The Uses and Complexity of Argument Structures in Expert and Student Persuasive Writing

Full Text:

This study investigated differences among student writers at three grade levels (6, 8, and 10) and between expert writers and students in terms of the uses and complexity of arguments presented in their persuasive texts. To analyze argument, a model was developed that could account for structural variations occurring across a range of writing situations. The characteristics of this model were defined using categories derived from a model of semantic representation in discourse. The structural analysis revealed that (a) argument was the predominant organizational structure for all writers, (b) more than 80% of students produced arguments involving some form of opposition, (c) embedded arguments identified in expert texts functioned primarily as countered rebuttals and in student texts as subclaims or reservations, and (d) expert texts contained relatively higher frequencies of warrants, countered rebuttals, and modals, and student uses of these substructures increased with grade.

Mastery of persuasive writing is important because it empowers students--it enables them to produce, evaluate, and act on the professional, ethical, and political discourse that is central to our democratic society (Hays & Brandt, 1992; Lauer, 1994). Moreover, because persuasion presupposes argumentation, the persuasive essay can be viewed as a heuristic--as a tool for critical and analytical thinking, the production of knowledge (D'Angelo, 1975; Perelman, 1982), and the creation of meaning (Enos & Lauer, 1992). It is an ongoing concern for educators, then, that most students demonstrate either a minimal or unsatisfactory degree of competency in persuasive writing. A series of reports generated by the National Assessment of Educational Progress (NAEP) indicates that the majority of students across Grades 4 through 12 are unable to produce an "adequate or better" persuasive essay (Applebee, Langer, Jenkins, Mullis, & Foertsch, 1990; Applebee, Langer, & Mullis, 1986; NAEP, 1980). Evaluative and descriptive studies by Cooper et al. (1984), Hays and Brandt (1992), and Hays, Brandt, and Chantry (1988) have revealed that students continue to experience difficulties with persuasive writing beyond the high school years.

The goal of the present study was to identify developmental features and characteristic weaknesses of student persuasive writing by analyzing samples of their written texts. This "product-based" approach is not novel. Previous research conducted in the area of argumentative writing--including the persuasive type--has involved (a) identifying the text features giving rise to the quality ratings of high school or college students' persuasive texts (Connor, 1990; Connor & Lauer, 1985; Cooper et al., 1984; Durst, Laine, Schultz, & Vilter, 1990; Knudson, 1992; McCulley, 1985; Witte, 1983); (b) describing differences in students' texts as a function of age, genre, topic knowledge, modality, or audience (Coirier & Golder, 1993; Crowhurst, 1980, 1987; Crowhurst & Piche, 1979; Golder & Coirier, 1994; Hays & Brandt, 1992; Hays et al., 1988; McCann, 1989; McCutchen, 1986, 1987; Pellegrini, Galda, & Rubin, 1984; Rubin & Piche, 1979); or (c) determining the effectiveness of experimental treatments and instructional strategies designed to improve the quality of persuasive writing produced by college, upper elementary, or high school students (Crowhurst, 1991; Knudson, 1991, 1992; Matsuhashi & Gordon, 1985; Scardamalia, Bereiter, & Goelman, 1982; Scardamalia & Paris, 1985). In describing and evaluating students' argumentative and persuasive writing, researchers have used text analysis systems based on (a) taxonomies of cohesive devices (Halliday & Hasan, 1976); (b) patterns of topic progression (Lautamatti, 1987); (c) syntactic features (Connor, 1990); (d) models of human reasoning and argument such as those described by Toulmin (1958) and Voss, Greene, Post, and Penner (1983); and (e) current understanding of audience-centered activity in writing (Hays et al., 1988).

Results of previous studies provide some evidence that the use of certain linguistic devices (e.g., cohesive ties) is related to differences in the quality of student persuasive writing (Connor & Lauer, 1985; McCulley, 1985), and that the frequencies with which students employ such devices do vary as a function of grade and type of discourse (Crowhurst, 1987; McCutchen, 1986, 1987; Pellegrini et al., 1984). In addition, research indicates that Toulmin's (1958) model of informal or practical argument may best capture the type of organizational or higher level semantic structures that are associated with persuasive writing. Connor (1990), Ferris (1994), and Knudson (1992) reported that the quality ratings of key elements--claims, data, and warrants--taken from Toulmin's model were among the most significant predictors of the holistic writing scores assigned to high school and college students' persuasive texts. McCann (1989) has reported developmental differences in students' knowledge and use of these same elements in

their written argumentative texts. And finally, researchers (Knudson, 1992; Matsuhashi & Gordon, 1985; Scardamalia et al., 1982; Scardamalia & Paris, 1985) designing and testing instructional programs using Toulmin's (1958) model have reported improvements in students' writing in terms of an increase in the use of specific elements such as claims and data.

Many textbooks on argumentation also have advocated that students use Toulmin's (1958) model as a heuristic to analyze and generate arguments (e.g., Ehninger & Brockriede, 1963; Hairston, 1981; Ramage & Bean, 1992; Rottenberg, 1985; Thomas, 1986; Toulmin, Rieke, & Janik, 1979). However, the exact nature of the relationship between the use of argument structure(s) and persuasive writing skill remains unclear for the following reasons: First, in analyzing or evaluating students' persuasive texts, researchers have limited their investigations to specific elements and fallen short of providing a comprehensive description. Although structures such as claims, data, and warrants are defining features of arguments, results of studies conducted by researchers taking an audience-centered perspective indicate that additional elements such as modals and counterarguments need to be considered (Ferris, 1994; Golder & Coirier, 1994; Hays & Brandt, 1992), and recent work by Stein, Bernas, Calicchia, and Wright (1996) and Stein and Miller (1993) in the area of interactive argumentation suggests that attention should be given to the conditional nature of claims.

Second, although argument is an inherent feature of persuasive discourse, it has not been treated as a unit of analysis. Extended persuasive discourse invariably consists of multiple, related arguments, but this dimension of structural complexity has yet to be described--in terms of the types of possible relational links between arguments--or analyzed in student writing. Hence, information is lacking as to how the uses of arguments may be related to the development of persuasive writing skills or account for variations in the quality ratings assigned to student persuasive texts.

Third, analyses of argumentative elements or features in persuasive texts have not been grounded in a theory of semantic representation in discourse. A number of theorists have proposed that, independent of task or situation, the semantics of discourse can be represented and described at two levels of detail--a propositional or microstructural level and a frame or macrostructural level (Beaugrande, 1980; Flower & Hayes, 1984; Frederiksen, 1975, 1986; Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983).(1) A substantial body of literature exists involving the analysis and description of narrative (e.g., Beaugrande, 1980; Frederiksen, Donin-Frederiksen, & Bracewell, 1987; Kintsch, 1977) and expository (e.g., Britton & Black, 1985; Meyer, 1975) types of text in terms of both their propositional content and higher level organizational or conceptual structure(s). Such a detailed semantic description, which provided a precise and explicit theoretical basis for developing models of narrative and expository writing and dealing with the variability in structure associated with these types of text, is lacking for argumentative text.

Toulmin's (1958) schematic was developed in response to a concern with formal argument as it was related to epistemology. Whereas his treatment of the issue represented a definite advance in the conceptualization of everyday, naturally occurring arguments, it provided little information as to how such arguments might be presented or identified in extended discourse. Defining the structure of argument substructures in terms of categories taken from a general model of discourse semantics offers the following advantages: First, the resulting more detailed and explicit characterization of argument is especially useful when attempting to deal with problematic elements such as warrants--elements which have proven difficult not only for students to generate but also for experts to identify reliably (Fulkerson, 1996). Second, the finer grain of analysis associated with the characterization of discourse in terms of propositional structures can result in a higher degree of reliability and accuracy as researchers attempt to identify argument structures and substructures (Bracewell & Breuleux, 1994). Third, a model of argument that is grounded in or linked to a general model of discourse semantics is not confined to a particular genre or mode. Hence, unlike traditional analytic schemes, a structural analysis based on this model can be applied to and permit comparisons with any discourse situation.

Finally, our understanding of the link between argument and persuasive writing skill is limited because interpretations as to what argumentative features of student texts are evidence of difficulties or weaknesses generally have proceeded without reference to models of "good" or "effective" persuasive writing. Specifically, sufficient attention has not been given to analyzing examples of well-formed persuasive texts and explaining structural variations in terms of the functional or rhetorical relationship between argumentation and persuasive discourse.

THE PRESENT STUDY

The purpose of the present study was to build on existing knowledge in the area of persuasive writing by adopting the following strategies: (a) conducting a comprehensive analysis of argument--one that dealt with the range of possible structures comprising an argument, (b) treating argument as a unit of analysis (i.e., examining the uses of embedded arguments), (c) describing the characteristics of argument structure in terms of categories derived from a model of semantic representation in discourse, (d) analyzing persuasive texts produced by expert as well as student writers, and (e) interpreting the results of the argument structure analysis within a framework consistent with contemporary theories of rhetoric.

MODEL OF ARGUMENT STRUCTURE

To treat argument as a basic unit of analysis and to ensure that the scope of this unit was sufficiently comprehensive, it was necessary to set up an intermediate objective for this study--the development of a general model of informal argument. Meeting this objective involved conducting a task analysis (Newell & Simon, 1972, chap. 3; see also Ericsson & Simon, 1984) to determine the structural characteristics of informal argument and using a formal language to express the structure of argument as revealed by the task analysis.

The model of argument structure developed for the purposes of the present study was a modified version of Toulmin's (1958) schematic. Not only have the results of previous studies (Connor, 1990; Connor & Lauer, 1985; Knudson, 1992; McCann, 1989; Scardamalia & Paris, 1985) indicated the efficacy of Toulmin's model in investigating the nature of persuasive writing, but the model is grounded in a theory of human argument and is adaptive to the various domains and purposes of mainstream argumentative

discourse, including that of persuasion, due to its field- independence quality (Toulmin, 1958). In addition to using Toulmin's (1958) original work, the task analysis involved considering various models and coding schemes that have been used to analyze arguments in discourse (Hays & Brandt, 1992; Hays et al., 1988; Kopperschmidt, 1985; Rieke & Sillars, 1975; Stein & Miller, 1993; Thomas, 1986; Toulmin et al., 1979).

Toulmin's (1958) model consists of the following elements: (a) a Claim, which is a contentious assertion advanced in response to a problem, (b) Data, which constitute the evidence or grounds on which a claim is based, (c) a Warrant, which authorizes the link between data and claim, (d) Backing or support for the warrant, (e) a Qualifier, which is a modal term indicating that the claim is a probable conclusion, and (f) a Reservation, which refers to conditions or circumstances under which the warrant will not hold and that can hence defeat the claim.

The modifications to Toulmin's (1958) model were of two types, elaborative and definitional. Elaborative modifications were as follows: First, the qualifying element (or Qualifier), was expanded to include not only modality operators but also Constraints: general and specific conditions that are necessary for the claim to be applicable. Second, a Backing element was linked not only to the Warrant but also to the Data element, which is consistent with later work by Toulmin et al. (1979). Third, the opposing element was expanded so as to include not only the arguer's acquiescence of conditions or circumstances under which the claim would not hold (i.e., the Reservation) but also instances of the arguer's rebuttal of potential threats to the claim (Countered Rebuttals) and recognition of possible Alternative Solutions. Finally, the Claim element was elaborated so as to deal with the arguer's use of Subclaims, or claims involving specific cases or circumstances linked to the general claim.

There were two types of definitional modifications to Toulmin's (1958) model. The first involved identifying the status of argument substructures as being either necessary or optional to the definition of an argument. Toulmin (1958) indicated that a claim and some form of justification are considered the necessary elements of an argument, with the justification generally taking the form of data or a warrant. Further, he suggested that in everyday or naturally occurring arguments, the warrant was often implicit, or deleted--an observation supported by the recent work of Stein and Miller (1990, 1993). In the current model, a Claim and the Data offered in support of this Claim are considered to be elements that are required or necessary for an argument structure. Warrants, along with the remaining substructures--Subclaims, Modals, Constraints, Backing for Warrants or Data, Reservations, Countered Rebuttals, and Alternative Solutions--are classified as being optional or elaborative.

A detailed presentation of the intricacies characterizing the second definitional modification is beyond the scope of this article but can be found in Crammond (1997). In brief, the entire argument model was represented as a semantic network or conceptual graph structure(2) and this structure is depicted graphically in Figure 1. The terminal nodes of the structure constitute the substructures of an argument--as described by their relational links--and are defined at a more detailed level in terms of categories taken from a general model of semantic representation in discourse.(3) The correspondences between the argument substructures and the general semantic categories are summarized in table form in Appendix A. This particular approach to modeling argument differs from Toulmin's (1958) schematic in that it involves specification not only of the constituent structures of argument and the functional relationships among these constituents but also how they can be presented in discourse: as an argument, a claim, a semantic component,(4) or a basic concept (e.g., object, attribute).

A final step taken in developing this model of argument was the use of a formalism (i.e., a semantic grammar or system of production rules) to represent the identified structure. This formalism, referred to as the Argument Grammar, is given in Appendix B. Whereas this feature may not be essential to the analyses and interests of this article, it is worth mentioning because it is part of a systematic and principled approach, with potential advantages for any discourse analysis. For further discussion concerning the nature and importance of this approach, see Bracewell (in press), Bracewell and Breuleux (1994), and Crammond (1997).

METHOD

Participants

Students who participated in the study were from two elementary schools and one high school located in the suburban areas of a large city. Students in two sixth-grade classes (n = 56), one eighth-grade class (n = 28), and one tenth-grade class (n = 27) were required to produce a written persuasive text in their English classes. However, only 12 texts from each grade level were randomly chosen for the purposes of the present study. Experts (n = 7) participating in the study were professional writers who wrote argumentative texts--including persuasive types (e.g., editorials, critical reviews, or advertisements)--for publication in various journals, magazines, and newspapers. The years of professional writing experience for these individuals ranged from 3 to 18.

Collection of Text Samples

All students and experts were required to generate an essay in response to a writing prompt that consisted of (a) written instructions asking the writers to present and defend their opinions regarding the training of animals and (b) a collage of black and white pictures depicting some of the ways that trained animals are used by humans. Researchers have reported that cues enabling students to access topic knowledge do have a direct impact on the amount or length of text school-age children produce (Bereiter & Scardamalia, 1982; McCutchen, 1986). In this study, pictures were included in an attempt to maximize performance insofar as the students had something to write about and the absence of specific structural elements being simply attributable to students' lack of topic knowledge was controlled for. Neither verbal descriptions of the pictures nor relational links among pictures were given. At all grade levels a printed assignment sheet consisting of the written prompt and picture stimuli was given to each student. The written prompt was as follows:

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Most animals can be trained by humans. Some are trained to perform jobs for people, and others are taught to perform
special tricks in circuses and shows. Some people feel that training animals is fine; others do not think so. What do you
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think? Try to convince your readers that your opinions are right.

The homeroom or English teacher read the prompt aloud to the class, instructed the students to read the assignment over silently; and suggested that they use the pictures to help them think about what they might want to write. The writing task was presented to the Grade-6 students as part of an annual boardwide assessment of student literacy skills and to the Grade-8 and Grade-10 students as a graded English assignment. In general, students spent 30 to 50 minutes completing the assignment.

Experts were given the same assignment sheet, although the task was administered to them on an individual basis and in their customary work environments. The investigator informed experts that the task and topic were selected so as to be appropriate for a range of writers and suggested that they write this particular text for a general audience. All experts agreed to participate in a think-aloud procedure while composing.(5) This procedure was used to obtain additional information that is to be considered in a subsequent study concerning the control structures involved in persuasive writing. The experts were paid an honorarium for participating in the study. With one exception (a writer who spent 100 minutes working on the assignment), expert writers generally spent 20 to 60 minutes completing the task.

Text Analysis Procedures

The subsets of student texts (n = 12) taken from each grade level and the expert texts were analyzed for the presence of the following argument substructures: Claims, Modal Qualifications, Constraint Qualifications, Subclaims, Data, Warrants, Backing for Data or Warrants, Reservations, Countered Rebuttals, and Alternative Solutions. In addition, it was noted whether writers used Arguments or Claims to present Subclaims, Data, Warrants, Reservations, Countered Rebuttals, or Alternative Solutions. This second round of argument analysis involved double-coding pieces of text. The coding scheme was derived directly from the argument model that is presented in Figure 1 and described formally in Appendix B. For each of the coding categories, definitions and examples taken from texts analyzed are given in Appendix C.(6)

Identification of argument substructures was based on the presence of specific semantic structures and linguistic devices. This approach was made possible by specifying the mapping relationships between (a) categories derived from the models of argument and semantic representation in discourse and (b) the structural links of the argument and the conjunctive ties that might be used to represent these links in the surface structure of a text.

All texts, then, were first described in terms of (a) general semantic categories and (b) use of conjunctive ties. The general semantic analysis was based on the model described in Crammond (1997), which is linked to Frederiksen's work (1975, 1986). The basic semantic categories that are relevant or defining features of argument are given in Appendix A, and the presence of these structures in a text were used to support decisions regarding coding of arguments.

The analysis of conjunction was based on Halliday and Hasan's (1976) work on cohesion. In general, four ways of creating cohesion in discourse have been proposed: reference, ellipsis and substitution, conjunction, and lexical organization (including collocation and repetition). In the present stud26 the analysis of cohesive relations was limited to conjunction because this involves the type of logico-semantic relations that are central to arguments. Grammatically, these expressions appear to be of two types: (a) conjunctive adjuncts that include adverbial groups and prepositional phrases (e.g., for example, for that reason, on the other hand) and (b) conjunctions (e.g., because, but, yet). Specific types of conjunctive ties were mapped onto the relational links defining an argument to facilitate coding of structures. For example, the justification relation between the claim and data was mapped onto the conjunctions because, so, for, therefore, and since and the conjunctive adjunct for this reason. The presence of such conjunctions served to guide decisions regarding the categorization of a piece of text as a Claim-Data complex and argument.

Although the results of the detailed semantic and linguistic analyses facilitated the identification of argument substructures, other sources were used to guide decisions as to the categorization of text as a particular element in an argument. Specifically, at times coding was based on the reader's ability to make inferences regarding the arguer's intention as to the function of a particular piece of text in an argument structure. These inferences were based on (a) a general knowledge of reasoning structures and persuasive discourse forms, which serve to set up expectations regarding contiguous text units that may not be linked explicitly by an "inference indicator" or conjunctive device;(7) (b) sources of cohesion beyond conjunction (such as the use of semicolons and dashes); and (c) syntactical patterns within and between clause complexes.

To test the reliabilities of the basic semantic analysis and argument analysis, a second researcher independently coded a random sample of the persuasive texts examined in this study. For the semantic analysis, the percentage of agreement between coders was calculated for components (91%) and intercomponent relations (86%). Percentage of agreement is not reported for the coding of constituents because once components were categorized, the identification of constituents was highly constrained and predictable. For the argument analysis, the percentage of exact agreement was calculated for claims (74%), justifications (86%), qualifications (83%), opposition structures (75%), and overall coding (79%). Separate reliability measures were not estimated for each argument substructure due to the low frequencies associated with their use. It should be noted that the coding of expert text generally involved a higher incidence of disagreement between coders and that most coding discrepancies involved text structures that needed to be double-coded (e.g., subclaims, and justifications presented as claims). The absence of explicit text structure markers (conjunctions) also was associated with a drop in agreement between coders.

Measures

The following measures were used to address the questions as to whether and to what extent student and expert writers used argument structures in their persuasive texts: (a) number of texts in each group containing at least one argument structure, (b) proportion of text accounted for by argument structure(s), (c) total number of arguments per text, and (d) density of argument structures in each text (argument structure per clausal segment).

To obtain an overview of the range of structural complexity representative of each group of writers, the proportion of writers in each group using a given argument element at least once in their text was calculated. To further examine the relationship between argument complexity and persuasive writing skill, a more quantitative approach was taken by considering the following measures: (a) maximum depth of an argument structure and (b) maximum variety of substructures used to elaborate an argument structure. The depth measure obtained for each participant represents the longest argument chain presented in their persuasive text. An argument chain is created by having an embedded argument, and as indicated in the argument model, this embedding may occur through the following substructures: Subclaims, Data, Warrants, Alternative Solutions, Reservations, and Countered Rebuttals. For example, the argument structure presented in Figure 2 has a depth of three because the top level argument (Argument 1) has an argument functioning as a Subclaim substructure (Argument 6), and this argument (Argument 6) in turn has an argument (Argument 7) functioning as a substructure--a Countered Rebuttal.

The elaboration of an argument structure refers to the inclusion of substructures that are defined as being optional (i.e., Subclaim, Constraint, Modal, Warrant, Backing, Reservation, Alternative Solution, and Countered Rebuttal). The elaboration measure obtained for each participant represents the maximum variety (how many different types) of optional substructures a participant incorporated into an argument structure.

To test for group-related differences in complexity of argument structure, a multivariate analysis of variance (MANOVA) was conducted using Group as the main factor, and maximum depth and maximum variety of elaborations of argument structure as the dependent variables.

Additional analyses of argument structure data were conducted to determine if group-related differences existed for those factors seen as contributing to the measures of argument complexity. First, to determine whether differences existed in how expert and student writers used argument structures, consideration was given to the relative frequencies of Subclaim, Data, Warrant, Countered Rebuttal, Reservation, and Alternative Solution structures presented as embedded arguments (i.e., frequency of argument substructure presented as embedded argument/total number of embedded arguments per text). Second, to investigate whether differences existed in the extent to which expert and student writers used different argument structure elaborations, consideration was given to the relative frequencies of different types of elaborative substructures (i.e., frequency of elaborative substructure/total number of elaborations per text).

RESULTS

Use of Argument Structure

Results of the argument structure analysis revealed that, with the exception of one Grade 6 student and one Grade 8 student, all expert and student writers used at least one argument structure (consisting minimally of a Claim-Data complex) in their persuasive texts. Moreover, as summarized in Table 1, argument structures and substructures linked to argument structures accounted for all texts produced by expert writers and almost all texts produced by student writers. Nonfunctional segments produced by students tended to be opinion structures related to the issue of training animals but either unrelated or not linked by semantic or syntactic relational links to the argument(s) presented in their persuasive texts.

Table 1

Group Means (and standard deviations) for Use of Argument Structure Variables

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Proportion of Density: Text Accounted Arguments for by Argument Arguments per Clausal Group n Structure per Text Segment
6th Grade 12 .90 (0.29) 2.50 (1.68) .15 (.08) 8th Grade 12 .86 (0.28) 3.08 (1.68) .12 (.07) 10th Grade 12 .97 (0.10) 3.50
(2.24) .13 (.09) Expert 7 1.00 11.57 (5.83) .24 (.07)
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The results of the ANOVA on number of argument structures per text revealed a significant group effect, $F(3, 39) = 19.91$, p [is less than] .001, and the subsequent planned comparison showed that the effect was due to the difference between the expert and student groups. Although an increase with grade level was noted among student groups, a trend analysis failed to find a significant linear effect.

To determine whether the greater number of arguments produced by the expert group was simply a function of text length, an ANOVA was conducted using the density measure as the dependent variable and group as the main factor. The analysis yielded a significant F statistic for Group effect, $F(3, 39) = 3.63$, p [is less than] .05, with the expert group differing significantly from the student groups. Overall, then, it appears that the experts used arguments more extensively than the student writers regardless of the length of their persuasive texts.

Structural Complexity: Use of Substructures

Table 2 presents data showing the proportion of writers in each group incorporating a given argument element at least once in their texts. All students and experts used at least one Claim, and most writers in all groups also included at least one Subclaim, Constraint, and instance of Data. Grade-related differences (see Table 2) were noted in the proportion of student writers using Modals, Warrants, Countered Rebuttals, and Reservations, and it is relevant to note that all experts used each of these substructures at least once in their persuasive texts. There was a gradual increase across grades in the use of Warrants, and a more abrupt increase between Grades 8 and 10 in the use of Modals and Countered Rebuttals. Finally, whereas most of the Grade 6 and Grade 8 students used at least one Reservation, there was a notable drop in the number of Grade 10 students employing this type of substructure.

Table 2

Proportion of Subjects in Each Group Representing Various Argument Substructures

Group Substructure	6th Grade (n = 12)	8th Grade (n = 12)	10th Grade (n = 12)	Expert (n = 7)
Claim	1.0	1.0	1.0	1.0
Constraint	0.75	0.83	0.75	1.0
Modal	0.25	0.17	0.58	1.0
Subclaim	0.83	0.92	0.92	0.86
Data	0.92	0.92	1.0	1.0
Backing (data)	0.42	0.50	0.42	0.29
Warrant	0.0	0.17	0.33	1.0
Backing (warrant)	0.00	0.00	0.00	0.29
Alternative solution	0.08	0.17	0.08	0.29
Reservation	0.75	0.83	0.25	0.86
Countered rebuttal	0.25	0.25	0.58	1.0

Structural Complexity: Depth and Elaboration

The group means and standard deviations for the two measures of argument structure complexity are presented in Table 3. The multivariate analysis revealed a significant group effect, $F_{(6, 76)} = 5.38$, p [is less than] .001, and the subsequent univariate tests yielded significant F values for both measures of argument complexity: maximum depth of argument structure, $F_{(3, 39)} = 9.80$, p [is less than] .001, and maximum variety of elaborative substructures, $F_{(3, 39)} = 6.09$, p [is less than] .01. For each of these effects, planned comparisons showed that the effect was due to the difference between the expert and student groups. Although grade-related increases in performance were observed among the student groups, trend analyses conducted to test for linear effects did not yield significant results.

Table 3

Group Means (and standard deviations) for Complexity of Argument Structure Variables

Group	n	Maximum Variety of Elaborations	Depth
6th Grade	12	1.50 (0.91)	1.75 (1.06)
8th Grade	12	2.33 (0.99)	1.83 (0.94)
10th Grade	12	2.17 (1.19)	1.92 (0.67)
Expert	7	3.71 (1.31)	4.14 (1.57)

Group	n	Total Number Elaborations	Embedded Arguments
6th Grade	12	9.25 (5.45)	1.67 (1.30)
8th Grade	12	9.67 (3.23)	1.92 (1.78)
10th Grade	12	8.83 (4.15)	2.25 (2.18)
Expert	7	30.43 (13.43)	10.00 (6.61)

Relative Use of Elaborations

Group means for total number of elaborations per text (see Table 3) indicate that there exist minimal differences across grades for this variable and significant grade-related differences were not found for the variety of elaborations measure. However, the data shown in Table 4 reflecting the relative frequency with which different elaborative substructures were used for student and expert groups provide further information regarding students' uses of substructures.(8)

Table 4

Group Means (and standard deviations) for Relative Frequencies of Elaborations

Group	n	Subclaims	Constraints	Modals	Warrants
6th Grade	12	.23 (.15)	.33 (.23)	.03 (.05)	.00
8th Grade	12	.25 (.15)	.32 (.20)	.03 (.06)	.04 (.10)
10th Grade	12	.23 (.15)	.30 (.24)	.07 (.09)	.04 (.08)
Experts	7	.11 (.08)	.20 (.08)	.26 (.08)	.13 (.09)

Group	n	Backings	Reservations	Countered Rebuttals
6th Grade	12	.16 (.29)	.23 (.23)	.03 (.05)
8th Grade	12	.17 (.20)	.16 (.11)	.05 (.09)
10th Grade	12	.18 (.24)	.03 (.05)	.15 (.15)
Experts	7	.03 (.05)	.10 (.07)	.15 (.12)

What is clearly evident from Table 4 is that students perform similarly on all measures except for oppositional types of substructures. Whereas a substantial proportion of all elaborations used by sixth- and eighth-grade students were Reservations, this type of elaboration was rarely employed by tenth-grade students. In contrast, Countered Rebuttals were rarely used by sixth- and eighth-grade students and were employed far more frequently by tenth-grade students. More important, if we consider the expert group data (which reflects the use of a greater variety of elaborative structures) we see that the Grade 10 group resembles the expert group in the relative use of Countered Rebuttals. However, the relative use of Modals and Warrants by tenth-grade students is more similar to the performance of their younger counterparts. By way of contrast, experts use these substructures extensively.

Role of Embedded Argument Structures

If we consider depth in terms of the longest unbroken chain of extended arguments in this study, experts performed at a significantly higher level than all student groups, supporting the notion that the use of embedded arguments is associated with better or good persuasive writing. To appreciate why such texts might be better, however, it was necessary to look at how these embedded argument structures were used: That is, the role they played within an argument. The model indicates that the following substructures can be presented as arguments: Subclaims, Data, Reservations, Countered Rebuttals, Warrants, and Alternative Solutions.

In Table 5, which shows students' relative uses of embedded arguments, it is clear that students are not using arguments at all to present Warrants and very rarely to present Countered Rebuttals. Instead, their use of embedded arguments is centered around three substructures; Subclaims, Data, and Reservations. Grades 6 and 8 show similar patterns of performance: When an argument is embedded, it generally takes on the role of a Subclaim or a Reservation. However, the Grade 10 students tended to use a larger proportion of embedded arguments to present Data substructures and few, if any, to present Reservations. Note too, that although data in Table 4 shows that Countered Rebuttals were used to a greater extent by Grade 10 subjects than by either Grade 6 or Grade 8 subjects, results presented in Table 5 indicate that these structures were not presented as arguments. In contrast, experts tended to use arguments to present Countered Rebuttals more often than any other substructure.

Table 5

Group Means (and standard deviations) for Relative Uses of Embedded Arguments

Group	n	Subclaims	Data	Reservations
6th Grade	10	.23 (.38)	.10 (.18)	.58 (.48)
8th Grade	10	.49 (.45)	.07 (.14)	.45 (.48)
10th Grade	9	.62 (.40)	.34 (.42)	.02 (.07)
Experts	7	.20 (.18)	.25 (.15)	.12 (.11)

Group	n	Countered Rebuttals	Warrants
6th Grade	10	.03 (.08)	.00
8th Grade	10	.00	.00
10th Grade	9	.02 (.06)	.00
Experts	7	.29 (.16)	.13 (.14)

NOTE: n = the number of participants in each group using at least one embedded argument in their persuasive text.

DISCUSSION

In this study, persuasive discourse is viewed from a rhetorical perspective and, as such, refers to text that is produced to either obtain or increase the adherence of an audience to a particular thesis. Argumentation is considered to be a part of the rhetoric of persuasion--the means rather than the end. While recognizing that types of argumentation (such as the rational, credible, and affective appeals proposed by Connor and Lauer, 1985) do contribute to a text's persuasiveness, this study focused on obtaining detailed descriptions of argument structures and conducting a functional analysis of the variations associated with these structures (i.e., examining the implications of including specific argumentative substructures with respect to the goals of persuasive writing).

Data presented in this study clearly indicate that argument structure is the predominant organizational framework in both student and expert persuasive writing; it functions as a type of rhetorical superstructure. Consistent with studies investigating students' uses of claims and supporting structures (Coirier & Golder, 1993; Scardamalia & Paris, 1985), the present study also demonstrated that the ability to produce a basic written argument is acquired at a relatively early age--at least by Grade 6. However, the performance patterns associated with student and expert writers' uses of embedded and elaborative argument structures in their persuasive writing are indicative of certain rhetorical skills underlying the production of good persuasive text and of important developmental changes occurring with respect to these skills.

From a rhetorical perspective, the overall frequency of embedded arguments in a persuasive text is seen as important because it reflects the use of argument chains--complex structures that can serve to strengthen a major claim. Everyday argument or persuasive discourse often consists of modalized propositions. Using an argument to present Data, which would otherwise stand as a qualified Claim, may be considered a particularly effective strategy in attempting to gain the audience's adherence to the overall or major Claim. Having a Countered Rebuttal take the form of an argument also seems a strategic move because this particular substructure comprises an attempt to support a top level Claim as well as refute the opposition. This interpretation as to the strategic use of arguments to present Countered Rebuttals and Data is supported by the experts' performance. There is also evidence that this ability develops with age in that the Grade 10 students made greater use of argument chains involving Data substructures than did their younger counterparts. It was noted that writers in all groups made use of argument chains involving Subclaims. This type of argument chain may reflect a strategic decision by the writer--to get the audience to accept a more restricted Claim either instead of or before the major Claim--or it may be a result of the writer's attempt to include Data involving concrete, familiar examples. Of interest is the finding that younger students clearly favor argument chains involving Reservations. Although including a Reservation may serve to make the Claim more acceptable to the audience (i.e., by taking into account exceptions), the justification of this inclusion (which is reflected in the embedded argument) may be evidence of some inner deliberation or dialectical activity rather than an acknowledgment of and a concession to the audience's concerns.

The presence of warrants in persuasive text can be seen as evidence of the author's engaging in a type of audience-centered activity that involves recognizing the need to explain or justify the link made between the data and claim. More than this, however, the inclusion of warrants is understood to be a powerful rhetorical strategy; it involves establishing mutually agreed upon premises, beliefs, and feelings, or a shared context with the audience, which, in effect, allow the writer to gain rapport with the audience and render the latter more receptive to the claims and arguments proposed (Berthoff & Stephens, 1988).

The absence of Warrant substructures in student persuasive texts at the Grade 6 level and the slight increase in occurrence found at the higher grade levels are results that are consistent with those reported by McCann (1989). The overall minimal use of Warrants relative to Claim and Data substructures, a pattern that persists even for older students, confirms findings of studies conducted by Connor (1990), Cooper et al. (1984), and Knudson (1992, 1993). That the inclusion of Warrant substructures is associated with good persuasive writing is evidenced by expert performance in the current study. However, it is also important to note that experts did not use Warrants in every argument structure presented within their persuasive texts. This is consistent with Toulmin's (1958) observation that it is not always necessary to state a warrant explicitly in informal argument and with Aristotle's discussion of the enthymeme (Rieke & Sillars, 1975). So what are we to make of the students' performances? One explanation is that they did not include warrants because it simply was not necessary. For example, few people would question the link between Claim and Data in the following argument, taken from a Grade 8 text:

```
I think training animals is fine {Claim} because it could help you for things. {Data} For an example, people train dogs
for blind people. {Backing}
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Hence, the infrequent use of Warrants by students may not reflect a weakness in structure, as Cooper et al. (1984) suggest, but may instead point to a tendency to favor arguments based on a mutual or general understanding with the audience as to the underlying context or principles.

A second explanation for students' minimal use of warrants concerns their possible failure to recognize when one is needed (Matsuhashi & Gordon, 1985). For example, a Warrant was not included in the argument presented below (taken from a Grade 10 text) although it might be considered useful because the existence of a mutual understanding between author and audience as to the principle underlying the justifying link is questionable.

```
If we are smarter than animals (suposively) [sic] then why are we the ones responsible for all the problems of the world?
{Data} Because of this animals have the right to live here on earth as much as we do if not more. {Claim}
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In this case, the Warrant justifying the Claim-Data link might run along the following lines: Having a right depends on whether one's actions reflect a level of responsibility that is commensurate with one's abilities. To clarify how this general statement might serve as a Warrant, the original argument can be reworded and expanded as follows: Although we (humans) are smarter than animals, our actions do not reflect this difference in abilities. Animals are not as smart as humans but do not cause problems. Therefore, humans and animals are equal in terms of the right to lead a free life.

The failure to recognize when it is necessary or desirable to state such a Warrant explicitly in the text may indicate that the author is not sufficiently aware of the audience's needs or background to make this decision. However, consideration of the above argument example suggests another possible explanation for the absence of a Warrant--the author's difficulty in expressing just what the Warrant might be. That is, it is likely that the student writer possessed some tacit knowledge that the sentences constituted an argument but was unable to articulate why this was so. Overall then, the rare occurrence of Warrant substructures in student texts might be attributed to any one of three factors: (a) the use of commonly agreed upon or less sophisticated arguments, (b) a failure to recognize when Warrant substructures would be necessary or rhetorically advantageous, and (c) a difficulty in articulating the Warrant or underlying belief system associated with more complicated arguments.

Toulmin (1958) has pointed out that the modal is an important if not defining characteristic of informal argument in that it deals with the probabilistic nature of practical, everyday argument--something that sets it apart from formal logic. From a rhetorical perspective, the inclusion of modals can be seen as an effective strategy in persuasion because it limits the claim only in a general, noncommittal way, and at the same time weakens or softens a claim, thereby making it more palatable to the audience.

The structural analysis conducted in the current study treats the Modal as one of two types of qualifications that can be placed on the Claim. The other type of qualification, The Constraint, limits the scope of the Claim in a specific manner. This substructure was used widely by students and experts alike. Although the Constraint could be viewed as an attempt by the author to accommodate the concerns of the audience, such activity is not clearly evident in the text. The modal, an expression of the degree of certainty associated with a statement, can be said to limit the scope of the claim in a general sense. Golder and Coirier (1994) report that the percentage of children using modals in argumentative writing gradually increased from less than 10% (ages 10 to 11 years) to approximately 40% (ages 15 to 16 years). In the present study, there was a notable increase in the percentage of students using at least one Modal between the eighth and tenth grades (i.e., from 25% to 58%), although there was little difference across grades with respect to how frequently Modals were used relative to other elaborative substructures. In contrast, all experts used at least one Modal and used Modals more frequently than any other form of elaboration. Overall, the expert data is interpreted in support of the idea that the ability to use modals in persuasive writing is an important rhetorical skill, and the student data indicates that there is an important developmental change occurring with respect to this skill between the eighth and tenth grades.

The very purpose of persuasive writing points to the necessity of considering those views of the audience that either challenge or are simply an alternative to the thesis being advanced. Based on the argument model developed in this study, three coding categories were used as a means of assessing whether and how a writer deals with these opposing or alternative views in persuasive text: Alternative Solutions, Reservations, and Countered Rebuttals. An Alternative Solution involves only the recognition or acknowledgment of opposition, and this particular substructure was used rarely by student and expert writers alike. Reservation substructures, which involve recognition and acceptance of conditions that would defeat a claim, could be viewed as potential evidence of rhetorical activity. Whereas it is possible that they are the result of some concession on the author's side to the audience's concerns, text analysis alone cannot serve to reveal whether this involves a consideration of audience apart from "self." The inclusion of countered rebuttals is generally accepted as strong evidence of audience-centered activity and is understood to be a highly effective rhetorical strategy (Golder & Coirier, 1994, Hays et al., 1988) because it involves not only identifying but also refuting the opposition, with the end result of strengthening one's own position.

Most experts used a Reservation substructure and all used a Countered Rebuttal substructure at least once in their persuasive texts. This finding supports the notion that these opposition structures are associated with good persuasive writing. However, a somewhat unexpected finding was that more than 80% of writers in each of the three student groups included at least one instance of either a Reservation or a Countered Rebuttal substructure. This stands in contrast to reports stated in previous studies of relatively few students in Grades 4 through 12 including structures that reflect either the recognition of opposition or a response to opposition (Knudson, 1992, 1993; McCann, 1989; Scardamalia & Paris, 1985). Moreover, Cooper et al. (1984) reported that only 16% of students at the college freshman level participating in their study took into account an opposing point of view when writing persuasive text. Student performance in the present study regarding the inclusion of opposition structures may be accounted for by the access to topic knowledge afforded to all participants by way of the picture stimuli included in the assignment sheet.

Although the majority of student texts in the present study showed evidence that opposing points of view had been considered, variation was noted in how this opposition was dealt with. Whereas few students (25%) in Grades 6 and 8 used a Countered Rebuttal substructure and most (75 to 83%) used at least one Reservation substructure, the reverse pattern of performance was true for students in Grade 10, only a few of whom (25%) used Reservations and more than half of whom used Countered Rebuttals. The developmental pattern observed with respect to the use of Countered Rebuttals is somewhat similar to that reported by Golder and Coirier (1994). These researchers found that less than 20% of their 11- to 12-year-old students used counterarguments in their argumentative texts as opposed to more than 70% of the 13- to 14-year-old students and 15- to 16-year-old students. Unlike in the present study, a notable increase in the number of students using at least one counterargument occurred between the ages of 11 to 12 and 13 to 14 years; in the present study, this increase appeared later on (i.e., approximately between the ages of 14 and 16 years) and was paralleled by an increase of similar magnitude in the use of modals.

Overall, the grade-related increases observed with respect to the use of Modals, Warrants, and Countered Rebuttals suggest some developmental changes occurring with respect to certain rhetorical abilities associated with persuasive writing--those that involve a concern for audience. The most often cited explanation for such findings is that students have difficulty forming an accurate and comprehensive representation of their audience, activities that are tied to their level of sociocognitive functioning (Clark & Delia, 1976;

Hays & Brandt, 1992; O'Keefe & Delia, 1979). More recently, Stein and Miller (1993) and Stein et al. (1996) have proposed that students do not spontaneously address opposition to their opinions in argumentative situations because to do so would result in conflict with their own goals and intentions. However, it is proposed here that the detailed description of the semantics underlying argument can further our understanding as to the source of student difficulties in incorporating such substructures as Warrants and Countered Rebuttals into their arguments. Such substructures are complex because they demand the coordination and integration of semantic units using multiple conditional relations: causal, negative, concessive, and adversative. Moreover, such elements do not stand in a direct relationship with the claim. By way of contrast, the underlying structures of narrative texts are based on temporal and intentional or goal-related relations that map onto real-world experiences and events. In effect, the results of analyzing the underlying semantic structure of arguments in persuasive text can add substance to the generally held belief that argumentative writing--including the persuasive type--is more complex and demanding than either narrative or transactional forms.

CONCLUSION AND IMPLICATIONS

The model of argument structure developed in this study is not only comprehensive but also specifies how arguments may be linked. The analyses based on this model resulted in novel data regarding the complexity and uses of argument structures by expert and student writers. The model also provides a detailed description of the general semantic structures that underlie arguments presented in discourse. Such information can contribute to our understanding of how basic conceptual frames and propositional structures may be developed and combined to meet the demands of a particular discourse situation. More important, whereas recognizing that student difficulties with persuasive writing may arise from the social complexities characterizing this activity (Stein et al., 1996), the line of research developed in this study suggests that an additional factor should be considered--that concerning the cognitive demands associated with constructing the highly complex semantic structures characteristic of sophisticated arguments.

Several questions for further research follow this study. First, additional information is needed regarding the extent to which specific argument substructures reflect or are influenced by arguers' awareness of their audiences. Warrants, Constraints, and Reservations would be a focus of interest because their inclusion in a persuasive text cannot be viewed as strong or definitive evidence for any audience-centered activity. Second, it would be useful to apply the current approach to argument analysis to other persuasive situations (e.g., political and labor negotiations that may be highly charged and involve oral as well as written discourse). Such research may further our understanding of the nature of persuasive and other types of argumentative discourse and indicate how the current model of argument structure might need to be refined. Third, additional research is needed to determine the various factors underlying student difficulties with persuasive writing. Research by Stein et al. (1996) and Stein and Miller (1993) on the development of argumentative skills in interactive, oral situations points to the importance of considering the social context (e.g., the interpersonal relationship between arguer and opponent) and the arguer's goals and intentions. As yet, it is unknown whether these factors play an equally important role in students' abilities to produce written persuasive texts in classroom situations.

This study also has implications for instruction. First, students should be given the opportunity to write persuasive texts on topics for which they have a well-developed knowledge base. Second, teachers should attempt to facilitate students' inclusion of rhetorically significant structures in their persuasive texts. This might be effected by providing information regarding audience characteristics, manipulating the audience factor (e.g., hostile versus friendly) (Hays et al., 1988), and instructing and encouraging students to engage in audience analysis. Finally it needs to be pointed out that this model was designed to support the analysis of arguments in discourse, and its potential to serve as a heuristic for either students or teachers in their attempts to produce or critically evaluate persuasive text is limited. Any attempt to construct or evaluate arguments presented in persuasive text cannot be based solely on either form or content but must be coordinated with an understanding of the audience to whom it is directed. Meaningful assessment or production of persuasive text cannot proceed unless grounded in an appreciation of the social context or community in which it occurs.

NOTES

(1.) An example is Frederiksen's (1975, 1986) detailed analysis of the various propositional and conceptual networks that comprise the semantics of discourse. A proposition consists of a simple concept-relation-concept triple or the more complex concept-relation-proposition and proposition-relation-proposition triples, where concepts are objects, actions, or properties (e.g., attributes, locations) and relations are case relations (e.g., agency) or logical relations (e.g., condition, category). Conceptual networks, or frames, are specific organizations of propositions into global or world knowledge structures. Frederiksen, Bracewell, Breuleux, and Renaud (1990) outline several such structures: causal event frames, procedural frames, problem frames, descriptive frames, and dialogue frames.

(2.) A semantic network is a node-link structure in which the links define the relationships between nodes (Woods, 1975).

(3.) The model of semantic representation in discourse used to define the argument structure is given in Crammond (1997) and is based on Frederiksen's (1975, 1986) analysis of the various propositional and conceptual networks or frames that comprise the semantics of discourse. In defining argument in terms of these categories, it became clear that such structures are specialized versions of descriptive, causal, and intentional frames.

(4.) Semantic components are the basic units of a model of semantic representation described in Crammond (1997). These components include (a) intentional event structures, (b) nonvolitional or cause-oriented event structures, and (c) static, descriptive structures. The model describes their constituent relations and possible interrelations.

(5.) The possibility that the think-aloud procedure influenced expert writer performance cannot be ruled out completely. However, it is relevant to note that argument analyses conducted on additional texts produced by these same writers in situations that did not involve any think-aloud activity revealed a similar pattern of performance in terms of the complexity and uses of arguments (see Crammond, 1997, Tables 3 and 4, pp. 77-78).

(6.) The text analysis procedures and coding scheme used in this study were developed to provide a detailed and comprehensive analysis of argument structure(s) in texts. This particular method should be regarded as a tool or tactic rather than as a prescription for subsequent research (Bracewell, in press). The content and context of many studies of argumentation are structured sufficiently so that analysis at this level of detail is not required. However, it is probably the case that any adequate method for analyzing the structure of arguments will conform to this method at some level of generality, allowing the method to be used as a backup procedure in the event that one runs into difficulties such as low intercoder reliabilities when using more general methods.

(7.) In general, this approach is consistent with one advocated in a number of instructional texts focusing on the analysis of argument in discourse, i.e., the Principle of Charity, or the Cooperative Principle. Essentially, this principle states that when analyzing reasoning, one should always analyze it in the way that interprets it as the strongest possible reasoning compatible with the inference indicators (i.e., conjunctions) in the discourse (Thomas, 1986).

(8.) Alternative Solutions were not included in Tables 4 and 5 due to the very low frequency associated with this elaboration for all groups.

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APPENDIX A

Mappings Between Argument Substructures and General Semantic Categories

```
ARGUMENT STRUCTURE TEXT EXAMPLE Claim markers(a) I think ..., In my opinion ... Claim assertion Training animals is a
good idea. We should train animals. Data Because they can help us. Data backing Trained dogs help blind people. Warrant
Animals were put here on earth for us to use and benefit from. Warrant backing In her (authority) view ... Modal Perhaps,
... Generally qualification speaking, ... Constraint If animals are treated qualification fairly ... Reservation Unless
they are mistreated. Rebuttal Sure they might be put in a (potential) big cage and be well fed ... Rebuttal But they
cannot really be (counter) happy because they are not free. Alternative But you might think solution differently.
ARGUMENT GENERAL STRUCTURE SEMANTIC STRUCTURE Claim markers(a) * Internal state, positive condition (marks assertion as
contentious) Claim assertion * Psychological attribute (evaluation) * Future tense, volitional event, modal root
(proposal) Data * Causal condition linked to claim Data backing * Exemplification of data Warrant * Causal condition;
acting on claim-data complex Warrant backing * Positive condition on warrant Modal * Modal qualifier operator
qualification Constraint * Positive condition on claim qualification Reservation * Negative condition on claim Rebuttal
(potential) Rebuttal * Denied implication (counter) adversative condition linked to potential rebuttal Alternative *
Contrastive adversative solution condition linked to claim
```

(a) General semantic structures marking a claim were specified due to the predominant role of the claim in an argument structure. That is, the claim is central to an argument structure in that other constituent structures obtain their identity by virtue of the fact that they stand in either a direct (e.g., data) or an indirect (e.g., backing) relationship with the claim.

APPENDIX B

Argument Grammar

The particular notation used to define the rules or semantic grammar underlying the argument structure is the Backus-Nauer form (BNF, Backus, 1959; Nauer, 1963), which is consistent with Frederiksen's (1986) approach to represent propositional and frame structures. In general, a BNF grammar consists of the symbols that designate the structures and relations and the basic notation or metasymbols that designate grammatical operations. The BNF metasymbols used in the Argument Grammar are presented in Table A.

Table A

Metasymbols for BNF Argument Grammar

```
"::=" designates "is rewritten as" "space" designates conjunction ("and") "|" designates disjunction ("or") "{}"
designates that a constituent is optional "*" designates that a constituent is iterative
```

Each BNF rule consists of three elements: (a) a head element, which is the left-hand symbol, (b) a rewrite metasymbol "::=," and (c) rewrites of the head element (i.e., constituents), which are the right-hand symbols.

The structure of the Argument Grammar follows Sowa's (1984) definition of a linear notation for conceptual graphs. Concept rules alternate with link rules to form concept-relation-concept (i.e., node-link-node) triples. One exception to the structure-relation alternation can be found in the relation-to-relation rule sequences that are used where a link rule expands into a disjunction. In this case, the disjuncts qualify the type of initial relational link. The terminal nodes of the Argument Grammar either map directly onto categories derived from general theories of semantic representation in discourse or can be unpacked to provide a more detailed and explicit representation of the semantics underlying argument. The top level or argument structure in the Argument Grammar is defined by the following rules:

```
ARGUMENT ::= CLAIM.REL JUSTIFICATION.REL* {OPPOSITION.REL}* CLAIM.REL ::= CLAIM JUSTIFICATION.REL ::= JUSTIFICATION
OPPOSITION.REL ::= REBUTTAL.REL | ALTERNATIVE.SOLUTION.REL CLAIM ::= ASSERTION.REL CONTENTIOUS.REL* {QUALIFICATION.REL}*
{SUBCLAIM.REL}* ASSERTION.REL ::= COMPONENT CONTENTIOUS.REL ::= EVALUATION | INTERNAL.STATE | MOD.QUAL |
PROBLEM.STATEMENT QUALIFICATION.REL ::= MODAL.REL | CONSTRAINT.REL MODAL.REL ::= MOD.CAN | MOD.COND | MOD.QUAL | MOD.ROOT
CONSTRAINT.REL ::= ATTRIBUTE | OBJECT | COMPONENT SUBCLAIM.REL = CLAIM | ARGUMENT JUSTIFICATION ::= DATA.REL
{WARRANT.REL} {D.BACKING.REL}* {W.BACKING.REL}* DATA.REL ::= COMPONENT | ARGUMENT | CLAIM WARRANT.REL ::= COMPONENT |
ARGUMENT D.BACKING.REL ::= OBJECT | COMPONENT W.BACKING.REL ::= OBJECT | COMPONENT REBUTTAL.REL ::= RESERVATION.REL |
COUNTERED.REBUTTAL.REL RESERVATION.REL ::= COMPONENT | CLAIM COUNTERED.REBUTFAL.REL :: = COUNTERED.REBUTTAL
COUNTERED.REBUTTAL ::= POTENTIAL.REBUTTAL.REL RESPONSE. TO.REBUTTAL.REL POTENTIAL.REBUTTAL.REL ::= COMPONENT | CLAIM |
ARGUMENT RESPONSE.TO.REBUTTAL.REL ::= COMPONENT | CLAIM | ARGUMENT ALTERNATIVE. SOLUTION. REL ::= CLAIM | ARGUMENT
```

NOTE: The CONTENTIOUS.REL rule serves to identify structures that signal that an assertion is a claim; unlike other Argument

Grammar rules, it does not mark a definitional or constituent structure.

APPENDIX C

Coding Scheme for Argument Structure Analysis

Argument Substructures

1. CLAIM

A Claim is a basic assertion advanced by the arguer that is of contentious truth value and hence open to dispute. Generally, a claim is advanced to provide either an answer to a question or a solution to a perceived problem. Depending on the type of question or problem posed, an assertion may take the form of a proposal or policy statement, an evaluation statement, an identification/definitional statement, or a causality/prediction statement (Ehninger & Brockriede, 1963; Fahnestock & Secor, 1983). It may be the final proposition in an argumentative discourse or an intermediate statement that serves as evidence for a subsequent claim in an argument.

Examples:

* I think animals should be trained to help people. (PROPOSAL)

* In my opinion it is a good thing to train animals. (EVALUATION)

The contentious aspect of a claim is always a function of the social context in which the problem, question, or issue under consideration is advanced, and may also be signaled by any one or a combination of the following semantic structures present in the argumentative text: (a) the problem statement, which is a statement of the issue or problem under consideration, (b) evaluations, which involve a personal or subjective assessment, (c) opinions, which involve such concepts as thoughts, beliefs, or opinions and hence serve to personalize the assertion (i.e., make it subjective), and (d) modal qualifying operators, which are modal adjuncts indicating explicitly that the truth value of the view advanced in the assertion is qualified.

Examples:

* Should animals be trained? (PROBLEM STATEMENT)

* There's nothing wrong with animal training. (EVALUATION)

* In my opinion, animals should be trained. (OPINION)

* By and large I think such training to be above criticism. (MOD.QUAL, OPINION, EVALUATION)

2. MODAL QUALIFICATION

A Qualification serves to qualify the universal applicability of the Claim. A Modal Qualification specifies that there is a degree of uncertainty associated with the claim advanced and constrains the claim in a general sense (i.e., it indicates that the claim is not absolute or universal but does not indicate the nature of the constraint). In the surface structure, these modal operators include adverbs and adverbial phrases such as perhaps, possibly, probably, and It is probable that, as well as auxiliary verbs such as might, should, could have, and must.

Examples:

* And yet, that is perhaps the only significant question when we ask whether humans are superior to other animals.

* More important, good people probably train animals decently, humanely.

3. CONSTRAINT QUALIFICATION

Constraint Qualifications are presuppositions and serve to constrain the applicability or validity of the Claim by specifying the particular circumstances under which the Claim would apply (i.e., would be true). In this situation, the arguer presents the claim or conclusion conditionally, indicating that the solution advanced in the claim would be true only if certain (i.e., enabling) conditions applied.

Examples:

* It's fine to train animals *if* there is no cruelty, undue pain or restriction involved.

* I think it is okay to train animals *but only* to a certain extent.

* I think it is all right to train certain animals.

4. SUBCLAIM

A Subclaim is a secondary or minor claim. Relative to the major Claim, the scope of a Subclaim is limited by the arguer's inclusion of one or more of the following structures: (a) a Qualification, (b) a Reservation, (c) a degree attribute, and (d) a specific instance of the general case stated in the major assertion. In effect then, the universality of the Subclaim's applicability is limited to a greater degree than the major Claim.

Example:

* I think training animals isn't a nice thing to do to animals especially if you are training animals to do work. (opening statement = SUBCLAIM). I don't think training animals is fair. (concluding statement = CLAIM)

5. DATA

Data provide justification by way of evidence or grounds for the Claim advanced. Data are basic assertions or statements advanced by the arguer that are either certainly known to be true or accepted by the audience as being true. They generally take the form of facts or truths, although they may also involve subjective, personal views, or value judgments (i.e., preferences; Ehninger & Brockriede, 1963; Perelman & Oltrechts-Tyteca, 1969; Thomas, 1986).

Examples:

* Dogs are good for lots of things. They can be used as house pets, great friends, and can be put in shows. Dogs can be eyes for blind people.

* I don't believe in criticizing that use *because* the blind need these trained animals.

6. WARRANT

A Warrant serves to validate the supportive relationship between the Claim and the Data. Many kinds of general statements serve as Warrants; the exact nature of the Warrant depends to some extent on the type or field of argument. For example, in law, the natural sciences, and mathematics, Warrants include legal and moral principles, laws of nature, and formulas. In fields such as medicine, aesthetics, and psychology, certain rules of thumb or systematic patterns that provide ways of looking at data may function as Warrants (Toulmin et al., 1979). Warrants may often be absent in an argument structure presented in a text, as they are implicitly understood by both the arguer and the audience (Stein & Miller, 1993; Toulmin, 1958).

Example:

* At the time, I found the story rather alarming. It seemed to me an almost ideological tract about curtailing our energies, harnessing them to a particular domestic task and situation, about civilization, which in the orthodoxy of the sixties (aspects of which still lurk in my mind) was a straitjacket binding the real nature of man.

6. DATA BACKING / 7. WARRANT BACKING

Backing may be used by the arguer to strengthen or support the statements advanced as Data or Warrants. Semantic structures functioning as support for Data include specific examples and authorities. Those functioning as support for Warrants include explanations, the background or context in which the statement is forwarded, and examples and authorities.

Examples:

* To be against animal training, in her view, is to be against the very notion of civilization. (BACKING WARRANT)

* I think training animals is fine because it could help you for things. *For an example*, [sic] people train dogs for blind people. (BACKING DATA)

8. RESERVATION

Reservations, like Constraints, serve to limit the universal applicability of the claim. However, whereas Constraint substructures represent circumstances that necessarily must be present for the claim to remain valid and applicable, Reservation substructures represent circumstances that necessarily must be absent.

Examples:

* I think that training animals are good [sic] *unless* they are treated cruelly.

* If your animal gets treated the way I have explained above, animal training is okay, *but if* the animal is treated roughly animal training is one of the worst things you can put it through.

* Training guide dogs to guide people was a very good idea, for us. *But* think of how the animals feel.

9. COUNTERED REBUTTAL

Unlike the Reservation structures, which represent the arguer's acknowledgment and acceptance of those circumstances that would defeat the claim, a Countered Rebuttal is the arguer's recognition but not acceptance of the force of the rebuttal. A Countered Rebuttal consists of a potential rebuttal (information that challenges and could potentially refute a claim) and a response (the arguer's attempt to counter the force of the potential rebuttal). In effect, by including a Countered Rebuttal, the arguer continues to present the claim as being acceptable and applicable even in light of circumstances that might refute it or undermine its force.

Example:

* Performing tricks is nice too. (CLAIM) All those people who say it isn't nice to teach animal tricks, (POTENTIAL REBUTTAL) you find them one day or the other watching the circus or an animal parade and enjoying it! (RESPONSE TO REBUTTAL)

10. ALTERNATIVE SOLUTION

An Alternative Solution is a possible solution or answer to the problem statement or question that is under consideration other than the claim advanced by the arguer. Identification of this substructure depends on lexical (i.e., other, you) as well as semantic analysis.

Examples:

* Some wholly reject such training, (ALTERNATIVE.SOLUTION 1) others reject all objections. (ALTERNATIVE SOLUTION 2) I would propose a middle way with various criteria. (CLAIM)

* Overall, I think animals should not be trained because it interferes with their way of living. (CLAIM) But you may think differently. (ALTERNATIVE SOLUTION)

Embedded Arguments and Claims

As mentioned, in order for a piece of discourse to be classified as an argument, it had to consist minimally of a Claim-Data complex. Such argument units were identified and, along with claims, indexed (numbered) for reference

purposes subsequent to the coding of argument substructures. This step involved the double-coding of the following substructures: Subclaims, Data, Warrants, Reservations, Countered Rebuttals, and Alternative Solutions. By way of example, in Figure 2, Claim 6 and Data 6 combine to form Argument 6, which functions as a substructure a Subclaim--in Argument 1. Claim 7 and Data 7 combine to form Argument 7, which functions as part of the Countered Rebuttal substructure in Argument 6.

NOTE: Italicized text represents an example of the argument element being described, and instances of text within asterisks are linguistic markers for the element.

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Source Citation (MLA 9th Edition)
CRAMMOND, JOANNA G. "The Uses and Complexity of Argument Structures in Expert and Student Persuasive Writing." *Written Communication*, vol. 15, no. 2, Apr. 1998, p. 230. *Gale Literature Resource Center*, link.gale.com/apps/doc/A53994279/LitRC?u=ucberkeley&sid=bookmark-LitRC&xid=c0f3cb94. Accessed 31 July 2022.
Gale Document Number: GALE|A53994279