there were will not be any survivor at all because it's linked to the existence of the State of Israel] (a_7). R writes a message as an annotation: [I am happy you participate. Would you have any idea why trips to Poland may be something negative] She edits again and again the message (b_7) and replaces the [I am happy you participated] by [I see that you know how to speak up on these matters :-)]. At last, she sends the message to Sohier only R. hovers over Sohier's contribution: [It will not happen again]R. selects Sarit in the Current Discussion list and hovers over all her contributions in the discussion map (c_7). R. writes [Don't forget to link your shapes to the shapes of other persons] **to Sarit and to Sohier** (not to Ygal) as an annotation to Sarit's contribution that seems relevant to Sohier (d_7)

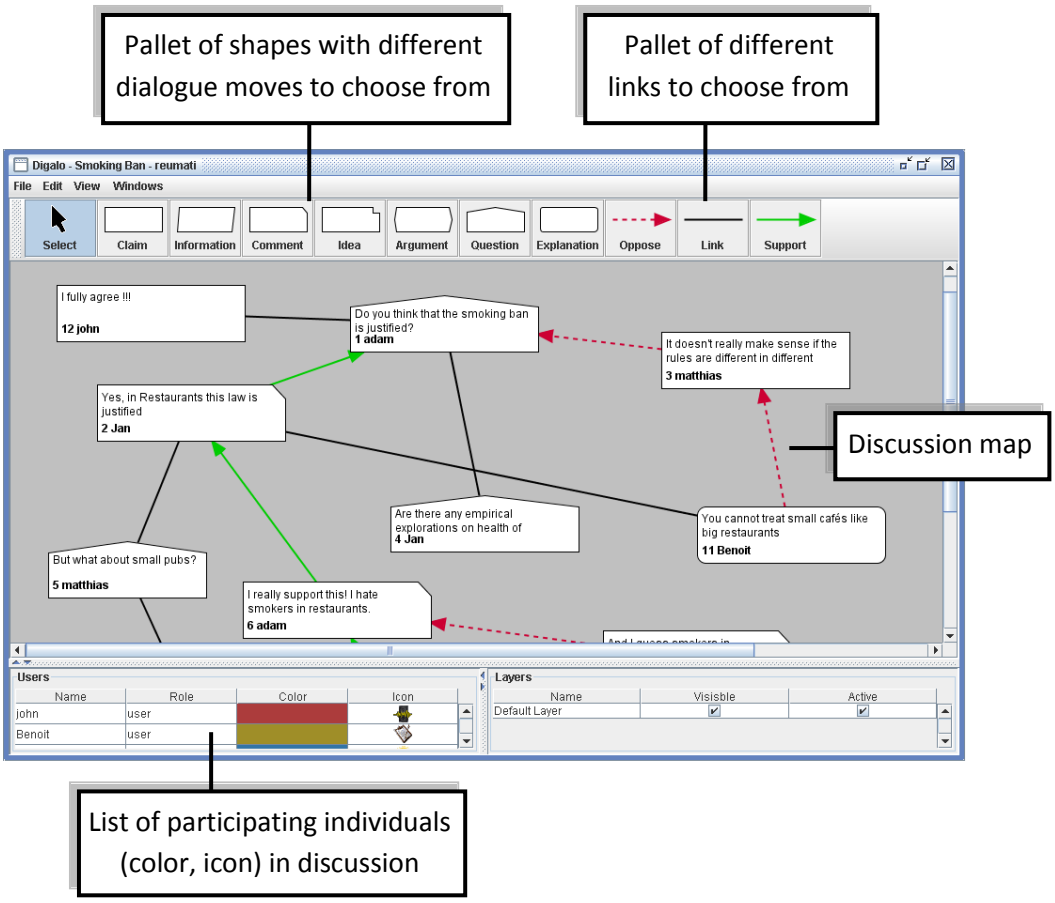
Table 8. *Putting public focus on problematic or substantial contributions*

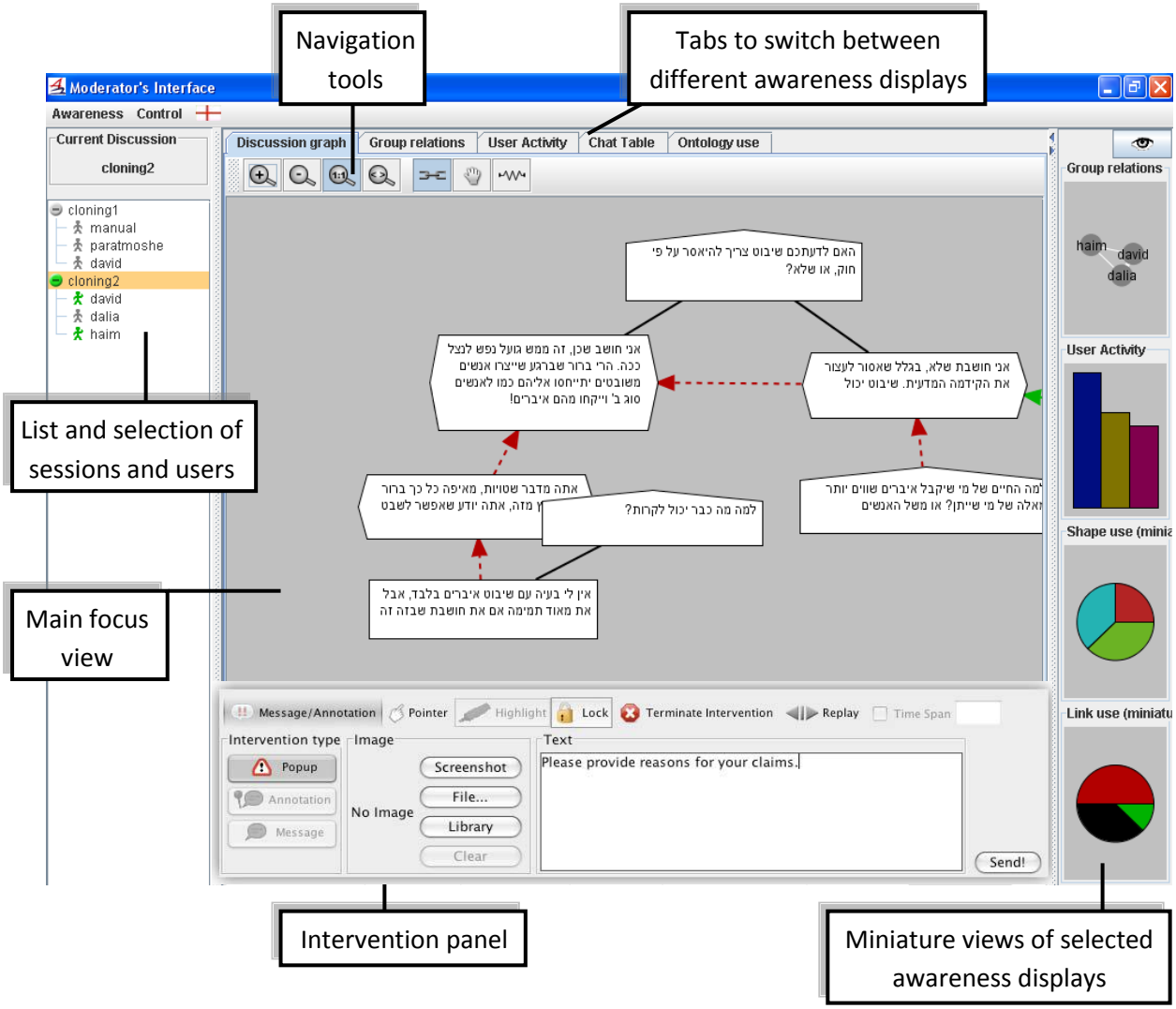
Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
I turned back to the other discussion. It was quite interesting. And he says: "I agree, but is this a good argument why to continue or to stop". Here there is an interaction, not at the highest level because Efrat doesn't write concrete things. She writes "Why not improve?" And I wrote "OK. What concrete things can you suggest? (1_8) Here also, as fast as somebody proposed to do the trip according to a different format, they began being dragged into the issue of organization. And this changed everything, people turned around about what and how, without dealing with preliminary questions (2_8). Here they began to discuss goals, and somebody dragged this to that direction. But if any, be concrete, don't say, "to improve". This doesn't mean anything. […] So here I saw something interesting (3_8). There is a risk in being "strengthened" by such a trip. And I wanted to blink it to everybody or to put an annotation to refer to this contribution. Because of the question whether remembering and strengthening is always a good thing. And I remembered that in another context it could strengthen racism (4_8). I'm not sure that I succeeded. They really got stuck on the memory stuff and on whether this is the best way to remember, and how to remember. But maybe remembering is not necessarily something good. But now I see that I did refer to it.	R. reads: [If the goal was to get a feeling of mission, this is a powerful and effective way, if the goal is to commemorate the Shoah, then I'm not sure about what happens there] then the reaction [I agree, but is this a good argument why to continue or to stop?]; reads Efrat: [Why not improve?] (a_8) R. annotates Efrat's contribution: [What concrete things can you suggest?] and sends it to all participants (b_8) R. goes on skimming over contributions in the map view Goes on skimming over the map view. R. reads: [Journeys construct collective memory and this is important so as to strengthen memory] (c_8) R. turns to the Ontology Use Tab and looks at the distribution of links. The majority of links is green (points at support and agreement) (e). R. writes: [You discussed memory from an emotional perspective. But is strengthening memory always a good thing?] and sends it as an annotation of the previous contribution to all discussants. She highlights this contribution (d_8)

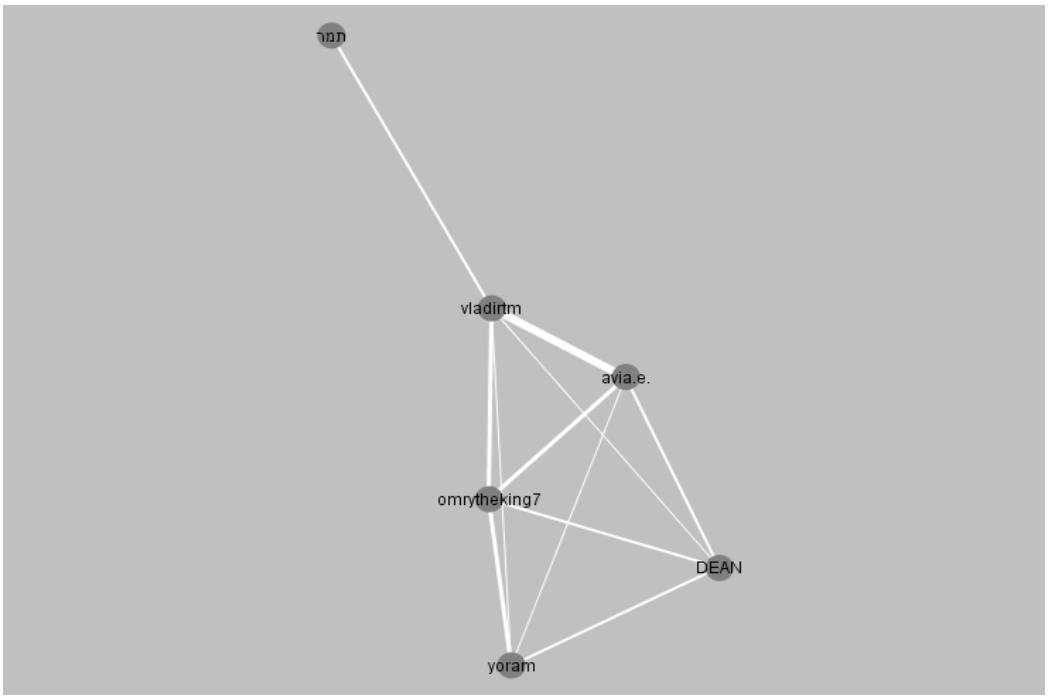
Table 9. *Monitoring effectiveness of previous moderation actions on discussion*

Rhonna's comments while looking at the screen recording of her actions as a moderator	**Rhonna's screen-recorded actions**
	R. skims over the Chat Table
	R. turns to the map view and hovers over the shapes (a_9). She selects discussants to highlight their contributions (b_9)
And I say again for the third time (1_9) that the most important thing is to consider different perspectives.	R. writes: [You spoke about the feeling of memory as the main perspective of the students, its contribution to their future and to the future of the state. What about other perspectives? The economic perspective or the perspective of the influence of the participation on the local Polish population]
At the beginning, I was general, then I hinted to the economic point of view and here I am explicit (2_9), I articulate what they said to give them to understand that all these things are of the same kind (3_9) [they consider the memory perspective only], and I check that I don't say something wrong, that I didn't miss anything.	She edits the above message as she hovers again and again over the shapes and reads their content.
Then I added the perspective of the influence of the journey on the inhabitants, on their image of Israel. I mentioned the striptease girls, it doesn't look good and one can say that it strengthens anti-Semitism (4_9). I was fed up, they all the time dealt with the same topic. There are other perspectives that they did not consider […]	At last R. sends the above message as a pop-up to all discussants (c_9)
	R. goes on skimming over the map view. She locates a question by Nitsan to Guy to which Guy did not answer. She reads Nitsan's question: [What 'mission' are you talking about?]She reads Guy's argument which preceded Nitsan's question: [It's worthwhile for students to go to Poland to strengthen their feeling of mission]
Now I sent a highlight to this aspect and I don't know why, but one student doesn't answer to the question of somebody else. I didn't know why. I always have to hover over the forms to see. The question seemed to me relevant. So I blinked him to refer to him and I wrote "For you attention".	R. highlights Nitsan's question, and sends it to Guy only with an annotation "for your attention"
	Turns to group4
And I went back to see what's up with Sohier. And I was pleased because I saw that somebody made a link to her with an arrow. And I checked to be sure. Somehow I reached the goal. Because Sohier is now not only with me but with Sarit. (5_9) There is a limit to what I can do without telling people "refer to Sohier" […] and it's not OK to tell them such a thing, it will not lead them to value more what Sohier says.	R. skims over the map view. She selects Sohier in the Current discussion list and skims over her contributions in the map. She looks at the Group Relation Map. (d_9)
And here I see that they begin bringing in	

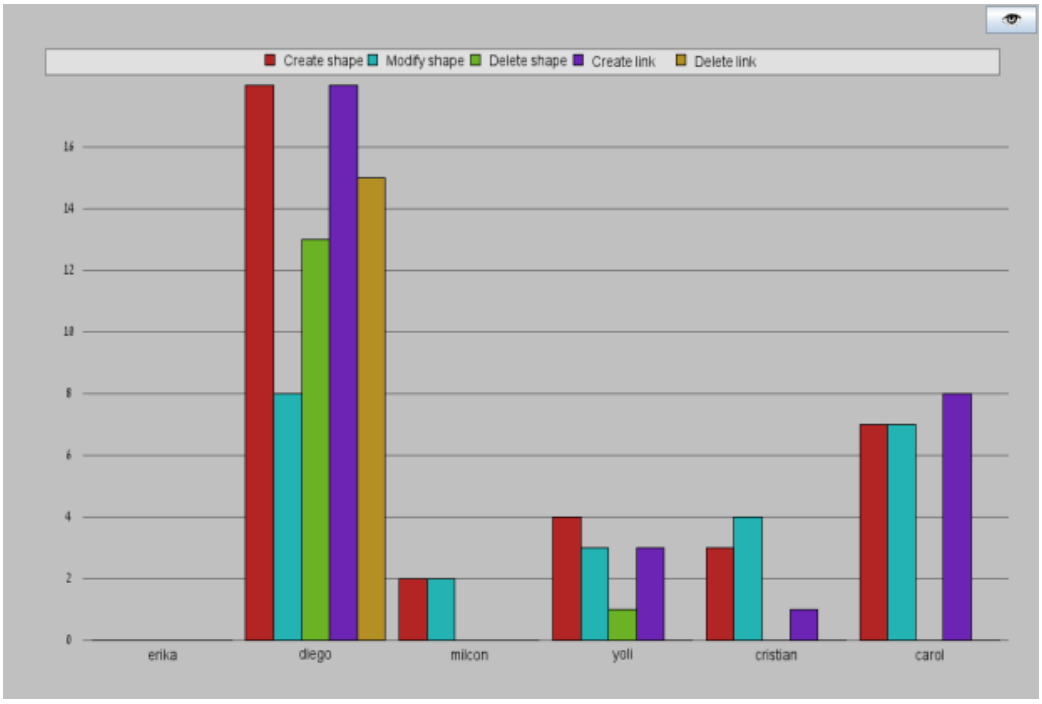
economic perspectives (6_9). This is exactly what I hinted to them (6_9). It made me happy that at last they bring in that. But I see that it doesn't go on; she said that, but where does it go on? (7_9) And I highlighted it (8_8). Yeah, in some way it's compulsion, because they are interested only in memory and on the aims but with all due respect, my interest is that they cover as many things as possible. I'll not force them but I'll bother them to the point somebody will do something. I don't tell them what to think. They can be pro, they can be con, but I want them to consider as many things as possible.	**Turns to group3** R. skims over the map view. R. reads: [And parents can't afford journeys to Poland. They are expensive] (e_9) R. highlights the above contribution and sends it to all discussants (f_9)
And I see that Sohier expresses herself very well, that "it depends on the kind of youngsters" (9_8) and somebody opposes her, and from my point of view, it's better to oppose and disagree than to be too polite. Let's be interactive! And at the beginning, the interaction was a bit oppositional only, but now it's oppositional but the proportion of arrows, the black is still dominant but it was much more dominant before. The red increased. (10_8) And I saw an interesting argument that raises how the journeys are perceived and have an impact on the image [of Israelis abroad]	**Turns to group4** R. selects Sohier in the participant list and reads her contributions in the map view R. looks at the pie chart visualization of links (g_8) R. turns to the Chat table and scrolls it up and down


Pallet of shapes with different dialogue moves to choose from
Pallet of different links to choose from
Digalo - Smoking Ban - reumati
File Edit View Windows
Select
Claim
Information
Comment
Idea
Argument
Question
Explanation
Oppose
Link
Support
I fully agree !!!
12 john
Do you think that the smoking ban is justified?
1 adam
It doesn't really make sense if the rules are different in different
3 matthias
Yes, in Restaurants this law is justified
2 Jan
Discussion map
Are there any empirical explorations on health of
4 Jan
You cannot treat small cafés like big restaurants
11 Benoit
But what about small pubs?
5 matthias
I really support this! I hate smokers in restaurants.
6 adam
Users
Name
Role
Color
Icon
john
user
Benoit
user
Layers
Name
Visisble
Active
Default Layer
List of participating individuals (color, icon) in discussion

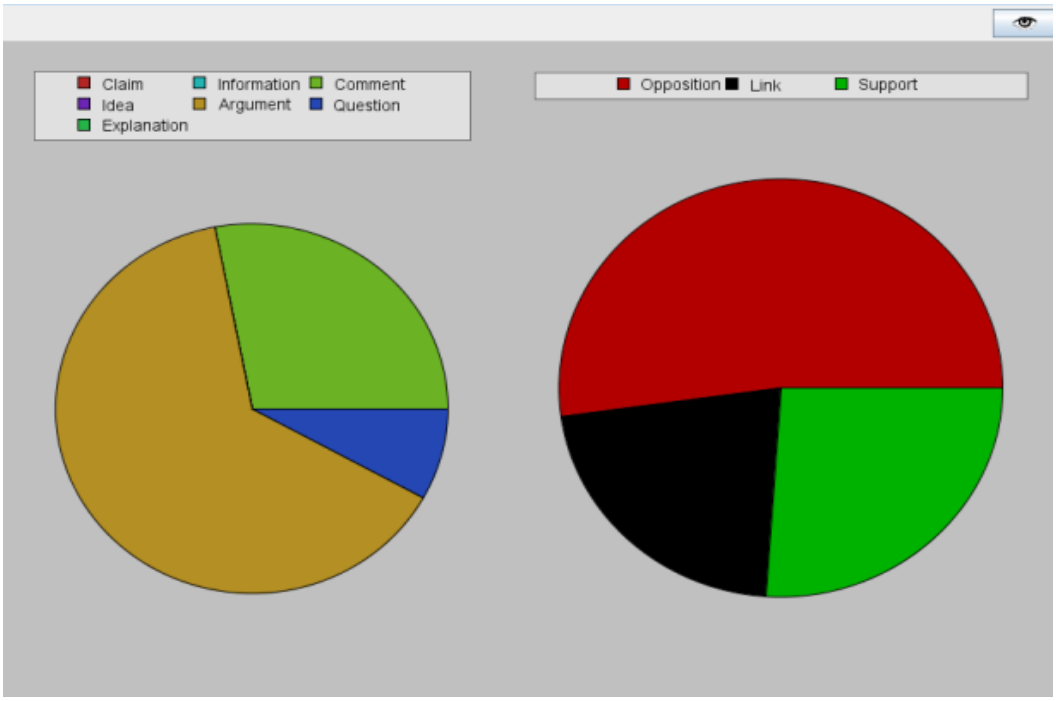

Navigation tools
Tabs to switch between different awareness displays
Moderator's Interface
Awareness Control
Current Discussion
cloning2
cloning1
manual
paratmoshe
david
cloning2
david
dalia
haim
Discussion graph
Group relations
User Activity
Chat Table
Ontology use
האם לדעתכם שיבוט צריך להיאסר על פי חוק, או שלא?
אני חושב שכן, זה ממש גועל נפש לנצל ככה. הרי ברור שברגע שייצרו אנשים משובטים יתייחסו אליהם כמו לאנשים סוג ב' וייקחו מהם איברים!
אני חושבת שלא, בגלל שאסור לעצור את הקידמה המדעית. שיבוט יכול
למה כבר יכול לקרות?
אין לי בעיה עם שיבוט איברים בלבד, אבל את מאוד תמימה אם את חושבת שבזה זה
Group relations
haim
david
dalia
User Activity
Shape use (miniz
Link use (miniatu
Message/Annotation
Pointer
Highlight
Lock
Terminate Intervention
Replay
Time Span
Intervention type
Popup
Annotation
Message
Image
No Image
Screenshot
File...
Library
Clear
Text
Please provide reasons for your claims.
Send!
List and selection of sessions and users
Main focus view
Intervention panel
Miniature views of selected awareness displays



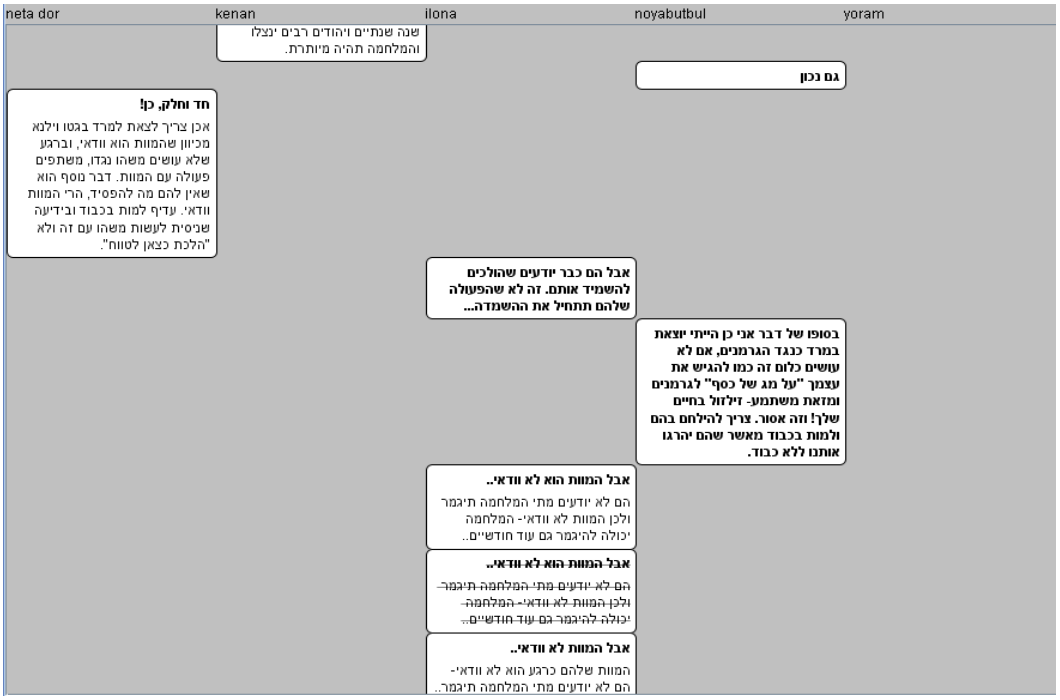
Note: Each node represents a different discussant; width of links represents the frequency with which two discussants created links between each others' contributions (exact number visible with tooltips).



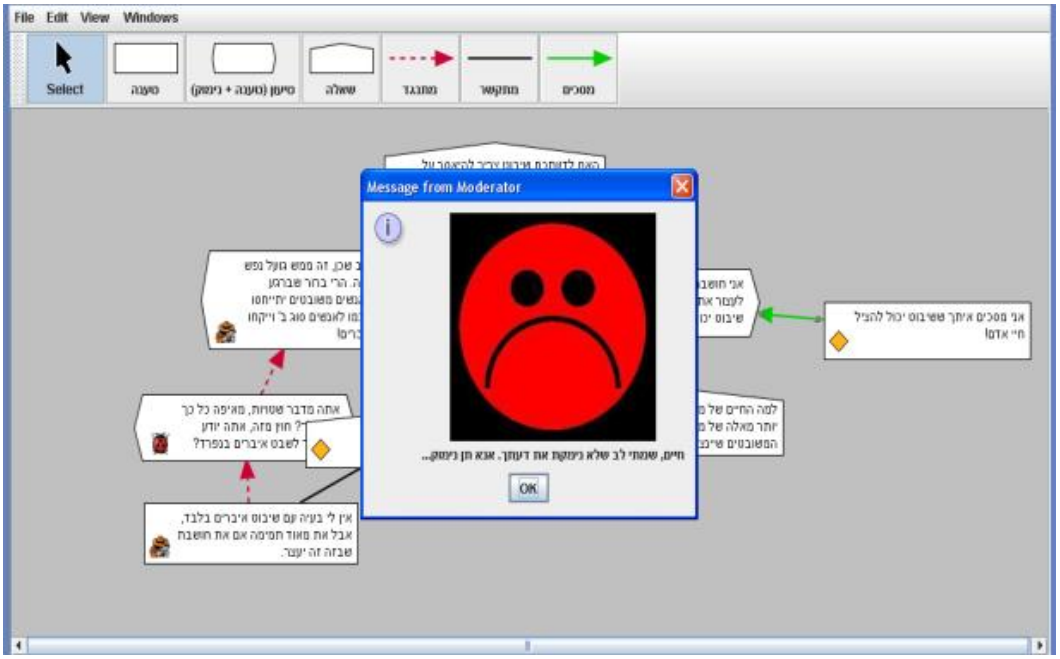
Note: The x-axis shows nr. of activities; the y-axis shows name of participants and different bar colors represent different type of activities (e.g., create/delete/modify shape/link)



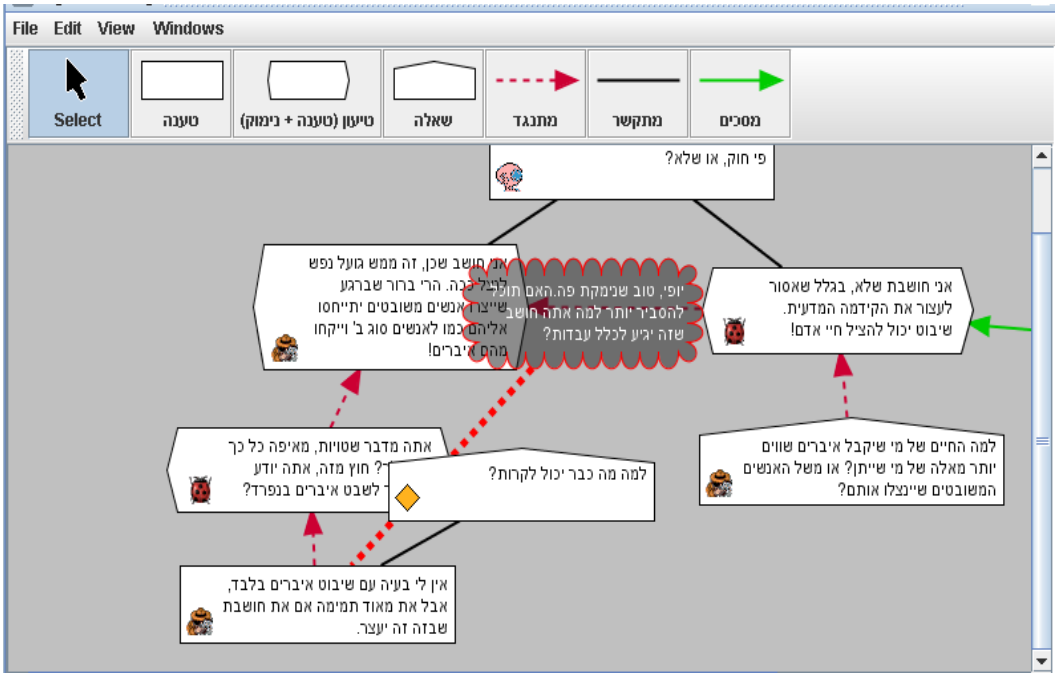
Note: Pie charts show relative frequency of the use of different shape types (left chart; e.g., argument, question, explanation, claim) and different link types (right chart; e.g., neutral, opposing and supporting) in the discussion graph.



Note: Contributions are vertically organized per discussant according to chronological order, and deletions or modifications are marked with the help of strike-through font and font colors



Note: Message can be clicked away with the OK button.



Note: Moderator's message is linked to a specific shape within the graph and cannot be clicked away by the recipient(s).

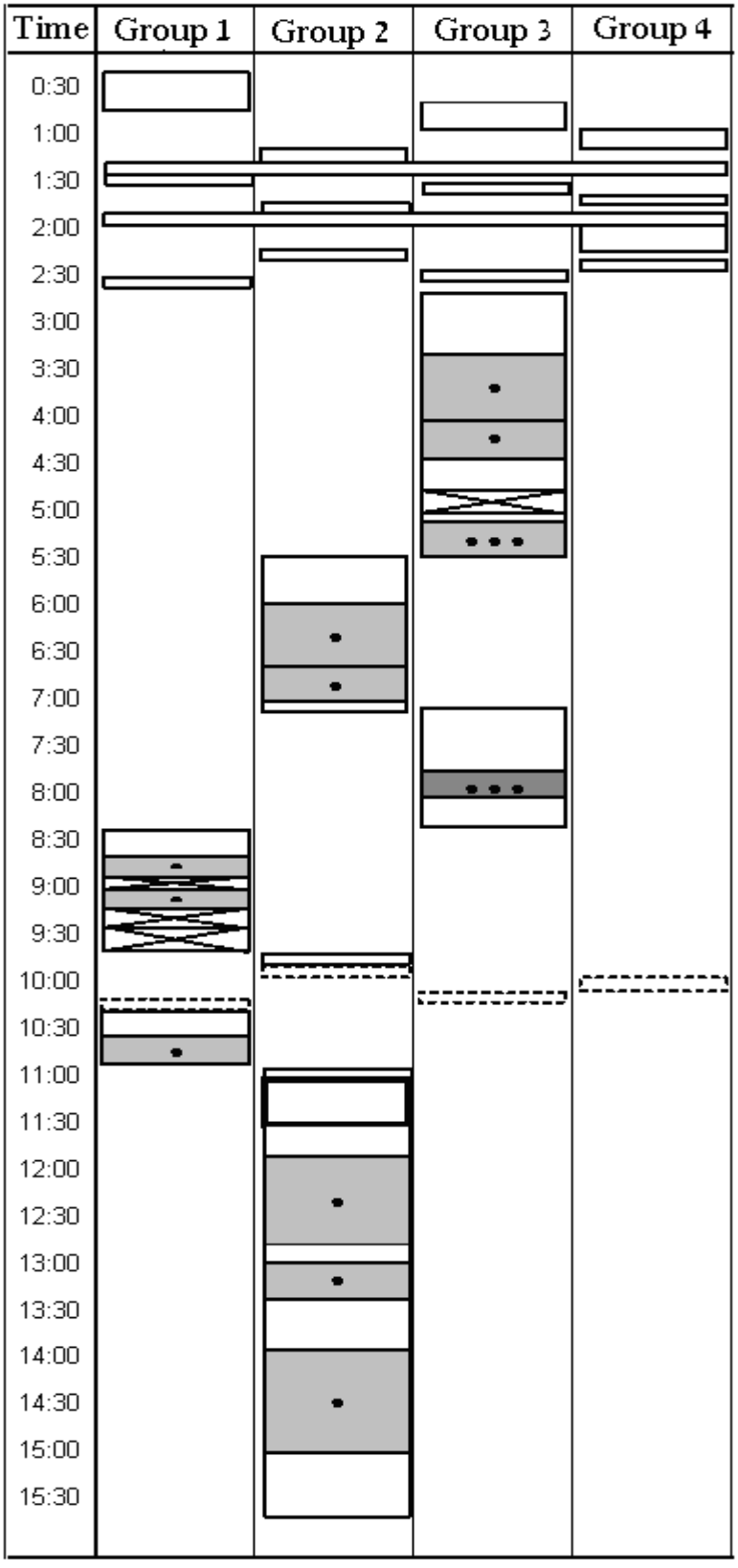
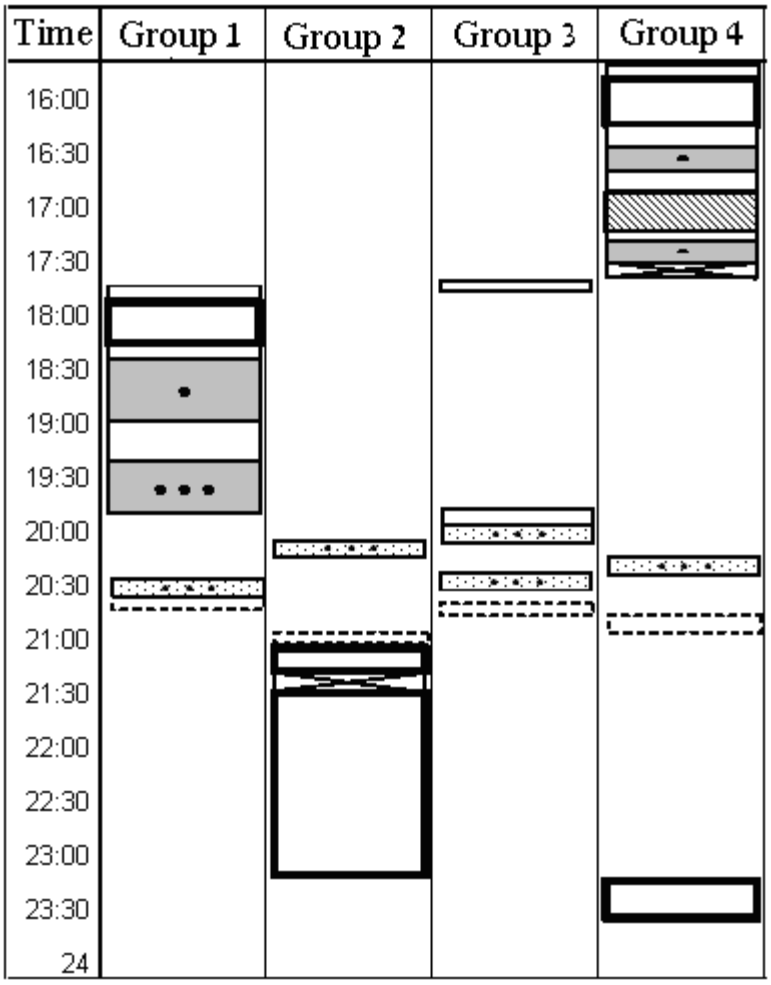


Figure 5 (cont.)



Legend:

Actions in Discussion graph display

Actions in Chat Table display

Actions in other Awareness displays (Group relations, Ontology, Activity Graph, mini-awareness)

Writing annotation message (dots within square represent number of students message is sent to, no dots is to whole group)

Highlighting a shape or sending a Popup message

Writing an Annotated message and highlighting it

Deleting a message

Organizational move (long rectangle across columns), such as checking who is on line, etc.