

Arguing on the Computer

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Abstract. We describe a collaborative computer-based activity as a means of developing argumentative discourse skills in middle-school students. The rationale for use of this technology is that it heightens the opportunity, and indeed demand, for metacognitive reflection on the communication, relative to direct verbal exchange. This demand is further heightened procedurally in two ways: (a) each dialog takes place among four participants, two who collaborate in producing and transmitting one side of the dialog and two who collaborate in producing and transmitting the other; subsequently, the respective pairs engage in analysis of a written transcript of it, with the aim of identifying how it might be improved.

Keywords: Argumentative discourse skills, metacognitive reflection

INTRODUCTION

Research on the development of inquiry and argument skills within developmental psychology remains largely unconnected to efforts within the CSCL community to use technology to scaffold these skills (Weinberger & Fischer, in press; Andriessen, Baker & Suthers, 2003; Hmelo-Silver, 2003). In describing our work to the CSCL community, we attempt here to forge such a connection. We describe a method and preliminary findings that have evolved from work with middle-school students aimed at developing intellectual skills through collaborative computer-based intervention (Kuhn, in press). The microgenetic method (Kuhn, 1995; Siegler, in press), in which close observation is undertaken of strategy changes as individuals engage repeatedly in the same or similar tasks over time, is employed as an analytic tool. Initial work was focused on the development of inquiry skills (Kuhn, 2001; Kuhn, Garcia-Mila, Zohar, and Andersen, 1995) and emphasized the ways in which social collaboration can provide intellectual scaffolding at the metacognitive, as well as cognitive, level. In other words, a collaborator monitors and manages cognitive strategies for a partner in a way that the partner is not yet able to do for him or herself. In a study by Andersen (reported by Kuhn, 2001), over a period of weeks students worked on parallel inquiry problems, one by themselves and the other with a partner, allowing direct comparison of performance and progress in the two conditions, and in a significant number of dyads the pair working together exhibited superior strategy use to what either member of the pair showed when working alone.

ARGUMENT VERSUS ARGUMENTATION

In current work we are examining collaborative computer-based activity as a means of developing intellectual skills of argument (Kuhn, in press). While inquiry has been embraced as a curriculum goal throughout the US science curriculum and to a large extent globally, argument by comparison has received relatively little attention as an intellectual skill. Yet educators seeking to develop thinking skills would likely consider their efforts largely successful if students became proficient in advancing, critiquing, and defending claims in reasoned discussion with peers. There exists a good deal of theoretical literature on argument and argumentation (see van Eemeren, Grootendorst, & Henkemaans, 1996, for a sampling), but relatively little empirical evidence has been available regarding argument skills, despite their considerable educational, as well as theoretical, significance (Yeh, 2002).

The terms *argument* and *argumentation* reflect the two senses in which the term *argument* is used, as both product and process. An individual constructs an argument to support a claim. The dialogic process in which two or more people engage in debate of opposing claims can be referred to as *argumentation* or *argumentative discourse* to distinguish it from argument as product. Nonetheless, implicit in argument as product is the advancement of a claim in a framework of evidence and counterclaims that is characteristic of argumentative discourse, and the two kinds of argument are intricately related (Billig, 1987; Kuhn, 1991). Most

of the empirical research on argument has been devoted to argument as product. Recently, however, this picture has begun to change, reflected in a landmark special issue of the journal *Discourse Processes* (Voss, 2001) that contains articles on argumentative discourse and its development.

MAKING ARGUMENTATION AUTHENTIC

In our own initial research on young adolescents' argumentative discourse (Felton and Kuhn, 2001; Kuhn & Udell, 2003; Felton, 2004), the weaknesses observed in dialogic argument in some ways resemble those observed in individual arguments, with only a minority of arguers going beyond exposition of their own position. Only infrequently do we see the genuine exchange that is the mark of authentic discourse. Why might this be? Felton and Kuhn (2001) suggest that attention to the other person's ideas and their merits may create cognitive overload, or it simply may not be recognized as part of the task. Most likely, both factors are at work – both procedural and meta-level limitations constrain performance.

As a result, dialogic argument is reduced to an activity curiously like that of individual argument. The objective is the same in both cases – to make the most compelling case possible as to the merits of one's position. If I do a good enough job, my position will prevail due to its merits, outshining any competitors, who will merely fade away. In the case of individual argument, the task is taken on as a solitary endeavor. In the case of dialogic argument, the task is similarly individual but two people engage in it simultaneously, juxtaposing their respective efforts in a turn-taking format.

A number of authors suggest that dialogic argument is the most viable and productive medium for developing students' argument skills (Billig, 1987; Kuhn, 1991; Graff, 2003). When asked in expository writing to generate an argument in support of a claim, too often, Graff (2003) suggests, a student undertakes to do so with little or no sense of why anyone might want to claim otherwise. In the absence of a physically present interlocutor, he goes on to propose, the student takes the task to be one of stringing together a sequence of true statements, avoiding the complication of stating anything that might not be true. The result is often a communication in which both reader and writer, or audience and speaker, are left uncertain as to why the argument needs to be made at all.

An implication of these ideas is that students stand to develop stronger argument skills in the dialogic context of argumentative discourse than they do in producing their own individual arguments in support of a claim. This is one of two key hypotheses addressed by our research. Its rationale is twofold. Dialogic argument lies at the heart of all argument, as noted. In addition, and quite unlike expository argument, dialogic argument has the advantage of building on the familiar form of everyday conversational exchange.

Teachers may claim that their students have ample opportunities for dialogic argument in the context of classroom discussions. Teachers conducting such discussions, however, commonly make one of two mistakes. One of them is to allow the activity to relapse into nothing but consecutive self-expression, first on the part of one student, then another. It does not matter much what each student says, and no student need listen to another. In this worst-case scenario, the only attention the next student pays to the speaker is to wait to observe a signal that this speaker is about to finish, so that he or she can begin. As long as everyone gets their share of turns to speak and no one speaks too long, there is a wealth of opportunity for self-expression. Yet, no further purpose is fulfilled. There is no continuity, no direction, no sequence to the discussion. Nor is there any particular role for the teacher to play except the procedural one of ensuring that the turn-taking norms are followed.

The other mistake teachers make is to retain tight control of the activity so as to insure that the content of what is said meets the teacher's concept of what needs to be covered. The teacher calls on students successively, and if a student begins to veer off track, the teacher will steer him or her back, if necessary with a more specific question ("Let me ask you this"). Or the teacher may simply go on to another student – a tactic even the best teachers are guilty of – until some student gives the response the teacher is seeking.

In both the self-expression and teacher-controlled discussion modes, the same model of communication prevails. All talk is directed to the teacher (figure 1). The most the student can hope for in the way of response is approval from the teacher for what he or she has said, before it becomes another student's turn to speak. Whether or not the teacher communicates it explicitly to students, the teacher's own behavior models the norm that we must be respectful of another's ideas, and students are usually quick to pick it up. Hence, students rarely get any strong reactions to the statements they make in classroom discussion. Instead, typical is the response teachers so often rely on when they can think of nothing else, "That's an interesting idea, Jamie," before going on to another student.

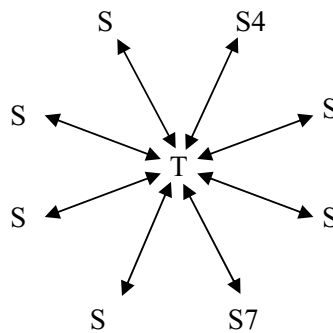


Figure 1: Teacher-centered Discourse

This form of communication stands in striking contrast to the discourse students will engage in as soon as they leave the classroom and enter the schoolyard. One student makes a claim, another challenges it, and others join in (figure 2); strict reciprocity between any pair of participants is not expected, but, still, a speaker addresses the claim that has just been made, with the goal of reaching a resolution. This discussion has a life that goes beyond the role of individual participants. If interest is not keen enough to maintain the discussion, it evolves to a new topic or terminates. Rarely do participants continue to talk about the topic without talking to one another within this goal-directed framework. It is this feature of authentic talk to one another that we seek to capture in students' dialogic arguments.

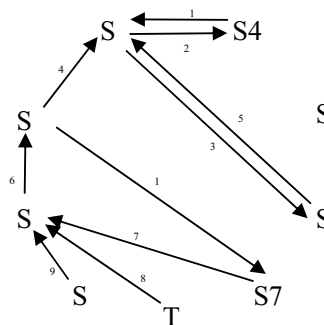


Figure 2: Student-centered Discourse (Hypothetical initial 10 moves)

COMPUTERS AS A MEDIUM FOR ARGUMENT

We thus have adopted dialog about a disputed claim as a template for the development of students' argument skills. The second key feature of our research is that this dialog take place via computer. The method takes advantage of the fact that the middle-school sample we have worked with have acquired everyday familiarity with email and instant messaging as a means of communication with peers and are comfortable with it. The rationale for use of this technology in the present context is that it will heighten the opportunity, and indeed demand, for metacognitive reflection on the communication (Kuhn, 2000, 2001), relative to direct verbal exchange. As elaborated below, this demand is heightened procedurally in two ways: (a) each dialog takes place among four participants, two who collaborate in producing and transmitting one side of the dialog and two who collaborate in producing and transmitting the other; subsequent to the electronic dialog, the respective pairs engage in analysis of a written transcript of it, with the aim of identifying how it might be improved.

In the work described here, 28 sixth-grade eleven- and twelve-year-old students were involved in an "Arguing on the Computer" intervention that took place over the course of 14 successive 45-minute class periods, twice per week. Students were introduced to the ColumbiaTown project, in which they were to debate what rules and laws ColumbiaTown should have. The first debate, they were told, was about whether ColumbiaTown children should go to the town school or whether it's all right for the parents to teach them at home if they want.

BACKGROUND OF THE DEBATE

“We’re going to be working in this project on setting up a new town in an undeveloped area. There will be lots of things to decide. One important issue that has come up right away is school for children. A good school has been set up that the parents and children are happy with. All children attend through high school. Since the houses are far apart, school gives children a chance to be together.

A problem has come up. The Costa family has moved to the edge of town from far away Greece with their 11 year old son Nick. Nick was a good student and soccer player back home in Greece. Nick’s parents have decided that in this new place, they want to keep Nick at home with them, and not have him ever be at the school with the other children. The family speaks only Greek, and they think Nick will do better if he sticks to his family’s language, and doesn’t try to learn English. They say they can teach him everything he needs at home.

What should happen? Is it okay for the Costa family to live in the town but keep Nick at home, or should they send their son to the town school like all the other families do?”

AN E-BASED ARGUMENT INTERVENTION FOR MIDDLE-SCHOOLERS

The intervention activity consists of the following phases:

1. Individual argument (Session 1)

Students’ opinions and supporting arguments regarding the first topic are assessed individually using a paper-and-pencil instrument (appendix B).

2. Paired electronic arguments with opposing-view pair (sessions 2, 3, 4, 6, 8, 10)

Students are paired with a classmate who holds the same view (home okay or school mandatory); these two students collaborate in engaging in an e-dialog with another pair (in a different room) who holds the opposing view. Pairs are instructed and reminded to collaborate with one another in constructing their input and, once in agreement, to take turns typing it on the laptop the pair shares for the activity. Pairs engage a different opposing pair for each new dialog.

3. Reflective analysis of transcripts of previous e-arguments (sessions 5, 7, 9, 11).

After students have had the experience of several collaborative e-dialogs (sessions 2, 3, & 4), during session 5 they are presented the transcript of their previous e-dialog (session 4) and asked to reflect on it, using the “other-argument” scaffold sheet provided for them (see figure 3), which elicits the other pair’s main argument and the counterargument they offered in their dialog and offers the opportunity to construct another, better argument. (Students’ attention is thus focused directly on the other side’s arguments, for those students who have not yet attended to them in the dialogs.) When all pairs have completed the sheet, sheets (and dialog transcripts) are exchanged with another pair, who then review their classmates’ sheet and offer comments (in particular with respect to possible counterarguments).

During session 7, presented the transcript from session 6, students are offered the “own-argument” scaffold sheet (see figure 4). When all are complete, each sheet is passed to another pair who reviews it and offers suggestions (in particular with respect to possible “comebacks,” i.e., rebuttals). During sessions 9 and 11, both sheets are available and students are encouraged to complete both.

4. Preparation for final, class-level e-argument

Session 12 marks the beginning of a culminating activity for students with respect to the topic. Students work within their same-side rooms, preparing for what will be a final “show down” debate at session 14. The pairs who have worked collaboratively to this point are now divided, one assigned to the other-side team and the other to the own-side team. Within each team, students’ task is to focus either on other-side argument (and best counterarguments), in the case of the first team, or to focus on own-side arguments (and best comebacks to counterarguments) in the case of the second team. (Students thereby experience directly the dual functions of argument.) The teams use their laptops to collaboratively compile an e-folder containing a portfolio of the best own-side argument (and comebacks), for use in the showdown or (in the case of the other team) an e-folder containing a portfolio of likely other-side arguments (and best counterarguments). All previous scaffold sheets are available (as well as dialog transcripts) for students to consult if they wish. This activity is continued in session 13.

5. Execution of final class-level e-argument (Session 14).

In session 14, students in each room are divided into a red and a blue team of approximate equal skill (and equal numbers of own-side and other-side specialists from the preceding activity). The final debate is conducted as an e-dialog between the two classes, projected onto a Smartboard, with the red team presiding for the first half of the debate and the blue team for the second half. (Various other procedural rules govern the activity.)

6. Judging and feedback


A transcript of the final debate is analyzed and an argument map prepared, diagramming all arguments, and all counterargument and rebuttals, on either side, that connect directly in the dialog flow to their corresponding arguments. A point system is then applied, to declare a winning team. The argument map and outcome is presented to all participants for their examination.

CONCLUSIONS

In sum, the present method incorporates successful elements of previous methods we have used in seeking to develop argument skills, a dyadic discourse element (Felton & Kuhn, 2001) and a goal-based element (Kuhn & Udell, 2003). In addition, and most significant, we have drawn on the availability of, and students' familiarity with, laptop computers to employ an electronic medium in which to situate discourse. This electronic medium, together with the socially collaborative context, we believe promotes the opportunity for reflection that scaffolds the development of meta-level cognitive skills. In stark contrast to the immediate response required in live discourse, electronic discourse enables one to contemplate both what one's conversational partner has said and what it is possible to say in response. A collaborative partner sharing the conversational role further heightens the demand for and likelihood of this reflection.

Our microgenetic analyses of dialog transcripts show rapid evolution in the quality of dialogs, as well as the quantity of discourse. The percentage of dialog devoted to off-task concerns rapidly diminishes as does the percentage devoted to meta-task utterances that are ineffective in furthering the argument. Such utterances, for example, progress from "You're being obnoxious" to "You're not giving a reason for your opinion." Our previous work applying a dialogic coding scheme (Felton & Kuhn, 2001; Kuhn & Udell, 2003) to dialog transcripts has shown the major developmental changes to occur in an increased usage of counterarguments and a decreased usage of statements explicating one's own position. A study by Felton (2004) documents that intervention involving metacognitive reflection enhances this process. Although analysis of data from the study described here is not complete, these same trends are evident. In continuing work, it remains for us to establish that gains are not limited to intervention argument topics and are maintained over time. We are also investigating the extent to which continuing intervention of the sort described induces further gain beyond that observed in an initial intervention. Alternatively, we may observe an asymptote following an initial intervention. This question has important instructional implications. Still a further question that has important educational implications and warrants investigation is the extent to which the observed gains transfer to individual (non-dialogic) arguments students make either verbally or in their expository writing. We look forward to addressing all of these in future work.

Team members _____
Date _____




Let's think... Starting with the other side's argument

One of the other side's MAIN ARGUMENTS was: _____ _____ _____	Our COUNTERARGUMENT against their argument was: _____ _____ _____
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Give a specific example of an improved, more effective COUNTERARGUMENT.

Figure 3: "Own argument" scaffold sheet

Team members _____
Date _____



Let's think...Starting with our argument

One of the our MAIN ARGUMENTS was: _____ _____ _____ _____	Their COUNTERARGUMENT against our argument was: _____ _____ _____ _____	Our COMEBACK was: _____ _____ _____ _____
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Give a specific example of an improved, more effective COMEBACK.

Figure 4: "Other's argument" Scaffold Sheet

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