

DOCUMENT RESUME

ED 391 153

CS 012 343

AUTHOR Anderson, Richard C.; And Others
 TITLE On the Logical Integrity of Children's Arguments.
 Technical Report No. 628.
 INSTITUTION Center for the Study of Reading, Urbana, IL.
 PUB DATE Nov 95
 NOTE 31p.
 PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
 DESCRIPTORS *Children; Communication Research; Discourse
 Analysis; Grade 4; Intermediate Grades; *Language
 Patterns; Logical Thinking; *Persuasive Discourse
 IDENTIFIERS *Communication Behavior; Conversation

ABSTRACT

A study investigated properties of children's naturally occurring arguments. The arguments were sampled from transcripts of 20 discussions held in 4 fourth-grade classrooms. The principal findings were that children's arguments are filled with seemingly vague referring expressions; that the arguments sometimes do not contain explicit conclusions; and that the arguments almost never contain explicit warrants to authorize conclusions. However, the missing or obliquely identified information usually is given in the text or preceding discussion or is a commonplace from everyday life and readily inferable by actively cooperative participants in the discussion. Children seldom back their arguments by appealing to general principles, except when the foundation for the argument is disputed or seems confusing. At a more general level, findings suggest that it is possible to give a coherent account of children's arguments within the framework of informal deductivism augmented with speech act theory. (Contains 27 references, 1 note, and 1 table of data.) (Author/RS)

 * Reproductions supplied by EDRS are the best that can be made *
 * from the original document. *

Technical Report No. 628

**ON THE LOGICAL INTEGRITY
OF CHILDREN'S ARGUMENTS¹**

**Richard C. Anderson
Clark Chinn
Janice Chang
Martha Waggoner
Hwajin Yi**

University of Illinois at Urbana-Champaign

November 1995

Center for the Study of Reading

TECHNICAL REPORTS

PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

ERIC

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- This document has been reproduced as received from the person or organization originating it.
- Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

**College of Education
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
174 Children's Research Center
51 Gerty Drive
Champaign, Illinois 61820**

2501234-3

CENTER FOR THE STUDY OF READING

Technical Report No. 628

ON THE LOGICAL INTEGRITY OF CHILDREN'S ARGUMENTS¹

**Richard C. Anderson
Clark Chinn
Janice Chang
Martha Waggoner
Hwajin Yi
University of Illinois at Urbana-Champaign**

November 1995

**College of Education
University of Illinois at Urbana-Champaign
174 Children's Research Center
51 Gerty Drive
Champaign, Illinois 61820**

Abstract

The purpose of this study was to investigate properties of children's naturally occurring arguments. The arguments were sampled from transcripts of 20 discussions held in 4 fourth-grade classrooms. The principal findings were that children's arguments are filled with seemingly vague referring expressions; that the arguments sometimes do not contain explicit conclusions; and that the arguments almost never contain explicit warrants to authorize conclusions. However, the missing or obliquely identified information usually is given in the text or preceding discussion or is a commonplace from everyday life and readily inferable by actively-cooperative participants in the discussion. Children seldom back their arguments by appealing to general principles, except when the foundation for the argument is disputed or seems confusing. At a more general level, we conclude that it is possible to give a coherent account of children's arguments within the framework of informal deductivism augmented with speech act theory.

ON THE LOGICAL INTEGRITY OF CHILDREN'S ARGUMENTS

All propositions of our colloquial language are actually, just as they are, logically completely in order. . . (Wittgenstein, *Tractatus Logico Philosophicus*, 1971, §5.5563)

By this [§5.5563] I meant to say that the prop[osition]s of our ordinary language are not in any way logically *less correct* or less exact or *more confused* than prop[osition]s written down, say, in Russell[']s symbolism or any other "Begriffsschrift." Only it is easier for us to gather their logical form when they are expressed in an appropriate symbolism. [emphasis in original. bracketed material added by editor] (Wittgenstein, *Letters to C. K. Ogden*, 1973, p. 50)

The question that we would like to be able to answer is this: How good are children's naturally occurring arguments? The first thing to understand is that the question is not really answerable in this simple form, because the answer depends upon the framework that is used for evaluating arguments. If one uses a relaxed standard for what counts as a good argument and makes charitable interpretations of children's utterances, it is almost preordained that children will be seen to reason well. On the other hand, if one insists on deductive validity as the standard for argument evaluation, it is almost preordained that children will be judged to reason poorly. The reason is that, at least according to the traditional definition of a complete argument, naturally occurring arguments typically are missing elements of recognized patterns of valid inference, as in *modus ponens* or a syllogism.

So, the first task is to formulate a theory of argument that has some empirical content. For several reasons, we will begin with deductivist theory. In her thoughtful book *Problems in Argument Analysis and Evaluation*, Govier has this to say about deductivist theory:

A good argument must be deductively valid: the premises must entail the conclusion. In a good argument, it is impossible for the conclusion to be false provided the premises are true. Furthermore, the premises are true. In this sense they provide full and sufficient reasons for the conclusion. . . . Any argument not meeting these conditions is logically inconclusive and, in fact, logically worthless" (Govier, 1987, p. 22).

Govier continues that deductivists

are aware that most naturally occurring arguments fail to be deductively valid. Few wish to draw the conclusion that most naturally occurring arguments are poor ones. To avoid this consequence, most deductivists urge that many naturally occurring arguments are enthymematic. They need to be 'filled in' with premises which were -- for one reason or another--left unstated by the arguer. Many naturally occurring arguments can be filled in with true or plausible premises in such a way that the amended set of premises entails the conclusion; they thereby qualify as inferentially good arguments on deductivist theory (Govier, 1987, p. 22).

Judging the deductive validity of arguments once reconstructed is unproblematical, except in the occasional complex case. The problematical aspect of the deductivist approach is filling in missing premises. It should be clear that unless there are principled grounds for reconstructing arguments, the whole exercise becomes indeterminate and what began as a fastidiously logical approach loses its force.

Following Govier (1987), we will distinguish between *formal deductivism* and *informal deductivism*. To see the difference between the two, consider the argument *Bill is an orphan; therefore, he does not have*

living parents. The formalist says this argument is incomplete, and deductively invalid, because it does not contain the premise *No orphans have living parents* required to make it into a conventional syllogism. An advocate of the informal position replies that not having living parents is a part of the meaning of *orphan* and, hence that the argument is complete and deductively valid in its original form. We subscribe to the informal deductivist position; otherwise, there does not seem to be any way out of the trap described by Govier that most naturally occurring arguments have to be judged "logically worthless."

In common with others investigating everyday reasoning, notably Eemeren and Grootendorst (1992) and Resnick, Salmon, Zeitz, Wathen, & Holowchak (1993), our working hypothesis is that *gaps in arguments occur because arguers leave out information that is obvious* to others participating in a discussion of an issue. From this perspective, one would not want to say that premises were 'missing' but rather that they were 'implicit,' 'unstated,' or 'suppressed.'

Before attempting to fill in unstated premises in arguments, an answer is needed to a prior question: What are the criteria for deciding that an argument contains a gap in need of filling? In an informative analysis, Ennis (1982) shows that not just any assumption required for an argument to work can be considered an *inference gap*. For instance, every argument assumes that the words used have their usual meanings, that words have the same meaning each time they are used, and so on. Having to list all such background assumptions that must hold for an argument to succeed would place a needless, perhaps impossible, burden on the arguer. Further, it is fruitless to expect the rules of reasoning that license a given type of inference to be explicitly stated. For instance, when an argument by analogy is offered, there is no point in requiring the arguer to assert as part of the argument that it is assumed that the things being compared are relevantly similar, since this is a background assumption *always* required of arguments by analogy. Of course, an argument may flounder because of drift in the sense of a word or the failure of things compared to be relevantly similar, or any one of many other problems, but this does not make the gesture of listing remedies constitutive of a complete argument.

So, what is a complete argument? Ours is the classic answer: A complete argument is simply one in which the premises imply the conclusion, in which the conclusion cannot be false if the premises are true.

Our hypothesis is that, following Grice's maxims of quantity, people are elliptical when discussing the known or the obvious. In an influential paper, Grice (1989) proposed that participants in conversations adhere to what he called the Cooperative Principle. He said,

Our talk exchanges do not normally consist of a succession of disconnected remarks, and would not be rational if they did. They are characteristically, to some degree at least, cooperative efforts; and each participant recognizes in them, to some extent, a common purpose or set of purposes, or at least a mutually accepted direction. . . We might then formulate a rough general principle which participants will be expected (*ceteris paribus*) to observe, namely: Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged. (1989, p. 26)

Grice sets forth four kinds of "maxims" participants in a conversation need to observe in order to honor the Cooperative Principle. Two of these he calls "maxims of quantity": (1) Make your contribution as informative as required, and (2) Do not make your contribution more informative than is required. To say *less* than necessary is to risk leaving the listener confused and to permit the inference that you are being deceptive. To say *more* than necessary wastes time and may be considered boring or patronizing.

The hypothesis that we wish to consider is that the children in the discussions we will analyze, although they frequently seemed elliptical, generally were as informative as they needed to be, because the

unstated or vaguely identified information usually was *given* in the sense that it previously had been explicitly stated or was readily inferable by other actively-cooperative participants. That is to say, the information was explicitly stated in the story everyone had read, explicitly stated in the preceding discussion, or a part of common knowledge and belief. A further requirement for information to be considered given is that actively-cooperative participants are able to figure out from a speaker's utterance which piece of information is intended.

It is now possible to reformulate the question with which we began. The question becomes: Are children's arguments deductively valid once unstated but obvious information has been supplied? Please be clear that we do not begin especially the champions of deductivism. Quite possibly the theory is too constrained to provide a descriptively adequate account of naturally occurring arguments. Indeed, following the development of this and other criticisms by Toulmin (1958) and Perelman and Olbrechts-Tyteca (1969), it would be hard to find champions of deductivism--the classical, formal version at least--among social scientists studying everyday reasoning. So, for instance, Perkins (in press, p. 35) entertains the position that "informal reasoning is standard logic in casual dress," but ends up rejecting it. More typically, others such as Stein and Miller (1993) and Means and Voss (in press) take it for granted that informal and formal reasoning are different without arguing the case in detail.

Philosophers and rhetoricians have two major complaints about deductivism as applied to everyday reasoning. The first is that typically everyday arguments, at best, give some support for a conclusion, rather than making it absolutely certain in the fashion of a valid inference pattern from formal logic. This is not an intractable problem for deductivism. The first solution is to include hedges and estimates of probability in one or more of the premises and carry these through to the conclusion of the argument, as in *Smokers have an increased risk of lung cancer; Bill is a smoker; therefore, Bill has an increased risk of lung cancer.* Whether Bill will be one of those who actually gets cancer is uncertain, but the reasoning is airtight. More generally, we believe that an other-things-being-equal or under-normal-circumstances clause should be considered to be a background assumption of every naturally occurring argument. Consider *If a rock is thrown into the air, then it will fall to the ground; a rock is thrown into the air; therefore, it will fall to the ground.* The conclusion doesn't follow because the rock might land on the wing of a passing airplane; yet, we believe that it would be pedantic to insist that the arguer explicitly hedge the argument; such unusual happenings are addressed by the under-normal-circumstances clause.

A second complaint of philosophers and rhetoricians is that there exist sensible kinds of arguments that cannot be accommodated by deductivism. One kind is the inductive argument that claims that what is true of a few or many instances in a category is true, or is likely to be true, of other instances. Another kind is argument by analogy from a presumably clear case to a presumably similar, disputed case. There are ways to gloss these kinds of arguments within a deductive framework, but doing so is beyond the scope of this paper and, anyway, we agree that the deductive treatment is not altogether felicitous.

Research from cognitive psychology reveals a different set of difficulties with deductivism. A frequently confirmed finding is that whether or not people will reason in accord with formal, deductive logic is strongly influenced by what they are asked to reason about. People perform poorly when asked to draw conclusions from abstractly worded premises. On the other hand, when asked to reason from realistic, meaningful premises, people frequently import assumptions, leading them to override the meaning (or what is taken to be the meaning on some interpretations) of logically significant words such as *if*, *then*, and *or*. People generally do not reason well with logical frames that involve contradiction, and when given the chance tend not to seek information that could reveal contradictions. Competing theoretical proposals to explain these and other empirical findings include pragmatic reasoning schemas (Cheng & Holyoak, 1985), mental models (Johnson-Laird, Byrne, & Schaeken, 1992) and natural logic (Braine & O'Brien, 1991). Ignoring the details of these proposals, which are not relevant to the present

investigation, a common thread is that given a certain framework for interpreting a problem expressed in natural language, people's reasoning within that framework generally is not inconsistent with deductive logic.

To summarize, there are several difficulties with deductivism as a model of human reasoning for which there are only partially satisfactory solutions. Nonetheless, there are reasons for adopting deductivism as the framework for exploration. First, deductive validity is still the gold standard for a sound argument. Second, deductive theory is strong enough to guide thinking about the internal structure of arguments. More expansive frameworks are less well-developed and have less to say about the inner workings of arguments. Thus, it is a worthwhile goal to discover whether deductivism enables a perspicuous account of children's arguments.

Method

The arguments subjected to analysis were from a corpus of 20 discussion transcripts containing in total about 62,500 words. The discussions were held in 4 fourth-grade classrooms in which 44 boys and 39 girls were enrolled. Two of the classrooms were from a socioeconomically diverse rural community and two were from a parochial school in a small city serving primarily children from middle income families.

The discussions were held in the morning during the period scheduled for reading/language arts instruction. At the beginning of the year, the teachers had organized the students into reading groups according to reading level. The reading groups served as discussion groups during this study. A typical group contained 8 or 9 students (range 5 to 10). There was cross-class grouping for reading at the rural school. Two groups higher in reading level were taught by one of the teachers and two lower groups were taught by the other. At the parochial school, there was a high, middle, and low group in each of the two classrooms. Thus, altogether there were ten discussion groups, four at the rural school and six at the parochial school. Transcriptions of two videotaped discussions in each group provided the data for the present analysis.¹

The discussions took place in a format we have termed Collaborative Reasoning (Waggoner, Chinn, Yi, & Anderson, in press). Prior to a discussion the children read the day's story (see below) silently at their seats. When they gather as a group, the teacher initiates the discussion with a single, *central question* about a dilemma faced by the story characters (see below). The children indicate their initial positions by raising their hands, then offer reasons and supporting evidence for their positions. They are expected to listen carefully and evaluate each others' arguments. When they disagree, they are encouraged to challenge with counterarguments. As the discussion proceeds, the students are supposed to weigh the reasons and evidence offered and decide whether to maintain or change their original positions.

An *open participation structure* is encouraged in Collaborative Reasoning. Students speak without raising their hands and without being nominated by the teacher. Students are urged to speak one at a time and to avoid interrupting each other, as in an adult conversation about a serious subject. The purpose of open participation is to foster wide-ranging consideration of issues; to heighten students' attention to what their peers are saying; and to remove the teacher from the role of the authority who evaluates each contribution.

The teacher's job during Collaborative Reasoning is to promote independent thinking and self-management of turn-taking through modeling, prompting, and encouraging. The teachers, all of whom were volunteers for the project, received a half-day workshop on how to lead Collaborative Reasoning discussions. The teachers had led a dozen or so Collaborative Reasoning discussions with each discussion group before the two discussions that were videotaped and transcribed. A member of the research team was present during most discussions and offered suggestions and discussed how to solve

problems with the teachers. By the time of the two videotaped discussions, we judged that the process was running fairly smoothly in each of the classrooms and that the participants understood what was expected of them.

Among the 20 discussions, there were 2 or more discussions involving each of the following stories and central questions:

- *My Name is Different* (Prasad, 1987) is a story about a young Chinese American boy who changes his name because he is anxious to fit into his new, mostly Anglo school. The question is, "Should Chang Li have changed his name?"
- *Stone Fox* (Gardiner, 1980) is about a boy, Willie, who lives on a farm with his grandfather. His grandfather has been ill and unable to pay the taxes on the farm. Willie enters a dog sled race intending to use the prize money to pay the taxes. His principal competitor is Stone Fox, a Native American man, who usually wins the races and uses the money to buy back ancestral lands. Willie is leading in the race, because he has taken a short-cut across a frozen lake, when his dog drops dead from exhaustion 10 feet from the finish line. The question is, "Should Stone Fox, who is running second, win the race himself or let Willie win?"
- *Make Room for Uncle Joe* (Litchfield, 1987) describes a family that has an uncle with Downs Syndrome who must find a new place to live. The question is, "Should Uncle Joe be invited to live with the family?"
- *Amy's Goose* (Holmes, 1977) is about a farm girl who is starting to nurse an injured goose back to health. The question is, "Should she let the goose fly south with the rest of the flock?"
- *Charles* (Jackson, 1949) tells the story of a kindergarten boy, named Laurie, who comes home everyday and tells his family about the escapades of the class bad boy, Charles. When Laurie's mother mentions Charles to the teacher, she replies, "Charles? We don't have a Charles in this class." The question is, "Who is Charles?"

The discussions were recorded by a member of the research team. The camera was oriented to try to maintain a view of every child's face. An external microphone placed in the center of the group was employed to make the speech as intelligible as possible.

Initial transcriptions of each of the videotapes were done in the manner that suited the transcriber. Some transcribers worked at a computer terminal as they viewed a tape, operating the VCR with a custom-made foot pedal. Other transcribers wrote the transcripts out in long hand, and a secretary then prepared a typed version. In either case, once initial typescripts had been prepared, every transcription was checked against the videotape by a second analyst. The goal was a complete, verbatim transcription of the discussion that included accurate identification of the speaker, reproduction of dialect features, and a record of interjections and overlapping speech. Inevitably, this goal could not always be achieved, even when difficult stretches of a discussion had been worked over several times. But we are confident that for the level of analysis addressed in this paper the fidelity of the transcription is entirely satisfactory.

Most of the analyses reported on the following pages were completed by a single analyst. However, there were several external checks on the analyst's work. First, proposed instantiations of ambiguous referring expressions and proposed argument reconstructions were discussed at length several times by the entire research group. Second, a group of raters was asked to evaluate the referring expressions

in a particularly vague passage (see Table 1). Third, a second analyst reconstructed 20 of the arguments described in the results section. Of course, comparing reconstructions is a task which itself involves judgement, but for what it is worth 16 of these were considered to be essentially the same as the reconstructions by the primary analyst.

Results and Discussion

The analysis will be presented in four stages. Considered first is whether there is a satisfying solution to the problem of seemingly indeterminate use of pronouns, infelicitous and therefore hard to understand expressions, and other vague words and phrases. Then, second, assuming enough clarity can be achieved at this first level, issues in argument reconstruction will be addressed. Presented third is a systematic analysis of apparent gaps in arguments in need of filling if the arguments are to be counted as valid. Considered, finally, are the circumstances under which children appeal to general principles to support their arguments.

Ellipsis and Abbreviated Referring Expressions

At first glance, the students' reasoning during story discussions often seems incomplete and there are lots of *its*, *this* and *that*s whose reference seems unclear. On closer examination, we believe that much of the unstated or vaguely identified material is *given information*. Our surmise is that, following Grice's maxims of quantity, the students are cryptic when mentioning the known or the obvious.

Deciding whether unstated or vaguely identified information is given is a judgement call, but here are three tests:

- Can analysts who have read the story and followed the discussion up to a point make an unambiguous interpretation of the next utterance and/or see the force of the next argument?
- Can the interpretation be justified by appeal to conventions of discourse anaphora?
- Is there evidence in the dialogue following an utterance that the other participants have understood the utterance?

Below, these tests have been applied to disambiguate the referring expressions in a student's contribution during a discussion of *Stone Fox* in which the question being debated was whether Stone Fox should let Willie win the dog sled race:

Teacher: You're just saying that...to say that Willie cheated is not a good reason for...to support Stone Fox winning. Is that what you're saying?

Edward: That₁ isn't that good of a reason because it₁ doesn't say in the beginning that there's no shortcuts. And besides, if he hadn't have taken that shortcut, Stone Fox would have won for sure. It₂ really wasn't cheating because, well, he didn't really cheat,

because, well, he sort of did have the right to do that₂. I still stay with my position because he only had one dog and Stone Fox and probably the rest of them had more than one.

that₁ = the claim that Willie cheated

it₁ = the story

he = Willie

it₂ that₂ = taking a short cut across the lake

them = drivers of other dog sled teams

In our judgement, these assignments are clearly justified. That₁ echoes the that in the immediately preceding sentence. The equivalence of it₁ and "the story" is established by an earlier utterance of Anthony's, where he said "It doesn't say at the beginning of the story that there are no shortcuts." He means Willie since Willie is the last male mentioned. It₂ and that₂ connect with "taking a short cut" because it is established by this point that the focal question is whether it is cheating to take a short cut. Them means the other drivers, because this is the only discourse-relevant class of which Stone Fox is a member.

The following utterance illustrates ellipsis as well as anaphora. The children are discussing the story *Make Room for Uncle Joe* and the question is whether Uncle Joe should move in with the family.

Amelia: Um, I think he should, because, he can, um, still go to the workshop, and he can get, uh, money, for himself, but he can't, he's not really responsible to stay in his own apartment.

In this utterance, he is Uncle Joe. This would be clear to every participant at its first use and the assignment is confirmed in the subsequent uses in this utterance since the attributions are true only of Uncle Joe. The phrase I think he should is elliptical for "I think Uncle Joe should stay with the family." Again, the participants would easily grasp the intended idea. The reason is that it is early in the discussion when children routinely take turns expressing their positions on the big question. Most of the other children were similarly elliptical when expressing their positions. Indeed, the teacher was elliptical herself when she polled the children about their initial positions:

Teacher: OK, how many people think that sh-, he should?

The phrase the workshop in Amelia's utterance is interesting. This is the first mention of the workshop in the discussion, yet the use of the definite article implies that Amelia assumes this is given information. The reason she can make this assumption is that a sheltered workshop for retarded persons is described in the story.

The following student seems vague beyond any hope of interpretation when her utterance is considered in isolation. While her remark is hardly a model of clear communication, if one has been following the discussion she is actually easy to understand.

Marla: But, that₁'s different [0] Mr. Halvorsen. Mr. Halvorsen, you see, none of, they didn't attempt to do that. They could have done that if they had wanted to. But, they didn't attempt to do it. Willie attempted to do it, so he should be able to get the award.

The immediate, preceding context for this utterance is an elaborate analogy offered by the teacher as a challenge to another student:

Teacher: Margaret, let's say that next weekend there is a track meet at Parkland, and St. Matthews is competing and there has been a special rule that lets 4th graders compete instead of just 6th, 7th, and 8th. And as you are running in the 400 meter dash, you decide to take a short cut. No one else dares to do it. You are the only one who dares to do it. Do you think that you would deserve to win that race?

To support the thesis that children were generally rather well understood despite ellipsis and abbreviated referring expressions, 38 undergraduates in elementary education were provided a synopsis of *Stone Fox* and an extended segment from the discussion transcript excerpted above, and asked to interpret the underlined elements in Marla's utterance. Their interpretations are summarized in Table 1. The he in the last sentence of Marla's utterance is a normal, unambiguous use of a pronoun that ought to be interpretable to any speaker of English; it was included to serve as a benchmark for the more problematic expressions. In fact, with one exception, the group of undergraduates was in as much agreement about the interpretation of expressions that might be considered problematic as they were about the interpretation of he. The exception was they, which some of the raters interpreted as meaning the runners competing in the track meet at Parkland. Otherwise, over 90% of the raters agreed on the interpretation of the referring expressions.

[Insert Table 1 about here.]

In summary, despite the children's elliptical manner of speaking, utterances generally did have consensual interpretations. Evidently, most of the seemingly vague references in the children's talk can be considered to be given information that could be readily supplied by the other participants in a discussion, and, thus, there is good reason to suppose that participants understood each other most of the time.

Several Reconstructed Arguments

Considered next are several children's arguments, representative of the range of arguments the children presented during these discussions, along with more or less complete reconstructions of the arguments, to illustrate several features of children's thinking, along with some of the problems facing the analyst.

When filling in unstated premises in an argument, the analyst necessarily relies to some extent on what is called the *principle of charity*, by which, in the most general terms, is meant the assumption that others are rational and intend to make sense when they speak. In an important paper, the philosopher, Davidson (1973-4; as cited in Govier, 1987, pp. 134-135) defended the principle as follows:

Charity is forced upon us: whether we like it or not, if we want to understand others, we must count them right on most matters. If we can produce a theory that reconciles charity and the formal conditions for a theory, we have done all that could be done to ensure communication. Nothing more is possible and nothing more is needed.

This seems an "astoundingly strong" (Thagard & Nisbett, 1983) position to an empirical social scientist, one that begs the questions to which answers are wanted. If you are required to assume that people are fully rational and coherent just to make understanding possible, it would seem that you have precluded the possibility of discovering faulty reasoning or inconsistent beliefs.

Still, in our experience, one must be charitable, sometimes extremely charitable, to make sense of children's arguments. Once a trial interpretation of an argument has been made, however, a more critical stance can be adopted, and the analyst can consider alternative interpretations that may give a better account of the utterance.

We assumed a specific form of the principle of charity as we reconstructed children's arguments. We assumed, in the spirit of a working hypothesis, that *children intended to present deductively valid arguments on one or the other side of the issue* being discussed. Each part of this assumption must bear some weight for a reconstruction to get off the ground. In attempting to interpret particular utterances, these questions and more have to be asked: Was the child presenting an argument or just making an incidental comment? Did the child suppose that a reason he or she presented provided sufficient grounds for the conclusion or did he or she suppose that the reason merely gave some support for the conclusion? Was the child arguing for a certain position or had he or she shifted perspectives? Ideally, there will be converging evidence that the arguer is committed to the beliefs expressed in premises that are supplied to fill inference gaps.

Of course, the hypothesis that it is obvious information that gets left out of arguments is another realization of Grice's second maxim of quantity: "Do not make your contribution more informative than is required." This hypothesis has an empirical entailment; when information is surprising, contested, or otherwise nonobvious, there ought to be an increasing likelihood that it will be included in an argument.

The first argument to be analyzed appeared in a discussion of *My Name is Different*. At first glance, the speaker, Anthony, does not seem very lucid in this utterance, since there are several awkward backtracks and vague space fillers. It looks like at the end of the statement he was struggling to come up with a precise formulation of the position that Chang Li would feel more comfortable if his name were like the names of the other children. Apparently, the first word that came to him was "same" He knew "same" was not right, which may have led to the "...sort of, because of.." stumble, and then the later correction from "same" to "similar."

Anthony: ::I think that he should. He doesn't feel that comfortable with his name, Chang Li. Other kids have names like Tom, George, and um Bill--he doesn't feel comfortable with um the name because then he might think that they're going to make fun of him because he has a different name. But um, I don't think he can feel comfortable with it because um I think he, he wil-, I think he should change his name, sort of, because um, he might, he'll feel a lot more comfortable if his name, like may be the same as his. I mean, not the same as the other ones but um maybe like similar.

Smoothness aside, this is one of the few arguments in dozens of pages of discussion transcripts that comes close to expressing a completely explicit and valid pattern of inference as judged by formalist standards. The conclusion is stated in the first sentence and restated later; "I think he should" is short for "I think Chang Li should change his name." The core of Anthony's argument is as follows:

Explicit premise: Chang Li cannot feel comfortable with his name. $\sim[n \text{ AND } c]$
 Explicit premise: He'll feel a lot more comfortable if he changes his name. $[\sim n \supset c]$
 Implicit (?) premise: He wants to feel comfortable $[c]$
 Explicit conclusion: Therefore, he should change his name. $[\sim n]$

In brackets following each premise is a formal representation of the premise, where n means he keeps his name, c means he feels comfortable, \sim means not, AND means and, and \supset means the conditional if-then relationship. Some analysts might insist that the premise *He wants to feel comfortable* is missing, however, our position is that wanting to feel comfortable is implied by the use of the word comfortable and that the premise should not be considered unstated. In any event, when the premise is included, the argument is formally valid; it is not possible for the conclusion to be false when the premises are true.

There are several aspects of Anthony's argument and our reconstruction of it that are worth noticing. First, the argument exemplifies *modus tollens*, one of the basic argument patterns. The form of *modus tollens* is (1) if a proposition p is true, then a second proposition q is true, (2) however, q is not true, (3) therefore, p is not true. In Anthony's argument above, the first premise, third premise, and conclusion comprise just this form (substituting n for p and $\sim c$ for q).

A second point about Anthony's argument and our reconstruction is that we are assuming the intertranslatability (although not the simple equivalence) of verbs such as *can*, *will*, and *should*. This raises slippery issues of modal logic which are beyond the scope of this paper. We will simply assume that, under some circumstances at least, it is legitimate to regard propositions containing different modal auxiliary verbs, such as *must* and *should*, as logically equivalent. This implies that placing the propositions in opposition results in contradiction. Thus, in the case of Anthony's argument, it means accepting that there is a tension, or contradiction, between the proposition that Chang Li *wants to be comfortable* and the proposition that he *cannot be comfortable* because of his name.

A third point worth noting is that, as we have reconstructed it, the second premise in Anthony's argument above, *He'll feel a lot more comfortable if he changes his name*, doesn't add to the logical force of the argument, and is hence irrelevant. Some people have the strong intuition that, far from being irrelevant, this premise lies at the heart of the argument. This intuition probably arises because they are giving the premise the strong reading that *Chang Li will feel comfortable if, and only if, he changes his name* (which can be symbolized $\sim n \supset c \text{ AND } n \supset \sim c$), instead of the weaker but more literal reading we have given: *If Chang Li changes his name he will feel more comfortable* ($\sim n \supset c$). The strong reading has the unwanted entailment that Chang Li will necessarily be comfortable if he changes his name, whereas, in fact, in this story he committed an embarrassing *faux pas* just because he changed his name. Anthony presumably is aware of this story episode; thus, there is converging evidence to the best reading in this instance. In many if not most instances, however, there is not enough evidence to tell whether children's arguments should be interpreted as having the deep logical structure $p \supset q$ or the deep structure $p \supset q \text{ AND } \sim p \supset \sim q$. Happily, it turns out that the conclusions we want to reach do not hinge on which interpretation is given.

A fourth point is that the rest of the Anthony's utterance contains a subargument providing backing for the premise that Chang Li doesn't feel comfortable because of his name. This argument, too, seems to us to be fully explicit and valid.

Explicit premise: The other kids have names like Tom, George, and Bill
 Explicit premise: "Chang Li" is different from these names.
 Explicit premise: He doesn't feel comfortable because he thinks kids will make fun of someone with a different name.
 Explicit conclusion: Thus, Chang Li doesn't feel comfortable because of his name.

The following contribution by another participant in the same discussion is more representative of our corpus. There are at least two different arguments in Margaret's contribution, which will be analyzed separately. Both arguments are elliptical--that is, both leave much unsaid that would have to be assumed in order for them to meet formal criteria of deductive validity. We have tried to supply some of the missing premises.

Margaret: I agree with Tim because I think that he should not change his name because of the fact that the kids at the school should be very nice to him because he is new. But also I think that...um I really don't think that it's appropriate to tease him or anything because he's just as equal as you. It's just because his eyes are shaped a little different and maybe he just has a different culture.

Margaret is manifestly a sincere and cooperative participant in the discussion; therefore, she is presumably intending to make her contribution informative and relevant. However, the comment that *kids at the school should be very nice to him because he is new* is not relevant to whether Chang Li should change his name, unless you suppose that Margaret thought that everyone understood that there was a strong reason for the kids *not* to be nice to him. Herein lies the motivation for the first part of the implicit argument that we have supplied.

Argument 1

[1] Implicit premise: Everyone wants kids to be nice to them.
 [2] Implicit premise: Kids may not be nice to someone who is different.
 [3] Implicit premise: Someone with a weird name is different.
 [4] Implicit premise: "Chang Li" is a weird name.
 Intermediate conclusion: Changing his name would remove a reason for kids not being nice to him.

However:

Explicit premise: Kids are very nice to those who are new.
 Explicit premise: Chang Li is new.
 [5] Implicit premise: Being new supersedes being different.
 Intermediate conclusion: Thus, kids will be nice to Chang Li despite his name.
 And finally, therefore: Chang Li should not change his name.

We believe that, although it contains several unstated premises, Margaret's first argument was clear to every participant and that it had the intended persuasive force. It certainly was clear and persuasive to us. The first two implicit premises can be considered common knowledge; since the premises are obvious, perhaps they do need not be stated. The third and fourth premises have a basis in the story; since everyone has read the story, these, too, can be considered as given.

There is alternative interpretation of Margaret's first argument that turns on the meaning of *should* in *kids at the school should be very nice to him because he is new*. In the reconstruction above, we have

interpreted *should* as expressing a prediction or expectation. A comparable sentence would be *If I flip this switch, the light should go on*. Using *should*, instead of *will*, points to--or at least, hints at--the background assumption that the electrical system is in working order. Likewise, on this interpretation, the *should* in the sentence about kids being nice to those who are new points to the assumption that the social system at the school is functioning normally. An alternative interpretation is that *should* expresses obligation, in which case the sentence is properly part of Argument 2 reconstructed below. One of the clues favoring the prediction interpretation is the contrastive *But also*. . . . This phrase would not be used if what followed continued the same line of reasoning.

The second part of Margaret's statement does not seem to be an argument about whether Chang Li should change his name, unless you assume that kids will do what is right. Also, the argument contains what superficially seem to be internal inconsistencies--for example, how can Chang Li be both equal and different?--unless you make assumptions like the ones we have made. We feel that most of these premises can be assumed to be given.

The one problematical assumption is that kids will do the right thing. If this assumption were exposed, it would show the argument to be vulnerable. Remember, though, that Margaret did not necessarily intend this to be an argument for why Chang Li should change his name. The words *But also*... may signal that she was changing perspectives, perhaps arguing that in a just world Chang Li would not have to worry about whether he should change his name. If Margaret did change perspectives, then there are no longer grounds for wondering whether she was entertaining a dubious premise. Throughout these discussions, children often seemed to shift perspectives. This means that one could not maintain a fixed standpoint for evaluating the children's utterances.

Argument 2

Implicit premise:	Someone is equal if they are not different in any important way.
Explicit premise:	Chang Li has different shaped eyes and a different culture
Implicit premise:	...as well as a different name.
Implicit premise:	The ways in which Chang Li is different are not important.
Explicit Intermediate conclusion:	Thus, Chang Li is equal.
Explicit premise:	It would be wrong for kids to tease someone who is equal.
Implicit premise:	Kids will do the right thing.
Intermediate conclusion:	Thus, kids will not tease Chang Li despite his name.
And finally, therefore:	Chang Li should not change his name.

Note that, as we have set these arguments out, the final step in the arguments requires a big leap. What is missing is some routine such as Chang Li should change his name only if there is a compelling reason for doing so, that the reason just considered is not a compelling reason, and so on,

Considered next is one more utterance from the same discussion of *My Name is Different*. Here, understanding depends upon disambiguating several vague referring expressions. The argument itself is also mildly elliptical. We supply what perhaps may be regarded as unstated premises.

Marcus I think that₁'s cheating because it₁'s the same thing as taking drugs and running. I mean, it₂ will make you a little stronger and you will speed up. And so, that₂ will be the same thing as going right through the path because that₁ will give you a head start just like the drugs will.

[Several lines omitted]

BEST COPY AVAILABLE

Marcus Well, he did cheat and so I think Stone Fox should win.

that₁, it₁ = taking a short cut across the lake

that₂, it₂ = taking drugs

going right through the path = taking a short cut across the lake

The presumption that *going right through the path* means the same as taking a short cut is not justifiable on strictly linguistic grounds. This is one of those communication problems that has to be solved using one's representation of the whole episode and with a heavy reliance on the principle that, whatever the surface form of their utterances, speakers mean to express ideas that make sense. To play the part required of them by the Cooperative Principle, listeners (and analysts!) must do the work to find the sense. We do think Marcus's argument was understood, not as he expressed it, but as he intended it.

Turning now to the structure of the argument, Marcus is displaying analogical reasoning, reasoning from a clear case to the case being debated.

Explicit premise:	Taking drugs before a race to "speed you up" or "give you a head start" is cheating.
Explicit premise:	Taking a short cut is equivalent to taking drugs.
Explicit premise:	Willie took a short cut.
Explicit conclusion:	Willie cheated.
Implicit premise:	Cheaters should not win.
Implicit conclusion:	Willie should not win.
Implicit premise:	Either Willie or Stone Fox should win.
Finally, therefore:	Stone Fox should win.

The premise *Cheaters should not win* is obvious; it would appear to be a truism that Marcus can assume all of the other participants in the discussion believe. Likewise, the intermediate conclusion that *Willie should not win* seems patently obvious. The premise *Either Willie or Stone Fox should win* can be considered to be a given, even though there were several other teams in the race, because it was framed by the question the children were discussing, namely whether Stone Fox should let Little Willie win the race.

Our tentative conclusion from this preliminary excursion into the internal structure of children's arguments is that, despite the frequent use of loosely-constrained pronouns, considerable awkwardness in expression, and many unstated premises, there is every reason to believe that, by and large, the students in these discussions were understood and that the force of their points was appreciated. With the possible exception of the second of Margaret's arguments, the reconstruction of the children's thinking preceded easily, without having to read anything except the most obvious of premises into their arguments.

Gaps in Children's Arguments

This section contains a more detailed analysis of which elements of arguments children leave unstated and how the nature of these gaps should weigh in an evaluation of the soundness of their arguments. Twenty-one utterances were selected from the transcripts of Collaborative Reasoning discussions for closer examination. Included were several utterances from each classroom, and at least one utterance from every discussion, except discussions of *Charles*, where many utterances could not be construed as presenting arguments. An analyst wrote out a reconstruction of an argument contained in 20 of the

21 utterances. In the remaining case, the child seemed to be making an argument, but the analyst could not understand it well enough to attempt a reconstruction.

In 8 of the 20 arguments that were analyzed, the child did not explicitly state a claim or conclusion. However, in 7 of the 8 cases, the claim the child wanted to make was obvious from the immediate context. Sometimes the claim was clarified in the subsequent discussion, as in the example of Marcus cited earlier. More often, the child had stated it explicitly in a preceding utterance, as in the example below excerpted from a discussion of *Stone Fox*:

Janet: And also, um, I think that Stone Fox shouldn't um win the race because he doesn't have like a cause to, like he doesn't have a reason. But Willie, he has a reason for his grandfather, but Stone Fox doesn't have a reason to win the race.

[Many lines later]

Janet: um, the Mayor said, that he was too little and usually kids that are about his age would go in the littler race. But he really wanted this. He felt really bad for his grandfather so he stood up for his grandfather and he wanted to win that \$500.00.

In other instances, the child's claim was evident because of the way the argument was framed by preceding utterances, as in Morgan's argument at the end of the following segment of a discussion of *Make Room for Uncle Joe*.

Teacher: OK, Luke, why do you, er, uh, Tim, why do you think he should stay?

Tim: Well, who else is going to care for him besides his social worker? But he needs somebody to love him (and all that).

Teacher: OK, Morgan?

Morgan: Like, everybody likes him there. At first it was hard for them, but they got to like him, and, he's a helper, and he's starting to be a helper in the house with the groceries and stuff.

It is clear that Morgan's claim is that Uncle Joe should stay with the family. It is equally clear that the claim could be understood by others without its being explicitly stated because it remains in focus from the earlier question by the teacher.

Thus, with the exception of a child who equivocated during a single utterance, first seeming to stand on one side and then on the other side of an issue, in this set of arguments one could confidently determine a child's claim even when none was explicitly stated. Presumably the unstated claims were obvious to all of the discussion participants and did not need to be expressed in order to be understood.

More serious, at least according to the conventional definition of a formally complete argument, 19 of the 20 arguments could be counted as missing a premise expressing a *warrant* (Toulmin, 1958) to

logically link a fact (or alleged fact) to a conclusion. For example, below is an argument voiced during a discussion of *Make Room for Uncle Joe*:

Georgia: Well, because he is part of the family. He should be with the family.

Substituting *Uncle Joe* for *he*, the argument can be expanded as follows:

Explicit premise: Uncle Joe is part of the family

Implicit (?) premise: If Uncle Joe is part of the family, then Uncle Joe should be with the family.

Explicit conclusion: Uncle Joe should be with the family.

Reconstructed in this fashion, Georgia's argument exemplifies *modus ponens*, one of the classical logical frames for a valid argument. *Modus ponens* consists of three parts: (1) a proposition, *p*, is true, (2) a conditional premise, or warrant, if *p* is true then *q* is true, (3) and the conclusion, therefore *q* is true.

According to the traditional criteria for evaluating arguments, Georgia's argument is defective because she has not explicitly asserted *if p then q*, or *If Uncle Joe is part of the family, then Uncle Joe should be with the family*.

However, we wish to challenge the common assumption that in this, and comparable cases, the premise *if p then q* is actually missing. Extending the reasoning of Govier (1987), our position is that in using words such as *because*, *so*, or, less frequently in the case of children, *thus* or *therefore*, the arguer intends to convey *if p then q*. This is not merely to say that *if p then q* is obvious, and can easily be supplied by an actively cooperative listener (see discussion below of Eemeren & Grootendorst, 1992). Rather, we want to say that *p therefore q*, *p so q*, *q since p* and *q because p* include *if p then q* in their meanings and, thus, that the premise is given in arguments as presented when one of these constructions occurs. We believe, further, that in asserting, for instance, *p so q* or *q because p*, the speaker is also asserting that *p* is true. Thus, we claim that the *p so q*, *q because p*, and comparable constructions constitute logically complete arguments in themselves.

Consider another argument containing the *q because p* construction, this one from a discussion of *Amy's Goose*. *She* refers to Amy and *it* refers to the goose.

Jennifer: I think she should let it go because it's part of nature, and it needs a family.

According to our analysis, Jennifer's statement implies that if the goose is part of nature and the goose needs a family, then Amy should let the goose go. Plainly, Jennifer is stipulating that the goose is part of nature and needs a family. Thus, if our analysis is correct, then Jennifer's statement entails the conclusion that Amy should let the goose go.

The reason for special attention to the *q because p* construction is that this is by far the most frequent form for children's arguments. In this set of 20 arguments, the word *because* (or *'cause*) appeared 39 times in 18 different arguments. In contrast, *if* appeared 11 times in 7 different arguments, while a proposed *if* clause followed by a *then* clause appeared only 3 times. Clauses joined with *so* appeared 13 times in 7 different arguments. There were no occurrences of *since*, *thus*, *therefore*, or *hence*.

Technically speaking, our thesis is that *q because p* is equivalent to *p AND if p then q*. Further, since *p AND if p then q* implies *q* and since purposeless speech acts violate the cooperative principle, the point

of utterances with the form *q because p* must be to convince an audience of *q*. Therefore, *q because p* constitutes a compact but logically complete realization of *modus ponens*.

The foregoing analysis works well when *because* has normative force, as in: *Chang Li should change his name, because he wants to change his name and his name is his choice*. This argument is convincingly paraphrased as: *Chang Li wants to change his name and his name is his choice. If he wants to change his name and his name is his choice, then he should change his name*, with the conclusion *He should change his name* understood as the point of the utterance. A caveat is that this analysis does not cover arguments in which *because* has causal/explanatory force. That this is so is easily appreciated in arguments involving long and improbable causal chains, such as the following: *The airplane crashed, because a fly landed on the pilot's nose*. The attempted paraphrase, *A fly landed on the pilot's nose. If a fly landed on the pilot's nose, then the airplane crashed* is unsatisfactory. In the *because* construction, it seems acceptable to assert only the initiating event, whereas the attempted paraphrase begs for a manifestly sufficient expansion of the causal chain. Moreover, the point of the utterance is to establish *p* instead of *q*.

In most of the children's arguments that we have analyzed, *because* is used with normative force. Evidence for this is that *should* was by far the most frequently used modal verb. It was used 27 times in 14 different arguments, and in almost all cases was judged to express obligation. For comparison, there was only one appearance of *may* and one appearance of *must*, while *will*, *would* and *can* appeared 6, 5, and 8 times respectively. The predominance of normative arguments simply reflects the kinds of issues the children were asked to discuss.

As reconstructed, *modus ponens* was at the core of most of the arguments. *Modus tollens*, in contrast, was rare. We judged this pattern was exemplified in only 3 of the 20 arguments subjected to detailed analysis in this section. This is not surprising. Research establishes that *modus tollens* is less intuitive than *modus ponens* even for educated adults (see Evans, Newstead, & Byrne, 1993, p. 36, Table 2.4).

Eemeren and Grootendorst (1992, p. 64) have a different treatment than we do of arguments with forms such as *p therefore q*, *p so q*, and *q because p*. They accept the conventional analysis in as much as they agree that such arguments contain gaps. They then distinguish between gap-filling premises, or warrants, which are "logically minimum" and ones which are "pragmatically optimum." In their words,

The logical minimum is the premise that consists of the "if . . . then . . ." sentence that has as its antecedent the explicit premise and as its consequent the conclusion of the explicit argument. The valid argument resulting from this addition has the form of *modus ponens*. So, the logical minimum amounts to connecting pieces of information that are already there: All it does is to state explicitly that it is permitted to infer the given conclusion from the given premise.

Pragmatically, this is not enough. From the very fact he advances this particular argumentation for his standpoint it is already clear that the speaker assumes that this conclusion follows from this premise. The logical minimum contributes nothing new and is, therefore, superfluous. Identifying this logical minimum as the unexpressed premise means that a violation of the third rule of communication (Do not perform any superfluous speech acts) is unnecessarily ascribed to the speaker.

The pragmatic optimum is the premise that makes the argument valid and also prevents a violation of Rule 3 and any other rule of communication. Predominantly, this is a matter of generalizing the logical minimum, making it as informative as possible without ascribing unwarranted commitments to the speaker. . . . (1992, p. 64)

Our position differs from that of Eemeren and Grootendorst in two respects. First, there is an apparent difference with respect to when arguments contain gaps. We maintain that utterances containing *q because p* and *p so q* are compact but logically complete arguments that should not be regarded as having missing warrants. Whereas their ostensible position is that such arguments do have gaps, Eemeren and Grootendorst say that adding "the logical minimum (the *if p then q* premise) to an argument contributes nothing new and is, therefore, superfluous." If adding a premise expressing *if p then q* contributes nothing, then there is no gap, and Eemeren and Grootendorst's position is indistinguishable from ours.

With respect to whether, or when, it is sensible to ascribe generalized warrants (or in Toulmin's terms, *backing*) to speakers, there appears to be a real difference between their position and ours. We believe that the policy they recommend of "generalizing the logical minimum" warrant and attributing this warrant to the speaker is dubious in principle and uncertain in practice.

Eemeren and Grootendorst are evidently committed to a theory of argumentation founded on appeals to universal principles. That is, they seem to believe that cause and effect reasoning in a particular case or normative reasoning in a particular case is satisfactory only when the argument is backed by a general principle. The first thing to notice is that whether an argument is founded on a general principle is an extralogical consideration. An argument can be logically complete and sound even when "all it does is connect the pieces of information that are already there."

Not everyone agrees that superior arguments are necessarily founded on general principles. Notably, Gilligan (1984) in her book *In a Different Voice* argues that women often prefer normative arguments that take close account of the particular set of circumstances in which a moral judgement must be made. It surely would be foolish to adopt an *a priori* stance toward what counts as a virtuous argument that might disadvantage half of the world's population!

Eemeren and Grootendorst try to justify the policy of attributing generalized warrants to speakers in terms of speech act theory. They say that to attribute only the "logically minimum" warrant to a speaker would be to condemn the speaker for being superfluous. To see the shortcomings of this position, let us consider a well-worked-out speech act analysis. The sentence *Do you have change for a dollar?* can be interpreted as an indirect request only if you believe the speaker desires change for a dollar; however, attributing this desire to the speaker is in no way to accuse the speaker of being superfluous. After all, the speaker did not say *I need change for a dollar*. *Do you have change for a dollar?* The first sentence in this longer utterance would be truly superfluous.

Likewise, Georgia's utterance to the effect that *Uncle Joe should be with the family, because he is part of the family* can be interpreted as an argument only if you suppose that Georgia believes that if Uncle Joe is part of the family, then he should be with the family. However, recognizing that she holds this belief hardly means that she is being superfluous. For her remark to be called superfluous, she would have had to utter the redundant if-then sentence herself. It seems that Eemeren and Grootendorst have caught themselves in a slide in perspective, confusing the speaker's suppositions with the analyst's attempt to express these suppositions. Thus, they fail to present a creditable justification for ascribing generalized warrants to speakers presenting arguments.

There are also practical problems with trying to divine the general unexpressed premises to which a speaker might be committed. The scary problem for the empiricist is that the reconstructed argument may owe more to the analyst than to the original speaker. There can be indefinitely many, more or less plausible formulations of the unexpressed premises in an argument. The choice among these formulations may reflect an adult researcher's theory of argumentation instead of children's reasoning. A reconstruction of an argument is a hypothesis; it should give a good account of the data and be as

parsimonious as possible. With respect to whether speakers may be reasoning in terms of general principles, stated or unstated, our policy is this: Don't assume. Look and see.

When we look at children's arguments to try to see whether they are, in fact, reasoning from general principles, in most cases in our corpus there is insufficient evidence to make a determination. In just 2 of the 20 arguments subjected to scrutiny in this section did it seem apparent that the speaker was committed to a generalized warrant. One of these appeared in a discussion of *My Name is Different* as follows:

- Teacher: Those of you that think he should not have changed his name, I'd like to hear your reasons, some of your reasons. Philip?
- Philip: One reason is because Chang Li is part of his history, his life, his um culture, like if, he, just 'cause he changed schools he didn't have to change his name, and even if they're all American, he lives in a Chinese part of town, and uh, it's his culture, all behind him, what, he does Chinese ceremonies and stuff, and um, he just shouldn't have changed his name, 'cuza all his culture and stuff.

While he is not completely explicit, we judge that Philip should be credited with a commitment to an expansive warrant, because it would be absurd for him to have used the sweeping phrase "life, history, and culture" and restrict the scope of reference to this one boy, Chang Li.

General Principles to Back Arguments

A further search of the transcripts was made to get a more complete understanding of the frequency and circumstances under which children express a generalized warrant, or to put it another way, appeal to a general principle to provide backing for an argument. The method was to search the transcripts for the roots *all*, *every*, and *general*. Only the search involving *every* was productive. Twenty-two utterances were discovered--including some from each classroom, group level, and story (except *Charles*, which wasn't searched)--in which the stem *every* (including *everybody*, *everyone*, and *everything*) appeared to be used as a universal quantifier. Boys produced 10 of these utterances and girls produced 12.

A good example of the use of *every* occurred in a discussion of *My Name is Different*, as follows, where *he* refers to Chang Li:

- Maria: Well, he's a person, and everybody should be treated the same because they're a person, they're alive.
- Teacher: OK, so you're saying maybe he shouldn't have, that he kinda changed your mind.
- Maria: [shakes her head]
- Teacher: Oh, no, you : haven't changed your mind.
- Maria: He shouldn't. He shouldn't have changed :: it.

Maria's first utterance did not contain an express conclusion, but she clarified her position when prompted by the teacher. Taking the exchange as a whole, her argument comes close to being a syllogism. It is still missing a premise to connect Chang Li's right to equal treatment with whether he should change his name, but this perhaps can be considered to be given in the surrounding discussion.

General principles were offered as backing for express or, more typically, implied warrants when (a) the warrant was grounded in a common cultural value, (b) the warrant had paradoxical or surprising features that might make it difficult to understand, or (c) the warrant was implicated in a disputed issue. The first two points are illustrated in the following exchange:

Marla: But Margaret, nobody's different, well everybody's//

Margaret: I know everybody's equal.

Marla: Everyone is different in some way. Like they might have a different color of hair. They might be short, they might be tall, they might be fat or thin or somethin' like that. Well, anyways, it doe-, everybody's treated equally.

Margaret: Right.

The idea that everyone is created equal is a common cultural value grounded in the Declaration of Independence and the Constitution. This idea, phrased in one way or another, was the most frequently expressed general premise throughout these discussions, no doubt in part because both *My Name is Different* and *Make Room for Uncle Joe* raise questions of fair and equal treatment.

Notice also, however, that the two girls excerpted above are struggling with seemingly contradictory propositions: everybody is equal, yet everybody is different. The tension created by this seeming paradox may be another reason that the children often felt a need to articulate the principle. An explanation in terms of speech act theory is that if a principle contains paradoxical, surprising, or confusing elements, then it cannot be considered to be given, and a fully cooperative participant in a discussion has the obligation to expressly state it.

Another example of a surprising warrant that was expressly stated appeared in a discussion of *My Name is Different*.

Sam: Well, I still think he shoulda kept his real name.

Teacher: Why do you think he should keep his real name?

Sam: Well, 'Cause it's the only one at school, and . . .

Teacher: So it's : (???)

Morgan: [hard to hear] : It's different from :: everybody else.

Gretchen: :: I think it's good being different.

Students: Mh hmm. Yeah.

Gretchen: It's kinda neat, because people just . . .

Jimmy: I don't agree.

Gretchen: No, 'cause then [laughs] ... I think it's neat to be different because, dif-, 'cause different people do different things, and everybody has different personalities and different w-, ways of thinking.

When Sam argues that Chang Li should keep his real name because *it's the only one at the school*, the teacher is confused. Perhaps to clear up the teacher's confusion, Morgan offers a paraphrase of Sam's point. Gretchen evidently discerns that the teacher's real problem is that she has failed to grasp the implied warrant, so Gretchen extends Sam's argument with *I think it's good being different*. People conventionally assume the opposite--that it's good to be like others; indeed, this was the position maintained up to this point in this discussion, and throughout an earlier discussion of the same story by another group in this classroom. Since the warrant is surprising, it cannot be assumed to be given and must be expressly stated, an obligation that Gretchen fulfills.

General principles were occasionally offered as backing for warrants when points were contested. For example, in a discussion of *Amy's Goose* the argument was advanced that the goose might die if it were allowed to leave with the flock before it is completely healed. In the excerpt below, Philip offers a rebuttal argument based on "natural law," in which he is joined by Gretchen, who enunciates the general principle. *He* refers to the goose.

Philip: He needs to be with his family, and that's part of nature if he dies. You live for a while, then you die
//

Gretchen: 'Cause everybody dies.

Only a handful of children were consistently sensitive to the possibility of backing arguments with appeals to general principles. One of these children was Gretchen, whose contributions have already been cited twice in this section. On these two occasions, she entered the discussion to cooperatively extend an argument introduced by a classmate. On other occasions she was adversarial, challenging the principle expressed or implied by a classmate. An occasion of the latter kind arose during the discussion of *My Name is Different* excerpted below, where *he* refers to Chang Li:

Teacher: Let's say you :: your family moved to China.

Calvin: Yeah.

Teacher: Would you want to take, would you like to keep your name, or would you want to take a Chinese name? Do you want to keep : your name?

Calvin: That's his choice. He gets to choose whatever choice he wants. It's his right.

Teacher: OK, so you say it's his choice.

Calvin: Yeah, I do.

Teacher: What would you advise him : to do?

- Gretchen: Oh, it's his choice? If he wants to take drugs, he can take drugs?
- Calvin: I'm not sayin' that. ::: I didn't say he can do anything he wants.
- Richard: That's a different story between changin' your name and takin' drugs.

In this episode, Gretchen presents a counterargument based on an analogy with taking drugs. Her counterargument presupposes that Calvin is committed to the expansive principle that in all matters Chang Li has the right of personal choice. Calvin immediately denies he has such a general commitment when he says, *I'm not sayin' that ::: I didn't say he can do anything he wants*. He is joined by Richard who counters that taking drugs is different from the situation they are debating. All three children manifestly understand that the issue is the scope of the principle that should be applied. The episode provides a nice illustration of the role of dispute in promoting explicitness about warrants and the backing for warrants.

Conclusions

This analysis of children's arguments yields several conclusions. First, children's arguments are replete with seemingly indeterminate pronouns and other apparently vague referring expressions. Usually, though, the intended referent is easily resolved and there is every reason to suppose that the arguers understand each other most of the time. Second, the arguments children present in the heat of discussion sometimes do not express conclusions, but the child's conclusion usually is obvious and its determination amply supported by discourse evidence. Third, very few children's arguments contain explicit warrants to authorize conclusions. According to the standard theory of argument, this is a serious flaw. However, we advance a theory of conversational logic, in which constructions such as *q because p*, the most frequent form for children's normative arguments during the discussions we have analyzed, can be construed as logically complete and formally sound. Fourth, although children seldom articulate general principles to back their arguments, when they do, one or more of the following circumstances seems to hold: A common cultural value is relevant. The implied warrant is surprising or confusing in some way. The warrant is implicated in a dispute.

At a more general level, we conclude that it is possible to give a coherent account of children's naturally occurring arguments within the framework of informal deductivism augmented with speech act theory. This is not to say that a logical framework can give a complete picture of everyday reasoning. There are many extralogical dispositions and abilities needed for successful everyday reasoning. Among those enumerated in Ennis's (1987) influential taxonomy are being clear, advancing creditable evidence in support of one's claims, and looking at issues from positions contrary to one's own. Further, everyday reasoning depends importantly on having adequate knowledge of the situation or the domain. Shortcomings in these or other nonlogical respects can cause an argument to go wrong. Thus, we do not disagree with Perkins (in press, pp. 38-39) when he says, "Informal reasoning has its own distinctive hazards. What people should do to reason better is to avoid these informal hazards, with shortfalls of standard logic a secondary priority."

So, how good are children's naturally occurring arguments? Part of the answer is that the form of children's arguments is acceptable, as long as you take the perspective of an actively-cooperative participant in the discussion. Expressing the answer in the words of Wittgenstein quoted in the epigraph (1922\1973, p. 50), it certainly takes some work "to gather the logical form" of children's arguments, expressed as they are in spur-of-the-moment ordinary language, but there are no compelling grounds

BEST COPY AVAILABLE

for concluding that the arguments are "in any way logically less correct or less exact or more confused" than arguments expressed in a formal notation.

References

- Braine, M. D. S., & O'Brien, D. P. (1991). A theory of If: A lexical entry, reasoning program, and pragmatic principles. *Psychological Review*, 98, 182-203.
- Cheng, P. W., & Holyoak, K. J. (1985). Pragmatic reasoning schemas. *Cognitive Psychology*, 17, 391-416.
- Conant, J. (1995). *Frege and the early Wittgenstein on elucidation*. Paper presented at the conference on Wittgenstein in America, Department of Philosophy, University of Illinois.
- Davidson, D. (1973-74). On the very idea of a conceptual scheme. *Proceedings and Addresses of the American Philosophical Association*, 47, 5-20; 18.
- Eemeren, F. H. van, & Grootendorst, R. (1992). *Argumentation, communication, and fallacies*. Hillsdale, NJ: Erlbaum.
- Ennis, R. H. (1982). Identifying implicit assumptions. *Synthese*, 51, 61-86.
- Ennis, R. H. (1987). A taxonomy of critical thinking dispositions and abilities. In J.B. Baron & R.S. Sternberg (Eds.), *Teaching thinking skills: Theory and practice*. New York: W.H. Freeman.
- Evans, J. S. T., Newstead, S. E., & Byrne, R. M. J. (1993). *Human reasoning: The psychology of deduction*. Hillsdale, NJ: Erlbaum.
- Gardiner, J. R. (1980). *Stone fox*. New York: Crowell Junior Books.
- Gilligan, C. (1982). *In a different voice: Psychological theory and women's development*. Cambridge, MA: Harvard University Press.
- Govier, T. (1987). *Problems in argument analysis and evaluation*. Providence, RI: Foris Publications.
- Grice, H. P. (1989). *Studies in the way of words*. Cambridge, MA: Harvard University Press.
- Holmes, E. T. (1977). *Amy's Goose*. New York: Crowell Junior Books.
- Jackson, S. (1949). *Charles*. In the lottery, or, the adventures of James Harris (pp. 91-96). New York: Farrar, Straus.
- Johnson-Laird, P. N., Byrne, R. M. J., & Schaeken, W. (1992). Propositional reasoning by model. *Psychological Review*, 99, 418-439.
- Litchfield, A. B. (1987). Make room for Uncle Joe. In B. E. Cullinan, R. C. Farr, W. D. Hammon, N. L. Roser, & D. Strickland (Eds.), *Crossroads* (pp. 22-33). Orlando, FL: Harcourt Brace Jovanovich.
- Means, M. L., & Voss, J. F. (in press). Who reasons well? Two studies of informal reasoning among children of different grade, ability and knowledge levels. *Cognition and Instruction*.
- Perelman, C., & Olbrechts-Tyteca, L. (1969). *The new rhetoric: A treatise on argumentation*. South Bend, IN: University of Notre Dame Press.

- Perkins, D.N. (in press). Standard logic as a model of reasoning: The empirical critique. In R. H. Johnson & J. Woods (Eds.), *Logic and practical reasoning, Handbook of practical reasoning: Computational and theoretical aspects* (Vol. 1). Hingham, MA: Kluwer.
- Prasad, N. (1987). My name is different. In B. E. Cullinan, R. C. Farr, W. D. Hammond, N. L. Roser, & D. Strickland (Eds.), *Crossroads* (pp. 4-20). Orlando, FL: Harcourt Brace Jovanovich.
- Resnick, L. B., Salmon, M., Zeitz, C. M., Wathen, S. H., & Holowchak, M. (1993). Reasoning in Conversation. *Cognition and Instruction*, 11, 347-364.
- Stein, N. L., & Miller, C. A. (1993). The development of memory and reasoning skill in argumentative contexts: Evaluating, explaining, and generating evidence. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol. 4, pp. 285-335). Hillsdale, NJ: Erlbaum.
- Thagard, P., & Nisbett, R. E. (1983). Rationality and charity. *Philosophy of Science*, 50, 250-267.
- Toulmin, S. (1958). *The uses of argument*. Cambridge: Cambridge University Press.
- Waggoner, M., Chinn, C., Yi, H., & Anderson, R. C. (in press). Collaborative reasoning about stories. *Language Arts*.
- Wittgenstein, L. (1971). *Tractatus Logico-Philosophicus*. (C. K. Ogden, Trans.). London: Routledge. (Original work published 1922)
- Wittgenstein, L. (1973). *Letters to C. K. Ogden*. (Edited by G. H. von Wright). London: Routledge & Kegan Paul.

Footnotes

¹Twenty other discussions were also videotaped. These discussions took place during a baseline period of observation during which most of the time was taken up with recitation. There were few, if any, utterances during the baseline discussions that could be construed as arguments.

Author Note

The authors are indebted to Michelle Commeyras, Anne Stallman, and Ian Wilkinson for their contributions to this project. Pseudonyms have been used for the discussion participants. The epigraphs from Wittgenstein were brought to our attention by Conant (1995). This research was supported in part by grants from the United States Department of Education and the University of Illinois Research Board.

Table 1

Percent of Undergraduates Making Dominant Interpretation of Referring Expressions

Expression	Percent	Dominant Interpretation
That ₁	100.0	Foot race at Parkland
[O]	90.0	Dog sled race in Stone Fox
They	70.3	Other dog sled drivers
Do that	97.1	Cross the frozen lake
Done that	94.3	Cross the frozen lake
Do it	97.1	Cross the frozen lake
He	94.6	Willy

Note: Total *N* equals 38. Ambiguous answers were not counted when computing percentages.