Project number: 027728

ARGUNAUT
An Intelligent Guide to Support Productive Online Dialogue
STREP
IST / Technology-enhanced learning

D6.3 - Evaluation report on the pedagogical content of ARGUNAUT system

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**Dissemination Level**

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<td>Restricted to a group specified by the consortium (including the Commission Services)</td>
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www.argunaut.org
Project Abstract: The ARGUNAUT project aims at unifying awareness and feedback mechanisms for working in e-discussion environments. The mechanisms should work on two existing (and potentially more) platforms: Digalo and Cool Modes/FreeStyler. The feedback is primarily directed to a human moderator facilitating the interaction but may also help students. At the heart of the AI (artificial intelligence) components proposed, an off-line analysis mechanism based on machine learning techniques - the "deep loop" - takes human-annotated and selected examples and generalizes them to indicators which can in turn be used for awareness feedback. ARGUNAUT suggests the development of a method and tools to support the conduction of high-quality e-discussions within small groups. The project is targeted to students and teachers in authentic learning environments, computer and cognitive scientists and S&T foundations.

Document Abstract: In this document we present the experiments and evaluation studies undertaken with the ARGUNAUT system during 2008. These studies vary in several important ways: location and cultural context, the age and education level of the participants, purposes and methodologies of research, etc. Together, they present a rich picture, highlighting the potential benefits of the ARGUNAUT system.
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1. Executive summary

The purpose of this document is to present the experiments and evaluation studies undertaken with the ARGUNAUT system during 2008, in Colombia, Israel, Germany and the United Kingdom.

Although all the studies presented within took place in the framework of the ARGUNAUT project, sharing an over-arching common goal of evaluating and implementing the ARGUNAUT system, we found it quite impossible to create a uniform testing environment. The constraints of ecologically-embedded implementation and evaluation are such that the studies in different locations (and sometimes, even in the same location) have different cultural contexts, different goals of the participating teachers/moderators, different ages and education levels of participating discussants, etc., making it unwise – in our opinion – to pursue a rigid, uniform evaluation standard. Furthermore, as the development of the tool progressed, more advanced versions were used for testing, so that the context of the tool use itself varied (i.e. added functionalities, corrected usability issues). In addition to this, it should be stated that the setup and research methodologies used were varied as well – while we wished to maintain some uniformity as far as evaluation tools are concerned, we valued the benefits of having a wider context for the application and evaluation of the tool.

In a way, this variety can be considered a research constraint: our data cannot be simply aggregated into one data set, and reporting and drawing conclusions from it are made more difficult. However, we believe that the very source of these limitations makes our findings more robust and more ecologically valid. The picture we are presented with is more vivid, more colourful, and, ultimately, reflecting more closely the varied contexts in which we hope the final release of the ARGUNAUT system would be used for in the future. Moreover, this variety reflects our attempt to test the ARGUNAUT system in different contexts.

This report starts with a brief description of an extremely important part of WP6 activities that were conducted in synthesis with the technological partners: the many testing activities of the different pre-release versions of the ARGUNAUT system in laboratory and genuine field settings (see section 2). These testing sessions did not take the form of a pedagogical study and are therefore not fully elaborated on in section 4.
In section 3, we set the theoretical and conceptual background for what has been referred to as the e-moderation challenge. Since the focus of this report is on the evaluation of the ARGUNAUT system as a tool to support effective e-moderation, it is important to give some background as to what e-moderation is and the literature on the features of effective e-moderation.

In section 4, we present the different studies that we conducted during the project's third period. Since, as stated above, the studies and findings cannot be fully and reliably presented in an aggregated manner, we present them herein as individual reports grouped per testing location. These reports are presented in a chronological order, in order to reflect our growing understanding of the appropriation of the ARGUNAUT system and related practices, as well as the use of more and more advanced and improved versions of the tool.

In section 5 of this document, the findings from individual threads of research presented in section 4 are woven together, in the form of an overall summary and integrative conclusions.

Below (section 1.1) we also present an overview of all the studies presented in this report in tabular format, in order to make it easier for the reader to get a more complete picture.
### 1.1 A brief overview of studies presented in this document

<table>
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<tbody>
<tr>
<td>4.1</td>
<td>Open university of Bogota, Colombia</td>
<td>4 experienced university tutors, 10 high school students, 10 B.A. students</td>
<td>(1) Testing the robustness and usability of the system and the appropriateness of our evaluation tools; (2) Studying how tutors appropriate the Moderator's Interface features in successive activities with both single-group moderation and simultaneous-moderation settings, and what are the differences between moderation via Digalo and via ARGUNAUT's Moderator's Interface.</td>
<td>Questionnaires, observation sheets, focus group discussions and interviews.</td>
<td>0.51</td>
</tr>
<tr>
<td>4.2.1</td>
<td>University of Exeter, UK</td>
<td>16 participants from varied background of school teachers to university lecturers</td>
<td>(1) To give the participants an understanding of the role and skills of an e-moderator as well as an opportunity to use the synchronous tool Digalo. (2) To gain some understanding of the ARGUNAUT System. (3) To pilot the Moderator's Interface and to provide feedback for improving the system.</td>
<td>Questionnaires, participant observation and focus group discussion.</td>
<td>0.51</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Carisbrooke High School, Isle of Wight, UK</td>
<td>3 teachers of science/English, 52 high school students</td>
<td>Pilot testing of the ARGUNAUT system in an integral context, both from a technical standpoint and from a pedagogical standpoint.</td>
<td>Think aloud protocols, interviews and questionnaires</td>
<td>0.51</td>
</tr>
<tr>
<td>4.2.3</td>
<td>University of Exeter, UK</td>
<td>3 teachers and 16 undergraduate students</td>
<td>A series of studies focusing on: (1) The pedagogical usability in real-time use of various Moderator's Interface features (what is used, when and why) from the moderator's point of view, both when moderating 1 discussion and when moderating 2 or more discussions at the same time; (2) The changes in moderators' attitudes/beliefs regarding moderation over time and with use of the Moderator's Interface; (3) The ability to moderate more than 1 discussion at a time;</td>
<td>Screen recordings, focus group discussions, individual interviews, questionnaires, and critical event recall interviews.</td>
<td>0.51</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Ziv School, Jerusalem, Israel</td>
<td>3 teachers, 60 high school students</td>
<td>To observe how teachers and students experience Moderator’s Interface-mediated e-moderation in authentic classroom settings and gather insights from teachers regarding e-moderation in co-located classroom settings</td>
<td>Observations, focus-groups discussions</td>
<td>0.67</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Ziv School, Jerusalem, Israel</td>
<td>2 teachers and a tutor (3 moderators), 12 university students</td>
<td>(1) To further test the affordances of the ARGUNAUT system (e.g., first time moderation of 4 groups at once); (2) To study how moderators appropriate its different functions after having gained extensive experience with e-moderation and the Moderator’s Interface; (3) To compare between single vs. multiple moderation and Digalo vs. Moderator’s Interface moderation, in a semi-controlled manner.</td>
<td>Screen recordings, questionnaires, semi-structured or critical event recall interviews with the moderators.</td>
<td>0.67</td>
</tr>
<tr>
<td>4.4.1</td>
<td>University of Duisb.-Essen, Germany</td>
<td>4 university students, 8 students</td>
<td>(1) Usability testing (primarily task-related); (2) Testing the evaluation instruments for reliability purposes.</td>
<td>Focus group discussions, observations and questionnaires.</td>
<td>0.65, 0.67</td>
</tr>
<tr>
<td>4.4.2</td>
<td>University of Duisb.-Essen, Germany</td>
<td>Same teachers as on 4.4.3 and 4.4.4</td>
<td>(1) Training teachers in e-moderation (for future experiments); (2) Gaining first insights on the moderation behaviour depending on the condition (Moderator’s Interface with Discussion Graph tab only vs. with added awareness displays).</td>
<td>Screen recordings.</td>
<td>0.67</td>
</tr>
<tr>
<td>4.4.3</td>
<td>University of Duisb.-Essen, Germany</td>
<td>2 teachers, 45 gymnasium students (15-16 years old)</td>
<td>To investigate the added value of awareness support during simultaneous moderation, focusing on: (1) Whether this is possible; (2) The effects on the moderator’s behaviour and the more indirect effects on the discussion itself; (3) Students’ perceptions of their participation in a moderated e-discussion. Perceived Use of the system</td>
<td>Observations, screen recordings, test tasks, questionnaires, and focus groups.</td>
<td>0.69</td>
</tr>
<tr>
<td>4.4.4</td>
<td>University of Duisb.-Essen, Germany</td>
<td>1 pre-service teacher, 12 univ. students</td>
<td>To investigate the added value of the Moderator’s Interface’s alerting mechanism during simultaneous moderation (effect on moderator’s behaviour)</td>
<td>Evaluation tasks &amp; questions, questionnaires.</td>
<td>0.69</td>
</tr>
</tbody>
</table>
2. Collaboration between pedagogical and technical partners

In this section we would like to dedicate a few lines to the many testing activities that took place in the course of the third period (M25-M33). The "outcomes" of these testing sessions are not reported here, since their main aim was to progressively improve towards a stable and complete version of the ARGUNAUT system. The main outcome of these activities is therefore the final release itself. The testing activities were characterized by close and continuous collaboration – often on the micro-level – between the pedagogical partners and the technological partners.

Starting from the second year of the ARGUNAUT project, a more flexible and user-centred design approach was undertaken by our team. This approach involved the refinement of the ARGUNAUT system through a cycle of design workshops. That is to say, the addition of features and improvement of usability issues through interaction between pedagogical partners, technological partners and end users. These design workshops were planned and orchestrated by the pedagogical team, with help and input from the technological partners. Insights gained from end users during these workshops were elaborated in correspondence and conversations between pedagogical and technological partners (e.g., the M5.3 milestone, the "work in progress" usability issues list) and their impact can be seen in the differences between consecutive pre-release versions of ARGUNAUT.

Furthermore, beyond specific design workshops and the involvement of end users, the system was improved in terms of increased stability, bug fixes and wider cross-platform capabilities, through a process of continuously testing pre-releases on different platforms and in different locations. Though a tool performs well when tested "in vitro", in the context of several networked computers in a tech computer lab, bugs and other problems may arise "in vivo", in the context of deployment in a real classroom situation (e.g., unpredicted overload of system when 20+ users are working intensively at the same time, problems related to read & write access from network drives, OS variations and system configuration issues, port collisions and firewalls, etc.). The discovery of many such issues was done through intensive technical testing by the pedagogical partners in various contexts (in terms of OS, network status and hardware capabilities), followed by joint sessions with the
technological partners in order to pinpoint the problems and resolve them. These sessions typically took place as conversation via Skype, often with concurrent use of the TeamViewer software for remote assistance and/or transmission of files (logs, screenshots) via email attachments. The success of this approach is evidenced by the robustness of the 0.67 pre-release version of ARGUNAUT, compared with, for example, version 0.60.
3. The ARGUNAUT contribution to the e-moderation challenge: setting the background

The focus of this report is on the evaluation of the ARGUNAUT system as a tool to support effective e-moderation. It is therefore important to give some background as to what e-moderation is and the literature on the features of effective e-moderation. E-moderating has come to the fore as a research issue in the context of the increase in e-learning requiring new roles from teachers. E-moderating can be differentiated from the more generic term ‘e-tutor’ through a focus on learning through interaction in groups (Brychan et al., 2004). There is a considerable literature on e-moderating however much of this of limited relevance to the ARGUNAUT system as it assumes asynchronous contexts of use without the support of specific moderators awareness tools. The ARGUNAUT system implies a distinct new model of e-moderation and one of the questions in our evaluation is whether or not this new model can work and if so what affordances does it have in relation to other models? This is something that we pick up in the conclusion section at the end of the report.

Influential work on e-moderation from one of the pioneering institutions in e-learning, the UK Open University, has succeeded in associating this with the facilitation of group learning (e.g., Mason 2001; Salmon, 2005) where the moderator works to support collaborative learning in much the same way as a group facilitator works with face to face groups. On this model moderators are ‘hosts’ encouraging online socialization as well as teachers organizing learning activities. This view of e-moderation led to the widespread application of Lave and Wenger’s situated model of learning to online courses where the moderators take the role of ‘old-timers’ in the community welcoming in the students and establishing the shared ground rules (e.g., Wegerif, 1998: Conole et al 2006). With the advent of asynchronous computer conferencing there were high hopes that students would spontaneously learn from each other in online dialogues but it was found that learning dialogues seldom occurred without the active and time-consuming support of moderators. Diana Laurillard, writing from her experience at the UK Open University, claimed of online conferencing that ‘the success of the medium is totally dependent on a good moderator’ and summarised the evidence as to the extra duties of an e-moderator:

- negotiate goals and timelines,
• set up new branches and topics as discussion progresses,
• nurture group processes,
• ensure adequate responses and reactions to all relevant contributions (Laurillard, 1993, p169)

In practice all this extra work proves very expensive on tutor time. As Garrison and Anderson (2005) point out ‘social presence’ is vital for this model of e-moderating to work and it is harder to maintain social presence online than in a physical face to face setting. Tolley (2000) for example, goes as far as to argue that it needs up to three times more tutor time to moderate an online course when compared to face to face one.

Computer mediated synchronous communication such as MSN chat has always been popular and has been used in education, but there is little literature on moderating synchronous communication in education since with most tools the conversation is so fast paced that moderating is almost impossible to do (Williams, 2006). McAllister and colleagues (2004) argue that synchronous communication is more motivating for students and engages them in thinking more effectively than asynchronous forums that are often underused. They have developed a synchronous system, InterLoc, to support learning through dialogue but it is noticeable that the only role for the moderator in their system is to set up the topics beforehand and to invite students to start the dialogue and then to tell them when the dialogue is over. In synchronous chat the messages fill up the screen so fast that the role of facilitator of group processes is not possible.

The ARGUNAUT system has been designed to respond to the limitations revealed by research into both asynchronous and synchronous online learning environments. It responds to the cost implications of the established model of e-moderation by enabling moderators to moderate several maps at once. The feasibility of this was investigated particularly through the research design in Colombia (section 2.1) the UK (2.2) but also in Israel (2.3) and in Germany (2.4). ARGUNAUT’s moderator awareness and intervention tools and its use of a graphical discussion map environment (Digalo) were intended to solve the problem of how to moderate synchronous online dialogue. The evaluations reported investigated whether or not and in what ways it had succeeded in doing this. However, this ‘scaling up’ and transformation of e-moderation through the use of mediating moderator’s tools and data representations inevitably leads to a transformation of the role of the e-moderator, and this
transformation of the role of moderator was also investigated in all the studies reported below with a particular focus on what is gained and what is lost in relation to more established models of e-moderation.
4. Individual Evaluation and Experimentation Reports

4.1 Evaluation and experimentation at the Open University of Bogota, Colombia

Christa Asterhan, Reuma de Groot, Raul Drachman, Rakhele Hever (HUJI), Luis Maldonado, Diana Landazábal, Linda Leal (UNAD) & Ulrich Hoppe (UDE)

4.1.1 Rationale and objectives

In March 2008, Raul Drachman, Reuma De Groot and Ulrich Hoppe visited the Open University of Bogota (Colombia) (hereafter referred to as UNAD). They guided an extensive 4-day workshop with four UNAD tutors, two research assistants and one senior researcher. Following the 4-day workshop, the UNAD staff executed a 4-day pilot study according to a research plan and accompanying tools provided by the HUJI team (and translated into Spanish by Raul Drachman).

The group of Prof. Luis Maldonado at UNAD has gained extensive experience with the development of Digalo-based learning activities and the implementation of these activities in actual classroom education and rehabilitation-oriented education of former FARC members. This experience was developed in a separate project called “Proyecto Digalo”, funded by the local government of Colombia and led by members of the HUJI team (Raul Drachman and Reuma De Groot). Many UNAD teachers have since developed a tradition of implementing argumentative activities in their classroom, with the help of Digalo software. We believed that this experience would prove to be an important pre-condition for a successful implementation and quick uptake of the Moderator's Interface: Teachers already know how to develop successful argumentative activities (using the Digalo tool), they have a clear goal of what they would like to achieve with such activities, and they know the discussant environment. No additional training activities are needed on that part (see the public

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1 For the antecedents and background information that led to carrying out a workshop and subsequent pilot study in Colombia for the ARGUNAUT project, please see the periodic and final Activity Reports.
ARGUNAUT deliverable D6.2 on further discussions on this issue). On the other hand, however, the UNAD team was not updated concerning the rationale and development of the ARGUNAUT moderation tools, which made the UNAD team a particularly promising target group to introduce the moderation tools to.

The combined goals of the workshop and the pilot study activities at UNAD (Bogota) were as follows:

a. Introduction of the ARGUNAUT system to a new community of learning scientists and educational practitioners (Note: the Open University tutors have extensive experience in e-moderation of learning activities). The objectives of these dissemination aspects of the UNAD activities are further discussed in document D7.2.

b. Test robustness of the ARGUNAUT system (v 0.51) in various settings, outside the Ziv school and the HUJI settings

c. Pilot testing of ARGUNAUT final evaluation tools

d. Usability assessment of the Moderator's Interface features

e. To investigate how tutors appropriate the Moderator’s Interface features in successive activities with both single-group moderation and simultaneous-moderation settings:

f. Collect data for final evaluation, concerning difference between direct moderation in Digalo vs. moderation through the Moderator's Interface

4.1.2 Method

4.1.2.1 Participants

• Four experienced UNAD tutors, two observers
• 10 High school students
• 10 B.A. students

4.1.2.2 Tools

• Questionnaires: Q_ModStyle, Q_Usability, Q_StudentExp, Q_ModeraExp (see appendices 1, 2, 3 and 4).
• Installed screen-recording software could not simultaneously run with the ARGUNAUT clients (v. 0.51). Therefore, observer sheets were developed to report on the moderator's actions and use of the Moderator’s Interface functions.
• Focus group discussions (previous to workshop and after case 0)
• Interviews with two moderators after the pilot study

4.1.2.3 Procedure

The UNAD activities consisted of:

(1) A preparatory stage under guidance of and with physical presence of the ARGUNAUT team, which included walk-throughs, hands-on experiences, reflective group discussions, and first try-outs with real students;

(2) A pilot study independently carried out by the UNAD team and reported to the HUJI ARGUNAUT team.

The complete plan of the workshop activities, the pilot study and the accompanying data collection activities are summarized in the table below:

Table 1. Design plan of the UNAD activities

<table>
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<th>Day</th>
<th>#</th>
<th>Action</th>
<th>Description</th>
<th>Data collection</th>
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<tr>
<td>PART I: WORKSHOP</td>
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<td></td>
<td></td>
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<tr>
<td>Day 1</td>
<td>1</td>
<td>introduction</td>
<td></td>
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<tr>
<td></td>
<td>2</td>
<td>questionnaire</td>
<td>Questionnaire on role of teacher in e-moderation in Digalo</td>
<td>Q_ModStyle</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Discussion: why moderation?</td>
<td>Guided discussion on moderation of argumentative discussions, role of teacher. Analyze two maps in Spanish with direct Digalo moderation</td>
<td>protocol transcription</td>
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<tr>
<td></td>
<td>4</td>
<td>Verbal description of Mi rationale</td>
<td>Introduce the rationale of the ARGUNAUT system</td>
<td></td>
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<td></td>
<td>5</td>
<td>Video part I</td>
<td>until the Moderator’s Interface part</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Walk-through: Paseo, Digalo2</td>
<td>Show and do together: open files, creating, managing files, setting up map configurations etc, + play around with Digalo2</td>
<td></td>
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<tr>
<td></td>
<td>7</td>
<td>Video part II</td>
<td>Show the Moderator’s Interface part of video, with verbal description</td>
<td></td>
</tr>
<tr>
<td>Day 2</td>
<td>8</td>
<td>Walk-through: Moderator’s Interface</td>
<td>Go through the different functions of the system, one-by-one.</td>
<td></td>
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<td></td>
<td>9</td>
<td>Role-playing: simulation of moderation</td>
<td>Two teachers have discussion in Digalo, two others moderate through Moderator’s Interface &amp; vice versa.</td>
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<tr>
<td></td>
<td>10</td>
<td>Group discussion</td>
<td>Discussion and collaborative preparation of case 0</td>
<td></td>
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<tr>
<td></td>
<td>11</td>
<td><strong>Internal Skype</strong></td>
<td><strong>debriefing and refining</strong></td>
<td></td>
</tr>
<tr>
<td>Day 3</td>
<td>12</td>
<td>Actual moderation (case 0)</td>
<td>Pre-prepared case, with 20 student discussants</td>
<td>observation sheets</td>
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<tr>
<td></td>
<td>13</td>
<td>Questionnaire administration</td>
<td>Usability questionnaire</td>
<td>Q_Usability</td>
</tr>
<tr>
<td>Day 4</td>
<td>14</td>
<td>Group discussion</td>
<td>Reflection on usability, share information, what was most useful, what did not understand, Q&amp;A</td>
<td>protocol transcription</td>
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<tr>
<td>Day 4</td>
<td>15</td>
<td>Preparation day</td>
<td>Preparation of the cases for pilot study</td>
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**PART II: PILOT STUDY**

<table>
<thead>
<tr>
<th>Day 5</th>
<th>16</th>
<th>Pilot: case 1</th>
<th>Tutors A &amp; B: Digalo, Tutors C &amp; D: Moderator's Interface</th>
<th>observation sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 6</td>
<td>17</td>
<td>Questionnaire administration</td>
<td>Questionnaires to students and moderators on moderation experience</td>
<td>Q_StudentExp Q_ModeraExp</td>
</tr>
<tr>
<td>Day 6</td>
<td>18</td>
<td>Pilot: case 2</td>
<td>Tutors A &amp; B: Moderator's Interface Tutors C &amp; D: Digalo</td>
<td>observation sheet</td>
</tr>
<tr>
<td>Day 6</td>
<td>19</td>
<td>Questionnaire administration</td>
<td>Questionnaires to students and moderators on moderation experience</td>
<td>Q_StudentExp Q_ModeraExp</td>
</tr>
<tr>
<td>Day 7</td>
<td>20</td>
<td>Pilot: case 3</td>
<td>Tutors A &amp; B: two sessions each (Moderator's Interface)</td>
<td>observation sheet</td>
</tr>
<tr>
<td>Day 7</td>
<td>21</td>
<td>Questionnaire administration</td>
<td>Questionnaire on role of teacher in e-moderation: Moderator's Interface Usability questionnaire (2nd time)</td>
<td>Q_Modstyle* Q_Usability*</td>
</tr>
<tr>
<td>Day 8</td>
<td>22</td>
<td>Pilot: case 4</td>
<td>Tutors C &amp; D: two sessions each (Moderator's Interface)</td>
<td>observation sheet</td>
</tr>
<tr>
<td>Day 8</td>
<td>23</td>
<td>Questionnaire administration</td>
<td>Questionnaire on role of teacher in e-moderation: Moderator's Interface usability questionnaire + satisfaction (2nd time)</td>
<td>Q_Modstyle* Q_Usability*</td>
</tr>
</tbody>
</table>

* Failed to be collected

All topics for discussion referred to social dilemmas and were collaboratively developed by the tutors

Due to local difficulties (a/o communication barriers, dropout of one of the four moderators, technical difficulties), the actual execution of the pilot study by the UNAD staff was as follows:
Table 2. Actual execution of the pilot study research design

<table>
<thead>
<tr>
<th>case</th>
<th>group 1</th>
<th></th>
<th>group 2</th>
<th></th>
<th>group 3</th>
<th></th>
<th>group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Juan Carlos (MI)</td>
<td></td>
<td>Martha (MI)</td>
<td></td>
<td>Milcon (MI)</td>
<td></td>
<td>Jorge (MI)</td>
</tr>
<tr>
<td>25/03</td>
<td>Juan Carlos (MI)</td>
<td></td>
<td>Martha (MI)</td>
<td></td>
<td>Milcon (Digalo)</td>
<td></td>
<td>Diana (Digalo)</td>
</tr>
<tr>
<td>26/03</td>
<td>Juan Carlos (Digalo)</td>
<td></td>
<td>Martha (Digalo)</td>
<td></td>
<td>Milcon (MI)</td>
<td></td>
<td>Juan Carlos (MI)</td>
</tr>
<tr>
<td>27/03</td>
<td>Marta (MI)</td>
<td></td>
<td></td>
<td></td>
<td>Milcon (MI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28/03</td>
<td>Milcon (MI)</td>
<td></td>
<td></td>
<td></td>
<td>Juan Carlos (MI)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.1.3 Outcomes and conclusions

**Testing ARGUNAUT v. 0.51**

The operation of the ARGUNAUT system v. 0.51 proved to be rather problematic in all but the final day of the study (see Table 3).

Table 3. *Moderator’s Interface functioning during the different days of the study*

<table>
<thead>
<tr>
<th>case</th>
<th>Technological difficulties reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Moderator’s Interface is very slow (delay of app. 10 minutes until update and receiving of messages)</td>
</tr>
<tr>
<td>1</td>
<td>Moderator’s Interface does not work well (reasons unclear from report)</td>
</tr>
<tr>
<td>2</td>
<td>No communication between Digalo environment and the Moderator’s Interface at all</td>
</tr>
<tr>
<td>3</td>
<td>No communication to the Digalo environment; ADs work well (Martha), Moderator’s Interface freezes completely (Milcon)</td>
</tr>
<tr>
<td>4</td>
<td>No problems reported</td>
</tr>
</tbody>
</table>

Remote assistance was provided by the Fraunhofer and UDE teams through TeamViewer software, which led to the identification of important operational difficulties. This, in turn,
enabled significant improvements in the following releases of the ARGUNAUT system (see section 1.2 for further details).
However, as a result of this malfunctioning other objectives of the pilot study could not be achieved. Most importantly, the questionnaires filled in by moderators and students immediately following each session to assess differences in awareness, mental effort and satisfaction (Moderator's Interface vs. Digalo moderation) could not be reliably analyzed, since students and moderators actually reported on non-existing, f2f or Digalo moderation instead of Moderator’s Interface moderation. Following we briefly report on the outcomes of the UNAD activities that could be achieved in spite of these major technological difficulties:

**Pilot testing of ARGUNAUT final evaluation tools:**
The tools were found to be successful. They were then adapted and submitted as an Annex to D6.2, "Tools for final evaluation".

**Usability of the Moderator’s Interface features**
Following the training session and case 0, three moderators rated the usability of the different Moderator’s Interface functions (v. 0.51):

![Usability ratings of the Awareness features by UNAD moderators (N=3)](image)

*Figure 1. Usability ratings of the Awareness features by UNAD moderators (N=3)*
Similar to findings from the teacher workshops in Fall 2007 (see D6.2), the Remote Pointer and the Ontology Use Awareness tab did not receive high ratings. Other functions were rated as useful for e-moderation, with the Highlight function, the Group Relation tab and the Mini-visualizations with highest ratings.

**Reflections on moderation through the Moderator's Interface**

In spite of the fact that in most cases the Moderator’s Interface could not be reliably used for real-time moderation of Digalo discussions, the moderators were able to form a reasonably good impression of the Moderator's Interface's affordances, how the tools could support their moderation and how this type of moderation is different from direct Digalo moderation modes. They very easily adopted its features and affordances. Following, we present the most important insights on Moderator’s Interface moderation that arose from the focus group discussions and the interviews:

- Overall, the moderators very much appreciated the Moderator's interface and its features. They reported that the program was easy to use and understand. One moderator particularly liked the option to send Pop-Up messages, which forces the students to read the moderator's interventions, whereas another moderator mainly focused on the Awareness features of the system (e.g., "Specifically, the Moderator’s Interface shortens the time a moderator has to spend in counting the contributions of each participant. All the information a moderator wants appears automatically during discussion and the graphs are very clear").
The moderators reported that simultaneous moderation of two discussions led them to divide their attention and caused them to be less able to keep track of the discussion development. They also reported that the Awareness Displays were particularly helpful in this case since they allowed for detection of instances that require intervention in a quick and easy manner.

The difference between direct Digalo and Moderator’s Interface moderation:

- According to one moderator the most important difference is the fact that the moderator’s interventions do not remain in the discussion map. He claims that this is more desirable, since when the moderator is “in the discussion map” his actions will have “too much impact” and will interfere with students’ autonomy.
- Another feature of the Moderator’s Interface that particularly impressed these moderators is the possibility to send private, personal messages to specific students.
- One particular moderator stated that the use of the Moderator’s Interface in combination with direct Digalo interventions would be optimal for moderation.

The Awareness displays can be used for synchronous moderation but also for off-line feedback. In particular, it was mentioned as a potentially useful way to prepare and personally tailor instructions and feedback in a series of Digalo activities (e.g., instructing a certain student to use more reasoned arguments in the x+1 discussion, based on the impressions from previous discussion x).

Regarding the role of the moderator: The four moderators that participated in the workshop conducted a group discussion on what the objectives of moderation should be. Collaboratively, they concluded that moderators should not be very dominant and interfere as little as possible. One of the reasons that they mentioned is the fact that the (Colombian) students’ focus is easily thwarted towards the moderator (who is regarded as an authority or an expert) and his actions, instead of communicating amongst themselves. According to them, a moderator should focus on (1) whether different perspectives are raised; (2) whether good arguments are made; (3) whether changes of opinions occur. They repeatedly stressed the danger of attempting to take control of the discussion in a direct manner, as is expressed in the following citation from the group discussion:
"The moderator can only present the question and he needs to let the participants respond freely. Only when the discussion reaches a dead-end, should the moderator intervene. The change in a position is not a direct result of moderator's intervention. The intervention should orient the discussion in new ways, such that a person may say: "I was wrong. I'm changing my position in this matter" (freely translated from Spanish).

- It is very important that students are informed beforehand of the fact that there is a moderator present, his/her identity and his/her mode of communication with them.
4.2 Evaluation and experimentation in the UK

Nasser Mansour, Rupert Wegerif, Mriga Williams, Maarten De Laat, Mike Charmada and Simon McAlister (Exeter)

An overview of the Exeter studies
In the UK we explored the use of the ARGUNAUT system as a new model of e-moderation through three separate studies. The first study was within an online course in e-moderation developed partly to test and discuss the ARGUNAUT system, here various factors including the early stage of technical development led to limited but informative data in the context of online use at a distance (section 2.2.1). The second study was in a Secondary School called Carisbroke where we had already been working with Digalo (section 2.2.2). Here we tested the ARGUNAUT Moderator’s Interface and got feedback on its features using talk-aloud protocols. Due to technical difficulties again we did not fully test the functionality of the system when working with it live but the three school moderators did manage to use and discuss many of the functions (section 2.2.3). These studies help prepare for the final main study which was with Students in Exeter University. Here we tested the functionality of the ARGUNAUT system working with a range of different scripted activities focusing on the question of the scalability of the system (Section 2.2.4). The combined results of the 3 moderators' feedback in the high school and the 3 moderators' feedback in the Exeter University main study are presented together in section 2.2.5. Moderators’ experiences and feedback of using Moderator’s Interface to moderate multiple discussions comparing with their experiences of moderating one discussion are presented in section 2.2.6.

4.2.1 Study 1: E-moderation course

4.2.1.1 Rationale and background
We developed a short online workshop on 'E-Facilitation' with the aim to give the participants an understanding of the role and skills of an e-moderator as well as an opportunity to use the synchronous tool Digalo. The content of the course allowed for not only learning to use the tool but also to gain some understanding of the ARGUNAUT System. At the same time it allowed us to pilot the Moderator’s Interface and to provide feedback for improving the system.
4.2.1.2 Method

Participants & procedure

The participants were recruited via the Miranda Network and the University staff development website. There were 16 participants from varied background of school teachers to university lecturers and even an education management consultant and a learning technologist. There was varied level of experience with online facilitation - novice to proficient. The distribution was across the world as we had participants from New Zealand, Australia, Singapore, Trinidad, France and UK. During the workshop, along with the asynchronous discussions we carried out 4 synchronous discussions using the Digalo in small groups of 4. One of these sessions in early 2007 tested an early version of the ARGUNAUT Moderator's Interface.

Data gathering and related issues: The data was gathered by using questionnaires for the students and the moderator, observing participants and holding Focus Group discussions with the students. The gathering of data proved to be difficult within this experiment due to many reasons. Background information on Digalo and the guide to installing was provided but those who were not familiar with using technology had considerable problems. Motivation appeared to be another problem as not everyone came to the timetabled sessions nor took the opportunity to negotiate another time. Initially Mriga used both the Digalo screen to guide the participants in the use of the tool as well as lead the discussion.

4.2.1.3 Outcomes

The use of moderators interface proved difficult as it took too long for the moderator interface screen to update and the screen froze when using some of the functions such as usage (to identify "lurkers" and dominant participants) and the deep loop classifiers so they were not used. The moderator, Mriga Williams, used the text box to welcome learners, to ask participants why they were silent or if they were having a problem. The pointer plus text box was used to point to message and ask the individual a question. The highlight plus text box was used to make a comment specifically to a participant regarding the message. This use of highlight, pop up text box and pointer all helped to improve the quality of the discussion to some extent. A number of points emerged that were fed back into the development of the system and of pedagogical strategies:
• When using the tool for distance learners there is a definite need for this socialising activity to develop the community of learning. In Digalo it would be good to have a small space demarcated for socializing in such a way that the moderator could move the discussion into the ‘topic’ space at the right time.

• It would be beneficial if the individual could respond back - for example when the learner was quiet and the moderator asked if there was a problem she had to respond in MSN as to what was the issue. Where only one participant is being asked for clarification or information there is no way for that individual to communicate except via the main screen.

• It would be helpful if there was someway of maintaining a record of facilitation (pointer highlight text) other than not deleting as mentioned above. It would allow better analysis of the moderator role.

4.2.2 Study 2: Carisbrooke High School, Isle of Wight

4.2.2.1 Rationale and objectives

To produce more comparable maps to Israel where Digalo was used in high schools we worked with Digalo in a high school (secondary school) as an addition to our main research in Higher Education contexts with University Students. We sought to test the usability of the ARGUNAUT System in this context and found many technical problems. However we used this study to pilot the system and offer feedback for further development.

4.2.2.2 Method

We worked with two teachers of a year 10 (age 15-16) science class, and one teacher of a years 11&12 (age 16-18) English class. Each teacher used Digalo for three sessions, each one week apart. Each time when the moderator had gotten the groups working smoothly the Moderator’s Interface was started up and the teacher’s thoughts on using it were recorded using a Think Aloud protocol. We ran 3 sessions according to the following setup (see appendix 5 for the details of the preparatory handout and experiment design):

Procedure

The first session introduced Digalo to the students and set them a topic to discuss, that was familiar to them. A handout (Appendix 5) explaining the concept of argumentation and the
tool was provided to all the participants and the moderators.

The second session was an exploratory session where the participants were asked to undertake some reading of materials on a course topic, and primed with a short exposition of what makes a good argument.

The third session was on debating the topic and provides the opportunity for a more full-on confrontation within the group. This is designed to get participants to elaborate their own arguments, furnish supporting evidence and to find the weak points in others’ arguments. Important for the moderator to review examples of good practice found in the discussions to drive the main points about good argument home (see Appendix 5).

Participants
Within secondary school all students in the class undertaken by the 3 moderators were part of the sample. The year 10 Science class counted 18-22 students and the year 11&12 English class counted 12 students. The use of the tool was integrated into the regular teaching by the moderators and so did not require specific consent for the experimentation.

4.2.2.3 Outcomes:
Findings from the 3 moderators’ questionnaires were combined with the three moderators from Exeter University in the next study to provide synoptic results given in section 4.2.4.2 below.

Feedback from Think Aloud technique
Moderators used the Think Aloud technique during the First session and came up with the following points in relation to Digalo tool and the ARGUNAUT System. They identified the following issues from use of the tool Digalo -

- Doesn’t show the user’s name in hover - option
- Anyone can make themselves a moderator
- Anyone can move a pad into another portfolio
- Anyone can move a blank box - so when user has finished typing it disappears
- Option not to have blank boxes appear
- Some students have deleted other students boxes
- Is the note feature useful on boxes - sometimes people put an anodyne header so
They identified the following issues from use of the ARGUNAUT System (Moderator’s Interface) -

- No obvious menu for finding pads
- No confirmation on Send
- What is the popup wizard box - too mysterious - also presence box appears sometimes
- Why doesn't right-click give context menu - good for clicking on graph objects if you want to annotate, right-click on user object for popup
- Need a tab detailing all annotations - or option off/on
- Popup needs a reply option from student and confirmation popup received (because of delay)
- Need a tab dealing with popup messages and their replies

**Technical problems and final comments**

While Digalo worked smoothly throughout the sessions, the Moderator’s Interface was problematic. It was very slow to run, often being 5-10 minutes behind what was happening in Digalo. Several times it refused to display any data, either for all groups or for some groups. Interventions through the Moderator’s Interface messaging were possible on two occasions, in one there was a 5-10 minutes delay between the message being sent and being received, and in the other no messages were received. The speed and reliability of the Moderator's Interface v. 0.51, as installed at the school, is not viable for active moderation, though the analysis can be useful and the awareness tools were appreciated. Note: School technicians have said there was unlikely to be any server contention issues to slow the Moderator’s Interface down. In spite of the negatives, we obtained good data from the moderators on what they wanted and needed from a moderating tool, with a list of improvements that could be made to the software.
4.2.3 Study 3: Exeter Higher Education Context

4.2.3.1 Rationale and objectives

Our main aims were twofold: to explore whether the ARGUNAUT system could support the scaling up of moderation to moderate several groups at once and to understand the new kind of moderation style required by the system. We had several more specific objectives:

- To observe how and if teachers attitudes/beliefs change over time regarding moderation in general and Moderator’s Interface
- To test and improve a dialogical pedagogical framework with ARGUNAUT
- To observe what are the awareness indicators that the teachers use to develop their moderation interventions when moderating using the Moderator’s Interface
- To observe if the moderator will be able to moderate more than 1 discussion at the same time.
- To gather insights from the students as to how they receive the moderation interventions.
- To observe when moderating using the Moderator’s Interface, what are the remote control tools the teachers use to moderate the students

4.2.3.2 Method

Technical details

ARGUNAUT v 0.51 was installed on 19 desk-top computers in School of Education and Lifelong Learning. 16 desk-top computers were used by the students on one room (BC218) and the other 4 computers were used by the moderators on another Lab (BC219) (See Figure 1). We used these 3 computers as 3 separated servers to decrease the load on the computers. We used the TeamViewer (http://www.teamviewer.com) to record the Moderator’s Interface’s sessions. No technical problems were reported in any Moderator’s Interface sessions.
Procedure

In order to prepare for this final test at Exeter we decided to have a series of three teacher workshops/experiments of small evaluative steps. The advantage of running a series of experiments is that we could work with the same teachers in order to follow how they improve over time in becoming an online moderator using the ARGUNAUT system. We paid students for their participation in these quasi-experimental designs in order to avoid any suggestion that we were compromising the quality of their teaching by using them for experiments. Also based on their (teacher and student) input we were able to flexibly adapt certain pedagogical strategies and develop technical 'work around’ when needed.

Workshops outlines were as following:

The first Workshop (scheduled in December 07)
The teachers got introduced to the ideas and concepts of the ARGUNAUT project as well as hands on experience working with the Moderator's Interface.

The second workshop (scheduled in March 08)
During this workshop the focus was on developing the dialogic pedagogical framework to be used to design moderation and learning activities for the collaborative learning tasks run in ARGUNAUT.

The third workshop (scheduled on the 21st April 08)
During the third experiment we worked with one moderator per group to explore the use of the Moderator's Interface and with one control group receiving no additional moderation.
Each teacher used the six thinking hats and moderated one group of 4 students for 30-45 minutes. (See Appendix 6 for more details.).

**The fourth workshop (scheduled on the 12th May 09)**

The fourth and final experiment was focused on the central ARGUNAUT question. Will the system allow the moderator to moderate more than 1 discussion simultaneously? In order to test this question we asked the moderators to moderate four groups of 4 participants at the same time.
Workshop outline:
- The first part of each session was a short introduction to the teacher and students about the experiment (ground rules, task description, timing, roles, etc. (Researchers: 10 minutes)
- The second part of each session was used for discussions (Digalo - students) and moderation (Moderator's Interface - teacher). (30-45 minutes) Each teacher moderated 4 groups of 4 students at the same time for one hour. Each moderator used different pedagogical strategy (SWOT-Concept map-6 thinking hats) from the other moderators (see Appendix 6).

**Session 1:** Moderator 1 moderating 4 groups of 4 participants (Strengths-Weaknesses-Opportunities-Threats ‘SWOT’)

**Session 2:** Moderator 2 moderating 4 groups of 4 participants (Concept map)

**Session 3:** Moderator 3 moderating 4 groups of 4 participants (6 thinking hats)

**Participants**

Within these experiments we asked for volunteers to take part in the discussion from a cohort of undergraduate students who are studying a technology related module. The students were offered monetary compensation for taking part in the experiments. The expectation is that they would be spending a total of 6 hours in the two experiments held over a period of 3 months. We were looking to recruit 16 students who would form 4 groups of 4.

We also needed to recruit 3 moderators to carry out the online facilitation and use the moderator’s interface to support the discussions. Each moderator would moderate one group in the first experiment and one group would be control and have no moderator. While in the second experiment all four groups would be moderated by one moderator. This would mean that each moderator was to carry out this approach but with a different task to keep the students focused and motivated to carrying out the task. Again the moderators were volunteers with a specific interest in the use of synchronous on line learning tool as well as the use of ARGUNAUT system of moderating.

All students were given clear information about the experiments. They were asked to complete the university consent form for participants in research. All students and moderator
were informed of the ways in which confidentiality would be maintained when carrying out analysis and reporting the findings. The interaction transcripts from each experiment were recorded in its entirety (including the moderators’ interventions) using TeamViewer. The records would be kept secure within one of the team computers. The names of all the participants were removed and only identified by numbers (for example student 1, student 2 etc. and moderator 1 and moderator.

**Instruments**

**Affordance observation**
To analyze the Moderator’s Interface’s perceived affordances an observation is conducted with a user who is unfamiliar with the Moderator’s Interface and let him/her think aloud to explain purpose of features that the Moderator’s Interface provides. This was done with secondary education moderators specifically.

**Usability Questionnaire**
A usability questionnaire (see Appendix 1) has been used to inform developers regarding technical functioning as well as perceived usefulness of implemented features during the design process. This was used to gain data from all the moderators involved with the experiments.

**Focus Group discussions and Individual interviews**
Following the activities with the Moderator’s Interface / ARGUANUT system and the questionnaires, users have been asked to participate in either focus group discussions (end-users in design workshop conditions) or individual interviews (single test-users). The questions that been asked in both types of methods focused on general satisfaction of the tool and specific functioning and usability of the individual features. This was used to gain data from all the moderators involved with the experiments.

**Critical event recall interviews (CER)**
Content analysis (CA) of the moderators’ screen recording has provided us with evidence of learning and tutoring process patterns that were occurring in this group during the moderation task. To understand these patterns further, we used the summary results of the CA as a stimulus for CER interviews with the moderators. This was done to gain feedback from them about their own understandings of the patterns that emerged, and to help us to
understand the context in which these patterns were emerging (De Laat & Lally, 2004). This method of data collection was used for higher education moderators specifically as it was easier than Think Aloud for this group of moderators. Table 1 below shows examples of CA and CER.

Table 1: Examples of CA and CER after using Moderator’s Interface

<table>
<thead>
<tr>
<th>Time</th>
<th>Content Analysis of the Event (CA)</th>
<th>Critical Event Recall Questions(CER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderator started to set up roles with</td>
<td>Why did you add these words to alerts?</td>
<td>Why did you add these words to alerts?</td>
</tr>
<tr>
<td>words (claim, think, reason, agree,</td>
<td>What is the relationship between these words and the students' task?</td>
<td>What is the relationship between these words and the students' task?</td>
</tr>
<tr>
<td>disagree, my idea)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderator didn’t do anything at all from</td>
<td>What you were thinking of during this time?</td>
<td>What you were thinking of during this time?</td>
</tr>
<tr>
<td>6.59 to 16.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checked the time span</td>
<td>What you were thinking of?</td>
<td>What you were thinking of?</td>
</tr>
<tr>
<td>Sent first message saying “……”</td>
<td>Do you think this message was on the right time or a little bit late? Why?</td>
<td>Shall you explain why?</td>
</tr>
<tr>
<td>When you read the students' texts. I</td>
<td></td>
<td>Also, you didn’t read them from Digalo? why</td>
</tr>
<tr>
<td>noticed that you read them randomly and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>not in order!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second message saying “…..”</td>
<td>What were you thinking of when you sent this message? Why did you sent it to the whole group,</td>
<td>What were you thinking of when you sent this message? Why did you sent it to the whole group,</td>
</tr>
<tr>
<td></td>
<td>and not just to the student who suggested the question?</td>
<td>and not just to the student who suggested the question?</td>
</tr>
<tr>
<td>Used Group Relations &amp; User Activity</td>
<td>Why did you use these tools at this time?</td>
<td>Why did you use these tools at this time?</td>
</tr>
<tr>
<td></td>
<td>Then you went to Digalo, why?</td>
<td>Then you went to Digalo, why?</td>
</tr>
<tr>
<td>Ontology Use - Digalo map - Ontology Use</td>
<td>Why did you go through this series of actions between the Ontology Use tab and Digalo? What</td>
<td>Why did you go through this series of actions between the Ontology Use tab and Digalo? What</td>
</tr>
<tr>
<td>- Digalo map</td>
<td>you were thinking of? How did these actions help you for your moderation of this group?</td>
<td>you were thinking of? How did these actions help you for your moderation of this group?</td>
</tr>
<tr>
<td>Used Group Relations and User Activity at</td>
<td>Why? What information did you come up with using these tools? How did it help your moderation</td>
<td>Why? What information did you come up with using these tools? How did it help your moderation</td>
</tr>
<tr>
<td>the same time!</td>
<td>process at this stage? What decision did you make based on this information?</td>
<td>process at this stage? What decision did you make based on this information?</td>
</tr>
<tr>
<td>Used Group Relations &amp; User Activity</td>
<td>Why did you use this tool at this particular time? And what decision or action you did you make</td>
<td>Why did you use this tool at this particular time? And what decision or action you did you make</td>
</tr>
<tr>
<td></td>
<td>based on</td>
<td>based on</td>
</tr>
</tbody>
</table>
In order to evaluate teachers’ perceptions of moderation and how this changes over time was use a pre-questionnaire on moderation before the first experiment was held followed with a post questionnaire and a final interview. This pre-questionnaire was filled out during the first teacher workshop where the teachers get introduced to the ideas and concepts of the Digalo tool and ARGUNAUT project as well as get hand on experience working with the Moderator's Interface.

Technical issues
There was no problem running the Digalo tool at any time in the Exeter University study. There was a problem interfacing with a distant server. We, therefore, had to install a local server for the ARGUNAUT System so that the Moderator's Interface could be run more smoothly. In Exeter University as in the High School there were issues of the Moderator's Interface functioning smoothly as there was a time lag in all updates whether from the client screen or from the moderator's attempts to moderate the discussion.

4.2.3.3 Outcomes

Exeter student perception of use of ARGUNAUT system

The data regarding students' satisfaction with moderation and their perceptions of the moderator's actions and the quality of discussion and moderation are elaborated below, for the 16 students who participated in this study.

Students' satisfaction:
18.8% of students were satisfied with teachers' moderation one discussion.
12.6% of students were satisfied with teachers’ moderation more than one discussion.

**Students’ perceptions of the moderator activity:**
Students expressed that the teachers didn’t address them personally and comment on their ideas and views that they had. The moderators just stuck to keeping them on track by telling them move on to the next sections. Also, they didn’t stop discussion that was not relevant to the task. These things happened much more when moderating more than one group. One of the students commented: “Probably happened because they were monitoring too many groups at once and could not get involved enough with individual participants and keep track of everything that was being said.”

- 43.8% of the students noticed that the moderator was active in moderation one discussion.
- 12.6% of the students noticed that the moderator was active in moderation more than one discussion.

**Moderator’s contributions:**
In general, students expressed that the Moderator’s Interface made positive contribution to the discussion. One of the students said:

*I remember the teacher commented on our discussion when our group went off task by prompting us to continue with the original task in hand. I also remember that when we wanted to conclude on our thoughts the teacher prompted us to move over to the left hand side of the page, we hadn’t previously realised that the page would expand if we all dragged the brainstorming boxes over. Once I realised that the moderator was interactive I asked a question about the reward for taking part in the research project and was supplied quickly with a response that came up on my screen. I liked the fact I had to press ok to show that I had seen what the moderator was trying to tell me as it ensures no one will miss something they have been told.*

Another student commented: “I liked the way the moderator communicated with us, it allowed us to get on with what we were dong but we knew he was there for guidance and support if needed.”
75% of the students have expressed that they noticed the moderators’ contributions during moderation in one discussion (workshop 3).

59.2% of the students have expressed that they noticed the moderators’ contributions during moderation in more than one discussion (workshop 4).

Moderation & quality of the discussion:

- The moderator who moderated one discussion helped 18.8% of students with their discussion.
- The moderator who moderated more than one discussion helped 6.3% of students with their discussion.

Quality of the moderation:
Students expressed that the interventions were quite equally balanced and of the right nature. One of the students commented that: The interaction could sometimes be a bit more explicit, for example, we were told to move on to the next activity but we thought we had already gone too far ahead so just assumed the message was sent to the whole class and didn’t move on. Maybe if we were told what part of the exercise to move onto in would have been more effective.

- 6.3% students noticed that the moderator has intervened much when moderating one discussion.
- 50% of students expressed that the moderator with one discussion was clearer than the moderator with more than one discussion
- 31.6% noticed that the moderator with one discussion was much helpful to keep them focused on task. However, 6.3% expressed that they kept focusing on the task by the help of moderator during the multi-moderation session.
- 37.6% of the students expressed the moderator was helpful with the discipline of the discussion. However they expressed that the moderators did not care for the discipline of the discussion at all during the multi-moderation session.
• 31.3 % of the students expressed that there was much time for the moderator when moderating one discussion to listen and understand what they said in the discussion. However, this caring was decreased to 25% during the multi-moderation session.

Problems of moderation during the discussion:
Students expressed that occasionally they received comments telling them to move on to the next task, or suggesting that they were off task. One comment said: "The comments appeared to be delayed, as sometimes we were told to move on several minutes after we already had."

• 68.8% of the students expressed that the moderator was quite slow in his responses when moderating one discussion. However, the moderation went worse and slower when the moderator moderate more the one discussion.
• 6.3% of the students expressed that the moderator's comments interfered with the discussion.

What the moderator should do but DID NOT:
Students made comments about the moderator should do when moderating one discussion or even more than one discussion:

• He should have interacted on a more regular basis so that we knew what we were doing correct and he could have offered more support so we felt more confident when contributing
• We often went off task and I feel that the teacher should have intervened.
• Also it would have been nice to have some positive praise or reflections on our comments to let us know we were on the right path and to encourage us to continue.
• Perhaps if they had gotten involved and asked questions or stated their opinions in the discussion too, that would have been nice.
• He could have guided us more and been more supportive towards our ideas. There were times when he addressed the wrong person about issues. Also there were times when we did not understand something and he should have been there to explain. Perhaps Digalo should invent a separate box which highlights when one needs help and then the teacher can address the problem straight away.
• I think it may have been helpful for him to remind us we only had a few minutes left at the end of each task - he did do this at the very end of the overall task but it may have been more useful throughout.

Combined moderator data from Carisbroke High school and from Exeter University

Since our main research focus was on the moderator experience with the Moderator's Interface the same questionnaires about the role and skill of a moderator when facilitating a discussion using the ARGUNAUT system as well as the evaluating the system itself were given to the 3 High School moderators and the 3 Exeter University Moderators, making 6 respondents in all. The data from the Questionnaires and the focus group interviews was collected and the findings explained below.

**Moderators' perceptions on the role and skills of online moderators**

The moderators agree that the online moderator -

1. Motivates the students (100%)
2. Encourages the participants and participation (100%) by getting the students contributing and thinking, asking questions, reflecting on interesting contributions and getting students to bring different perspectives to the discussion.
3. Should not become part of the discussion (84%).
4. Should role model scaffolding by encouraging the students to refer and respond to each other's words (84%).
5. Keeps the discussion focused (67%) while the rest do not feel it is so important to manage the activity.
6. Creates a good learning environment (67%) by jumping in when you see things that will upset others, moderate behaviour, ensuring no rude behaviour or bullying was taking place, leaving people space to make mistakes, using his/her presence in a way that is not intrusive yet that is effectively raising the quality of the discussion.
7. Gives feedback and monitors the dialogue for quality (33%)
8. Eagle-eyed and alert to what is happening on the screen (33%)
These points are very much related to what Garrison and Anderson refer to as ‘teacher presence’ (Conole et al., 2006) except for point 6 and 8 which relate to what they call ‘social presence’.

There were few comments (33%) on actual skills required for online moderation which are specifically related to social presence and also for technical support for participants new to technology -

- IT skills
- multi-tasking skills
- good online communication skills
- good interpersonal skills

The moderators were of divided opinion with regards to following aspect of the role of online moderator -

- To make sure that the students know the teacher is present and reading what they say
- Encourage students to regulate and coordinate their discussions
- To make sure that the students are using good arguments
- To contribute to the discussion expert content-area knowledge about the issue being discussed
- To challenge the students cognitively
- To raise aspects that haven't been raised yet
- To be fair and just
- To be supportive
- To use humour

The comments in this section are indicative of a mix of personal experience and philosophy of teaching role. Some of the moderators have clearly indicated that they have difficulty with the issue of not being able to ‘control’ the group nor interact with the participants during the online discussion as they would in a face to face discussion.

**E-Moderation using the Moderator’s Interface**
The moderators’ responses to questionnaires and focus group interview after the experiments were collated in relation to overall impression of ARGUNAUT system in supporting them to moderate and online discussion and also individual features that are part of the tool. The moderators in the school used different versions of the ARGUNAUT system Moderator’s Interface from the moderators carrying out experiments with undergraduate students since the latter were carried out later that the school experiments.

General Comments

- Very powerful - range of tools was pretty innovative, pretty original (33%)
- Turns the data into something that is fairly quickly interpretable (33%)
- Some of the tools there were making pretty sophisticated use of the data pretty quickly (33%)
- Slow and unresponsive (33%)
- The view is tiny because the controls at the bottom of the screen take up so much room (16%)
- Highlight someone’s name and their contributions come up highlighted (16%)
- Can’t see any annotations attached to any of the boxes (16%)
- Cues in the interface not very useful (16%)
- Some of the tools there were making pretty sophisticated use of the data pretty quickly (16%)
- The Discussion Graph tab and Digalo screen were differently displayed and so had to flip from screen to screen (16%)
- Any tools used and messages sent had to be deleted to remove from the student screen (33%)

Difficulties perceived by the moderators -

- Initially it was difficult to get the students to take the tool seriously to allow Moderator’s Interface to get going (16%)
- User does not have control over who gets which avatar nor be able to change accessibility from private to public and vice versa. Need to ensure you do not set yourself as a user (16%)
- Problem using some tools, messaging system and deep loop (16%)


• There was no record of moderating events for you to see and reflect on later as all the messages and pop ups as well as other tools had to be clicked off after use (16%)
• Way for students to respond privately back to the moderator (16%)

Overall only few of the moderators made these general comments. Many of the perceived difficulties were due to technical issues or lack of familiarity of the Moderator’s Interface as well as with Digalo. Again the difference of opinion about the tool was also based on the comfort level of the moderator in using synchronous online discussion.

**Moderators’ comments on the various Moderator’s Interface features**

All the tools established within the Moderator’s Interface are supporting the moderator to be effective in their online moderation of synchronous discussion.

- **User Activity tab.** Used by 84% of which 33% would not use it again, while the other 50% felt this was a useful tool and the rest would use it occasionally.
  Comments -
  • Crude quantitative view that someone is contributing, not so useful in moderating multiple discussions, becomes too complex for the moderator, don’t know why or when to use this (50%)
  • Information useful after the fact (16%)
  • Does not tell you the quality of contribution (16%)
  • To see if contributions were happening, helpful in seeing that the interaction between the students was taking place and balanced within the group (16%)

- **Discussion Graph tab.** Used by 67% and not by the rest but all (100%) agreed that it was a useful tool.
  Comments -
  • Could see the use of highlight or pointer here (16%)
  • Could have the same screen as Digalo and be able to have these features seen there rather than open 2 screens to see real features (84%)
  • Provides overview and sense of the map (50%)
- **Group Relations tab.** Used by 100% with 50% stating they find it useful, 33% do not find it useful while rest are unsure of its usefulness.

Comments -
- If someone does not link contributions you can send private message. Useful if student could respond back privately as well (16%)
- Never did figure out what it does (16%)
- Limited use if the group is small (3 or 4) but would give good view of interactions distribution if the group was large (16%)
- To see if interaction between the students was taking place and balanced within the group (50%)

- **Shape (Ontology) Use tab.** Used by 50% of the moderators, however all feel it is a useful tool.

Comments -
- It would be useful to know what sort of contributions were being made (50%)
- To see an individual breakdown of contributions (33%)
- Have a visual of the deep loop (16%)

- **Participation Statistics tab.** Used by 50% and considered useful tool to have.

Comments -
- A quick overview of each participant's actions (50%)
- Not useful in seeing who has been quiet for some time (16%)

- **View per session or per discussion.** Used by 50% of the moderators and most found it not useful.

Comment -
- See all the discussion as 4 small windows. I had the Discussion Graph tab on the main window box and the User Activity tab in the small windows on the side (16%)
- To have an overview of a discussion or discussions (16%)

- **Remote pointer.** Used by all the moderators but 50% are unsure of its usefulness.

Comments -
- Pointing out interesting/important contributions (16%)
• I point but they do not know why (16%)
• Time lag before the pointer hand is seen by the students and the discussion has moved on. (33%)

- **Highlight**: Used by all but considered useful only by 50%.
  Comments -
  • To point to a specific message (16%)
  • Since the highlighting was not very clear (too thin). (16%)

- **Annotate**: Used by 84% of the moderators, however all felt that this was a very useful tool.
  Comments -
  • To communicate with the participant(s) by commenting on their shapes (50%)
  • In combination with a highlighter or pointer (33%)
  • Cannot see the annotated comments (50%)

- **Popup**: Used by all moderators and deemed to be a very useful tool.
  Comments -
  ▪ Great for management (67%)
  ▪ Give feedback (16%)
  ▪ It is very quick and direct (84%)
  ▪ To give general message as each name has to be highlighted (16%)
  ▪ The participants do not have a chance to respond directly to the moderator (16%)

### 4.2.3.4 E-Moderating multiple groups using the ARGUNAUT System

All Moderators had the experience of moderating more than one group simultaneously. While Moderators at Exeter University had an opportunity to compare the experience of one to one group and one to multiple groups, the Moderators from Carisbroke High School had only moderated one to multiple groups. The Moderators were all of the opinion that the challenge of undertaking moderating increased considerably when number of groups was increased.
Some general comments from moderators’ about using Moderator’s Interface with multiple groups comparing with moderating one group:

- When moderating one discussion, it is possible to follow the thread of the discussion and moderate when appropriate. However, it can be challenging to follow several people’s chain of thoughts and therefore the discussion development can sometimes seem a complex problem.
- I try not to intervene too much, but whenever I see quality in a discussion, I try to point it out to all the participants in order to encourage them to develop the idea further. The time was very tight when moderating multiple discussions.
- During multiple groups section, the postings are quick. It can be difficult to read the content and reflect on it. Moderating tools can be of help but then the content is usually lost by using them.
- While the Moderator’s Interface allowed us to visualise all the 4 groups in one window each feature however had to be viewed separately for each group. This led to a lot of flicking back and forth between the various screens for each group.
- The font size in the Discussion Graph tab is small and so keeping up with one map is hard and this multiple maps just increased this difficulty.
- The same issue was with using the other features like the pointer and highlight and popup as I had to be very careful about sending messages to the correct map.
- There was no time to carry out annotations and I tended mainly to use popup.
- I feel that this moderating multiple maps allowed me to just ensure social presence and some amount of teacher presence. If I was to use this as a regular feature and I had the opportunity to record my interventions alongside the map I would find it easier to use it to facilitate reflection on the learning at a later time.

The usability of the Moderator’s Interface’s awareness functions when moderating multiple groups compared with one group

Overall, the Moderators reported that it was quite useful to use the Discussion Graph tab and the User Activity tab for moderating discussions either multiple discussions or one group. However, they found it was much easier when using it with one group. On the focus group interviews after the multiple sessions, one moderator expressed: *I found it very difficult to use the Discussion Graph tab with multiple discussions*. All the moderators reported that
using the User Activity tab was very useful when moderating one discussion which helps to allow a quick view to see if everyone was talking. However, they found it very detailed for the amount of contributions happening in multiple maps comparing with one map. The Ontology Use tab was another feature of Moderator’s Interface that all the moderators reported that it was not useful when moderating multiple discussion comparing with using it during moderating one discussion. One moderator commented during the interview that it was not so useful in this complex moderating exercise, not enough time especially when moderating more than one discussion. All moderators expressed that using the Group Relations tab and viewing per session or person added were very important to understand the relationship between the discussants. However, they couldn’t use them much when moderating multiple sessions. One moderator reported that he used them once for only one group of the four groups. He commented they are marginally important tools when you have to look at four groups. Another reason of not using these tools was the time was very limited to follow up the discussions.

**The usability of the Moderator’s Interface’s remote control tools when moderating multiple groups compared with one group**

Overall, the moderators found it was very useful and easy to use the Popup tool and the Remote Pointer on both the multiple discussions and one group discussion. A comment from a moderator said the following: *Good tool, efficient and effective, draws attention of the participant(s). It worked very well with both multiple discussions session and one discussion session.* The moderators used the Popup tool mainly to direct and give feedback and maintain the environment. However one moderator reported that it was very hard to give general message as each name has to be highlighted. He commented on the interview that it was very time consuming when moderating more than one groups. Even the moderators reported that using the Highlight tool was very slow while moderating multiple maps; the found it very useful and easy when they used it with just one discussion. Also, the reported that it was manageable to use the Annotate along with Highlight when moderating one group but it was impossible to do that when moderating multiple sessions. One comment said I managed to use the Highlight once when moderating multiple sessions with only one group but of course I used so much when I was moderating one group.
References:


4.3 Evaluation and experimentation in Israel

Christa Asterhan, Baruch Schwarz, Rakheli Hever, Julia Gil, Reuma de Groot & Murielle Hadid.

The HUJI team initiated and guided two different studies in Israel with rather different, yet complementary goals and settings:

(1) Ecologically embedded field implementations:
The goal of these activities was to implement the ARGUNAUT system and teacher e-moderation practices of synchronous Digalo discussion in genuine school settings (secondary education).

(2) A semi-controlled laboratory study of successive moderation:
The goal of this study was to test the affordances of the ARGUNAUT system and to study how moderators appropriate its different functions after having gained extensive experience with e-moderation and the Moderator’s Interface. A semi-controlled format was preferred over authentic classroom settings so as to maximize the possibility to test specific questions concerning the affordances of the ARGUNAUT system. For this reason, a number of different set-ups were created (single vs. multiple moderation, Digalo vs. Moderator's Interface moderation, activities with different learning goals and different moderation styles) in a semi-controlled manner.

They are separately described in the next two sections.

4.3.1 Ecologically embedded field implementations in Ziv School

The following is a brief report on the experimentation and pedagogical development activities with secondary education teachers who implemented the ARGUNAUT system in genuine classroom activities. As a result of stability issues of the ARGUNAUT system that were resolved throughout the spring, part of the research plan that was planned to be executed with these teachers could not be completed according to the plans detailed in D6.2. Therefore, an additional experiment was conducted with University students to execute the research plan as planned (see section 2.2.2).
In the next section (4.3.1.1), we detail the reasons for this change in the genuine classroom study, followed by an adapted version of the Objectives and Rationale of the genuine classroom study (4.3.1.2). In the final section (4.3.1.4) we present the most important insights and conclusions from the classroom observation and reflective discussions with teachers.

### 4.3.1.1 A short background description

Six teachers from Ziv secondary school (Jerusalem) participated in an extensive in-service teacher-training course on the implementation of computerized communication technologies in their teaching practices, led by Reuma de Groot and Yoram Haim. In February-March 2007, four teachers integrated Digalo discussions in their regular curriculum classes. In this early stage of software deployment in actual school computer labs (with all its limitations), Digalo2 was successfully used with multiple Digalo clients within the ARGUNAUT (v. 0.5.1) system. However, as a result of serious stability issues with Moderator's Interface clients, classroom implementations of teacher e-moderation of student discussions through the Moderator's Interface had to be continuously postponed.

In June 2008, ARGUNAUT v. 0.67 was internally released. Around that same time it became also possible to access the ARGUNAUT v. 0.67 system through the Internet (via the Silogic server). Immediate testing sessions at the local school lab showed that this version allowed for a Moderator's Interface client and several Digalo clients to run simultaneously in a stable manner and that most of the Moderator's Interface functions functioned satisfactory. However, by then we had reached the last two weeks of the school year, which is traditionally characterized by many extra-curricular activities and events, final examinations and the close-down of facilities for reparation and renewal. In other words, the availability of teachers, students, supporting staff and facilities at this time of the school year is highly problematic.

All six teachers received training with the ARGUNAUT system in personal training sessions. Thanks to intensive efforts by the teachers, management and supporting staff at Ziv School in spite of the time constraints, three of the six teachers each managed to conduct classes in which students conducted Digalo discussions and teachers moderated through the Moderator's Interface. These practices and insights from them will be described in the next
section. The other three teachers will conduct ARGUNAUT sessions in September (start of next school year).

4.3.1.2 Rationale and Objectives

- To implement the ARGUNAUT tools in authentic secondary school settings
- To observe how teachers and students experience Moderator’s Interface-mediated e-moderation in authentic classroom settings
- To gather insights from the teachers concerning e-moderation in co-located classroom settings

4.3.1.3 Settings of the classroom implementations

**Technical details**

ARGUNAUT v. 0.67 was installed on 20 desk-top computers in Ziv school's computer lab (Pentium Dual; CPU: RAM 0.99 GB, 1.79 GHZ; windows XP 2002). A split-server setup (one local and the SILOGIC server available through the Internet) was employed in each classroom session. The number of clients that were run on the local server was progressively increased from session to session to test the robustness of the system. No operational or technological problems were reported in any of the different sessions, except for the fact that the Alerts option was not used (problems of identification accuracy as a result of ongoing improvement and development of these features).

**Procedure**

Each session was conducted with half a classroom (app. 16 pupils, or: 4 groups of 4 pupils, some of which had prior experience with Digalo1).

All the cases were developed by the teachers and Yoram Haim (the teacher-training instructor) and were integrated in the regular curriculum, but adapted in accordance with dialogical perspectives of leaning.

At least three adults were present in each session:

1) The teacher, who moderated one or two groups through the Moderator's Interface and during the discussions was seated behind her/his computer screen;
2) Yoram Haim, who provided f2f technical and operational support to the students when needed, and took care of discipline when needed;
3) A member of the ARGUNAUT HUJI team, who sat next to the teacher and provided operational support upon the moderator’s request;
4) In some instances a second member of the HUJI team was present to aid with data collection, video-recordings and helping out pupils if needed.

**Background details on the three teachers**

**Ned**

*The teacher:* A high school history teacher in his thirties, who is very enthusiastic about and open to integrating technologies in the classroom. However, his first implementation of Digalo classroom discussions in early spring (without the Moderator’s Interface) was a great disappointment to him (students misbehaved and the learning activity did not reach its goal). This significantly affected his motivation as well as his expectations from the second implementation (in June).

*Topic of discussion:* The British mandate in Palestine

*Grade:* 11

*Number of groups moderated simultaneously:* 1

**Miriam**

*The teacher:* An educator and mathematics teacher in her fifties, who defined herself as moderately techno-phobic. Throughout the teacher training activities she repeatedly expressed her scepticism about the potential effectiveness of modern communication technologies in school learning, and in addition was very apprehensive about her own functioning in such settings. She did not have any Digalo experience in a real classroom setting (but participated in two training workshop of 2 hours each with Digalo, in addition to the Moderator’s Interface training) prior to the June implementations.

*Topic of discussion:* In what cases will you (not) report misbehaviour of a classmate to your superiors? (i.e., given a number of scenarios)

*Grade:* 7

*Number of groups moderated simultaneously:* 2
Ada

The teacher: An educator and Biology teacher in her early thirties. She did not have any Digalo experience in a real classroom setting (but participated in two training workshops of 2 hours each with Digalo in addition to the Moderator's Interface training) prior to the June implementations.

Topic of discussion: Moral dilemmas in genetics

Grade: 9

Number of groups moderated simultaneously: 2

Data collection

- Observation prior to and during classroom implementations
- Presentations by each of the three teachers which reflected on their experience and the role of e-moderation and Digalo discussions in classroom activities

4.3.1.4 Insights from genuine classroom implementations of the ARGUNAUT system

Preparing the classroom activities

Prior to the classroom implementations, both Ada and Miriam frequently expressed apprehension concerning their ability to fluently operate the system in real-time and handle this novel classroom practice. To them, the tools seemed too complicated, they were confused as to their own role in such activities, and they thought that it will cause them to loose control of the classroom discussion. Their view of a good teacher is based on subject matter expertise, on the one hand, and pedagogical expertise on the other. Until their participation in the project, both teachers felt quite confident in these two areas. However, implementation of these new technologies requires novel pedagogies and skills, which in turn caused apprehension and reduced self-confidence. As a result, one of the teachers even decided to leave the in-service teacher training course for a while.
During the case preparation process the teachers were trained to use the Moderator's Interface and became familiar with the tool. In this process they prepared the maps by themselves which, according to them, significantly boosted their confidence. It was also decided that a HUJI team member would be seated next to the teacher to provide operational support upon request.

**Observations during the classroom activities**

All classroom activities followed the regular format of classes that include Digalo discussions (see D6.2): (1) introduction to the topic; (2) modelling ground rules of a civil, reasoned discussion; (3) introduction to the Digalo environment; (4) Digalo discussion in small groups; (5) summarizing and/or presenting conclusions in f2f format. The first five minutes of the Digalo discussions were characterized by students' questions on how to operate the system and create accounts, throughout which all of the three adults provided f2f assistance. After these few minutes, however, the students turned quiet and were very engaged in their online discussions. The teacher remained seated behind his/her computer throughout the Digalo discussion. Each of the teachers reported that they greatly enjoyed the activities in general and the option of e-moderation. Both the observers as well as the teachers defined the activities as very successful.

**How did the teachers operate the Moderator’s Interface?**

In spite of their apprehension and the fact that Ada and Miriam were only required to moderate one group, once they entered the Moderator’s Interface they immediately opened the discussion maps of two groups and operated the system without any notable difficulty. Ned, on the other hand, could only open one discussion map (since the other groups ran on the Silologic internet server) but, reportedly, could have easily handled more discussions (Ned: "I’ve done moderation of one group, but I think that it is important that next time I’ll do two groups").

As for the different awareness displays, both Ada and Miriam hardly used the statistical representations of discussion features. Instead, they mainly switched between the Discussion Graph tab and the Chat Table tab. Their e-moderation approach was mainly characterized by
their interest in what certain targeted students contributed to the discussion, such as students that are usually problematic in class, those that are expected to need support and encouragement, or those that are often quiet (e.g., Ada, while e-moderating: "Hmmm, I am interested what X thinks about the topic. I wonder whether he actually gave reasons for his opinion"). In other words, their approach was very individual and content-oriented and the Chat Table tab provides the most valuable information for such an approach. Ned, on the other hand, showed interest in the other awareness displays: Group Relations, User Activity, and Discussion Graph. However, this could also be caused by the fact that he had more time to just look around and try different features, since he moderated only one single discussion.

Pictures from the teachers (upper) and students (below) during the classroom implementations.

As for the remote control features, the teachers used only pop-ups (with and without images) and annotations. They were very curious to know whether the students received the messages or not, and checked their computer screens or by asked them orally. Interestingly, several instances were reported in which students immediately clicked away the pop-up message without reading them. Often, the teacher messages included positive feedback.

Students' reactions.
Noteworthy observations concerning how the students received the teachers' interventions concern the following:

(1) It appeared that the visualization of the pop-ups was quite similar to regular error and alert messages within Windows, which users are used to click away automatically. This was reported to the technological partners, and a more distinctive visualization has been developed since.

(2) Some students indicated that they searched for and would have liked the possibility to reply to the teacher's comments.

(3) A number of students expressed disappointment from the fact that they were in an "un-moderated" group. They indicated that they would have liked to receive the teacher's evaluation of their actions and contributions.

**In retrospect: Teacher reflections on the classroom activities**

**The students**

In general, the teachers expressed their surprise concerning the ease with which the students operated the program and appropriated its features. They were also very pleased with the fact that, overall, students were very engaged and on-task, without any disciplinary problems to speak of (Ned: "During the lesson I felt like I'm in heaven"). In particular, Miriam's 7th grade class was known to be a problematic class with high frequencies of disruptive behaviours and concentration problems. This aspect of the classroom activities particularly pleased the teachers since they were initially afraid that the opposite would occur: that the lack of direct teacher control and inspection would cause students to misbehave, both in the virtual discussion as well as within the classroom reality. Everyone was engaged in the task: "good" students, "disruptive students" and quiet students alike.

The teachers mentioned the fact that working with new technologies is motivating for students and increases their engagement with learning. However, Ned pointed out succinctly that in order to avoid opposite (negative) effects on motivation, the technology would have to be of good quality and up-to-date: "This is important since there is on-going competition between the technology available at home and what the school can offer. To attract students, we should not only offer modern software but also up-to-date hardware."
The teachers felt that the students welcomed the teacher's comments and appreciated the mode of communication. Some of the students were reported to have added answers to the moderator's interventions in the map.

The role of the teacher in the ARGUNAUT system

There are several aspects of the Moderator's Interface experience that the teachers mentioned to have particularly enjoyed since they allowed them to adopt a different role as a teacher than they are used to:

- **Observing students**: Ada mentioned that she particularly enjoyed the fact that she could observe her students from the sidelines and see how they behaved and performed in actual peer interaction without interfering. The fact that all students were engaged in the task and she did not have to take care of classroom management in combination with the affordances of the awareness displays allowed her to sit back, be solely focused on the students and read the contributions of those individuals that she was particularly interested in (such as, for example, shy students).

- **Student autonomy**: Teachers also mentioned that they liked the fact that students could engage in a peer-to-peer discussion without too much teacher interference, on the one hand, or disruptions on the other (as is often the case with f2f small group discussions). Even in teacher-led classroom discussions, teachers usually control the discussion (by turn allocation, paraphrasing, guiding, and giving immediate corrective feedback). The e-moderation tools in combination with the discussion software allowed them to take a step back and let the students talk amongst themselves and try to solve the dilemma, while the teacher monitors from the sidelines to make sure that everything goes well. This is for example evident in the following comment by Ned: "I didn't walk among the students to check what they are writing or to maintain order. In the beginning, the students addressed me orally as they always do. As a teacher I wanted to reply instantly, but I stopped myself and said: I'm sitting by the Moderator's Interface. The students liked it. Personally, I think the teacher should give students some space. I think the lesson was very successful."

- **Private communication**: The teachers also mentioned the possibility to send private messages to specific students. In classroom communication the teacher usually addresses the whole class. Even when (s)he addresses a certain subset of
children the communication is usually overheard by the rest of the class. In contrast, the Moderator’s Interface allows teachers to send private messages to selected students, which allows for personal, one-on-one communication. As expressed by Ada: “It is as if you are speaking personally with them. In the classroom you usually speak in a public way”

- **Equality**: They also alluded to the fact that the e-moderation activities allowed them to adopt a more equal-status position towards their students. Whereas the teacher’s decision to promote student peer discussions already testifies of a more equalitarian stance, this is also felt in the design of the tools, as mentioned by Ed in the following excerpt: “There is a sense of equality, my comments are put next the students’ in the same font size. It’s not like, for example, when the teacher is standing and the student is sitting, or when the teacher speaks loudly and the students are quiet. The student responses were positive and I felt great. (...) When I first started teaching I hoped that I wouldn’t have to deal too much with discipline. But I soon discovered there wasn’t much choice. During this [ARGUNAUT] activity, I felt that I was going back to my first ideal of a teacher approach: running a productive discussion between students” (Ned).

All three teachers indicated that they would like to continue working and explore the Moderator’s Interface in the upcoming years.

### 4.3.2 A semi-controlled laboratory study of successive moderation practices

#### 4.3.2.1 Rationale and objectives

As a result of the delay in the time schedule of a stable release of the ARGUNAUT system that would allow for a number of simultaneously running discussions and the Moderator’s Interface client at the same time, the classroom implementations were forced into the last two weeks of the school year. Unfortunately, these time constraints did not allow for the execution of the research questions concerning the impact of the ARGUNAUT system in authentic school settings, as was planned in the research plan for the third year (see D6.2).
For this reason, an extra experiment was conducted in July 2008. In this experiment (which lasted a total of 8 hrs), three different e-moderators and 12 students participated in a series of 7 successive discussions, in different semi-controlled set-ups (single vs. multiple moderation, Digalo vs. Moderator’s Interface moderation, activities with different learning goals and different moderation styles). The settings in this experiment were created so as answer the following research questions:

Q1. How does the use of the Moderator’s Interface affect the moderation experience, in comparison with direct moderation modes within the Digalo environment? The following aspects will be focused on:
   1.1 Moderator satisfaction of perceived impact on discussion, self-reported mental effort, and awareness to interaction and discussion features
   1.2 Discussant satisfaction of moderator and awareness to moderator interventions

Q2. How do moderators appropriate the Moderator’s Interface features in successive activities that include both single-group moderation and simultaneous-moderation settings:
   2.1 When moderating through the Moderator’s Interface, what are the awareness indicators / remote control intervention panel tools the teachers use and why do they prefer certain features over others?
   2.2 Simultaneous vs. single group moderation: Does the moderator concentrate on different aspects, use different functions? Can a moderator handle four simultaneously running synchronous discussions?

4.3.2.2 Method

Participants

Moderators:

- Moderator Y: Teacher (Psychology and Biology, secondary education) in her late 20-s, experience with Digalo and Digalo moderation, received Moderator’s Interface training.
- Moderator E: Teacher (Biology and Bio-technology, secondary education) and Educator in her 50-s, no prior experience with Digalo, received Moderator’s Interface training.
• Moderator R: Tutor in early 30-s, extensive prior experience with Digalo, very knowledgeable of the ARGUNAUT system, but no prior experience of actual moderation through Moderator's Interface.

Discussants:
Thirteen university students who were recruited from different BA or MA classes in the Education department. Each participant received financial reimbursement for their participation (total duration: 8 hrs).

Data collection tools
The following tools were employed for data collection in the course of the experiment:
- The following questionnaires were administered: Q_Usability, Q_StudentExp, Q_ModerExp (see appendices).
- Log file recordings of the moderators actions (from the Moderator's Interface awareness display "Log table")
- Screen recording of selected discussions (with screen recording software CamStudio)
- Semi-structured interviews with 2 moderators
- Critical event recall interview with one moderator

Procedure
Each discussant participated in 7 different discussions consecutively. For each discussion session (except for sessions 1 and 2) group formation was changed to avoid group effects. Moderators Y and E each moderated 6 sessions each: twice with Digalo, three times with the Moderator's Interface (single group) and once moderating two groups simultaneously with the Moderator's Interface. The third moderator (Ra) moderated three sessions with the Moderator's Interface: Twice with two groups, and once with four groups.

In the majority of sessions (1, 2, 3, 4c, 5c, 7), the topics that were chosen for the discussions sessions were ethical-societal dilemmas which would ensure high levels of motivation and that did not require intensive instruction on the topic. The topics were developed in collaboration with the moderators. In sessions 4a/b, 5a/b and 6a/b, on the other hand, the topics of discussion focused on content knowledge in psychology and biotechnology. These topics were personally chosen by moderators E and Y as topics within
their own content expertise (psychology and bio-technology, respectively). In most sessions, participants were handed out sheets that contained some background information on the topic of discussion.

Following each session, both discussants and moderators filled in questionnaires on the moderation experience (Q_StudentExp and Q_ModExp, respectively, see appendices 3 and 4). Usability questionnaires were administered at the end of the experiment. Interviews with the moderators were conducted between 2-3 weeks following the experiment. The sequences of activities (design) of the experiment as a whole is presented in Table 1.

**Table 1. Moderators, topics, group formation and tools for moderation used in the different cases**

<table>
<thead>
<tr>
<th>Session</th>
<th>Details of each session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vaccination</td>
</tr>
<tr>
<td></td>
<td>Topic</td>
</tr>
<tr>
<td></td>
<td>Moderator</td>
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<tr>
<td></td>
<td>Y.</td>
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<tr>
<td></td>
<td>E.</td>
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<td></td>
<td>Tool of Moderation</td>
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<td></td>
<td>Digalo (1)</td>
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<td>Digalo (1)</td>
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<td></td>
<td>-</td>
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<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Censoring the Internet</td>
</tr>
<tr>
<td></td>
<td>Topic</td>
</tr>
<tr>
<td></td>
<td>Moderator</td>
</tr>
<tr>
<td></td>
<td>Y</td>
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<tr>
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<td>E</td>
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<td>Tool of Moderation</td>
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<td>Digalo (1)</td>
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<td>3</td>
<td>Rights of handicapped people</td>
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<tr>
<td></td>
<td>Topic</td>
</tr>
<tr>
<td></td>
<td>Moderator</td>
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<tr>
<td></td>
<td>Y</td>
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<tr>
<td></td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>Tool of Moderation</td>
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<td></td>
<td>Moderator’s Interface(1)</td>
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<td>Moderator’s Interface(1)</td>
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<td></td>
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<tr>
<td>4</td>
<td>4a. Bystander 4b. GMO 4c. Holocaust edu. for teens</td>
</tr>
<tr>
<td></td>
<td>Topic</td>
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<td></td>
<td>Moderator</td>
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<td>Y</td>
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<td>Tool of Moderation</td>
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<td>Moderator’s Interface(1)</td>
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<td>Mi(1)</td>
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<td>Moderator’s Interface(2)</td>
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<tr>
<td>5</td>
<td>5a. Bystander 5b. GMO 5c. Holocaust edu. for teens</td>
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<td></td>
<td>Topic</td>
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<td></td>
<td>Moderator</td>
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<td>Y</td>
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<td>E</td>
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<tr>
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<td>Tool of Moderation</td>
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<td>Moderator’s Interface(1)</td>
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<tr>
<td></td>
<td>Moderator’s Interface(1)</td>
</tr>
<tr>
<td></td>
<td>Moderator’s Interface(2)</td>
</tr>
<tr>
<td>6</td>
<td>6a. Bystander effect 6b. GMO</td>
</tr>
<tr>
<td></td>
<td>Topic</td>
</tr>
<tr>
<td></td>
<td>Moderator</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>Tool of Moderation</td>
</tr>
<tr>
<td></td>
<td>Moderator’s Interface (2)</td>
</tr>
<tr>
<td></td>
<td>Moderator’s Interface (2)</td>
</tr>
<tr>
<td>7</td>
<td>Gay Parade in Jerusalem</td>
</tr>
<tr>
<td></td>
<td>Topic</td>
</tr>
<tr>
<td></td>
<td>Moderator</td>
</tr>
<tr>
<td></td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>Tool of Moderation</td>
</tr>
<tr>
<td></td>
<td>Moderator’s Interface (4)</td>
</tr>
</tbody>
</table>
4.3.2.3 Outcomes and discussion

Mental effort, awareness and satisfaction of moderation

The moderators' perceived mental effort and moderation satisfaction is reported in Table 2.

Table 2. Moderators' perceived mental effort and moderation satisfaction

<table>
<thead>
<tr>
<th>Variable</th>
<th>Moderator</th>
<th>Digalo moderation (twice for each moderator)</th>
<th>Moderator's Interface: Single (3 times for each moderator)</th>
<th>Moderator's Interface: Simultaneous (once for each moderator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean overall satisfaction of moderation*</td>
<td>Ya</td>
<td>2.5</td>
<td>1.7</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>El</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.5</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Mean perceived effectiveness</td>
<td>Ya</td>
<td>3.25</td>
<td>3.96</td>
<td>3.83</td>
</tr>
<tr>
<td>(based on 4 items)</td>
<td>El</td>
<td>4.05</td>
<td>3.25</td>
<td>3.94</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.65</td>
<td>3.61</td>
<td>3.88</td>
</tr>
<tr>
<td>Mean perceived Mental Effort*</td>
<td>Ya</td>
<td>1.9</td>
<td>1.9</td>
<td>-</td>
</tr>
<tr>
<td>(based on 8 items)</td>
<td>El</td>
<td>2.7</td>
<td>2.8</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.3</td>
<td>2.2</td>
<td>-</td>
</tr>
</tbody>
</table>

* Range: 1=not satisfied at all to 5=very satisfied
** Range: 1=very difficult to 4=very easy

Satisfaction: A different pattern was found for each moderator (Ya was more satisfied with Digalo moderation, whereas the opposite was true for El).

Perceived effectiveness: No overall difference was found on this measure. However, interestingly Ya perceived moderation to be more effective in the Moderator's Interface, and the reverse pattern was found for El. Moderation in the simultaneous sessions was perceived as more effective overall than single moderation, by both moderators.

Mental effort: Ya felt it was easier to follow the development of the discussion with Moderator's Interface and to monitor discussants relationship. El, on the other hand, reported that Digalo was easier in facilitation when to intervene and how. Ya found this task very difficult in both programs. Ya and El both found that Digalo required less mental effort to know who is discussing with whom. From the interviews it became clear why: in the Moderator's Interface's Discussion Graph tab, it is not easily to recognize who posted a certain contribution (the icons are not visible and the user selection does not use distinctive colours for each user). Overall, no significant differences were found between (single moderation) through Digalo or the Moderator's Interface. This is encouraging, since the
Moderator's Interface with its many features does not seem to require them to spend valuable effort on getting a grip on these new features.

**Awareness to discussion features:**

So as to assess the effect of tool (Digalo - Moderator's Interface) and settings (single - simultaneous) on the moderators' awareness to discussion features, following each discussion (and with the computer screen turned off) moderators were asked 20 questions (see appendix 2) on which they rated the extent to which each of these 20 descriptions characterized of the discussion. The descriptions related to five different themes: argumentative quality (items 1, 4, 8, 16), On/Off-task (items 6 and 7), social interaction (3, 10, 12, 24), mutual respect (items 20, 21) and participation (items 13 and 15). Following the experiment, a HUJI team research member then rated each of the total of 14 discussion maps on each of these 20 descriptive characteristics (while having the discussion maps open and freely available at her disposal). We then calculate the extent of agreement (Pearson correlations) between the researcher's and the moderators' ratings. The extent of agreement was used as an indication of the extent to which moderators were aware to the discussion and interaction features during moderation. The findings are summarized in Table 3.

**Table 3. Agreement between the moderators' and the objective ratings of different discussion features, per moderator and setting**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Moderator</th>
<th>Digalo moderation (2 sessions)</th>
<th>Moderator's Interface: Single (3 sessions)</th>
<th>Moderator's Interface: Simultaneous (one session)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement between moderators' and observer's ratings (Pearson's r)</td>
<td>Ya</td>
<td>.71</td>
<td>.74</td>
<td>.90</td>
</tr>
<tr>
<td></td>
<td>El</td>
<td>.61</td>
<td>.91</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>.66</td>
<td>.88</td>
<td>.77</td>
</tr>
</tbody>
</table>

The data in Table 3 show that, compared to Digalo moderation, the Moderator’s Interface improved the moderators' ability to accurately assess what went on in the group discussions they moderated. In addition, even in the simultaneous moderation condition moderators' awareness was higher than in the Single moderation Digalo condition. This seems to indicate that the Moderator's Interface indeed significantly increases moderation accuracy and awareness. In the section we will explore whether this also had an impact on the satisfaction and perceived effectiveness of their moderation in the eyes of the discussants.
Discussants' satisfaction of and awareness to moderation

1. Awareness: As aforementioned, the discussants were also asked to turn off the computer screen after each discussion and report on their awareness to the moderators’ actions and interventions (see appendix 3). Unfortunately, however, we found that the pre-release version of the ARGUNAUT system (v. 0.67) that was used in this experiment does not stably save the moderators' action logs in a persistent file yet (in spite of the option that did already exist in the Log Table AD in the Moderator’s Interface). Therefore, it was not possible to compare the student reports on moderator activities with the actual moderator actions in the EUE, and student awareness accuracy could therefore not be assessed.

It should be mentioned though, that in the Digalo moderation condition, some discussants reported that they were not aware at all of a moderator being present in the discussions and that they thought that the moderator was one of the discussants.

2. Satisfaction and perceived effectiveness of moderation:

Table 4. Students' satisfaction and perceived effectiveness of moderation, by moderator and condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>Moderator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Digalo moderation (N=12, S=4)</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Ya 3.59 3.33 3.50 -</td>
</tr>
<tr>
<td></td>
<td>Total 3.50 3.12 3.57 3.18</td>
</tr>
<tr>
<td>Perceived effectiveness</td>
<td>Ya 3.56 3.52 3.17 -</td>
</tr>
<tr>
<td>(based on 6 items)</td>
<td>Total 3.69 3.43 3.39 3.30</td>
</tr>
</tbody>
</table>

Notes: N= total number of respondents in condition, S=total number of discussion maps in a condition
Satisfaction ranged from 1(not satisfied at all) to 5 (very satisfied),
Perceived effectiveness ranged from 1(low) to 5 (high)

Comparison between (single) Digalo and Moderator’s Interface moderation modes: Overall, students’ ratings were more positive of the moderator when in the Digalo mode than in the Moderator’s Interface mode. However, this difference was largely caused by a decrease in satisfaction and effectiveness measures for the moderator El, and not for Ya. Ya's
evaluations where rather stable, independent of condition. It would be interesting to see whether the decrease in El's evaluations may be due to the particular topic that she chose for the Moderator's Interface moderation sessions (GMO), which may have been less adequate for e-moderation, or by her moderation style, which did may not have matched the Moderator's Interface. From observations we know that El adopted a sort of distant, teacher-like type of scaffolding style. However, unfortunately we do not have the log files of the moderators' action in order to pursue this investigation further. Such research is planned with the final release of ARGUNAUT which will have integrated the option of saving and exporting the moderators' action log files.

Comparisons between single and simultaneous moderation: Satisfaction and perceived effectiveness decreased only very slightly from single to two-group moderation. Satisfaction and perceived effectiveness decreased significantly from moderation of 2 to 4 groups at the same time. The moderator (Ra) reported that she was also rather unsatisfied during the 4-group moderation session and experienced strong feelings of having missed out on some important moderation opportunities.

**Task-affordance Usability**

The assessment of task-affordance usability of the Moderator's Interface is based on the usability questionnaires (see appendix 1) and on the interviews conducted with moderators Ya and El two weeks following the experiment. As for the Awareness Displays, Ya and El appreciated the Chat Table tab the most, but also appreciate the User Activity and the Group Relations tabs. All three were used frequently. Ya used the Chat Table tab very frequently, whereas El preferred the Group Relations tab more. As for the Remote control functions, neither used the remote pointer, nor thought that it could be very useful. The highlight, annotation and pop-up option function were rated high. As for the former two, both moderators often used the annotation option in conjunction with the highlight option; they both reported that they thought that this combination was particularly attractive and successful.
They also made some very interesting distinctions between the choice of using pop-ups or annotations for different situations: In particular, Ya elaborated that she used pop-ups for general, managerial messages to the whole group, or to personal messages to a certain person. For discussion- and content-related contributions and comments she preferred using the annotation & highlight option. She also repeatedly related to the unpleasant and intrusive nature of the pop-ups ("they just appear right in your face", "they have a negative connotation, they remind me of punishments"). When asked, she did believe that a different visualization of the pop-up and a more un-intrusive format will possibly reverse her preference.
Reflections on moderation practices

Two weeks following the experiment, moderators Ya and El participated (separately) in a 1-1.5 hrs long interview each on their experiences and evaluations. The interview was semi-structured, with pre-prepared questions (see a/o Addendum to D6.2 for some of the questions). They focused on several themes: their subjective experience as first-time e-moderators, the difference between Direct Digalo moderation and moderation through the Moderator’s Interface, their role as e-moderators in synchronous discussions, and the different functions of the Moderator’s Interface and their usefulness (see previous section). For space limitations we will not present all of the findings from these interviews, but highlight some of the more interesting aspects concerning their experiences:

Both moderators were very enthusiastic to have participated in the experiment and the moderation activities. This was particularly true for El, an experienced educator who currently holds an important position within the Ministry of Education. El has been promoting the importance of classroom discussions and student-centred learning activities for several years. She did not have extensive experience with new technologies and the role of e-moderation of peer learning. She was very excited about the activities and reportedly enjoyed very much to have been introduced to a novel educational practice. She reported to see a lot of potential in the integration of such activities in everyday classrooms, embedded and meticulously organized within the curriculum. Ya also believed that e-moderation practices could be easily integrated in classroom, provided that students will uphold strict ground rules of a civilized discussion [Note: Ya is active in Special Education and teaches youngsters with behavioural problems].

According to El, a moderator (teacher) should act like a guide, an expert on the subject matter but one that lets the students discover and learn the topic by themselves. The teacher should orchestrate the learning experience such that the students can manage by themselves, while the teacher monitors from the sidelines, referring the students to relevant materials every now and then. These attitudes and beliefs were also reflected in her view of the e-moderator’s (ideal) role: (S)He should be the expert on the subject matter, the one that can lead the students to arrive at important insights by gently scaffolding them. Her focus is very much on knowledge guidance, very didactic, and not on enticing or challenging students. However, this may also be the reason for the relatively low evaluations she
received. Students (and university students in particular) may perceive the goal of an e-
discussion more as a stage on which they can express their opinions and freely discuss them
with others, and less as a didactic activity in which the teacher wants them to come to learn
a new topic within the curriculum. El often expressed her satisfaction with the Moderator’s
Interface, and emphasized several times that the tool matches her personal moderation style
and philosophy perfectly.

The extensive experience that both moderators had gained with e-moderation during the
experiment allowed for some interesting insights on the process of e-moderation in different
environments: Independent of the environment (tool) that was used for moderation, both
moderators felt often overwhelmed with the speed and density of the discussions. It was
difficult for them to follow the discussion development, partly due to the non-chronological
sequencing of communication in a discussion map. For Ya, the Chat Table tab helped out a
lot with that, but on the other hand in the v. 0.67 release there is no direct way to switch
between a certain selected contribution from the Chat Table tab to the Discussion Graph tab
and back. A recurrent theme in both interviews was their difficulty with keeping track of their
own moderation actions. According to these two moderators, they did not experience any
increase in mental efforts or cognitive load as a result of the many AD and RC features and
options. They quickly mastered the tool and reported to have enjoyed using it very much.
Both also emphasized the ease with which moderators can query about discussion features.

However, they recurrently pointed out that moderation in the EUE environment has one very
important advantage, namely the fact that the moderator’s actions remain part of the
discussion map. It is important to note that this characteristic (the persistence of
moderator’s interventions in the EUE) was exactly one of the reasons for developing the
Moderator’s Interface remote control function. In addition, previous research has shown that
the persistence of many typical moderator actions in the EUE (managerial comments,
personal interventions, didactic comments etc) is not appreciated by students, nor effective
(Asterhan, Schwarz & Gil, 2008). According to these moderators, the fact that they cannot
keep track of what they did, when and whether someone acted upon their comments was
experienced as extremely confusing. When moderating directly within the EUE, the
moderators can visually see who reacted to their contributions (i.e., there are links to it),
which provides them with some indicator of effectiveness and relevance of their moderation
actions. This difficulty is even reinforced when moderating several discussions at once: they often did not remember what they send to which group. To compensate, they then sent the same message several times, just to be sure.

In sum, it seems that the non-persistence of the moderator's actions creates two difficulties: (1) Moderators are not able to construct a coherent mental representation of their moderation, of their actions and contributions as (albeit special) participants in a group discussion; (2) Moderators meet with great difficulty in assessing their impact and effectiveness as moderators, since they do not receive any direct or indirect evidence or feedback.

These findings were not foreseen by any of the ARGUNAUT research team members, or by the other teams. They were also not found in the other experiments that included only a few (1-2) experiences with the Moderator's Interface moderation tools (but see section 4.2.7 for an exception in the Exeter studies). We believe that any experienced difficulty or increase in mental effort after only a few experiences with Moderator's Interface moderation will be attributed to the novelty of the tools and the settings. In contrast, these two moderators had moderated 7 successive live sessions (not included the training sessions). This allowed for a more structural feature of Moderator's Interface moderation to emerge, one that may prove to be problematic and not that easy to solve (since it may be inherent to the system).

**Insights from simultaneous moderation of 2 and 4 discussions**

The insights in this section are based on the experiences of one moderator, Ra. Ra has played a central role in the development of the Moderator's Interface. She has often been the first to test intermediate versions of the Moderator's Interface and that reported on problems of installation and of design. Her technical mastery of the tool was then ideal and it was natural to ask her to use the Moderator's Interface in the most challenging configuration for a moderator, several group discussions in parallel. Ra moderated three sessions (see Table 1). For the first and the second one, she moderated two discussion groups of three participants each. For the third one, she moderated four discussion groups of three participants each.
Although Ra fully mastered the tools and is a very quick reader, she is not a teacher and so did not have any specific content area she could offer pedagogical expertise about. We asked Ra to choose the two issues to be discussed in her sessions according to her personal interest, stipulating that she choose issues for which it is well known that there is no consensus in the Israeli society. Ra chose the issues/questions of: (1) whether to send Israeli adolescents to Poland to visit significant sites concerning the Holocaust; and (2) whether to allow the annual Gay Pride parade to take place in Jerusalem. Both issues, and in particular the second issue, are considered controversial in the socio-cultural context of the discussants: Israeli society is polarized with secular-religious, right-winged - left-winged and socio-economic tensions. To prepare herself for moderating the discussions, Ra read texts that reflected conflicting views on these issues. For the second issue, that of the Gay Pride parade, she also used knowledge of relevant arguments in favour of and against the parade, as raised and discussed extensively during weekend dinners with her extended family (the controversy around the parade makes news headlines every summer and offers a “hot topic” for discussions). We asked Ra to allow the discussants to pursue their own course and flow of discussion, but at the same time to monitor critical thinking and other aspects relevant to the quality of the discussion (in her opinion) and to intervene when necessary. Ra moderated discussion in 4 different groups, for each of the two topics (for the topic of Poland trips, she mediated two discussion groups simultaneously each time x 2 sessions, and for the topic of the Gay Pride parade all 4 discussion groups were moderated at the same time).

For the final sessions, sessions 7 and 8 (see Table 1), we recorded Ra's actions within the Moderator's Interface environment as a video file that displays her screen as she moderates two or four groups in parallel. Several hours after these discussions took place, Ra took the time to reflect on her moderations and write down relevant points of interest in her notes, which were subsequently sent to the researchers. In addition, several weeks after the moderation sessions, we replayed to Ra the two videos of her moderations and asked her to comment on her intentions when performing actions, whether she thought that she reached her goals, whether she encountered difficulties and whether her interventions improved the quality of the discussions.
We present first significant points that Ra wrote in her notes, then describe very succinctly her additional reflections on her moderation actions as she watched them being replayed. A more detailed and integrated analysis of this data will be presented in a forthcoming publication.

Ra's Notes

_My moderation goals and strategies [and the degree to which I think they were achieved]_

1. Make sure there is representation for at least 2 conflicting opinions/arguments. [My impression is that this was achieved for all discussions I moderated.]

2. Make sure more than one aspect is covered, preferably several pertinent aspects I've previously identified. [Only partially achieved in the 4-group moderations, successfully achieved in the 2-group moderations.]

3. Challenge arguments and opinions of discussants, but not in a way that would imply that compliance to my own opinion is expected. [Hard to judge how my interventions were interpreted, but mostly I think I managed to stay balanced.]

4. Intervene when incorrect, biased or unclear information is presented, if none of the participants did (e.g. saying “most people think so” without backing it up with data, implying that there are explicit sexual acts @the Jerusalem pride parade, etc.) [I probably missed out on some things... Also, I felt that in some cases there was no appropriate response to this type of intervention.]

5. Keep arguments from going off topic, even on somewhat relevant tangents. [Hard to judge, I would say partial success only.]

6. Encourage participation and interaction between discussants. [I didn't think of the participation issue originally, given the context of the experiment. However, in the Holocaust discussion there was real need to encourage one of the participants, who isn't Jewish, to express an opinion, and in the end she did...]

7. Send personal feedback regarding shapes and opinions I found interesting or needing intervention, in most cases to the person who wrote them only. [Sometimes I saw the response in the map itself, sometimes not...]

8. Intervene not only when “bad” stuff is happening, but also to give credit/praise to fresh perspectives, a balanced representation, etc. [I didn't do this a lot per
individual, given limits on my own attention and other people's attention, but I did it more when I thought it was worthy of continuation and/or attention from others.]

9. Send pop-ups (typically to the group as a whole) for things like encouraging using different connectors, summarizing, and raising aspects that were not discussed. [Not sure all the pop-ups reached everybody... In some cases, re new aspects for discussion and summarizing, I could see an immediate effect.]

10. Highlight shapes to bring them to the discussants’ attention (usually with some annotation note attached explaining why this is interesting/relevant/important). [I can't say how successful this was overall, but I noticed it did help in a few instances.]

11. In the last round of discussion, I intervened less, for 2 reasons: 1) some feedback re intervening too much before, which led me to think twice and re-check before sending most interventions (esp. those of a “charged” nature, e.g. challenges); 2) the increased cognitive difficulty of moderating 4 discussions at once. As a result, I felt I missed out on some things, for example one of the discussions getting a bit off topic (too much revolving around who serves in the military...), discussants expressing themselves in unclear and/or possibly offensive ways and one specific request for assistance in changing an icon when 2 users had the same icon (which I saw a bit too late and couldn’t help with anyway, since the session was cloned and I could not edit the configuration of the Digalo map).

Main Awareness Displays I looked at:

1. The Discussion Graph tab (because I had to use it to intervene, i.e. select shapes to highlight/annotate).

2. The Chat Table tab (see comment below about how problematic it is to try and flip between that and the Discussion Graph tab in order to give an intervention).

3. Mini-visualization for arrow ontology use.

4. Briefly glanced about once or twice per discussion: User Activity and Group Relations tabs. People were fairly active (unsurprising given the context), so I didn’t worry too much about that. In one case, I tracked this in particular to make sure a certain participant was included. After encouragement from me to her only, she wrote some things and connected them to other contributions, and then she got some links to her shapes, so I didn’t have to intervene further.
5. Tried to look at the state table but the letters were too small to read and I got lost in it. The Chat Table tab was better for tracking new contributions per user.

Problems/issues/suggestions for the tool:

1. One should be able to intervene by selecting shapes via the Chat Table tab as well. It is very hard to follow a discussion in several graphical maps at the same time, and the Chat Table tab helps with that, but then you waste a lot of time trying to find the right shape in the map itself so you can intervene.\(^2\)

2. One should be able to have some kind of way to mark a shape as “read”, so one can save time and just read new shapes.

3. It is very hard to track what one has already done/said, to whom/where/when, which makes it harder to have any kind of coherent intervention, to make sure you are not flooding participants and to see whether people are responding appropriately. Interventions should be grouped by session, and furthermore, I think they should be visible on my own discussion graph upon request.

4. There should be a channel for someone to send a personal message to the moderator, to draw their attention to something (esp. technical matters).

5. Some people said they did not get some of the interventions sent to them. Hard to track/replicate.

6. Alerts were not working properly for “shallow” elements, making it harder to moderate at the same time.

7. A specific problem with Digalo2 icons were found (2 users were randomly assigned the same icon, which led to confusion). In general, the use of icons is confusing, showing names might be better.\(^4\)

Ra’s Interview

The interview was held in two sessions, three and four weeks after the experiment ended. The interviewer replayed the recorded moderation sessions of the last two multiple

\(^2\) The experiment used the pre-release version of ARGUNAUT available at the time (v. 0.67). This issue was later addressed, and the particular function of sending interventions through the Chat Table tab is already implemented in a subsequent version of ARGUNAUT (v. 0.81a).

\(^3\) These bugs have been reported and will be fixed in the final release.

\(^4\) This bug was since fixed. Additionally, Digalo2 now enables toggling between displaying users icons and user names (with names being the default).
discussions (with two and four groups in parallel respectively). The replay displayed Ra's actions as moderator, as expressed on her computer screen (primarily her actions in the Moderator's Interface window). This data was recorded as a video-file using the CamStudio software. The interviewer asked Ra to comment on her own actions as she sees them in the running video replay and to focus in particular on (a) what she intended to do by performing a certain action, (b) whether what she did helped her in her goal, and (c) whether the moderation she accomplished succeeded in improving the quality of the synchronous discussions. Ra opened her comments by saying that she's not sure she remembers her exact motivations and considerations.

As the first video played, after several minutes in which no interventions were made by Ra, she pointed out that she intentionally did not intervene right away whenever she noticed a possible problem, as a strategy throughout all sessions. She wanted to give the opportunity to students to express themselves and to address the issue on their own.

A very natural and frequent action Ra performed throughout her moderation sessions was to follow the discussion threads using the Discussion Graph tab and, by laying the pointer on each contribution, to read its full contents (students often used the 'title' of the shape/contribution to express the gist of their interventions and its 'comment' or 'note' functionality, which visible only when the shape is opened in Digalo or when the mouse hovers over it). Ra surveyed many shapes in this manner, and when reconstituting this reading, she affirmed: "I watched what was going on in the discussion."

During the discussion on the revolving around Holocaust education (student trips to Poland), through her browsing of the discussion graph of one of the groups, Ra quickly realized that one of the students needed special attention. This was the case of the student So, who did not feel really involved. As she expressed in a Digalo contributions, she was unsure of what the question was, and when it was explained to her (via an annotation note Ra attached to her question shape), claimed in another contribution that she doesn't know what to say about this subject. This was not a surprise to Ra, given that So is of a non-Jewish nationality, Ra knew she should be sensitive and encourage her to express her potentially different views, which she attempted to do via adding a personal annotation note to the second contribution. Ra realized very quickly that So did not feel committed to the issue, or that she
did not feel it was her place to express an opinion. Ra's second annotation note pointed a possible special role for So: since she is not emotionally engaged, she can serve as the critical and rational eye in the discussion, offering a unique perspective. This role was adopted by So, who began to express her opinions more fully, referring to others' interventions. At later intervals, Ra returned to the Group Relations tab and to the Discussion Graph tab in order to verify that others were also linking their contributions to those of So.

Although the Moderator's Interface does not enable two-sided communication between moderator and discussants (that is to say, moderators can send messages to discussants directly, but not vice versa), it appeared that through the contents of their further actions, students at whom an intervention was directed answered by referring to the suggestions made by the moderator. The example of So is telling in this context, as are some examples of aspects and arguments added to the discussion graph almost immediately following relevant pop-up interventions from Ra.

Ra often several times that in some of the discussion maps, links were not distributed in a uniform way (for example that there were almost only neutral links). Such a phenomenon typically led Ra to intervene through a Pop-Up sent to all discussants. Ra was very clear that she didn't intend to intervene so as to impose any behaviour. She did not write interventions such as "use more opposition links", but suggested opening different perspectives (a result/indicator of which would be more opposition links), and on other occasions pointed the discussants attention to the type of links used (e.g., "please review your links to make sure you are indeed using the right type of connectors").

As the discussions developed, Ra recurrently had increasing difficulties in following them by "reading" from the Discussion Graph tab in the manner described above: it became a complicated endeavour as the discussion progressed since she always needed to go back look not only at the newly added shapes, but at the full map (to get the context). This was less of a problem when moderating only 2 discussions simultaneously (since it was easier to remember what was said where).

Despite this difficulty, when she simultaneously moderated discussions with two groups in parallel, Ra succeeded in delving into the arguments students raised to fructify discussions in
depth (by questions/challenges to arguments raised) and in breadth (by asking for more perspectives). This was generally obtained through non-generic and rather specific remarks. For example, since one group seemed to stick to a 'collective memory' perspective with regards to educational trips to Poland in the context of the Holocaust, Ra succeeded in fructifying the discussion by asking for a socio-economic perspective (e.g., the cost of these trips making it possible only for students of higher socio-economic status to participate and thus leading to tensions), or the perspective of the impact of these trips on the local population.

An interesting strategy Ra adopted consisted of identifying a contribution which seemed to her valuable, and then highlighting it plus attaching an annotation note to it (explaining its importance). These joint interventions were most often sent to all discussants in the relevant group. Ra also made extensive use of the option to send "private" pop-ups and annotation notes to students, thus being able to push their arguments forward by challenging them and yet avoiding potentially embarrassing them in front of the others (e.g., a discussant that made a wide claim, which Ra felt to be unfounded, received a private annotation note to her relevant contribution, asking her what she based this information on).

Another phenomenon that pertains to development of discussions is that of increased cognitive load, for both the moderator and the discussants. As mentioned above, the more the discussions progressed, the harder it became for Ra to follow them using the Discussion Graph tab. At a certain stage, Ra felt that it was almost impossible to follow the sequence of actions in this manner, and still intervene timely and effectively. Ra turned then to other tools: first of all, the Chat Table tab, and in some cases, to other awareness tools: mostly, the Mini-Visualisation of Link Use, and the Group Relations tab. Ra also considered the added cognitive load her persistent interventions could constitute to the discussants attempting to follow the Digalo discussion map. She therefore took care to "terminate" older and less relevant interventions which were, in her view, "taken care of", thus clearing them from the discussants' maps.

An additional phenomenon that occurred is that Ra used ideas raised by one group in another one (i.e. sent interventions based on them). She felt that, as a moderator in parallel discussions revolving around the same topic, she could reuse ideas from others and widen
her own perspective (as discussants sometimes raised aspects and arguments beyond those that occurred to her on her own). The second side of the coin is that Ra did not always remember what has been brought forward in which group, and confessed to have been mixed up, especially at the end of e-discussions, when it was very difficult to come to grips with the complexity of the discussions.

A very interesting fact concerns the extremely personal relation that could develop between a specific discussant and the moderator (because it was possible to use a private mode of communication, and although this mode was in a one-way direction). This can again be illustrated through the example of So: Ra felt that So's initial argument in favour of the trips to Poland, which was also accompanied by a declaration that she doesn't have anything to say about the subject, was superficial and possibly motivated from reasons of social desirability. It seemed to her likely that So did not feel comfortable to express herself and her views given her own Palestinian identity. Asking her directly to be critical is a delicate matter, with potentially unwanted results. Ra succeeds in showing to So that a dialogic and sincere expression of ideas is possible even for thorny issues and in making her feel that her own unique view was valuable and desired. Ra questioned herself several times as she was sending interventions to So, wondering whether or not she was adopting a patronizing attitude in her moderations. Ra additionally took care to highlight some of So's contributions to the other discussants in her group, for their consideration.

Summary

Ra's notes and interview are highly interesting because they show that the environment enabled sophisticated mediation of group thinking. In addition, they show that specific Moderator's Interface actions like sending pop ups or highlighting shapes were used for different and specific purposes, providing us with more evidence regarding the pedagogical usability of the tool. Further data in this respect pertains to the use of multiple displays and how it facilitated moderation of multiple groups at the same time. It should also be noted that the Chat Table tab seemed to be much more useful than other representations to following the contents of the discussion.
4.4 Evaluation and experimentation in Germany

Astrid Wichmann, Ulrich Hoppe, Adam Gienza

This section gives an overview of the studies conducted this year at UDE. The first two sections (see 4.4.1 and 4.4.2) can be regarded as preparation activities for the two main studies, the Awareness Support study and the Alert Mechanism study. Both studies were designed to investigate if and how teachers handle to moderate several discussions at the same time. Also, both studies had the goal to investigate specific features of the Moderator's Interface. The Awareness study (see 4.4.3) specifically focused on the Awareness Support Displays, which can be added as additional tools to the Discussion Graph tab. Another focus of this study was to test the ARGUNAUT system under authentic conditions with regard to the intended audience that the ARGUNAUT system is made for. Hence, we collaborated with two school teachers who selected the topics of discussion according to the curriculum requirements at this point of the school year. So, the respective school classes spent considerable amount of lessons beforehand to study the topic in depth. The Alert study (see 4.4.4) on the other hand concentrated on the alerting mechanism, which is a tool that can be customized by the moderator to monitor specific behaviour of the students.

4.4.1 Piloting / Usability

4.4.1.1 Rationale and Objectives

Aspects which are subsumed under piloting consist of testing under lab conditions. We pursued two major aims with the piloting activities: One aim was to continue and conduct usability testing as is was done and foreseen throughout the period of the project. A second aim during piloting was to adjust and test evaluation instruments for reliability purposes. For instance, we conducted usability testing with Komedia students, who gave us not only feedback regarding the ARGUNAUT system but also regarding face validity of evaluation instruments. In addition, statistical analyses were conducted to test reliability of research instruments. For space purposes we will summarize settings and findings for all piloting conducted in the last phase of the project.
4.4.1.2 Settings

Students were selected from university seminars, specifically from computer science and Komedia seminars. Usability testing sessions consisted mostly of 5-10 students. We tested and evaluated in a lab setting at university with either a local network or internet connection (to test Alerting Mechanism). Every student worked on one computer each, participating in discussion sessions with student mates. If the discussion was moderated, one student was responsible to moderate one to three sessions using the Moderator’s Interface. The discussions lasted mostly between 20 and 30 minutes. The discussion topics were related to media and technology (e.g. online searches by the state, internet security). We piloted all student questionnaire instruments developed by UDE (see appendices 7-10).

4.4.1.3 Insights

Small adjustments regarding the questionnaires were done after the piloting. Overall reliability of the scales was high. Adaptation of the questionnaires was done according to the insights received from piloting. Usability issues were reported and shared with the tech team and took effect in the next release.

4.4.2 Training Moderators

4.4.2.1 Rationale and Objectives

From the experience we gained during the teacher Workshop in the autumn of 2007 (see ARGUNAUT deliverable D6.2), we knew that one crucial factor was to train the teachers to moderate using the Moderator’s Interface. Besides a short introduction into the tool functionality, we wanted to give the teacher a small moderation experience before actually moderating an own class. This was important for several reasons. First, our teachers differed in experience and expertise of using technology (e.g. we had one computer science teacher who developed technology by herself and another sports teacher who would avoid working on a computer as much as possible). Second, the functionality of the Moderator’s Interface is easy to grasp on a declarative level but actually using the Moderator’s Interface to interact with students effectively is quite a challenge. Therefore we wanted to make sure that the
teachers' way of handling the Moderator's Interface was not corroborating the teachers' way of moderating an e-discussion.

4.4.2.2 Method

For all teachers that moderated discussions in the Awareness Support Study and in the Alert Study, we setup an ARGUNAUT system that used the replay function to replay a 12 minute Freestyler discussion. This discussion was prepared beforehand in accordance to student discussions that we reviewed from HUJI discussions with Digalo. After a short introduction, the teacher did a moderation of the same discussion in two phases: the first moderation was done with only the Discussion Graph tab; the second moderation included the Discussion Graph tab + other Awareness Displays (or Alerts for the Alert Study respectively). During the moderation we asked questions (e.g. “how many contributions did “Julia” do? Please send her a message”) to engage the teacher more deeply in moderation and to see if the questions can be answered correctly and tasks can be accomplished. We also trained the teacher to engage in two different modes of discussion: guided and unguided moderation. In summary, the replay function of the ARGUNAUT system allowed us to train teachers in moderation very economically. All moderation during the training was screen recorded using the screen recording program CAMTASIA.

4.4.2.3 Insights

The questions that we asked and the tasks that were provided during the guided moderation were appropriate to compare experimental with control (Moderator's Interface with Discussion Graph tab only) condition. Hence, teachers were able to carry out tasks in both conditions. Also we could see from the screen recording, that teachers were open to use the additional features (Awareness Display or Alerts) without additional encouragement, hence they were not restraining themselves to only use the Discussion Graph tab. Also, we gained first insights on the moderation behaviour depending on the condition. For instance, we could observe that in the control condition (Discussion Graph tab only) all teachers relied often on guessing to answer questions (e.g. “How many counterarguments were provided by the students?”). Thus, the questions were answered incorrectly or inaccurately. Especially in situation that required the teachers to count contributions, links etc., they were not able to answer the question correctly, because it seemed that the activity was too exhausting.
4.4.3 Study 1: Awareness Support

The moderation of discussions facilitated through computer-mediated argumentation maps puts high demands on the teacher who is responsible for moderating the discussions. A good moderator would not only want to give simple feedback in the form of positive or negative reinforcement, he or she would also want to facilitate the discussion by providing some kind of scaffolding. Teachers use scaffolding strategies in the classroom, to engage students in activities that would be otherwise out of reach (Collins, Brown & Newman, 1989). During discussions, teachers can scaffold students by providing scaffolding questions. According to Chi and colleagues (Chi, Siler, Jeong, Yamauchi, & Hausmann, 2001) these types of scaffolding questions engage students more than simple feedback. We were able to show in a previous study that teachers have difficulties to give scaffolding support and do it much less than they think (Wichmann, Harrer, & Hoppe, 2008). This is not surprising because in order to moderate a discussion effectively, teachers need to have high awareness regarding the discussion process in terms of students reasoning (argumentation) processes, social behaviour and ground rules (Gil, Schwarz, & Asterhan, 2007). In the current development of the ARGUNAUT System, it was our goal to enable moderators to moderate several discussions simultaneously. This puts an extra load on the moderate because he/she has to switch between discussions and keep track of several discussion threads at the same time. Additional tools are needed to support teachers' awareness of ongoing e-discussions.

4.4.3.1 Rationale and Objectives

The overall rational of this study was to investigate the added value of Awareness Support during moderating several sessions at the same time. To achieve this, we explored effects of Awareness Support during online moderation on the moderator's behaviour and the more indirect effects on the discussion itself. In addition we were interested whether teachers are able to simultaneously moderate several discussion sessions using the Moderator's Interface. In addition we were interested in how the students perceived their participation in a moderated computer mediated discussion. From these questions, we postulated that supporting moderation via Awareness Support will affect the moderators' behaviour.

4.4.3.2 Method

Participants

2 school classes from Gymnasiums in Germany participated in the study. 24 students from
the Elsa Gymnasium in Oberhausen took part in the study the first day and 21 students from the Wolfskuhle Gymnasium in Essen took part the second day. The students were between 15 and 16 years old. The Elsa class was taught by a male teacher instructing economy as a school subject. The Wolfskuhle class was instructed by a female teacher within the subject of computer science. The students were randomly assigned to one of two conditions. A teachers judgement on the students level of activity (1=very active, 2=average active, 3= not active) in the classroom was used for balancing purposes to assign each student randomly to one of the two groups.

**Design**

The study followed a within subject design regarding the moderator. In the *Awareness condition*, the teacher moderated the discussions using all components of the Moderator’s Interface including the Discussion Graph tab and the other Awareness Displays. In the control condition (*No Awareness condition*), the moderator could only access the Discussion Graph tab, hence no other Awareness Displays were available. The conditions were counterbalanced for sequence effects. Moderator 1 moderated first in the *Awareness condition* and afterwards in the *No Awareness condition*. For Moderator 2 we reversed this
sequence (see Figure 1). Dependent variables were moderators’ behaviour and moderators’ perceptions.

The ARGUNAUT system was prepared for each condition with three Freestyler sessions, which have been setup in PASEO in the beginning of the discussion. For the Awareness condition, the Moderator’s Interface was loaded with the Discussion Graph tab and the Awareness Display tabs (Chat Table, User Activity, Ontology, and Group Relations). The access of Awareness Support during the second discussion will be limited for the study to minimize cognitive load. For the No Awareness Condition, only the Discussion Graph tab was loaded. In both conditions, the moderator could use the Intervention Panel to actively moderate discussion sessions.
Procedure

The study took place in a university computer lab room. Every school class visited the university for one school day to participate in the discussion. The topics of discussion were chosen and developed by the teacher. For the Elsa gymnasium class the teacher discussed an economy subject related to an activity that has been planned and organized within the school year. This activity was estimating costs and balance involved when planning a party with school bands. The task during the study was to discuss the reasons why the project failed. The Wolfskuhle class teacher decided to discuss the topic of privacy in the context of internet. On both study days, half of a class participated in the first condition. Before starting the discussion, we demoed the software FreeStyler (Hoppe, Gaßner, 2002) and students spent 20 minutes trialling the software. After that, the students participated for about 50 minutes in the discussion. Every discussion session had 3 participants. Questionnaires were administered and a follow-up interview was conducted right after the discussion was finished. The other half of the class participated in the second condition while the first half of the class did other non-related activities. The moderation consisted of two moderation phases, an unguided moderation phase and a guided moderation phase. In the unguided moderation phase the teacher was being left alone with the moderation task. In the guided moderation phase, a research assistant asked questions and posed tasks. After the discussion was finished we continued to ask questions to the moderator. We then administered a questionnaire to the moderator.
**Instruments**

*Added value of awareness support* - The main research question was evaluated with regard to teachers' moderation behaviour. We measured the teachers' awareness of the moderation situation by assessing the moderators' knowledge about the discussion state and by observing the moderators' moderation behaviour. The assessment of the moderators' knowledge about the discussion took place during and after the discussion by providing tasks. These tasks were given during the guided moderation phase and after the discussion was finished. The tasks consisted of two parts, first to guess the discussion state from scratch and second to determine the discussion state using the Moderator's Interface. For example, one task was to find out who was the strongest contributor in each session (see appendix 8 for complete list of tasks).

**Table 1: Task for the moderator in the guided moderation phase**

<table>
<thead>
<tr>
<th>Task: Strongest contributor</th>
<th>Guess: “Tell me now who you think is the strongest contributor. Tell me this for each session.”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Determine: “Determine now the strongest contributor using the Moderator’s Interface. Do this for each session.”</td>
</tr>
</tbody>
</table>

The task list consisted of 9 tasks from which 5 have been asked during the discussion and 4 have been asked directly afterwards. Every task was done for each of the 3 sessions in one condition respectively. Every task was read once by the research assistant and in addition provided on a paper.

*Moderation* - We evaluated both the teacher and the students to get insights regarding satisfaction of moderation. The teachers questionnaire consisted of Likert scale items measuring overall satisfaction with the discussion and the own moderations. The questionnaire also included specific items regarding the discussion situation. The student questionnaire consisted of items regarding overall satisfaction with moderation and specific items on how the students perceived the teachers moderation actions. In addition we conducted focus groups after each discussion to get more insights on how the students perceived moderation. We asked 13 questions regarding the quality of moderation and the effect moderation had on the discussion.

*Usability* - In the context of usability evaluation, we assessed usefulness of the ARGUNAUT System from the moderator’s perspective and from the students' perspective. From the
teacher's perspective, we assessed usefulness of awareness support and intervention panel (see appendix 1). From the students' perspective, we assessed usefulness in terms of technology acceptance.

We asked students whether they perceived the ARGUNAUT system as useful and whether it was easy to use. We did this by using scales adopted from the Technology Acceptance Model originally developed by Davis (1989).

### 4.4.3.3 Results

All questionnaires used a 1-5 Likert scale. All results are reported with 1 being the weakest rating and 5 being the strongest rating.

**Added value of awareness support** –

**Did teachers use the awareness support deliberately?** We analyzed the moderators' moderation behaviour in the Awareness Support condition in both phases the unguided and the guided moderation phase to find out whether, the awareness support was used deliberately (instead of sticking to using the Discussion Graph tab only). In the unguided moderation phase, both teachers used all awareness displays available in addition to the Discussion Graph tab. Most favoured displays were the Chat Table tab and the User Activity tab. In the guided moderation phase both teachers used the Awareness Support features to conduct the tasks and did not rely on the Discussion Graph tab.

**Did the teachers have more awareness after the unguided moderation phase?** Results show that moderators had limited awareness of the ongoing discussion sessions in both conditions. Right after the unguided moderation phase, we asked the teachers questions, which they had to answer from scratch (without the help of information from the Moderator's Interface). Only one question was answered correctly in both conditions by both moderators ("Did everyone contribute?"). Also both teachers could guess correctly the strongest collaborator in almost all sessions (one teacher guessed incorrectly in one session). For all other 7 questions, the moderators provided either no or a flawed guess from scratch. This might indicate that awareness support features are needed to handle e-discussions effectively. But also it shows that teachers do not gain more awareness by providing awareness tools without encouraging them to use the tools.

**Were teachers able to conduct specific tasks better?** To answer the question, we compared whether the teachers were able to conduct specific tasks one time with Awareness
Support and one time without. In the Awareness Support condition, the teachers could do all required tasks successfully. However in the No Awareness condition, several tasks were not conducted at all or incorrectly. In particular, tasks that cannot be answered with a cursory glance at the Discussion Graph tab were not conducted at all, or were conducted incorrectly. For example, both teachers were not able to determine correctly which of the discussants had collaborated the most with others. However in the Awareness Support condition, both teachers could easily determine strong collaborators. They both used the Awareness tab "Group Relations" to determine the answer successfully. Another task that seemed to be difficult to answer without Awareness Support was related to students' contributions. In sum, the Awareness Support was not only helpful but also necessary for tasks, which require deep knowledge about the argumentation maps.

Table 2: Tasks determined successfully

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks with No Awareness Support</td>
<td>2</td>
<td>1.36</td>
<td>1.69</td>
<td>1.52</td>
<td>.24</td>
</tr>
<tr>
<td>Tasks with Awareness Support</td>
<td>2</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>.00</td>
</tr>
<tr>
<td>Valid N (list-wise)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Moderation -

Teachers' satisfaction with moderation (see appendix 3): The teachers regarded the quality of all discussions as high or very high (M=4, SD=.00 or M=5, SD=.00). For example, they agreed that students discussed correct and relevant concepts. Also they agreed that students made correct links between concepts, provided counterarguments, interacted, that students took into account different perspectives and that they treated each other with respect.

Teachers' need of moderation (see appendix 3): The teachers said, that they had fun doing the moderation and they agreed that moderation improved the discussion (4, SD=.00), hence that interventions were needed (M=4, SD=.00). One teacher agreed that the students took into account his interventions (M=4, SD=.00). One teacher did not agree to that statement during one discussion (M=2, SD=.00). This might have to do with the aspect that the Moderator's Interface has no function of allowing a student to respond to the teacher directly, when receiving an intervention. We will refer to this problem more deeply in the section 5.

Teachers' effort of moderation (see appendix 3): Overall, the teachers reported that it was quite easy or easy (M=3.6, SD=.31) to moderate. In the condition of No Awareness...
Support, the teachers reported that it was difficult to know, who talked to whom. In the condition with Awareness Support, the teachers perceived that this aspect was easier to manage (M=4, SD=.00).

**Teachers’ GUI suggestions regarding the Moderator’s Interface:**
- Improvement of the Highlight function by implementing a right-click option in the Discussion Graph tab to highlight contributions.
- Implement a possibility for students to communicate with the teacher to enable responses to interventions.

**Teachers’ perceived role of moderation:** All teachers (incl. the teacher from the Alert study) described their moderation role as guarded, guiding, and observatory.

**Situations that were moderated the most:**
- Situations in which the discussion came to an end or slowed down. Moderators provided new ideas or highlighted specific aspects.
- Ground rule violation situations. For example, anonymous accusations
- Too narrow formulated contributions. For example the moderator was encouraging elaborations.
- Several discussion branches developed independently from each other even though, they discussed the same topic. The moderators encouraged the participants to bring discussion branches of the same topic together.

**Students’ satisfaction regarding moderation (see appendix 4):** Students reported that they were satisfied with the moderation (M=3.4, SD=.56). However their satisfaction with moderation either highly correlated with their response to satisfaction of teacher or they decided to choose a neutral option (neither / nor) to answer the question. Therefore, we can assume that their response regarding satisfaction of moderation is highly biased with their impression of their teacher. From the student moderation questionnaire (see appendix 4) we isolated the items pointing towards satisfaction of moderation. Results from this selection indicate that students were satisfied with moderation (M=3.4, SD=.47 – which is the same result as satisfaction measured above). For example, students did not agree that comments seemed to be delivered too slowly. Also, they agreed that the moderator did not intervene too much (M=4.06, SD=1.12).

From the Focus Group questions we seem to get little bit different picture about moderation. We will summarize the results including only the main points. Overall, the students reported
that the moderator's comments were well understood and that they were helpful to focus on specific aspects of the discussion. Mostly the moderator's comments resulted in an even stronger focus on the discussion. However some of the comments were only noticed later or not at all because the students’ focus was on the discussion. Pop-ups were always noticed, but sometimes the students got confused because the comments did not relate to her/his current situation or action. Another aspect that seemed to prevail in the Focus Group discussion was that the students felt that the moderation was not salient enough. Some students even reported that the moderation was so little that it didn't affect the discussion at all. Other students said that moderation was not necessary.

**Usability** -

**Awareness support (see appendix 1):** Both teachers regarded the awareness support overall as useful (M=3.8, SD=.85). Especially the Chat and the User Activity tabs were the preferred Awareness Displays. These both Awareness Displays were also used the most during moderation. One teacher regarded the Mini Display as not useful at all. After consultation, he reported that he found the mini displays not useful for moderating several sessions at the same time, but very useful for moderating one session.

![Figure 3. Usefulness of Awareness Support](image-url)
Students’ Perceived Usefulness and Perceived Ease of Use regarding the ARGUNAUT system: Overall students (N=38) perceived the ARGUNAUT system as useful (M=3.9, SD=.22). Specifically, they reported that the system could improve possibilities for computer-based discussions in school or at university (M=4.1, SD=.80). Perceived Ease of Use was perceived even higher than Perceived Use: Students agreed that the ARGUNAUT system was easy to use (M=4.2, SD=.60). For example, they reported that using the system was easy to learn (M=4.7, SD=.51).

4.4.4 Study 2: Alerting Mechanism

The previous study focused on added value of awareness support. We specifically focused on the awareness displays of the Moderator’s Interface. An additional feature besides the awareness displays is that of the alerts, which can be customized beforehand or on demand to keep track of the ongoing discussions. The Alerting Mechanism is a monitoring feature, which aims at reducing the teachers’ task load by taking over specific monitoring tasks.
4.4.4.1 Rationale and Objectives

The purpose of this study is to explore the added value of the Alerting Mechanism during simultaneous moderation. We adopted the study design from the previous study with the Alerting Mechanism as a focus of investigation (instead of Awareness Support). We focused again on the moderation behaviour in the first place and also evaluated students' perceptions about moderation and discussion.

4.4.4.2 Method

Participants

12 university students with background in media and computer-related topics took part in this study. All students have stated to be fluent in English language. The moderator was a pre-service teacher in Sports and English. The discussion topic was chosen by the teacher and the students were asked to prepare to be able to give informative input to the discussion. The students were randomly assigned in each condition.

Design

This study had a within subject design with two conditions: moderation with alerts and moderation without alerts. The moderator was trained to moderate in both conditions; He also received the list of alerts a week earlier to study the descriptions. The moderator was allowed to use the Discussion Graph tab and the Intervention Panel in both conditions. In the first condition, the moderator used the Discussion Graph tab only, in the second condition, the moderator used the alerting rules in addition to the Discussion Graph tab. Since we had only one pre-service teacher for this study, no counterbalancing was done. However we did an extensive training with the Moderator’s Interface in both conditions prior the study to reduce sequence effects. Still, it cannot be assured that no sequence effect took place. The setup of the ARGUNAUT System was as follows: We prepared two FreeStyler sessions for every condition (moderation without alerts vs. moderation with alerts) in which 3 students were participating for each session. In both conditions the Moderator’s Interface was loaded with the Discussion Graph tab only. In the With Alert condition, the moderator was allowed to setup and run the alerting rules, which can be selected from the main menu. In the No Alert condition, the moderator used the Discussion Graph tab only.
Procedure
The groups discussed the topic of which energy sources should be used in Germany. The topic was discussed in English to test the Deep Loop Alerting Mechanism. The procedure was the same as in the Awareness Support study. The Moderator’s Interface was displayed on a SMARTboard, so the teacher used the touchable screen to moderate the discussion.

Instruments
Added value of alerts - We evaluated the added value of the alerts by assessing the moderators' awareness and his moderation behaviour. The moderator's awareness of the discussion sessions was assessed by asking questions during the guided moderation phase and after the discussion. These questions were specifically tailored to the alerts, 4 questions focused on shallow loop alerts and 4 questions focused on deep loop alerts. The tasks consisted of two parts, first to guess the discussion state from scratch and second to
determine the discussion state using the Moderator's Interface (same method as in previous study). For example, one task was to find out if any off topic conversation took place.

**Table 3: Deep Loop Alert Tasks**

<table>
<thead>
<tr>
<th>Task</th>
<th>Questions to the Moderator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off Topic Talk</td>
<td><strong>Guess:</strong> “Did students engage in off topic conversation? Can you cite concrete examples?”</td>
</tr>
<tr>
<td></td>
<td><strong>Determine:</strong> “Determine now if this discussion included off topic talk using the Moderator’s Interface”</td>
</tr>
<tr>
<td>Question-answer</td>
<td><strong>Guess:</strong> “Did you find evidence of students asking questions, and their fellow students trying to answer the questions in the discussion?”</td>
</tr>
<tr>
<td></td>
<td><strong>Determine:</strong> “Please use the Moderator’s Interface to find evidence for question - answer combinations”</td>
</tr>
<tr>
<td>Contribution-Counterargument</td>
<td><strong>Guess:</strong> “Can you tell whether counter-arguments are posted?”</td>
</tr>
<tr>
<td></td>
<td><strong>Determine:</strong> “Please use the Moderator’s Interface to determine whether counter-arguments are posted”</td>
</tr>
<tr>
<td>Chain of argument</td>
<td><strong>Guess:</strong> “Did you see evidence of students exchanging arguments and counter-arguments back and fourth?”</td>
</tr>
<tr>
<td></td>
<td><strong>Determine:</strong> “Please use the Moderator’s Interface to find students exchanging arguments and counter-arguments.”</td>
</tr>
</tbody>
</table>

In addition, we included specific questions regarding using the alerts in the post-questionnaire. The questions were presented in an open answer format. One question was for example whether the alerts were perceived to be accurate or not (see appendix 9 for complete list of 8 tasks).

**Moderation** - Same instruments were administered to students and the teacher as in the previous study.

Usability: In the context of usability evaluation, we focused on the Alerting Mechanism; hence we assessed usefulness of alerts using open and closed questions. Additionally we assessed usefulness of the ARGUNAUT System from the students’ perspective in terms of technology acceptance (same as previous study).

All Likert scales used in this study ranged from 1 to 5 with one representing the lowest and 5 representing the highest rating.
4.4.4.3 Outcomes

All questionnaires used a 1-5 Likert scale. All results are reported with 1 being the weakest rating and 5 being the strongest rating.

Added Value of Alerts -

Did the pre-service teacher use the alerts deliberately? The screen recording files and the logging data show that the teacher used the alerts deliberately during the unguided moderation phase. He set-up several alerts beforehand and run them during the discussion several times manually.

Did the teacher gain insight after using the alerts? During the guided moderation phase the teacher was required to guess the answer to 8 questions, without the help of information from the Moderator’s Interface. After answering each question, the teacher determined the answer to every question using the Moderator’s Interface. The results show that sometimes, it was not possible for the moderator to make correct guesses (e.g. “was there any offline talk”). For 6 out of 8 questions, the moderator either failed to guess the correct answer or failed to give an answer at all. Only two questions were guessed correctly, both referring to shallow loop questions (1. Were there any students who didn’t contribute 2. Were there any students who were ignored). However, all of the questions were determined correctly afterwards in both conditions, with the help of the Moderator’s Interface. Especially interesting was the question regarding off-topic talk. In the No Alert condition, the students indeed did not engage in off-topic conversation, therefore the teacher guessed correctly and therefore he couldn’t determine any off-topic talk. In the With Alert condition, students talked off-topic, but the teacher didn’t recognize it. Even after determining it using the Off-Topic Alert, the teacher insisted on his guess. Only after reading the contribution the alert was pointing to, the teacher gave in.

 Were teachers able to conduct specific tasks better? We compared how well the teacher determined the questions using the Moderator’s Interface in both conditions. Results indicate that the moderator was able to determine all questions in both conditions. However, the moderator spent much more time on finding the answer in the No Alert condition. This applied especially to the questions concerning the deep loops alert tasks. Apparently deep loop alert tasks seemed to require more complex understanding of the discussion structures. For example, for answering a question regarding contribution-counter arguments, the moderator spent more than 10 minutes to answer that question if no Alert Mechanism was available. Also for answering a question regarding chain of arguments, the moderator spent
about ten minutes searching and counting contributions using the Discussion Graph tab. In the condition with Alerts, it took much less time (1 minute to answer that question).

*Moderation* -
Between both conditions *(With Alerts - No Alerts)*, the moderator found the discussion to be of high or very high quality. Specifically he reported that both discussions were vivid. During the *No Alert* condition, he found his moderation neither high nor low. During his moderation with alerts he found his moderation satisfying. During both conditions the moderator found it difficult to follow the discussion and to know who talked to whom. On the other hand, he reported to find it easy to know when students provided good arguments. The moderator described his own role as supportive, encouraging, motivating and guiding.

*Usability* -
All four Alerts were regarded as somewhat useful, useful or very useful. The Off-Topic Alerts was perceived as most useful (5 on a Likert Scale), The Question - Answer Alert was perceived as useful (4). Both, the Contribution Counterargument Alert and the Chain of argument alert were perceived as somewhat useful. Overall, the moderator found that the alerts were helpful, especially for analysis and regulation purposes. He stated that alerts provide quick info's regarding the discussion and the students. In terms of accuracy, the moderator mentioned that the purpose of every alert was not completely transparent to him. He also doubted accuracy of the alerts. As a suggestion of improvement he mentioned that it would be useful to have the alert list in a sortable sidebar. The moderator also made suggestions towards the Moderator's Interface in general, which are added in the results section of the Awareness Support study.

**References**


5. Overall summary and conclusions from the final evaluation studies at different locations

5.1 Task affordance usability and appropriation of the different functions

Usability evaluation was conducted by all partners in the different settings of piloting and the main study settings. Usability testing was driven by two objectives:

- The moderator will be able to determine the purpose of Moderator’s Interface features.
- The moderator will be able to perform the tasks that he/she wishes to perform in the way the user achieves the goals he/she wishes to achieve by using the Moderator’s Interface.

Both usability objectives have been pursued by focussing on technical and task-related usability (for distinction see the ARGUNAUT deliverable D6.1 Addendum page 27). During this final phase of the project we concentrated on task-related usability (see Gantt chart in the ARGUNAUT deliverable D6.1 Addendum, page 32). Hence, we preferred relying on focus group discussions, observations and questionnaire. Bug reporting was done through the bug reporting system hosted by Silogic. Usability questionnaires have been administered throughout all studies including piloting studies and main studies. The usability questionnaire and focus group discussions were mutually used by all partners.

We evaluated usefulness of awareness displays on all sites. The evaluations of the following awareness displays were included at all sites: Chat Table\(^5\), User Activity, Ontology Use, Group Relations and Mini-View. Results suggest that especially the Chat Table tab seemed to be very useful for the moderators. This became evident during our studies, because the moderators appreciated to have a procedural view on the discussion. Usability results in Colombia, Israel and Germany show also high ratings on the User Activity tab and the equivalent Participation Statistics tab (used in the UK). This result matches results we gained

\(^5\) Except in the Colombia and Exeter studies, since the Chat Table tab was not yet integrated in these versions.
from screen recording. The moderators in Germany and Israel used the User Activity tab and the Chat Table tab the most, when working with the Moderator’s Interface. Moderators from all sites rated the Ontology Use tab either as less useful or it was less frequently used. The Group Relations tab was perceived as useful at all sites. Moderators from the UK and Germany stated that this tool was very useful for discussions with many participants and not so useful for small number of participants. The ratings for the mini-visualisations were quite heterogeneous. Only in Israel and during the training phase in Germany, they were perceived as very useful.

A second focus of evaluation was the Intervention Panel of the Moderator’s Interface. Across sites, the moderators seemed to prefer textual communication (Pop-Up and Annotation) instead of passive, visual communication (Remote Pointer and Highlight). The moderators reported that the Remote Pointer and Highlight was less useful than the rest of the intervention possibilities. Again, this perception became evident during the actual moderation. For example in Germany, the moderators did not use the Remote Pointer or Highlight at all to spontaneously moderate discussions. In case of the Israel studies, moderators found the Highlighting feature to be useful but in the actual moderation it was mostly used in combination with annotation. Thus the more textual Intervention Panel tools were preferred. The moderators had quite different views on the usefulness of the pop-up. Some moderators disliked the intrusiveness (“they just appear right in your face”), some appreciated it (“It is good for important message and makes sure that the student notices it”). During moderation it was used frequently by moderators from all sites. Also from the students’ perspective we received different views. Several students reported that they automatically clicked the pop-up message away because they are so used to commercials appearing in pop-ups. On the other hand, we also had students who didn’t notice messages on the side-bar at all and appreciated pop-ups because they were noticeable. Student-Teacher communication was difficult in general, because the Remote Control provides no function for the student to respond to a moderator’s Intervention. On all sites, except Colombia, moderators and students reported that a way for students to respond to the moderator would be appreciated. For example, one moderator said that the formulation of interventions was more difficult because he had to work around that issue by not including questions, when sending messages to the students.
Overall, the moderators were able to determine the purpose of most tools within the ARGUNAUT system. Moderators had some difficulties with understanding the purpose of the Group Relations tab. In general, the moderators were able to perform most of the tasks they wished to perform. Limitations were related to response possibilities of the student to the moderator, more flexibility to use the Intervention Panel not only with the discussion Graph tab but also with the Awareness Displays (e.g., Chat Table tab).

5.2 Impact of the ARGUNAUT system

The main goal of the ARGUNAUT system is to support e-teachers and tutors in their attempts at e-moderation of e-discussions in a graphical discussion environment (diagrams). One of the more challenging factors of e-moderation is to keep track of discussion development, group dynamics and contribution content. This in turn is likely to affect the effectiveness of moderator interventions. The design of the system's awareness features was intended to support moderators in this aspect. Assessment of the impact of the integrated pre-release versions of the ARGUNAUT system thus mainly focused on three factors: (1) whether the mental efforts that moderators invested during moderation decreased; and (2) whether their awareness to selected discussion features increased; and (3) whether the students' and the moderators' satisfaction of moderation improved. In addition, we assessed the overall success, enthusiasm and satisfaction of moderator tutors and teachers with the help of interviews and focus group discussions. We created three types of comparisons: direct Digalo moderation vs. Moderator's Interface moderation, single vs. simultaneous Moderator's Interface moderation, and Moderator's Interface moderation with vs. without awareness tabs.

First of all, the impact of ARGUNAUT on moderators' awareness to discussion features is composite and complex: Compared to direct moderation in the EUE environment ("direct Digalo moderation"), moderation through the Moderator's Interface slightly improved moderator awareness to discussion features. On the other hand, the Awareness tabs did not improve measures of directly assessed awareness compared to Moderator's Interface moderation without the Awareness Tabs, whereas it did improve the number of tasks that they executed correctly. The Alerting mechanism study (see 4.4.4) also showed that they slightly improved the moderator's awareness to discussion features. Whereas the assessment
of students' awareness to the moderators' interventions proved to be problematic in some studies (in particular in Israel), descriptive findings seem to indicate that students were quite aware to the Moderator's Interface moderator's interventions. On the other hand, however, students seem to be more aware of the moderator's presence in general in the direct Digalo mode of moderation. In the Moderator's Interface moderation conditions, several students indicated that they would have liked to "feel" the teacher's presence more distinctively. Not surprisingly, such student reactions were even more prevalent in simultaneous Moderator's Interface moderation conditions.

Moderators also rated the mental effort that they invested in selected moderation aspects. Overall, moderators' reactions and ratings showed that they felt that they could easily handle the different moderation aspects. Comparisons between direct moderation in the EUE and through the Moderator's Interface show that perceived mental effort was indeed lower in the latter settings. Comparisons between single-session and multiple-session moderation showed that the increase from single to two sessions did not affect the mental effort reported (Israel), but that the moderation of four groups simultaneously (Israel and UK) was perceived as too demanding and as damaging to moderation effectiveness.

Taking together all the different settings and studies, it seems that there is a difference between moderators in laboratory settings (that do not know the student discussants personally) and high school moderators in field settings (that moderated discussions between their own pupils). Moderators that participated in lab settings all emphasized that e-moderation of synchronous discussions is a very demanding task (in all the different conditions). We did not receive any such reactions from teacher moderators in field settings (in Germany, UK and Israel). To the contrary, they were overall quite enthusiastic and mentioned that they greatly enjoyed the moderation experience. This difference could be attributed to three possible reasons: First of all, the high school teachers moderated their own students' discussions. This is likely to decrease the mental efforts involved: the teachers know what and who they are looking for, they know what to expect from their students and can focus on what is really important (to them). Secondly, they could be more used to and have lower expectations of handling and monitoring group work in large-size classes. Finally, their discussions were embedded in genuine and on-going curriculum activities and teacher-student interactions. This allows for more preparatory work with the students prior to the
discussion session and the possibility to continue the topic in subsequent classes. Therefore, their expectations of what they should achieve within one, single discussions could have been more lenient. Moreover we might suggest that teachers’ motivation to master the tool (Moderator’s Interface) for their relevant work with their students was higher than of the moderators in the "lab conditions". This is to say that the teachers in the classroom setting felt that the Moderator’s Interface helped them to realize something which they already wished to do for long time: mainly watch (calmly) their students' work. While realizing this they treated the difficulties they encountered with the use of the Moderator’s Interface only as "minor obstacles" to reach something they believed to be useful for their daily work. Mastering the Moderator’s Interface was then considered "only" as a tool to reach a pedagogical goal and was not considered as difficulties to report about. On the other hand, for the moderators in the Lab condition mastering the Moderator’s Interface was considered as a task by itself, so every difficulty encountered was reported.

Another, unexpected aspect of mental effort in e-moderation that emerged from the interviews and CER sessions, concerns the fact that the moderator’s actions are not visualized within the Moderator’s Interface environment. As a result, several moderators (in particular those that had developed more experience with the Moderator’s Interface) reported that it is very hard to track what one has already done, to whom, where and when. This in turn, makes it difficult to develop a coherent intervention pattern, to make sure the moderator is not flooding participants and to see whether people are responding appropriately. This aspect of mental effort and developing a coherent mental representation of the interaction and their role in it was not expected. It could be an interesting venue for further development in other projects.

Satisfaction of students and moderators of moderation varied among studies. Whereas satisfaction was high in studies in Israel and Germany, UK students did not think highly of moderation practices. We believe that this difference can (at least in part) be attributed to the fact that in the UK Higher Education study (see 4.2.3) an earlier ARGUNAUT version was used than in the others. The communication between the EUE and the Moderator’s Interface in version 0.51 was still quite problematic.
In sum, whereas most moderators were very enthusiastic about moderation through the Moderator's Interface, the exact extent to which the Moderator's Interface made moderation easier is not easy to determine at this stage. More then anything else, the ARGUNAUT system creates a different moderation experience, which in turn may cultivate new traditions of moderation. Its design highlights certain functions of e-moderation, and de-emphasizes others. Each moderation tool is appropriate to different settings, moderation goals and moderation styles. We will refer to the experience of e-moderation within ARGUNAUT in the next and final section.

5.3 E-moderation with ARGUNAUT

Insights concerning the new practice of moderation that was created with the Moderator's Interface, role of the moderator, professional development etc

The three key questions which the ARGUNAUT project addresses in relation to e-moderation are:

1. Is it possible to successfully moderate synchronous dialogue with this system?
2. Can this scale up to effective moderation of several maps?
3. What new models of e-moderation, if any, emerge from this experience?

Our findings so far are very provisional and tentative. The empirical studies of e-moderation with the ARGUNAUT system of course depended on the technical development of the system and so several have been done quite recently with data that is still being analysed. The deep loop awareness indicators in particular have not been effectively trialled as they were not working sufficiently well to be useful in all but the German Alert Mechanism study (see 4.4.4). This was a new technology being trialled in most cases by teachers with little experience of e-moderation so inevitably their reactions are shaped by what they are most familiar with. The real affordances of any very new system like this can take some time and familiarity to emerge. Despite all these limitations some clear conclusions can be drawn at this stage.

In the studies where discussions were moderated using the Moderator's Interface the evidence is fairly conclusive that the moderation was experienced as useful by both
moderators and students. This is already a significant advance on previous practice since the successful moderation of synchronous computer-mediated dialogues is rare. Of course, some awareness tools were found more useful that others and some intervention tools were found more useful than others, as detailed in the feedback but on the whole the interface worked to support moderation. However, even with moderating a single Digalo session we find moderator reports of how difficult it is to keep up with the complexity of the map and rapid pace of change. The strength of this response probably relates to the expectations of moderators. As Gil and colleagues (2007) bring out there are many different moderator styles and the ARGUNAUT system does not support them all. The synchronous nature of the interaction with several participants often typing at once does not enable deep engagement with the content and an encouraging or shaping response to every message of the kind often recommended in the literature on effective asynchronous e-moderation. The Moderator’s Interface also removes the moderator from being a participant in the construction of the map, frustrating those who want to be more engaged.

These effects already present in response of moderators to moderating single maps are magnified when they move up to multiple maps. Here some sense of a loss of quality is reported by both moderators and students. Some UK moderators report it getting too complicated for them to effectively engage and some UK students reporting that they felt that moderators were not very present and were managing their work rather than engaging with their ideas. This shift was found most uncomfortable by those moderators who wanted to engage more with the content of students’ discussions such as Ra in Israel.

The responses of the moderators suggest the emergence of new e-moderating style to cope with the cognitive load of managing several maps simultaneously while providing effective support for students. This is that of a learning manager, intervening only when necessary to, for example, move learners on between phases of work, solve problems and bottlenecks, to prompt with seed questions when the dialogue is not productive or are going seriously off-task and to privately encourage those who are not participating. The ARGUNAUT system does not support the deep engagement in content and the nurturing of ideas more familiar to moderators of both face-to-face and online asynchronous forums. However the kind of moderation that it does support is valuable and was simply not available before. Before ARGUNAUT, it was not possible to effectively moderate even small groups in synchronous
computer mediated dialogue, whereas with ARGUNAUT it is possible to moderate a normal size class.

Another interesting aspect of the possible benefits from using ARGUNAUT came across with observing the three teachers at Ziv School in Israel. In this context, we had the opportunity to see how teachers use the tool while they actually work with their own students in their daily routine. In this case, teachers had to master ARGUNAUT (1-2 discussions) and monitor their students at the same time. At this point teachers were concerned how to use the tool best for supporting their students work, as well as keep all students on track with their assignments. Therefore, while teachers expressed the added value that they see with the use of the tool (Moderator's Interface) they spoke about teacher-student relationships (e.g., "There is a sense of equality with the use of the tool"), as well as their own expectations and identity as teachers (e.g., "Personally, I think the teacher should give students some space"; "...allowing for one-on-one communication"). We believe that these preliminary results emphasize the potential use of the tool to fulfil teachers' pedagogical ideals, as well as positioning the teachers for such a change in their pedagogical practice. It is apparent in Ned's reflections: "When I first started teaching I hoped that I wouldn't have to deal too much with discipline. But I soon discovered there wasn't much choice. During this [ARGUNAUT] activity, I felt that I was going back to my first ideal of a teacher approach: running a productive discussion between students". The point here is, that not only does the evaluation research reported in this document show what is now feasible moderation is with ARGUNAUT or how moderation can be improved using the ARGUNAUT tools, but also the fact that the ARGUNAUT tools create an opportunity for change in pedagogical practices and teaching styles.
## Appendices

### Appendix 1. Q_Usability (Usability Questionnaire of Moderator’s Interface functions)

Name: ______________________________
Date: ______________________________

For each of the following displays/representations, please indicate how you evaluate the level of its usefulness for moderating/monitoring Digalo / FreeStyler discussions:

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Very useful</th>
<th>Somewhat useful</th>
<th>Not useful at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion Graph</td>
<td>A representation of the Digalo discussion map in the Moderator’s Interface</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Participation Statistics</td>
<td>A representation of participation levels for each student</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>User Activity</td>
<td>A representations of the number of actions per action type, for each student</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Ontology Use</td>
<td>A pie chart showing the relative distribution of ontology use (different shape types), for each group</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Group Relations</td>
<td>A representation of the relationship between participants (who responded more to whom, etc.) in a 2-dimensional way</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>View per session or per discussion</td>
<td>In the 3 small sub-windows on the right side of the Moderator's Interface window, you can choose between seeing different aspects of one discussion, or alternatively, one aspect over several discussions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For each of the following displays/representations, please indicate in what type of situations this display would be particularly useful and why. What type of information would you be looking for in this situation and how do you think that this display could help you in the moderation process?

<table>
<thead>
<tr>
<th>Discussion Graph</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation Statistics</td>
<td></td>
</tr>
<tr>
<td>User Activity</td>
<td></td>
</tr>
<tr>
<td>Ontology Use</td>
<td></td>
</tr>
<tr>
<td>Group Relations</td>
<td></td>
</tr>
<tr>
<td>View per session or per discussion</td>
<td></td>
</tr>
</tbody>
</table>
For each of the following intervention options please indicate to what extent you see it as useful during moderating/monitoring Digalo discussions:

<table>
<thead>
<tr>
<th><strong>Moderation actions</strong></th>
<th><strong>Description</strong></th>
<th><strong>Not useful at all</strong></th>
<th><strong>Somewhat useful</strong></th>
<th><strong>Very useful</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Pointer</td>
<td>... point to a specific contribution(s) with a pointing hand cursor</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Highlight</td>
<td>... highlight a specific contribution(s) with a blinking red outline around it</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Annotate</td>
<td>... write a short message on a &quot;note&quot; and &quot;attach&quot; it to a certain contribution(s)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Popup</td>
<td>... can send pop-up messages to a user(s)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Message</td>
<td>can send messages to a user(s)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

For each of the following functions, please indicate for what type of moderation actions (what does the moderator want to accomplish with his actions) a certain communication function seems to be particularly effective or useful. Please give examples, if possible.

| Remote Pointer         |                                 |
| Highlight              |                                 |
| Annotate               |                                 |
| Popup                  |                                 |

Were there any intervention function and/or representations of important characteristics of the discussion which you find important and aren’t a part of the Moderator’s Interface? Please tell us in detail:
If you have any further comments, please write them here:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

___________________________________________________________________________
Appendix 2. Q_ModStyle

Teachers' positions about moderating classroom discussions

Name: _____________________________

Subjects taught: ___________________________ Grades taught: ______

Circle the degree of your agreement with the following statements: to what extent do these following sentences suitable for describing the teacher's role.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Very much agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>To encourage participation in the discussion</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To make sure that the students are using good arguments</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To provide expertise knowledge in the content-area of the issue being discussed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To make sure they are discussing the topic and not other things</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To encourage them to relate to each other's contributions</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To allow the students to express themselves and discuss things with each other without teacher interference</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To challenge the students' thinking</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To actively take part in the discussion as one of the discussants</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To create a pleasant and supporting atmosphere</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To make sure the students are speaking and behaving in a civilized manner</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To introduce perspectives that were not mentioned yet</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>To express a personal position and argue alongside the students</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
To make sure that they're reading contributions from others 1 2 3 4

To make sure that they are conducting a high-quality argumentative discussion 1 2 3 4

To make sure that the students provide backings for their claims 1 2 3 4

To make sure that everyone participates 1 2 3 4

To make sure that the students stay on topic 1 2 3 4

To provide explanations and help them content-wise 1 2 3 4

To give positive feedback and personal-emotional support 1 2 3 4

To make sure that the students know the teacher is present and reading what they say 1 2 3 4

Describe in your own words what the teacher's role in this environment is and why:

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________
Appendix 3. Q_ModeraExp: Teachers on Moderator’s Interface moderation

The following questions relate to the discussion that you just moderated and your experiences as a moderator in this discussion. Please close the computer when filling out this questionnaire!!!

Name: _______________________ Name of map moderated: _____________________
Number of students in the discussion: ____
Moderation through: Digalo / Moderator’s Interface (circle what is appropriate)

How would you rate the quality of the discussion that you just moderated?

<table>
<thead>
<tr>
<th></th>
<th>Very high</th>
<th>Good</th>
<th>Fine</th>
<th>Not so good</th>
<th>Very low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How would you rate your satisfaction with your moderation in this discussion?

<table>
<thead>
<tr>
<th></th>
<th>Very satisfied</th>
<th>Satisfied</th>
<th>It was fine</th>
<th>Not so satisfied</th>
<th>Not satisfied at all</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please indicate to what extent the following statements characterized the discussion you just moderated:

<table>
<thead>
<tr>
<th></th>
<th>Don’t Agree At All</th>
<th>Neither / Nor</th>
<th>Agree Totally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students used the correct (content-related) concepts and relevant terms</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I enjoyed moderating this discussion</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>There was no interaction between the different discussants</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Students provided adequate backings / reasons when making claims?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The discussion quality improved as a result of moderation</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>----------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Students talked off-topic (social talk or other topics)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderating this discussion was difficult</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students posted adequate links between the shapes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderation was essential in this discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students referred to each other's ideas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderation was an easy task</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students disagreed with each other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students contributed equally to the discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students reached a common solution / agreement on the topic of discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All the students interacted with each other equally</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students related to different perspectives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students talked on-topic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students paid attention to the moderator's remarks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students acted upon the moderator's remarks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students used foul language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students related to each other in a respectful and civilized manner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The discussion did not require moderator interventions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt that my moderation was</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There were different subgroups that only interacted with each other

<table>
<thead>
<tr>
<th>Name of discussant</th>
<th>Very active</th>
<th>Quite active</th>
<th>Not that active</th>
<th>Almost no activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Was there a dominant participant in this discussion? No / Yes, name of student: __________________________

What characterized his/her participation dominance?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Please describe the relations between the different discussants. How would you characterize the group interactions?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
____________________________________________________________

Please indicate the effort you felt you invested to accomplish the following:

<table>
<thead>
<tr>
<th></th>
<th>Very easy</th>
<th>Easy</th>
<th>Difficult</th>
<th>Very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>To follow the discussion development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To know who was talking to whom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To know whether each student participated sufficiently</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To know whether students acted civilized and did not use foul language</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To know what each student did in the discussion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To know whether they made reasoned arguments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To decide when to intervene</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To decide how to intervene</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Describe key situations during the discussion that most required moderator intervention. Please indicate how you intervened and why for each case.

1._________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

2._________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

3._________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

4._________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

How would you define your role as a teacher / moderator in this particular discussion?
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
Appendix 4. Q_StudentExp : Students on Moderator’s Interface or Digalo moderated session

Name: ______________________ Age _____________  Sex:   F    /    M
Name of the Digalo discussion map you just participated in:_______________________

The following questions relate to the discussion that you just participated in. We are particularly interested in how you experienced this discussion and what you thought of the moderation in this discussion.

Please note that your answers are confidential and that the teachers will not see your answers

Please close the computer when filling out this questionnaire

To what extent were you satisfied with the teacher’s moderation in this discussion? (circle the appropriate answer that reflects your satisfaction):

Very satisfied  Satisfied  It was fine  Not so satisfied  Not satisfied at all

We will now ask you a few more questions about the moderator’s behaviour during this discussion. Please indicate to what extent you agree with the following statements concerning the moderator’s behaviour:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Neither agree/Nor Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The moderator made a lot of comments and actions</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I hardly noticed the moderator’s comments and actions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The moderator’s comments and actions improved the discussion</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I did not understand the moderator’s comments and actions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The moderator acted as a regular participant in the discussion</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator should have intervened less</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator’s actions were very clear</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator helped us remain focused on the task</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator interfered as little as possible</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator provided help and guidance when it was needed</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator should have intervened more</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator stated his own opinions</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator seemed quite slow in his responses</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator’s comments were not really helpful</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator’s comments interfered with the discussion</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator took care of discipline problems</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The moderator paid attention to what we said in the discussion</td>
<td>1   2   3   4   5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How many times did the teacher address you personally? ________ times

How many times did he interact with the group in general? ________ times

Are there other interventions the teacher should have undertaken, to you or to others? If so, what and why?
Appendix 5. Experiment Design for Secondary School Participants in Carisbroke High School

Pedagogy and Digalo

Purpose of Digalo
The main purpose of Digalo is to get students accustomed to using reason and logic within a virtual context, and to contribute effectively to discussion and argument as team members or collaborative learners. Students are helped to deal with areas of uncertainty in a rational manner and to get experience of making balanced and justified assessments using good argument and evidence.

Activities with Digalo
Digalo can be used in one-off sessions to generate ideas but more often it is used within a structured activity to encourage deeper thinking about a specific topic. It is best used after students have been given information and preparatory materials to review and discuss. Discussion, reasoning and argument within Digalo helps students understand an issue or topic in more depth. An activity of this kind can have several stages – preparation (reading and research), familiarisation (exploration of a topic), refinement of knowledge (debate or critique), summary (reflection and/or decision). An example activity is given overleaf.

Groups
Digalo is best employed by small groups of 4 to 5 students who use both face to face discussion and Digalo to map their discussion. In order to stimulate argument within the group students may be assigned alternative positions to defend, though with mature students this is not usually necessary. It may be helpful to assign students randomly to groups after a preliminary session to get them to focus evenly on the other members (rather than form sub-groups).

Good Argument
It is helpful to explain to the students the components of good argument in a preliminary session. A good argument will be well reasoned and use plausible evidence to reach a conclusion. The conclusion should be justified and proportional to the argument. Good argument does not use personal or demeaning criticism, but should weigh the evidence and
whether it is reliable (i.e. does it come from an informed and authoritative source and not just an opinion). The presence of counter-argument is essential to test the value of any argument and so students should be encouraged to critique others’ arguments and point out shortcomings. The groups should be allowed to discuss the issue verbally at certain times in the activity, followed by mapping within Digalo.

**Suitable Topics**

Suitable topics will have issues that have more than one perspective. If there are strong arguments and evidence to support more than one position this will encourage in-depth argument. Often provocative and contentious questions will stimulate argument, and moral questions are known to be good candidates for this (e.g. the behaviour of a real or fictitious character). Science topics that have a known correct answer may be set up as a problem in which alternative assertions are made and for each one an argument proof is devised by the students to show if it is true or false.

**Good Argument – Example 10min lesson plan**

(you may find this is helpful - adapt it to your own context)

Question: What makes a good argument?

Leading questions:

- what is the point of argument – what is it intended to achieve?
  - *it is convincing and plausible - it persuades*

- Consider this argument: I want to leave my TV on standby, therefore we should switch to nuclear power. Does it make sense, does it make the case for switching? What would the argument have to look like to make sense? (steps would include - we want to use more power - we can't get that power from fossil fuels for much longer - damage to the planet from fossil fuels - nuclear power is safe(ish) - the overall benefits outweigh the risks - therefore we should switch)
  - *it is reasoned and logical - each step in the argument towards a conclusion follows from what came before*

- what if it ignores important and relevant facts? ‘Nuclear waste can be safely stored underground’. Nuclear waste can be toxic for thousands of years, so safe in this context is limited to the near future.
  - *it uses all the relevant evidence - the evidence should support the argument*
if a politician and a nuclear scientist disagreed about how much energy a nuclear powerplant will produce, who would you believe and why? If the question was about how much danger the nuclear powerplant would be to the local community, would your answer be different?
(Note: you might expect the expert to be believed on simple facts, however, on the last point the answer might be treated with more caution as it is somewhat out of the scope of expertise of a nuclear scientist and there are few simple facts).

**evidence should be weighed as to its reliability** - who says it and how informed they are gives authority to an argument - anyone's opinion is not evidence

**Experiment** -

The **first session** introduced Digalo to the students and set them a topic to discuss, that was familiar to them. A handout (appendix 1) explaining the concept of argumentation and the tool was provided to all the participants and the facilitators. A fairly light touch in instructions to curb disruptive behaviour, but allow them to explore what this sort of interaction can do. Point up good practice at the end.

Teacher (10 mins): introduction to Digalo e-discussions, purpose - to help participants contribute effectively to discussion and argument as team members, how to launch it, how to use it - different box shapes - links to support or oppose and other do and don'ts.

Digalo (20 mins): participants play with a contentious hot topic that needs no preparation.

Teacher (10 mins): *demonstrate to the class examples of good practice* in participant pads on whiteboard (these could be pre-prepared, but more fun if taken from what is going on currently). Good practice would include -

- use of evidence
- supporting others
- critique of others / counter-argument
- good reasoning

Outcome: participants are able to operate the Digalo interface and are confident and enthusiastic about making contributions; they are able to link to, support or oppose others’ contributions. Participants will adjust to the new social conditions of virtual discussion.

The **second session** was an exploratory session where the participants were asked to undertake some reading of materials on a course topic, and primed with a short exposition
of what makes a good argument. This reading material contained several positions or stances on the topic and each participant was assigned one position to argue and defend within a group of 4-6 classmates. Each group contained all the positions. Thus this was a more focussed session on a course topic. Allow the participants time to marshal arguments and try to employ the good practice that has been outlined. Towards the end we look for some interaction by the group (verbally or in Digalo) in supporting or critiquing each others work in terms of good practice. Those participants who have been tentative should now have some pointers as to what they should be doing.

Preferred Materials: one succinct balanced summary of issue, one short article for each possible position - these can take extreme positions. Pads divided into quadrants to provide an individual space for 4 group members
Teacher (10 mins): instructions for activity, the preparatory reading materials on different positions within the issue under discussion, present good argument principles and evidence (see example argument lesson)
Optional: allow students to research one new source of material and use it in their mapping in addition to what is already provided.
Reading (10 mins): students individually read/research material, (Facilitator can use this period to assign participants to groups and to positions).
Digalo (10 mins): participants map initial arguments using evidence in their individual space.
Digalo (10 mins): participants discuss their work so far in the group (this can be verbally which has the advantage that more ground can covered - or if not convenient then by leaving comments on each others work). Questions to guide their discussion include:
  - is the argument relevant and important to the issue?
  - is the argument reasoned and logical?
  - is the conclusion of the argument justified?
  - does the argument use the available authoritative evidence?
  - are there exceptions to the argument and other contexts to consider?

Outcome: participants will be familiar with alternative perspectives and have explored at least one perspective in more depth. They will have practiced the skill of using evidence to construct an argument and shared their views within the group in a constructive manner.
The group should be more aware of what makes a good argument and the importance of evidence.

The third session was on debating the topic and provides the opportunity for a more full-on confrontation within the group. This is designed to get participants to elaborate their own arguments, furnish supporting evidence and to find the weak points in others arguments. In this context, it's important for the facilitator to review examples of good practice found in the discussions to drive the main points about good argument home.

Materials: use Digalo pads from last time to provide a reminder of what they did, but they will work in a fresh space within the pad.
Teacher (10 mins): instructions for activity, participants should propose their arguments and oppose others’ arguments review good argument counter-argument (‘I disagree because...’) ('Do you have evidence....')
Digalo (20 mins): participants copy best arguments into a shared group space and concentrate on opposition and counter-argument
Teacher (10 mins): select an argument from each group to illustrate on e-whiteboard, critique (with class if possible) each in terms of good argument, counter-argument and best collaborative practice (i.e. being supportive)

Outcome: participants have experience of proposing, supporting and defending a position in the debate and offering some critique of other positions. Participants will have made progress in understanding: how to use evidence to support an argument; what can be justified and what cannot; how to make a valid counter-argument; supporting and critiquing others’ contributions in a constructive manner.

An opportunity for further reflection and summary was provided as a written assignment on the topic would be useful to crystallise the benefits of the discussion. The participants should have a printout of the Digalo map for their group to recall the arguments while writing an assignment.
Appendix 6: Overview of the pedagogical activities at the University study in Exeter

- **Experiment 3 on the 21st April 08**

  Workshop outline:
  - The first part of this session was an introduction to facilitators and students about the experiment (ground rules, task description, timing, roles, etc. (Researchers: 10-15 minutes)

  - The second part was used for discussions (Digalo - students) and moderation (Moderator's Interface - teachers). Each teacher used the six thinking hats and moderated one group of 4 students (30-45 minutes). As shown in Figure. 4

**Activity one: Six thinking hats**

![Diagram showing six thinking hats and four students]

Introduction (for students to read before starting the task)
To use Six Thinking Hats to improve the quality of your decision-making, look at the decision 'wearing' each of the thinking hats in turn.

Each 'Thinking Hat' is a different style of thinking. These are explained below:
• **White Hat:**

With this thinking hat, you focus on the data available. Look at the information you have, and see what you can learn from it. Look for gaps in your knowledge, and either try to fill them or take account of them.

This is where you analyze past trends, and try to extrapolate from historical data.

• **Red Hat:**

'Wearing' the red hat, you look at the decision using intuition, gut reaction, and emotion. Also try to think how other people will react emotionally, and try to understand the intuitive responses of people who do not fully know your reasoning.

• **Black Hat:**

When using black hat thinking, look at things pessimistically, cautiously and defensively. Try to see why ideas and approaches might not work. This is important because it highlights the weak points in a plan or course of action. It allows you to eliminate them, alter your approach, or prepare contingency plans to counter problems that arise.

Black Hat thinking helps to make your plans 'tougher' and more resilient. It can also help you to spot fatal flaws and risks before you embark on a course of action. Black Hat thinking is one of the real benefits of this technique, as many successful people get so used to thinking positively that often they cannot see problems in advance, leaving them under-prepared for difficulties.

• **Yellow Hat:**

The yellow hat helps you to think positively. It is the optimistic viewpoint that helps you to see all the benefits of the decision and the value in it, and spot the opportunities that arise from it. Yellow Hat thinking helps you to keep going when everything looks gloomy and difficult.

• **Green Hat:**

The Green Hat stands for creativity. This is where you can develop creative solutions to a problem. It is a freewheeling way of thinking, in which there is little criticism of ideas.

• **Blue Hat:**

The Blue Hat stands for process control. This is the hat worn by people chairing
meetings. When running into difficulties because ideas are running dry, they may
direct activity into Green Hat thinking. When contingency plans are needed, they will
ask for Black Hat thinking, and so on.

**Task:**

You are working as a head teacher in a primary school in 2025. The government gives you
£100,000 to spend on ‘information services’. The government wants you spend it on the ICT.
You have a governor who says you should spend it re-stocking the library with books.
Another says you should ignore the government entirely and spend it on a gym. How do you
invest the money? Give details and reasons for any choices.

<table>
<thead>
<tr>
<th>Brain storming</th>
<th>Six thinking hats/ 20 minutes</th>
<th>Conclusion or reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question/ 10 minutes</td>
<td></td>
<td>(decision making)/10 minutes</td>
</tr>
</tbody>
</table>

Roles:

1. Use neutral shape on the first phase to discuss which area you like to spend the
money on in 10 minutes.
2. Select two or three ideas and pull over with reason why do you think it is good idea
to the second phase that you think you like to develop them further and use the six
thinking hats to discuss with your team the plan of spending the money.
3. Try to use different hats so you can discuss an idea from different views.

Moderator roles:

1. After 10 minutes the moderator will send a message to the group asking them to
choose 2 or 3 new thoughts.
2. Look at if the students use different hats or not.
3. Setting up alerts associated with the activity, foe example, alerts if somebody
doesn't say anything for about 5 minutes.
4. Setting up alerts associated with key words related to task. For example:

Task time:
• Introduce the using of the six hats with task and their roles and the moderator role during the discussion (10 minutes).
• Phase one/ brain storming using the neutral shape (10 minutes).
• Phase 2 / discussing and developing the best 2 or 3 new ideas using the six thinking hats (20 minutes).
• Phase 3 reflection or conclusion (10 minutes)

**Experiment 4 on the 12th May 08**

Workshop outline: (4 sessions)
- The first part of each session was a short introduction to the teacher and students about the experiment (ground rules, task description, timing, roles, etc. (Researchers: 10 minutes)
- The second part of each session was used for discussions (Digalo - students) and moderation (Moderator's Interface - teacher). (30-45 minutes) Each teacher moderated 4 groups of 4 students at the same time for one hour. Each moderator used different pedagogical strategy from the other moderators.

Session 1: Moderator 1 moderating 4 groups of 4 participants (SWOT)
Session 2: Moderator 2 moderating 4 groups of 4 participants (Concept map)
Session 3: Moderator 3 moderating 4 groups of 4 participants (6 hats)

**Activity two: SWOT analysis** (Strengths-Weakness- Opportunities- Threats)

![Figure. 5 Moderator 1 (from 2-3 pm)](image-url)
Introduction (for students to read before starting the task)

A SWOT analysis generates information that is helpful in matching an organization or group’s goals, programs, and capacities to the social environment in which it operates.

Strengths:
Positive tangible and intangible attributes, internal to an organisation. They are within the organisation’s control.

- What advantages does your company have?
- What do you do better than anyone else?
- What unique or lowest-cost resources do you have access to?
- What do people in your market see as your strengths?
- What factors mean that you “get the sale”?

Weakness:
Factors that are within an organisation’s control that detract from its ability to attain the core goal. Which areas might the organisation improve?

- What could you improve?
- What should you avoid?
- What are people in your market likely to see as weaknesses?
- What factors lose you sales?

Opportunities:
External attractive factors that represent the reason for an organisation to exist and develop. What opportunities exist in the environment, which will propel the organisation?

- Where are the good opportunities facing you?
- What are the interesting trends you are aware of?
Useful opportunities can come from such things as:

- Changes in technology and markets on both a broad and narrow scale
- Changes in government policy related to your field
- Changes in social patterns, population profiles, lifestyle changes, etc.
- Local events

Threats:
External factors, beyond an organisation’s control, which could place the organization mission or operation at risk. The organisation my benefit by having contingency plans to address them if they should occur.

- What obstacles do you face?
- What is your competition doing that you should be worried about?
- Are the required specifications for your job, products or services changing?
- Is changing technology threatening your position?
- Do you have bad debt or cash-flow problems?
- Could any of your weaknesses seriously threaten your business?

**The task:**

There is a competition about who is going to organise a party for the end of the course for this year 2008. The winner team will get award of £500. You are working with a team to plan for this party. Can you discuss with your team the strengths, weaknesses, opportunities, and threats relating to this task?

**Script:**

1. Stage 1 brainstorm party options
2. Stage 2 select the best 2 or three and swot them
3. Students will work together on each space for about 10 minutes
4. Te moderator will send another message asking the student to move to another SWOT.
5. The students can go back to any space of SWOT at any time to develop or add new ideas.

**We can use the SWOT simply as following:**

<table>
<thead>
<tr>
<th>Brainstorm (10 minutes)</th>
<th>Strengths (10 minutes)</th>
<th>Opportunities (10 minutes)</th>
<th>Weakness (10 minutes)</th>
<th>Threats (10 minutes)</th>
</tr>
</thead>
</table>

**Ground rules**

Simple rules for successful SWOT learning:

- Be realistic about the strengths and weakness of your organisation when conducting SWOT analysis with your team.
- SWOT analysis should distinguish between where your organisation is today and where it could be in the future.
- SWOT should always be specific. Avoid grey areas in your opinion.
- Always apply SWOT in relation to your competition i.e. better than or worse than your competition.
- Keep your SWOT short and simple. Avoid complexity and over analysis.
- SWOT is subjective. This encourages you to express your opinion freely and also to accept the other to argue against it.

**Activity three: concept map**
The task:

There is a debate in different cultures about the role of science, technology and religion in developing a good citizen in society? How do you think this relationship should be representing on education to develop a good UK citizen? And which concept should have the main concern in educating our child?

Script:

Phase 1: phase 1: collect the participants’ experiences and views about each concept. Give the participants about 5 concepts Science-Technology- Religion - citizenship- UK society and ask them to make brain storming about each concept on its importance to childhood. Phase 2: ask them to think and discuss the relationship between these 5 concepts. We will give them similar to and different from shapes to label relation lines. Phase 3: ask them to pull over the citizenship concept on the middle and discuss how they develop it based on their discussion on phase 1 and 2.

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain storming about each concept related to the childhood need</td>
<td>Relation ship between the 5 concepts</td>
<td>developing the citizenship by emphasizing the role of other concepts</td>
</tr>
</tbody>
</table>

Duration:
Phase 1: 15 minutes  
Phase 2: 20 minutes  
Phase 3: 15 minutes

**Activity four: 6 thinking hats**

![Diagram of 6 students and Moderator 3 using 6 Hats]

**The task:**
Imagine you have a child and you to choose their education which kind of education and why? What the most important factor for you?

**Script:**
1. Each student come up with his/her idea in the space  
2. Comments on the other ideas  
3. The comment on the other comments  
4. They move the new ideas to the space
## Appendix 7. UsabilityAlerts

### Usability questions for the teachers regarding Alerting Mechanism

For each of the following displays/representations, please indicate how you evaluate the level of its usefulness for moderating/monitoring Digalo discussions:

<table>
<thead>
<tr>
<th>Alert</th>
<th>Description</th>
<th>Very Useful</th>
<th>Somewhat Useful</th>
<th>Not Useful At All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-topic alert</td>
<td>The alerting rule that allowed you to see whether students made off-topic contributions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Question-answer alert</td>
<td>The alerting rule that allowed you to see whether students asked and answered questions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Contribution-counterargument alert</td>
<td>The alerting rule that allowed you to see whether students made single counterarguments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Chain of argument alert</td>
<td>The alerting rule that allowed you to see whether students engaged in a chain of arguments and counter-arguments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

In general, did you find the alerts to be useful and helpful? Why or why not?:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Did you find the alerts to be accurate? Why or why not?:

___________________________________________________________________________
___________________________________________________________________________
What suggestions do you have for how the alerts might be made easier to use and/or more helpful?:

Were there any important intervention functions and/or alerts that you thought were missing from the Moderator’s Interface? Please tell us in as much detail as possible.:  

If you have any further comments, please write them here.:
## Appendix 8. Q ModerationTasksAwareness

Tasks provided to the moderator during and after moderation (UDE only)

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Questions and Tasks</th>
</tr>
</thead>
</table>
| Strongest Contributor               | *Judge:* “Tell me now who you think is the strongest contributor. Tell me this for each session.”  
                                           *Determine:* “Determine now the strongest contributor using the Moderator’s Interface. Do this for each session.” |
| Certain Contributions               | *Judge:* “Tell me now, which was the 10th, 12th and 15th contribution in the discussion.”  
                                           *Determine:* (...) |
| Person Links                        | *Judge:* “How many links did ***** make to other people.”                             
                                           *Determine:* (...) |
| Strongest Collaborator              | *Judge:* “Give now feedback about who collaborated the most.”                        
                                           *Determine:* (...) |
| Number Questions                    | *Judge:* “How many questions were asked until now.”                                  
                                           *Determine:* (...) |
| Most Linkage                        | *Judge:* “Which person made most links to other people.”                            
                                           *Determine:* (...) |
| Contribution All (after discussion) | *Judge:* “Did all contribute?”                                                      
                                           *Determine:* (...) |
| Most Linktype (after discussion)    | *Judge:* “Which links type was used the most?”                                       
                                           *Determine:* (...) |
| Strongest Collaborator (after discussion) | *Judge:* “Which person collaborated the most?”                                      
                                           *Determine:* (...) |
### Appendix 9. Q ModerationTasksAlerts

Tasks provided to the moderator during and after moderation (UDE only)

<table>
<thead>
<tr>
<th>Task</th>
<th>Questions to the Moderator</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Activity</td>
<td>Judge: “Were there any students who didn’t contribute for 5 minutes?”</td>
</tr>
<tr>
<td></td>
<td>Determine: “Please use the Moderator’s Interface to find out if there were any students who didn’t contribute for 5 minutes.”</td>
</tr>
<tr>
<td>Ignored User</td>
<td>Judge: “Were there any students who were ignored, that is, students who were not involved in the discussion?”</td>
</tr>
<tr>
<td></td>
<td>Determine: “Please use the Moderator’s Interface to find out if there were students who were not involved.”</td>
</tr>
<tr>
<td>Ignored contribution</td>
<td>Judge: “Were there any contributions that were completely ignored; that is contributions that were not connected to the discussion?”</td>
</tr>
<tr>
<td></td>
<td>Determine: “Please use the Moderator’s Interface to find out if there were any contributions that were completely ignored.”</td>
</tr>
<tr>
<td>Dominance</td>
<td>Judge: “Please use the Moderator’s Interface to find out which students dominated the discussion.”</td>
</tr>
<tr>
<td></td>
<td>Determine: “Please use the Moderator’s Interface to find out which students dominated the discussion.”</td>
</tr>
<tr>
<td>Off Topic Talk (deep loop)</td>
<td>Judge: “Did students engage in off topic conversation? Can you cite concrete examples?”</td>
</tr>
<tr>
<td></td>
<td>Determine: “Determine now if this discussion included off topic talk using the Moderator’s Interface”</td>
</tr>
<tr>
<td>Question-answer (deep loop)</td>
<td>Judge: “Did you find evidence of students asking questions, and their fellow students trying to answer the questions in the discussion?”</td>
</tr>
<tr>
<td></td>
<td>Determine: “Please use the Moderator’s Interface to find evidence for question – answer combinations”</td>
</tr>
<tr>
<td>Contribution-Counterargument (deep loop)</td>
<td>Judge: “Can you tell whether counter-arguments are posted?”</td>
</tr>
<tr>
<td></td>
<td>Determine: “Please use the Moderator’s Interface to determine whether counter-arguments are posted”</td>
</tr>
<tr>
<td>Chain of argument (deep loop)</td>
<td>Judge: “Did you see evidence of students exchanging arguments and counter-arguments back and forth?”</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Determine: “Please use the Moderator’s Interface to find students exchanging arguments and counter-arguments.”</td>
</tr>
</tbody>
</table>
**Appendix 10. Q Usability Students: Technology Acceptance**

**Scales - Perceived Use and Perceived Ease of Use**

(UDE only)

For Students

Avatar Name: ______________________

Name of the discussion map you just participated in: ______________________

The following questions are about using the ARGUNAUT System. There are no right or wrong answers. Your opinion is what is want. Please circle your response according to the statements. 1 represents the highest and most positive impression, 3 represents a moderate impression, and 5 represents the lowest and most negative impression.

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Neither agree/Nor Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the ARGUNAUT System would improve possibilities of computer-based discussions at schools or at university courses.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the ARGUNAUT System would enable me to participate in computer-based discussions more effectively.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would find the ARGUNAUT System useful for supporting computer-based discussions at school or at university courses.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the ARGUNAUT System would improve possibilities of doing computer-based discussions.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Using the ARGUNAUT System would make it enhance possibilities of doing computer-based discussions. .

Using the ARGUNAUT System would make it easier do run computer-based discussions at schools or at university courses.

Learning to operate the ARGUNAUT System was easy for me.

I find the ARGUNAUT System to be flexible to interact with.

I find it easy to get the ARGUNAUT System to do what I want to do.

It is easy for me to become skillful at using the ARGUNAUT System.

I find the ARGUNAUT System easy to use.

My interaction with the ARGUNAUT System is clear and understandable.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the ARGUNAUT System would make it enhance possibilities</td>
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<td>of doing computer-based discussions.</td>
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<td>Using the ARGUNAUT System would make it easier to run</td>
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<td>computer-based discussions at schools or at university courses.</td>
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<tr>
<td>Learning to operate the ARGUNAUT System was easy for me.</td>
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<tr>
<td>I find the ARGUNAUT System to be flexible to interact with.</td>
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<tr>
<td>I find it easy to get the ARGUNAUT System to do what I want</td>
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<td>to do.</td>
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<tr>
<td>It is easy for me to become skillful at using the ARGUNAUT</td>
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<td>System.</td>
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<td>I find the ARGUNAUT System easy to use.</td>
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<td>My interaction with the ARGUNAUT System is clear and</td>
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<td>understandable.</td>
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