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Assessing the Impact of a Structured Argumentation Board on the Quality of Students' Argumentative Writing Skills

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Abstract: This paper focuses on design of qualitative discourse-based methods for effective assessment of students' quality of argumentation. We advance a method for qualitative assessment of students' argument which we through discourse-based methods evaluate the speaker's stance in the argument, the speaker's thematic development of the content and criteria for layout. Our research program takes a design-based research approach focusing on the design and evaluation of Web-based learning environments that support the teaching and development of student's critical thinking skills and disposition through development of the skills of sound argumentation. The purpose of the research is to develop materials and strategies to support argumentation in the classroom with a Web-based tool for group argumentation, and to support the teachers' developing skills for teaching argumentation. Data was collected pre and post and during a four week intervention. Students causal argumentation essay were collected both pre and post. The paper presents the method with an analysis of one student's causal argumentation essays before and after the intervention.

Keywords: Critical thinking, argumentation, qualitative assessment, ICT, structured argumentation board

Introduction

A key skill for critical thinking is that of argumentation. To argue effectively, students must first be able to articulate their thinking, and then also be able to reflect on that thinking. Kuhn's [1] study of argument-based reasoning across the lifespan found that, I everyday reasoning, people readily make assertions about what causes of various social phenomena (e.g., what causes students failure in school). However, they experience difficulty providing cogent reasons for the phenomena or they find themselves unable to provide sound evidence for the reasons they give. In her more recent book, Kuhn [2] further argues that the most enduring and valuable skills that educators can impart to school children are the skills of inquiry and argument. Unless educators pay special attention to nurturing students' argumentation and reasoning skills, it appears that the development of such skills will not occur.

Traditional methods for assessment of students argumentation has mainly focused on the criteria for layout of the argument, evidence and explanations [3] and [4], in this paper we advance a method for qualitative assessment of students' argument which we through discourse-based methods evaluate the speaker's stance in the argument, the speaker's thematic development of the content, in addition to criteria for layout.

In the current study, a class of middle-school students engaged in causal argumentation over a period of four weeks. A combination of online and offline learning activities was designed to introduce the students to causal argumentation. A web-based structured argumentation board was used for the online argumentation. The paper proceeds

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with a review of relevant previous work critical thinking and argumentation, a brief overview of the research program, our theoretical framework and analysis of one student's causal argumentation essays before and after the intervention.

1. Critical Thinking and Argumentation

While there is a long-standing literature on thinking [5], critical thinking [6] and critical reasoning [7], traditional approaches to the subject have focused on critical thinking in a logico-deductive framework that emphasises the importance of argum`ent validity and the need to detect and avoid fallacies in reasoning (e.g., Munson, Conway & Black, 2004). All too often, students end up learning about critical thinking rather than acquiring the skills of critical thinking. As Kuhn [2] emphasises, however, "[t]he concept of thinking skills adopted here contrast sharply with [the] traditional one. Thinking is something people do, most often collaboratively, while they are engaged in pursuing the activities and goals that fill their daily lives" (original emphasis; p. 13).

Dialogue is not simply talk or the sharing of ideas. It is a structured, extended process leading to new insights and deep knowledge and understanding and, ultimately, better practice. There is a strategic orientation implicit in dialogue aimed at advancing beyond participants' initial stages of knowledge and belief.

Argumentation that occurs in group context has the decided advantage of helping participants understand their position in a critical light as they begin to re-evaluate it in a broader, fleshed-out information space of counterarguments, rebuttals, and alternative assessment of evidence. Students engaged in the process of argument are given the opportunity to understand that "the difficult part in an argument is not to defend one's opinion but rather to know it" Andre Maurois, 1885-1967, cited [8].

Argumentation that occurs in a collaborative learning context has the additional advantage of getting students engaged in the process of collaborative meaning-making and co-construction of knowledge as teams of students engage in dialogue and debate. Through this process, students are helped to understand that "any true understanding is dialogical in nature" [9] as they appropriate the multiple voices participating in the dialogic space. In addition, students also come to "know themselves" and construct a sense of personal identity [10] through the practice of argumentative discourse.

2. Research Programme

The current study takes the form of a design experiment with two cycles. Design experiments, as a research methodology, emphasize the detailed implementation and study of interventions with evolving pedagogical goals in rich, authentic settings. It acknowledges the complexities of classroom teaching and enlightens both practitioners and researchers by leading to the development of theoretical ideas grounded in contexts of practice.

2.1 Research Objectives

Our analysis of the previous body of research led us to the belief that promoting the practice of argumentation requires the development of appropriate pedagogical strategies and materials that offer practical guidance to the teachers. Furthermore, due to the importance of engaging the students in cooperative and collaborative dialogical group argumentation we decided to develop a Web-based argumentation tool. Therefore our

main research objectives are:

1. Develop understanding of and principles for classroom interventions related to fostering students development of critical thinking and argumentation skills using design-based research.
2. Develop and enhance a Web-based argumentation tool for group argumentation.
3. Investigate methods of effective student assessment using discourse-based qualitative methods.
4. Develop collaborating teachers' abilities to design their own lesson plans for continued use of the Web-based argumentation tool.

The focus of the study reported here is, however, principally on the third area of interest.

2.2 Intervention

40 middle-school students participated in the intervention which was infused into the regular English language curriculum. Before and after the intervention, the students were asked to write an essay on a causal argumentation topic.

Classroom lessons introduced them to elements of Toulmin's argument pattern [11] & [12]. Due to the limited curriculum time, the warrant and backing elements are planned to be introduced to the students at a later intervention cycle. The students were given a topic to discuss about and went through tasks to (i) develop claims of their own, (ii) support their claim with reasons, (iii) provide evidence for their reasons, and (iv) to develop rebuttals against another student's claim. Throughout the classroom activities, they were exposed to the use of appropriate sentence openers for each Toulmin element through the use of structured worksheets and the teacher modeled the argumentation process. The sentence openers also appear as scaffolds in the online structured argumentation board.

After a week and a half of classroom activities, the students used the online structured argumentation board to discuss about the topic they covered in class to get themselves familiarized with the online environment. A new discussion topic was given and the class was split into teams.

3. Theoretical Framework for Assessing the Quality of Students Argumentation

Drawing upon previous work at the analysis of students' argumentation [11] and [12], we propose a framework which involves an examination of the stance the student takes toward the content presented, the depth and strategies of the development of the content, and the layout of the argument. Each of these is described briefly below.

In order to assess the speaker's stance in the argument we draw upon Halliday and Matthiessen's [13] modality system. The first element is that of polarity ('yes' and 'no'). For example, "I liked Yen" (positive) and "I didn't like Yen" (negative). When a text consists only of such sentences, the author takes an authoritative stance toward the content of the text and tends to close off the opportunity for negotiation and dialogue with the reader. Such a text does not encourage alternative points of view and is likely to become a target for attack on its tendency to over-generalize. The second element is the space between 'yes' and 'no', the Modality [13]. There are four types of modality. These are explained below.

(i) Probability: where the speaker expresses judgments as to the likelihood or

probability of something happening or being, 'maybe yes or maybe no'. For example,

'The bridge was *possibly* built in the 1920s', 'The bridge *must* have been built in the 1920s'. In both examples, the author is tentative and allows alternative judgments to be given by the reader; (ii) *Usuality*: where the speaker expresses judgments as to the frequency with which something happens or is, 'sometimes yes sometimes no'. For example, 'he *usually* sits there all day'; (iii) *Obligation*: where one gets other people to do things in a less direct way, through using a way other than the imperative 'Get out of here!', for example. Examples: 'We *must* read "The Bostonians"', 'You *are obliged* to read Henry James!'; and (iv) *Inclination (& Ability):* willing / able to do something (for someone else). For example, 'I *'d like* to lend you "The Bostonians"'.

For the analysis of the speaker's strategy for developing the thematic content and underlying ideology we draw upon Lemke's [14] semiotic thematic system analysis. Semiotics describes social actions in terms of semiotic resources and semiotic formations. Semiotic resource systems matches the kinds of meanings you can make (semantic functions) with the actions (such as words) needed to make those meanings in a particular community [14]. Semiotic formation is an actual pattern of meaningful action, using semiotic resources that is repeatedly performed and recognized in a community [14]. Activity structures and thematic patterns (more properly called thematic formations) are examples of semiotic formations. A record of social action, whether piece of writing, video etc., is a semiotic text. The actual events constitute a semiotic production [14]. In the current study, we are analyzing a semiotic text in terms of the thematic pattern of the content.

A thematic pattern is a way of picturing the network of relationships among the meanings of key terms in the language of a particular subject. Those terms and their synonyms amount to ways of saying the thematic items of the pattern. The grammar and rhetorical forms used in speaking or writing provide the means for expressing the semantic relationships among these items.

For criteria for layout we draw upon Toulmin [11]. According to Toulmin [11] and [12], an individual argument consists of a statement or claim which can be supported by grounds or data. A warrant is used as a justification for the claim. In addition, backing, qualifier, and rebuttal are optional elements that make up an argument. Backing provides evidence and data for the warrant while a qualifier indicates the degree of force or certainty that a claim possesses. Qualifiers are similar in nature to Halliday's modality system [13]. A rebuttal represents certain conditions or exceptions under which the claim will fail [11]. Ramage et al [15] adapted Toulmin by added another element named reason to link the grounds to the claim and re-defining the warrant as the underlying assumption behind making the claim and/or the reasons supporting it.

4. Data Analysis – Speakers Stance

The two topics 'what causes students to make friends more easily in your school?' and 'what causes teenagers in Singapore to stay up till past mid-night on a regular weekday?' invite students to identify and hypothesize the causes for some phenomena and justify their hypotheses. Given the complexity of student and adolescent lives and the limitation of individual's observation, the students will of necessity adjust the contents they put forward, unless they decide to include (a) some accounts about themselves, their siblings and other close relationships, and (b) some accounts that they believe they can present as facts, that do not need a modification or qualification. By examining the modal choices that a student makes we can judge their awareness of the audience and hence also their own selves, and their facility with these interpersonal resources.

4.1 Analytical procedure

Following Halliday and Matthiessen [13], we first segmented the text into ranking clauses and then established whether or not each clause is polarized or takes a modal element. If the clause is of the latter type, we further identified the type of modal element presented briefly above. We also included as instances of modal elements separate clauses (interpersonal metaphor, [13]) and group or group complexes, in accord with the observation that interpersonal meaning is prosodic and may appear in various places and in various forms. In what follows we describe how one student employs modal resources to present his arguments.

4.2 Analysis of one pair of essays

Within the 32 ranking clauses in the pre-intervention essay, 15 modalities were identified (will, it is known, usually, may, we also know, usually, definitely, will, definitely, able to, we also know, will, probably, may, can). This results in a 46.9% (15/32) ratio of modality to ranking clauses.

Overall, the student took care to modify his statements through the use of modal elements, such as 'may' and 'probably'. He was well aware of the presence of alternative points of view. For example, 'Usually, people of our ages may make friends easily as we are more outspoken and more daring to approach'. The use of 'usually' and 'may' suggests that the student has taken a balanced, non-dogmatic view of the content of the clauses. Also, the student is able to make conscious selections of the modal resources to achieve the specific effects that he intends. For example, in 'we students will definitely meet up everyday, and therefore…', 'will definitely' brings about a specific effect and suits the content of the clause well.

In the post-intervention essay, 36 ranking clauses were found. Within these clauses, there were 23 modalities (definitely, it is known, definitely, from my own experience, will, always, in my opinion, unable to, can, from what I see, unable to, really, will, from my personal experience, always, it is known, personally, can, from what I think personally, will, have to, will, the conclusion). This results in a 63.9% (23/36) ratio of modality to ranking clauses.

Compared with the pre-intervention essay, the student attempted more modal elements and exhibited a larger variety of them as well. More significantly, the student included more mention of 'my personal experience' as a way to both beef up the validity of the content of his clauses and make his statements less prone to attacks from critical readers. 'My personal experience' was a sentence opener scaffold introduced to the students in the web-based argumentation board. However, it would take more practice for him to be equally skilled in both form and function. For instance, the structure for 'in my opinion of staying till midnight' is incorrect.

5. Data Analysis – Thematic Development

5.1 Analytical procedure

In our analysis of the thematic pattern of the content we draw upon Lemke's [14] semantic relations for thematic analysis. In thematic analysis, a semantic relation describes how the meanings of two words or phrases (thematic items) are related when they are used together in taking about a particular topic. Thus the thematic pattern shows how the semiotic text strategically develops its meanings.

5.2 Analysis of one pair of essays

In the pre-essay the speaker sets up two thematic formations. The two thematic formations become clear when the speaker states: "These are some time and place factors which allows making friend in …easier". In the first thematic formation the speaker refers to teenager's stage in the life cycle of human being as "outspoken", "attractive", "daring to approach" and seem to imply that girls and boys are eager to know each other. In the second thematic formation the speaker refer to place as the school. The speaker develops the second thematic formation with the activities in the school (outings, field-trips, CCA, sports), shared religion and activities with the primary school.

In the post-essay the speaker sets up two thematic formations and takes an evaluative stance to the content of the two thematic formations. The two thematic formations become clear when the speaker states: "Though these things can be controlled, there are stuff which makes one not sleeping early". The first thematic formation is the activities teenagers themselves choose to do which causes them to stay up late (online chatting, watch television). The second thematic formation is the uncontrollable factors which cause one not to be able to sleep. The writer seems to refer to biological causes with the words "energetic" and "hyperactive" and "it is known that if a person does his workout late in the night, it affects his sleep". The writer takes an evaluative stance to the content of the two thematic formations by constructing an alliance between them [16] the speaker normalizes and warrants the two thematic formations [16] as he develops his argument.

5.3 Comparison

Compared to the pre-essay, the speaker better develops the thematic content in the post-essay. The speaker is able to develop the two thematic formations by constructing an alliance between them. In the pre-essay, the speaker does not explicitly construct an evaluative or attitudinal stance [16] to the content of both thematic formations. The speaker develops the second thematic formation (place: school) where as the first thematic formation is not developed.

6. Data Analysis – Criteria for Layout

6.1 Analytical Procedure

The text is first segmented before being coded as one of the elements in Figure 1 based on its overall relation to the text as a whole. A portion of text will be used as an example: "Definitely it means less sleep each day due to the fact that teenagers are in secondary school. It is known that secondary schools definitely gives homework and projects to students. From my personal experience, homework will always be dragged till late midnight."

Analyzing the first sentence "Definitely it means less sleep each day due to the fact that teenagers are in secondary school", the student claims that having less sleep each day is due to school. The student then continues on to support his claim by providing a reason, "school gives homework and projects", of why he believes it is so. An additional elaboration is given in the next sentence in the form of personal experience, which acts as grounds for the student's earlier reason.

6.2 Analysis of one pair of essays

In the student's pre-intervention essay (Figure 2), 9 claims were made, with only 5 being supported by reasons. No other major Toulmin Argument Pattern elements were found other than qualifiers. Even though a lot of claims were made, the student only gave supporting reasons for 5 of them. Even then, the reasons were not elaborated on and were no longer than one sentence each.

In the post-intervention essay (Figure 3), the student made 5 claims and provided reasons for all of them. The reasons provided were also better elaborated on as compared to the pre-essay. Two counts of personal experiences were coded as evidence in the form of grounds. Two self-rebuttals were also coded in the essay. In summary, the post-essay was richer in terms of Toulmin's Argument Pattern due to the display of a more dialogic tone through the self-rebuttals and having better elaborated reasons. The student also understood the need to back up his claims with grounds and offered two of his own personal experiences as evidence.

7. Conclusion

The method for analyzing student argumentation described in this paper provides for a richer and more complete analysis in that it takes into consideration the speaker's stance and the speaker's strategy for developing the content in the argumentation as well as the criteria for the layout of the argument. It is our purpose to further develop this framework into an analytical tool for assessing students' argumentation. Due to space limitations here, an exhaustive analysis at this stage is not possible. This will be provided in the presentation format.

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Appendix – Student Essays

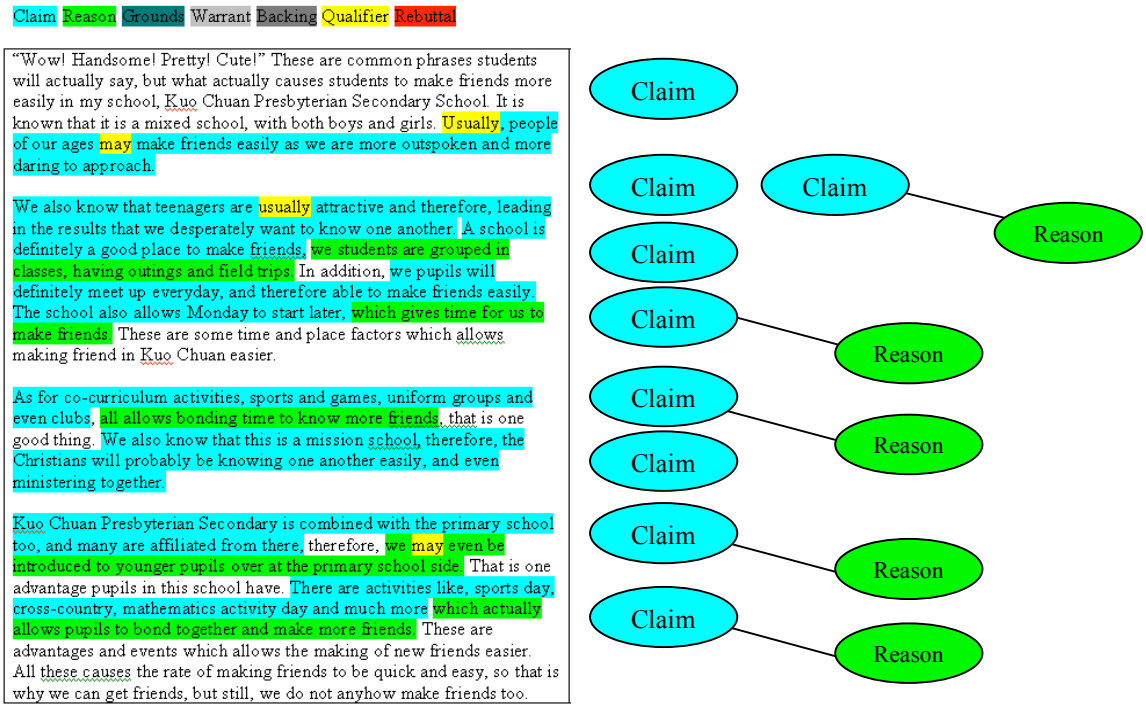

Figure 1: Pre-intervention Essay Toulmin Argument Pattern Analysis

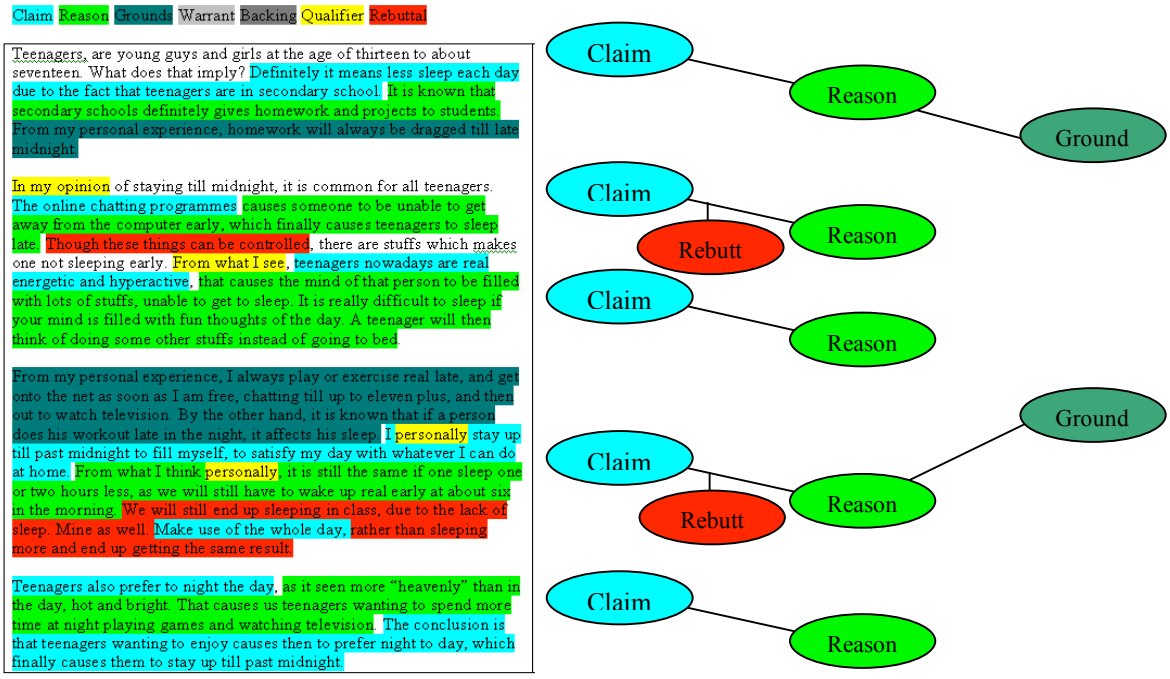

Figure 2: Post-intervention essay Toulmin Argument Pattern Analysis