

Writing as a Cognitive Activity

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This paper examines characteristics of the mental processes required for writing. Comparisons and contrasts are made with the nature of processing required for other cognitive activities such as arithmetic, problem solving, reading, and particularly conversation. Recent research on children's writing is reviewed that reveals the advantages as well as disadvantages of superimposing writing skills over well developed language skills. This research suggests that it is the inability to access already existing skills which determine the form of language, rather than an absence of such skills, that poses the major obstacle to the development of writing abilities.

The past few years have seen a major shift in researchers' and educators' approach to the skill of writing. Until recently there was a dearth of information available on writing as an activity. Apart from the monograph by Emig (1971) and the *Paris Review* interviews of eminent writers (Cowley, 1958), information on writing was confined to descriptions of the texts that had been written (e.g., Loban, 1963, 1976). The emphasis on written text also dominated education. Teachers, charged with the duty of improving children's written language, relied primarily on the intervention of motivating the student to write well, and then evaluated the effectiveness of their motivating procedures by examining the subsequently written texts. The intervening event — the act of writing — was largely ignored both for teaching and evaluation purposes. But at the present time, as the topic of this issue of *Visible Language* attests, a great deal of work has been carried out on writing activity itself. So much, in fact, that it is now possible to compare what we know about writing as a skill with what we know about other mental skills such as problem solving, reading, and speaking. The purpose of this paper is to begin that comparison and to draw some conclusions about the nature of writing activity.

A preoccupation with written text, as opposed to writing activity, is easy to understand. In the first place writing is a private activity, at least for mature writers. It is usually done in isolation that is not only physical but also behavioural. The various idiosyncratic habits that attend writing essentially isolate and protect the activity from other behaviours. In the research carried out in Toronto by the Writing Research Group we have had a difficult time getting adults to submit their writing activity to scrutiny. We have not found comparable reticence with younger children, however, in part because writing is examined in school situations and in part because of the different characteristics of writing for children. In the second place,

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writing is a very complex activity. There must have been a feeling within the educational and psychological communities that the time to study writing had not yet come. Only with more powerful theories, better measurement techniques, and greater knowledge of the way the mind works would it be possible to study writing activity. Indeed with the kind of behaviourism characteristic of North American psychology from the 1920's to the 1960's, it would have been difficult even to begin to formulate a theory of writing activity. Only with the acceptance of an orientation such as that of cognitive psychology, which tolerates the assumption of complex mental processes, could a study of writing activity begin.

But one may still ask the question whether the time to study writing has come. In spite of the advances made by cognitive psychology, writing is still a very difficult topic to research. An indication of the difficulty can be gained from comparing research on writing with research on another difficult topic, that of oral speech development. The latter has demonstrated that an understanding of the context of an utterance can be used to recover the meaning of a child's utterance. But how can one apply such a powerful technique to writing when so much of the context for writing is inside the writer's head?

This last question neatly summarizes the problems with studying writing — so much of it goes on inside the writer's head. Writing lies at an extreme; it is uniquely different from other sophisticated cognitive activities like mathematics, speech, and reading. All these activities involve complex mental processes intervening between input variables and responses. They differ, however, in the degree to which environmental context governs mental processing, with writing being the least contextually constrained.

For a consideration of the differential effects context exerts on processing, it is useful to split the mental activity underlying the use of cognitive skills into two levels. First, there is that activity which is involved with the intention and purpose for using a particular cognitive skill. Skills at this level generally are referred to as metacognitive (Brown, 1978); the mental activity often is referred to as executive processing that is guided by executive schemes (Newell and Simon, 1972). Second, there are those activities that manipulate input and output information. Examples would be decoding processes in reading and whatever operations underlie addition. This latter level will be referred to as that of mediating activity. This label highlights the position of these activities which lie on the one hand between environmental context and responses, and on the other hand between executive processes and the environment in which a particular cognitive skill is applied. The characteristics of these two kinds of mental activity and their interrelationship serve to elaborate the similarities and differences among the various complex cognitive skills. In the following section the skills of arithmetic, mathematical problem solving, speaking, listening, reading, and writing each are briefly considered.

Arithmetic

Simple arithmetic skills are both the most contextually bound and those for which manipulation of information is most clearly separated from purpose. If my purpose is to determine my bank balance, then my mental activity is governed almost entirely by that purpose and the relevant numbers. What I do is add my previous balance and the intervening deposits, add my intervening withdrawals, and subtract the latter from the former. The relationship between the metacognitive activity that realizes my purpose and the information manipulation activity is a comparatively simple one that consists primarily of the executive activity issuing start and stop orders to the mediating activities. The separation between executive and mediating activities is shown by the fact that much of the mediating activity can be taken over by my handy pocket calculator. This separation is so marked that for instructional purposes in schools, exercise of the mediating activities can become an end in itself. Students calculate pages of sums and differences in order to consolidate these arithmetic skills. Their activity is governed by numbers and the arithmetical operator of the exercise items. This activity is also governed by a purpose, namely that the teacher has asked them to find the correct answers. Thus the executive process in the application of arithmetic skills in the classroom has a primarily external locus in the environment rather than an intrinsic one in the child.

Mathematical problem solving

It is one thing to calculate a sum as an arithmetic exercise; it is another thing altogether to solve a relative velocity problem when the context information is couched in the language of two trains approaching each other. The literature on mathematical problem solving, let alone problem solving in general, is too great to be summarized succinctly here. Those interested in analyses of the mental activities underlying problem solving behaviour are referred to Greeno (1978) and to Resnick and Glazer (1976). Generally speaking, the purpose of mathematical problem solving activity is to understand the mathematical characteristics of the problem situation. It is a mistake to assume that the purpose is simply to find the correct answer as it is with most arithmetic tasks. With problem solving, "finding the correct answer" is simply a handy abbreviation for the above more extensive purpose. The mediating activities in mathematical problem solving are the logical, algebraic, or geometric rules that can be applied to the specifics of the problem, just as arithmetic rules can be applied to sums and subtractions. The relationship between executive processes that underlie the purpose and the mediating activities that handle information, however, is much more complex than that for arithmetic tasks. Straight forward directives to start and stop mediating activities are not sufficient to solve a mathematical problem. Recognition by the problem solver that such a simple relationship between purpose and mediating activity is not adequate is, in fact, used to define a task as a problem solving one for that person (Resnick and Glazer, 1976). Unlike the arithmetic task the

problem solving task does not yield to a routinized application of mediating processes. This is because the information given in the statement of a problem is not sufficient in itself to solve the problem. What the problem solver must do is provide more information about the problem by selectively using knowledge about permissible rules of logic and so forth, hence the definition of the purpose as one of understanding. Such activity in problem solving is usually characterized as constructive.

A number of aspects of arithmetic and mathematical problem solving skills merit comment since they bear directly on the similarities and differences with writing skills. First, whether a particular task admits a routinized solution as most arithmetic tasks do, or is a problem solving task, will vary from person to person. The opening moves of a chess game are a problem solving task for the novice, but merely routine for the master. Likewise, a particular writing task may be treated either routinely or as a problem solving task. Second, how a writing task is treated does not necessarily follow a novice-problem solving versus expert-routine pattern. This seems to be the case primarily because beginning writers are already sophisticated oral language users, and there is a strong tendency for them to use inappropriately their oral language skills when writing. It is the more practiced writer who begins to move away from routine application of oral language skills to deliberate consideration of a given writing task that is more characteristic of a problem solving approach. Third, writing activity is not nearly so determined by environmental context as arithmetic or mathematical problem solving. Mathematical activities are governed by the information given as part of the task and by the limited set of rules (compared to grammar) for manipulating information. Those mathematical tasks usually found in schools lead to a single solution or endpoint; whereas a writing task is open-ended. It is the writer who must decide when the task has been completed.

These latter two differences are likely to lead to fairly profound processing differences between mathematical and writing activity. The greater degree of information given in both arithmetic and mathematical problem solving tasks probably helps to cue the appropriate mental activity. For writing, on the other hand, the writer must not only recognize a problem given relatively little information, but must also construct most of the problem situation. Furthermore, this must be done using an ability, that of language, in which the writer both is highly skilled and has developed many routinized procedures for dealing with information. The significance of basing writing activity on an already sophisticated oral language base can only be examined by considering those skills underlying speaking and listening.

Speaking

A consideration of the mental activities underlying speaking must take into account the context in which this skill is usually exercised, namely, that of conversation. The purpose of an utterance generally is to communicate something; specifically it is to act on the environment in a given way. For example, a person may wish to tell something to somebody, or may simply wish to have salt passed at dinner. Mediating activities are those processes that draw on grammar, phonology, phonetics, and information structure in language. The relationship between the intentional and mediating processes for speaking bears a distinct resemblance to that for arithmetic. Although it may seem that for speech the locus of control of the intentional processes is internal to the speaker, recent analyses of conversation have shown the great extent to which speech is contingent on the immediately preceding utterance of the other speaker (Dore, 1977; Grimes, 1975). Much of this work has been concerned with analyzing the function of utterances in a given context and is couched in the terminology of speech act theory (Austin, 1962; Searle, 1969). A consideration of the differences in function between oral and written language, and the transition the child must make in becoming a writer is presented below.

Listening

It may seem strange to include essentially receptive skills such as listening and reading in this consideration. Those considered above, and of course writing itself, are largely productive rather than receptive. There are, however, important components of both listening and reading that transfer directly to writing.

It is convenient to split the consideration of listening skills in two — those involved with short time durations and those involved with longer time durations. The former skills are used primarily in conversation and are simply the complement of the speaking skills outlined above. As such, listening skills are governed by the same kinds of processes as speech skills. The intention is usually to understand the function of the speaker's utterance and to act in accord with that function. Mediating activities are the application of grammar, phonology, etc. The relationship between intentional and mediating processes is facilitated by the conventional nature of most utterances.

More interesting are listening skills that involve longer time durations. A favourite pastime of both children and adults is listening to stories. The mediating activities of this pastime vary from use of phonological skills to use of story grammars. But what is the intention or purpose of this endeavour? It is not to understand the speaker and then respond or act accordingly since the speaker is simply a proxy and the context of the story is not immediate. On the surface the purpose of the request, "Tell me a story!" is enjoyment; but as with problem solving this purpose is simply a label for a much more complex intention. The purpose of listening to stories is to understand, but not as with problem solving to understand in order to find a solution; rather it is to understand who one is and what place one is to

take in the world. This is a goal that admits no single solution and the characteristics of the executive processes that underlie it appear to be complex indeed. On the one hand, the child identifies in a straightforward manner with the hero and heroine of the story, and undoubtedly derives vicarious pleasure from the suspense of the plot and the overcoming the villain. But at a deeper level the kinds of stories preferred by children, as Bettelheim (1977) has analyzed, provide the child's unconscious with myriad information on what at a conscious level would be very threatening subjects — information on sex roles, child-parent relations, the necessity and trials of independence, etc. The purpose of listening for extended periods of time to texts such as stories goes beyond the merely pleasurable to address issues of intense personal importance.

It is this latter function of stories that accounts for children's rather amazing development of executive processes for understanding stories at a very young age. Because of the personal significance of stories the child acquires the ability to listen to and understand extended sequences of language that are not only out of context but often foreign to the child's experience. The executive processes, then, that are involved in a child's listening to stories are very complex. Likewise, the interaction between executive and mediating processes must be complex since decoding processes applied to the language and interpretive processes dependent on semantic memory feed into both conscious and unconscious levels of the executive process. Although these complex processes remain to be illuminated by future research, one implication of this analysis for writing activity stands out: writing, like listening to stories, requires extended attention to and interaction with language. It seems likely that in order to foster and maintain such interaction the activity of writing like that of listening must fulfill some of the child's (and the adult's) deepest needs.

Reading

The view taken here is that reading skills essentially parallel listening skills in their structure. For reading the mediating processes must be supplemented by knowledge and processes of sight-language correspondences; but most of the remaining mediating processes remain the same. As with listening, a consideration of reading may be split into two divisions — reading for short periods of time and reading for extended periods of time. At least for children, reading for short periods of time is almost always a task imposed by the school. Passages from classroom readers tend to be short and are usually followed by a series of questions on factual and implied information from the story. The brevity of the text and the question-answer format that follows suggest that the mental activities involved in children's short-term reading most closely resemble activities involved in conversation and short-term listening. This may appear to be a somewhat extreme conclusion; but there is no doubt that much classroom reading has a large interactive language component.

This characteristic of short-term reading is highlighted by the contrast with extended duration reading. Children rarely and adults never answer comprehension questions about a book they are reading or have read.

Whereas to a great extent the purpose of short-term reading is environmentally imposed either by the questions to be answered or by the teacher's directive that the children participate in the interactive activity, the purpose of extended reading must be more self-determined. People engage in extended reading for the same reasons that children listen to stories — to find out more about themselves and what they can be in the world.

Writing

And finally what about writing? How can the mental activities underlying writing skill be characterized? First, the purpose of writing is primarily writer determined, rather than determined by the environment. Even where a topic is given by the teacher in the classroom, the intent of the piece must be defined and elaborated by the writer. In older terminology, the writer must determine the rhetorical situation of the to-be-written piece. Second, mediating processes that underlie writing (grammar, spelling, information structure, etc.) are overdeveloped in some respects and underdeveloped in others. In particular, those mediating processes that result in coherent text are not well developed.

In order to see the problems with learning to write better, let us examine writing as a skill in the light of the other skills the child has acquired. Such an examination reveals that those activities that the child has acquired for other cognitive skills are often at cross-purposes with those that facilitate writing. At the level of intent, writing attempts to comment on experience or the world in some significant way, if not always for the reader, then at least for the writer (Flower and Hayes, 1980). Such comment demands extended interaction with language so that the author's intent is realized accurately by both the form and the content of what is written. The child who is beginning to write usually has had considerable experience with extended duration language; but this experience has been limited to receptive language activity in listening and reading. For such receptive activity the mental processes that operate on the form and content of text are completely intertwined and highly routinized. As Chafe (1970) has commented, people (including children) read and listen for meaning; the way in which things are written or said are of transitory importance and are used primarily to recover the writer's or speaker's intentions. We remember the gist of what has been heard or read rather than its exact form or content. Thus the child is familiar with extended sequences of thought as realized primarily by stories, but lacks skills that focus on extended sequences of language form and content separately from meaning. Consequently, the child both has, and does not have, the mediating skills necessary for writing. The understanding of stories indicates skills applied to information structure — grammar and the like — but these skills are applied to others' language in the service of deriving meaning, not in the service of self-expression.

In productive language activity the child displays a greater virtuosity with the form of language, but the child's manipulation of information

structure, grammar, and vocabulary, occurs over only short duration conversational turns and, moreover, is still highly dependent on the environment since the options for language form are constrained by what the previous speaker has said. The extended interaction with language that is necessary for writing requires a transfer of and expansion upon skills nurtured in conversation that deal with language form, and also a transfer of skills used to derive extended sequences of thought from a receptive to a productive mode. In both cases, the child must break free of a dependence on the environment in order to achieve self-direction on the form and content of language.

Indeed, the major problem to be explained about writing is why it is so difficult for beginning writers to put together form and content for extended sequences of language. For it is the relationship between form and content that distinguishes the good writer from the poor, the undeveloped writer from the skilled. This is so because writing is a curious skill. The activity of writing *per se* requires a minimum of perceptual integration or conceptual knowledge. Unlike other skills, such as doing arithmetic or even driving a car, writing is essentially a technique that is applied to transform the output of well-mastered language skills from an aural to a visual medium. Initially at least, writing is simply visible speech. Thus the range of skill level in writing is not between those who can and those who can't, but between those who write well and those who write poorly, and the issues in writing are issues of integration, not primarily issues of acquisition (Bereiter, 1980). All of us who attempt to write know what a struggle it is to achieve such integration. Recent analyses of language structure and of how structures function in discourse, whether conversational or literary, have begun to reveal the nature of the struggle.

Conversational skills and their transfer to writing

A basic complexity of language as it is used by adults and children lies in the frequent disassociation of language form and language function. Of course, in many cases the form of an utterance or sentence reveals directly what the speaker wishes the language to do — for example, the imperative grammatical structure serves to direct someone to do something. On the other hand, a directive function need not be realized in the imperative form. The textbook example is the use of an assertive form such as, "The window is open," which in the appropriate circumstances can act as a directive to close the window.

Further consideration of this complexity requires a brief foray into a terminological thicket. Following Austin (1962) the functions of language usually are referred to as illocutionary acts. The categorization of illocutionary acts is somewhat contentious; however, an illustrative classification is that of Searle (1975b) who identifies five general types of illocutionary act: (1) representatives, which communicate speakers' beliefs about the world, (2) directives, which get people to do things, (3) commissives, which bind speakers to some course of action, (4) expressives, which communicate speakers' attitudes toward something, and (5)

declaratives, which serve to define and label parts of the world (e. g., "I claim this land for France"). Representatives, commissives, and declaratives can be explicitly expressed using the assertive sentence form, the latter two requiring use of specific lexical items (e. g., "I promise . . ." to achieve the commissive act of promising). Directives can be explicitly expressed via interrogative and imperative forms. And expressives are made explicit by various idiomatic forms. In these explicit forms, the given illocutionary act is said to be conveyed *directly*. But as indicated above with the "window" example, a given illocutionary act may be conveyed by forms other than the explicit ones. In such cases the act is said to be conveyed *indirectly*. The assertive form in particular, which in the absence of lexical specification functions directly as a representative illocutionary act, serves to convey the other types of illocutionary acts indirectly.

One of the major purposes of this complex relationship among language forms and functions is to allow the achievement of multiple functions for a single sentence by conveying both direct and indirect illocutionary acts. For an analysis of writing skills, the significance of this complexity is that it is largely mastered by children for their oral language by the time they begin to write, as the following example of nursery-school conversation, taken from Dore (1979), reveals. The segment of conversation occurred between a nursery school teacher (T) and one of her pupils (J) during the activity of wiping a table before eating. The conversation is listed on the left side of Table I, and illocutionary acts performed are listed on the right. It can be seen by examining the utterances that most are in an assertive form and hence act directly as representatives. The obvious coherence of the conversation can be accounted for only by examining the indirect acts that are carried out. Thus, J's first utterance (1) and its repetition (2) are in assertive form and act directly as representatives, specifically as a report of a personal wish or desire. They are intended, however, and understood by the teacher as directives, specifically as requests for permission to participate in the activity of washing the table. The teacher in turn replies with assertive (3) that indirectly acts as a directive, specifically a denial of the indirect request, by referring to a previously established commitment to another pupil. The teacher continues with another assertive (4) that has an elaborate indirect function. Not only does (4) act as a commissive, specifically a promise that J can participate after eating, but also as a directive (most likely because of the teacher's higher status), specifically a suggestion that J participate after eating. Utterance (5) is a directive seeking acknowledgement of the directive in (4), and (6) functions as a repetition of (4). Evidence that these multiple indirect acts are in fact realized by (4) to (6) can be found in J's following utterances (7) and (8). Utterance (7) is a response to the suggestion, specifically a denial that it will be followed; its form is too truncated to decide whether it is a representative (e. g., I do not want to do that) or a directive (e. g., No, my actions will not conform to your suggestion). Probably both are intended. Utterance (8) replies to the promise with an expressive, one of thanks, an appropriate response since promises to be made felicitously must be intended and perceived as beneficial to the promisee.

TABLE I. Illocutionary acts from a sample of child and teacher conversation

(Dore, 1979)

Speaker	Utterance	Illocutionary Act	
		Direct	Indirect
J	(1) I want to wash the table	representative: report on internal state	directive: request for permission
	(2) I want to wash the table	representative	directive
T	(3) I told R she could do it first	representative: report of previous talk	directive: denial of request
	(4) You can wash it after juice,	representative: future action	commissive: promise directive: suggestion
	(5) okay?	directive: request for acknowledgement	nil
	(6) You and M can do it after we've finished eating	representative	commissive directive
J	(7) No,	representative?: denial of suggestion	nil
	(8) thank you	expressive: acknowledgement of commissive	nil

The conversation of Table I serves also to illustrate a second aspect of children's skill in conversation. Not only do children's conversations display comprehension and production of illocutionary functions, they also display a sophisticated skill with discourse. Conversations are not random collections of utterances by speakers, but are sequenced in time and organized around a common topic. Sequencing is achieved by turn-taking; in Table I there are three turns, one by the teacher and two by the student. These turns do not overlap but are produced successively by the speakers (Coulthard, 1977; Sacks, Schegloff, and Jefferson, 1974). The organization of the conversation is around the topic of the student's participation in cleaning the table, which is announced in (1), and is achieved primarily through sequencing of the illocutionary functions for utterances over turns. These illocutionary sequences take the form of adjacency pairs of illocutionary functions. For example, directives, since they attempt to act on the environment, solicit a response. Three such pairs occur in the eight utterance conversation of Table I: J's request in (1) with its repetition in (2) is responded to by the teacher in (3). The teacher's suggestion in (6) is responded to by J in (7) and her promise in (6) is acknowledged by J in (8). This kind of sequencing is revealed in conversation in a number of ways. These include cohesive devices (Halliday and Hasan, 1976) such as use of pronominal reference and repeated lexical items (e. g., "it" in [3] refers to the phrase "wash the table" in [2]), grammatical structure that directly indicates an illocutionary function (e. g., the use of the interrogative to

express a question), and prosodic features of speech (Gumperz and Herasimchuk, 1972).

Given that even nursery school children possess sophisticated illocutionary and discourse skills, the question arises as to why, at a later age, they do not use these skills to sustain their writing. One way to approach this question is to consider to what extent young children use the skills deliberately to structure and guide conversation as opposed to using them reactively to participate in conversation. The evidence on this point is somewhat equivocal, but tends to support the view that they are not able to mobilize their discourse skills to manipulate long stretches of conversation. Dore (1979) reports that his nursery school subjects could not tolerate extended side sequences of conversation away from the main topic of conversation. Interruption of a conversation by a side sequence was not followed by return to the main topic. Furthermore, nursery-school activities such as washing the table that were mediated by conversation were usually initiated and maintained by the teacher rather than the children, although this may have more to do with the asymmetrical status relationship between teacher and students rather than with discourse skills. Much more research on children's conversations, especially in play situations, is required to document the development of discourse skill from one that is largely dependent on environmental inputs for its maintenance to one that is under the flexible control of the language user.

Receptive language skills and their transfer to writing

Although both conversation and writing involve the use of language, the interactive nature of conversation makes it quite a different activity from the solitary nature of writing text. As indicated above, however, children do have extensive experience with non-interactive language, namely in listening to and reading stories. Research on children's memory for stories indicates that, as with conversation, children develop quite sophisticated discourse skills for understanding and remembering the stories they hear (Mandler and Johnson, 1977; Stein and Glenn, 1978). For example, Stein and Glenn analyze stories using a hierarchical structure in which a story can initially be divided into setting and episode units, setting can be divided into time and location units, episode(s) into initiating events, character responses and actions, and consequences. The results of tests of children's memory for stories indicates that they use at least some of these units to organize their comprehension of stories. Six-year-old children remember setting, initiating event, and consequent units better than other types of units (Glenn, 1978; Mandler and Johnson, 1977; Stein and Glenn, 1978); furthermore, they tend to remember multiple episode stories by episode. That is, failures in memory tend to take the form of deletion of entire episodes (Glenn, 1978). Of course, exactly such discourse knowledge is required for extended text production since it constitutes an abstract plan of the types of information required for writing stories.

Once again, given this discourse skill in a receptive situation, one can consider to what extent children use the skills deliberately to structure

stories. Data on children's use of discourse skills in the production of stories as opposed to memory for stories are only beginning to appear in the literature.

Some of the more tantalizing data, based on Labov's analysis of story discourse units, are reported in the ethnological literature on children's oral production of stories for peers or trusted adults (Kernan, 1975; Labov, 1972; Watson-Gegeo and Boggs, 1975). The Labov analysis is roughly parallel to those of Mandler and Johnson and Stein and Glenn, but superior in one respect: While Labov includes units comparable to setting, initiating events, character actions and consequences, he also specifies two additional categories labelled *abstract* and *evaluation*. An abstract is an opening statement that proclaims a story and gives an overview of what is to follow (e.g., "I once got the scare of my life . . ."); an evaluation is a comment by the narrator that emphasizes the significance of some information in the story. Both additional units lie outside the direct line of narrative sequence and serve audience rather than narrative functions. The abstract serves to capture audience attention and to define the activity as one of story telling—a necessary function in the competitive environment of children's play. Evaluations serve to maintain audience interest since they are intended to enhance audience appreciation of parts of the story. Watson-Gegeo and Boggs (1975) report that two thirds of a sample of stories recorded from Hawaiian children aged six to seven years contained setting, complicating action, and resolution units, and that one half of the stories contained evaluative comments. Rather sketchily reported data by Kernan (1975) suggested a similar pattern of story structure for seven to eight-year-olds and a full complement of Labov's discourse units for stories by students aged ten years and older. Botvin and Sutton-Smith (1977), in a better controlled study, report similar patterns of story discourse structure using a discourse unit analysis derived from Propp (1968). Thus, the use of discourse skills in oral production of stories appears comparable to memory for stories at about age seven and fairly well mastered by the age of ten or eleven years. Of course, it remains an open question whether such knowledge can be transferred to writing where there is no immediate audience first to capture and then to captivate.

A least one study suggests that such transfer is not straightforward. Brown and Smiley (1977) had children aged eight, ten, and twelve years, and a group of adults, listen to a story and then retell it in their own words. Although they tended to remember less content, children of all ages included those ideas of the story that adults considered most important. In other words, children's understanding of the story was similar to adults' but not as detailed. In a second part of the study the same children were asked to point out those parts of another story that they thought were the most important. In other words, they were asked to use deliberately knowledge of the story structure that they had used on the retelling task. On this second part children of all ages did not do nearly as well: eight-year-olds showed no consistent pattern of choice, and ten and twelve-year-olds only approximated adult choices, whereas adults performed in a manner comparable to their retellings of the first part of the experiment. The

implications of these results are that (1) children's knowledge of story structure used for retelling the story was used tacitly rather than deliberately, (2) children had difficulty using this knowledge deliberately on the choice task, and (3) more generally with respect to writing, which requires deliberate choice among language forms and content, the inability to use such knowledge presents a major obstacle to the development of the writing skill.

Cognitive processes of younger writers at the discourse level

The problem beginning writers, and indeed unskilled writers of all ages, face has been characterized as one of putting together form and content of language to achieve extended sequences of text that are coherent. The above brief review reveals that in some way children "know" a great deal about language form, both at the sentence and discourse level. They appear to experience difficulty, however, in using their knowledge and skills deliberately to guide conversations or to think about the structure of texts—a difficulty which implies serious consequences for writing.

In the studies outlined below, it will be seen that children's writing difficulties lie primarily with the language form. It is an inability to use skills that determine the form rather than the content of texts that is responsible for ineffective writing. A striking aspect of these difficulties, found at both discourse and sentence levels, is that they are not produced by an absence of skill but by an inability to access deliberately skills that are well developed and used in other language activities.

A Representative study supporting this conclusion for discourse knowledge and skills was carried out by Bereiter, Scardamalia, and Turkish (1980). Children aged nine and eleven years were asked what kinds of information would be found in a story. In other words, they were asked to give general discourse information characteristic of a story genre. Not surprisingly this is a difficult task for children of these ages to do. Almost all began by giving concrete content (e.g., it could be about school), but as a result of directions that the information had to be useable in any story, they were able to give some general discourse characteristics (the most frequent being something like, "I'd tell where it happened," which was scored as setting information). These results indicate that children of these ages can recall relatively abstract discourse information. But whether they can use such recalled information to organize the stories they write is unclear. The same children subsequently wrote a story on a topic of their own choice which was scored for the presence of discourse information using a structural analysis similar to that developed by Stein and Glenn (see above). The most significant outcome of this scoring was found when, for each child, the correlation was calculated between kinds of information named on the first task and kinds of information used in the written story. It was found that there was no correlation. This effect seems to be a general one since a similar lack of correlation was found in results for talking about and writing arguments and descriptions. Thus, even though they have some ability to talk about it in the abstract, children's use of discourse information in writing does not appear to be mediated by a conscious strategy.

A more concerted effort to investigate the role of discourse knowledge in children's writing of arguments was made by Paris, Scardamalia, and Bereiter (1980). The basic rationale and strategy of the study were straightforward: Bereiter, Scardamalia, and Turkish had found that for all three genres examined children use more discourse units in their compositions than they were able to name. The failure to find evidence of conscious use of discourse units in writing could have been produced simply by children's unfamiliarity with identifying and labelling concrete information at a more abstract discourse level. Accordingly, in the Paris et al. study children aged nine and eleven were trained to recognize and label sentences with argument discourse units. Argument discourse units were six: statement of belief, reason, example, elaboration, counter-reason, and conclusion. An example of a sentence used during training is, "This is because people might get hurt if there were no rules." A child was expected to identify this sentence as a reason discourse unit. Following this training they were asked to do various composing tasks in order to test for the effects of training.

The results from this procedure paralleled those of the Bereiter, Scardamalia, and Turkish study, yielding evidence that children knew about discourse information, but no evidence that they used this information deliberately in composing. For example, training in the identification of sentences proceeded rapidly. It was clear that this part of the study for the children was one of simply learning verbal labels for already existing discourse concepts, rather than learning the concepts themselves. (Learning did occur and was retained, however. On a post-test the trained children correctly labelled more examples of discourse units in a text than a control group of children who were just shown a list of discourse units paired with sentence examples.) But this learning was not applied to composing tasks. In one of these, children were asked to give a sequence of discourse units that they could use to write an argument by arranging a set of cards that had discourse unit labels printed on them. The most frequently given sequence was a very brief one: statement of belief, reason, elaboration, and conclusion. This was also the most frequent sequence given by the untrained control group. On another composing task children wrote two arguments, one by following a commonly found order of discourse units (e.g., statement of belief, reason, elaboration, example, counter-reason, conclusion) and another by following an uncommon order (e.g., reason, statement of belief, elaboration, counter-reason, conclusion, example.) All children were more successful in following the more common order, but just barely: most children were able to follow the common order only as far as the belief-reason sequence; whereas for the uncommon order most children had difficulty beginning with a reason. In addition, the trained group was not superior to the control group. Taken together, the results suggest again that children use discourse information in composing, but that conscious access to this information and skill in manipulating it are quite limited.

Perhaps the most surprising result of this study was the brevity of productions: increased ability to recognize discourse information did not produce expanded argument sequences. This result appears to be similar to one found for content information (Scardamalia and Bracewell, 1979).

Children aged nine to eleven were able to list appropriate content for self-chosen argument topics when given minimal probes by the experimenter (e.g., "And what else can you think of?"). They failed to use much of this content, however, in writing a composition on the topic immediately after the listing procedure. The brevity of the argument compositions, in spite of discourse and content knowledge, suggests a skill deficit in organizing available knowledge about discourse and content during composing. Children's default strategy for organizing their written arguments appears to be based on oral language skills, since the structure of the arguments resembles a conversational turn. Evidence supporting this oral basis has been provided by Scardamalia (unpublished data) who, modelling a conversational sequence, simply asked children if they could continue after they informed her they had finished writing an argument. The children readily continued their arguments, adding not only written and therefore redundant information but new information as well. Use of an oral skill basis helps explain why children readily submit to scrutiny while writing. At this age their writing is an activity that essentially assumes the presence of another.

The demonstration that children do have, or can be taught, discourse knowledge yet do not apply such knowledge to improve their writing is at best embarrassing and at worst alarming. Suppose such results were to be found at all language levels from vocabulary, through grammar, paragraph structure, to overall text structure. If this were the case, what evidence could a researcher cite to demonstrate to educators that a cognitive approach to writing held any promise of leading to better instruction, let alone to demonstrate to colleagues that a cognitive approach could begin to explain writing as an activity? Since availability of knowledge did not appear to facilitate composing for beginning writers, we decided to attempt to facilitate the composing process directly in a fairly simple (some might think simple-minded) manner by having the experimenter intervene as the child composed (Bereiter and Scardamalia, 1980; and Bereiter, Scardamalia, and Bracewell, 1979). This procedural facilitation technique is best illustrated by summarizing a specific study.

Bracewell, Bereiter, and Scardamalia (1980) hypothesized that one reason for children's well-documented inability to revise their compositions (Bracewell, Scardamalia, and Bereiter, 1978; National Assessment of Educational Progress, 1977; Nold, 1980) might be lack of skill in deliberately applying their discourse knowledge to their already written texts. Therefore, in order to facilitate revising in this study, decisions about the application of discourse knowledge were made by the experimenter as a child revised his or her composition. Children aged nine and eleven years wrote an argument composition on a self-selected topic (e.g., Should girls be allowed to play on boys' sports teams?), and then revised it with the experimenter's help. First, the experimenter underlined and labelled the sections of the child's original composition using argument units like those presented above for the Paris et al study. Second, as the child revised, the experimenter suggested additional units that might be added to the composition. These interventions follow a pre-planned procedure that led

to a composition considering positions and evidence on both sides of the topic. The language used by the experimenter was at an abstract level, non-specific to individual topics (e.g., "Why don't you put in a reason now?"); the content to realize the suggested discourse unit was supplied by the child.

Procedural facilitation techniques like these have begun to reveal the composing processes of children. For example, in the Bracewell et al study, blind comparisons of original and revised compositions revealed that revisions contained superior content, indicating that when discourse information was made salient during revision, children could use it to recall and insert appropriate content into their compositions. Where children ran into difficulty was in inserting this content to make their compositions more rhetorically effective. Revisions were not rated as being more convincing than originals in spite of their better content. This finding appears to be related to the finding that revisions also were not rated as more coherent than originals, since the best predictor of whether a revision was considered convincing was the coherence score—the higher the coherence, the more likely a revision was to be rated convincing. Subsequent examination of revised compositions revealed little use of cohesive devices, such as pronoun reference and conjunctions, and awkward topic-comment shifts between sentences where an insert had been made.

Another revision study that used procedural facilitation techniques demonstrated that children can evaluate their writing realistically, but again have difficulty using these evaluations to revise so that the quality of their writing increases (Scardamalia and Bereiter, 1980). Children aged nine, eleven, and thirteen years wrote, evaluated, and revised their argument compositions. Evaluations and revisions were carried out sentence-by-sentence as the children composed using a set of descriptors and directives for revision that were printed on cards available to the children (e.g., "People may not understand this; I'd better change the wording"). Children chose an evaluation from the set, which included the option of making no revision, and then modified the sentence according to the directive. The experimenter's overt role in this procedure was to stop the children and direct their attention to the evaluation set at the end of each sentence; otherwise children simply keep on writing. The children's evaluations were scored by having an expert adult writer evaluate children's original sentences using the set of descriptors and revisions. It was found that these adult evaluations substantially concurred with those made by the children; however, blind ratings as to whether revised compositions were superior to originals failed to favour revisions. As with the Bracewell et al study, children were unable to implement their decisions in effective prose.

Procedural facilitation techniques initially might appear to be a rather bizarre research method since a first impression is that the experimenter takes over a part of the writing process from the child. The method seems to imply that for the ultimate in facilitation the experimenter would write the entire composition, with the child simply copying the experimenter's output. In such an extreme one might learn something about the experimenter's writing skill, but it is unlikely one would learn much about

the child's. In fact, an important aspect of the technique is that the experimenter takes over only a part of composing activity. Such partial support allows one to see the different cognitive skills that make up the writing act, both by revealing skills that children can already do, such as evaluating their sentences in an adult-like manner, and by revealing specific skill deficits such as an inability to translate topic-relevant content into coherent prose. Moreover, it appears inaccurate to characterize facilitation techniques as ones in which the experimenter "takes over" a part of the writing process. In practice, the experimenter's activity is highly interactive with the child's, and seems to achieve effects not simply by doing some part of the writing for the child but by cueing already existing knowledge and skills. The difference between procedural facilitation and taking over a part of an activity from a child can be clarified by an analogy. In teaching a child how to hit a pitched baseball with a bat, procedural facilitation would consist of using a lighter and larger ball that slows down quickly because of air resistance and can be hit more easily, and of using a light bat with a larger diameter which can be easily swung and is more likely to contact the ball because of its size. In contrast, taking over the activity might consist of guiding the bat by reaching over the child's shoulder. With procedural facilitation the child does all the activity himself or herself; whereas this is not the case with the latter method of support. Although at present speculative, it appears that procedural facilitation works for writing because it allows the child to transfer to the writing situation and to use deliberately those language skills and knowledge that have been acquired in the course of mastering other language activities.

Cognitive processes of younger writers at the sentence level

One of the most significant outcomes of the procedural facilitation studies was the finding that in spite of effective use of skills at the discourse level children were unable to implement their discourse level decisions in effective prose. This difficulty suggests a skill deficit in manipulating language of a by now familiar kind. It is clear that by the time children begin to write they are already competent language users whose oral output reveals a mastery of most of the great variety of syntactic and lexical devices that serve to communicate meaning. Why then when they write do they not call upon this knowledge to produce coherent prose? A pair of recent studies (Bracewell, 1980; Bracewell and Scardamalia, 1979) suggests that the difficulty is again one of transfer of skills and knowledge from tacit to deliberate use.

One of the most surprising implications of these results is that reading skills may interfere with the development of writing skills. An interference effect of text syntax on revision was demonstrated when eleven-year-old children were presented with materials like those in Table II. The task was to write up in a single sentence all the information initially presented either as sentences or in tabular form. Children needed more trials to achieve the single sentence when writing from the sentence version of the materials than when writing from the tabular version (Bracewell, 1980). At the

moment this result has the status of an interesting fact about writing. Before considering what it may mean, let us turn to another set of results that clarifies somewhat the relationship between reading and writing skills.

TABLE II. Language materials used for composing a single sentence

(Bracewell, 1980)

Example of sentence materials

The bird is in the cage.
The cage is under the table.
The table is in the room.
The bird is yellow.

Example of tabular materials

<i>what</i>	<i>relation</i>	<i>what</i>
bird	in	cage
cage	under	table
table	in	room
bird	is	yellow

Example of coordinated sentence

The yellow bird is in the cage under the table in the room.

TABLE III. Language materials used for reading and writing study

(Bracewell and Scardamalia, 1979)

Example of sentence materials

1. Ernie has a dog. Grover has a cat. Grover has a canary. Grover has a dog.
2. Ernie has a dog. Grover has a cat, a canary and a dog.
3. Ernie has a dog; but Grover has a cat, a canary and a dog.
4. Ernie has a dog; but Grover has three different pets, a cat, a canary and a dog.

Example of tabular materials

Title:	Who has what pet?	<i>Who</i>	<i>Pet</i>
		Bert	hamster
		Kermit	goldfish
		Kermit	turtle
		Kermit	hamster

Bracewell and Scardamalia (1979) had children, aged seven, nine, and eleven years, read and evaluate sentence items like those presented in Table III. Specifically, a child was asked to pick that item he or she thought was the best written one, and to give reasons for these choices. Choices of items and justifications showed a developmental trend. Seven-year-olds show no regular pattern of choice and justification; but both nine- and eleven-year-olds consistently selected the third or fourth item as the best written and the first item (the one made up of four separate sentences) as the worst written. These older children were able to justify their selections appropriately, pointing out the use of conjunctions in the more coordinated sentence items as being a good way of expressing this information, and pointing out the lexical repetition of the first item as being a poor way of expressing this information.

Immediately afterwards the same children were asked to compose sentences from a table like that presented in Table III. Specifically, children were asked to compose a "best" write-up and a "worst" write-up like the ones they had just selected on the reading task. Examination of these write-ups revealed that both best and worst productions contained an intermediate degree of coordination (e.g., "Bert has a hamster. Kermit has a goldfish, a turtle, and a hamster".) that was neither as well coordinated as the item selected as worst.

The results of both these two studies (Bracewell, 1980; Bracewell and Scardamalia, 1979) suggest an inability to manipulate syntactic form deliberately on production tasks. Clearly children can "decode" the syntactic structure of the sentences in Tables II and III, otherwise they would not be able to understand them. Moreover, when reading these kinds of materials, older children have some conscious awareness of language form and whether it expresses meaning adequately. But they have difficulty using such language-form knowledge when composing.

The thread that links the results of these two studies is children's skill in reading sentences for meaning. Normally the emergence of language skills, involving awareness for language form, which can be attributed in part to increasing exposure to different forms of text as children master reading skills, would be a cause for rejoicing. But the results presented above suggest that such skills also lead to problems for writing. Although children when learning to read initially must pay a fair amount of attention to the surface features of printed text, they rapidly automatize those perceptual and cognitive processes that mediate surface structure and meaning. Indeed, given working memory limitations, it is difficult to conceive of rapid and efficient securing of information without automatization of such processes. It is now commonplace that one remembers the gist of language, whether read or heard, rapidly forgetting the surface structure. But one implication of such efficient processing is that it does not facilitate the activity of writing, where awareness of possible misleading interpretations of what is written from what was intended, and the ability to act on such awareness by manipulating language form independently of meaning, is crucial.

The significance for instruction of the gap between awareness of written forms in reading and their deliberate use in writing may be better appreciated if one examines the pattern of children's productions across age for another medium of expression — that of painting and drawing. Unlike writing, children express themselves through representational art from an early age and age-related patterns of drawing and painting have been well documented. A striking feature of the use of representational media is that it declines precipitously at the age of ten to eleven years (Lark-Horowitz, Lewis, and Luca, 1967). The decline is correlated with and probably explained by an increasing awareness of the significance of technique in representational expression (Carothers and Gardner, 1979; Lark-Horowitz, 1938), an awareness that children rarely can match in their own drawing and painting. Of course, a comparable decline in writing is infrequently observed because children often do not master the perceptual-motor components of writing until nine or ten years of age. Where this component is mastered earlier, as in Donald Graves' exemplary program, available evidence has indicated a similar sudden decline in writing output (Graves, 1980). The correspondence is an exact one. At about the age of ten years an awareness and concern for technical aspects of productions in both art and writing manifests itself. With this manifestation productions in both media decline.

Such a pattern suggests that we revise our ideas of why so little writing is done by students in school. Writing activity tends to be minimal not simply because teachers, and the educational system generally, dominate or thwart self-expression through writing (Britton, Burgess, Martin, McLeod, and Rosen, 1975), but also because children's natural development of specific skills in reading, and more general skills in appreciating the techniques of self-expression, leads them inevitably to an awareness of their own productions' shortcomings. Since one cannot do without reading, a successful writing pedagogy will have to deal with those processes of reading that hinder cognitive processes necessary for effective writing. To return to a distinction made at the beginning of this paper, one of the principal problems in learning to write is that mediating skills for language form, which use discourse and syntactic knowledge, appear to be only minimally under the control of metacognitive skills that are involved with intention and purpose in writing. Allowing students to gain deliberate control over such mediating skills should be a major objective of writing instruction. The technique of procedural facilitation, translated into instructional tasks, offers a promising starting point for effective writing instruction at the discourse level (Bereiter and Scardamalia, 1980). But it remains to be seen whether such an approach can be successful for acquiring control of language form at the sentence level.

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"Writing has got to be an act of discovery . . .
I write to find out
what I am thinking about." 1

"If I write what you know, I bore you;
if I write what I know, I bore myself;
therefore I write what I don't know." 2

"I think that one is constantly startled
by the things
that appear before you
on the page
when you're writing." 3

"A writer has to surprise himself
to be worth reading." 4

"The easiest way for me to lose interest
is to know too much
of what I want to say before I begin." 5

"The language leads, and we continue
to follow where it leads." 6

1 Edward Albee

2 Robert Duncan

3 Shirley Hazzard

4 Bernard Malamud

5 William Matthews

6 Wright Morris