Kinds of Knowledge-Telling: Modeling Early Writing Development

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Abstract: The thesis of this article is that Bereiter and Scardamalia's (1987) knowledge-telling strategy may be viewed as a family of strategies. In particular, when young writers compose expository themes from their own knowledge, they may use one of three writing strategies: a flexible-focus strategy, a fixed-topic strategy, or a topic-elaboration strategy, all of which may be viewed as kinds of knowledge-telling. The article then proposes models to characterize the organization of cognitive processes in each strategy. The three writing strategies produce texts with identifiably different topical structures. Finally, the article provides evidence based on texts written by children in grades one through nine to indicate that the three strategies have distinct developmental trajectories.

Keywords: knowledge-telling, writing development, evaluation, cognitive models, exposition, topical structure

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It is generally assumed that skilled writers employ processes of planning and revision to organize the global structure of their texts. This is certainly the assumption embedded in the Hayes and Flower (1980) and Hayes (1996) models. But can this be true of young writers? Berninger and Swanson (1994) have pointed out that there is little evidence of planning and revision in the writing of primary and intermediate school students. However, Fuller (1995) and Donovan (2001) have shown that, even in the early primary grades, students write texts that do have global structure. How do young writers, then, manage to create global structure their texts? The literature provides some interesting suggestions.

In an extensive study of 3rd, 6th, and 9th graders, Langer (1986) found that although children did not use the familiar high-level rhetorical structures such as problem/solution, cause/effect, and compare/contrast (the ones that are generally taught in school) to organize their texts, they did have a major strategy to create overall structure. "For both stories and reports, the children at all three ages relied most frequently on a top-level rhetorical predicate (a title or main idea);" (Langer, 1986, p. 40). However, she also found differences between the two genre. As Langer noted "sequence was used extensively by story writers, . . . The temporal organization implicit in the sequence is less consistently appropriate in report writing tasks: instead, the children's reports tended to be organized around information clusters" (p. 40). Langer's (1986) study, then, provided empirical support for the widely held belief that topic and genre are important features that children use to structure their texts.

Myhill (2009) proposed a model for development of text organization focused on the paragraph. The model posits three successive developmental stages: graphic, topical, and textual. In the graphic stage, writers move from an absence of paragraphing to arbitrarily and randomly dividing the text into paragraphs. In the topical stage, writers move from simply marking paragraphs with topic sentences to organizing paragraphs coherently by topic. Thus, less advanced writers in this stage may be more likely to use a topic sentence than to succeed in organizing the paragraph around the indicated topic. In addition, writers in this stage move from a simple understanding of the topic to an understanding of its relation to subordinates and superordinates of the topic. In the textual phase, writers move from organizing sentences in paragraphs by topic to organizing paragraphs by relations among paragraph topics across the text. In addition, they increase the number and variety of cohesive devices that they use to connect paragraphs. In Myhill's model, organization proceeds from local to global.

In their classic work, *The psychology of written composition*, Bereiter and Scardamalia (1987) proposed two models of text production— knowledge-telling,

a relatively simple strategy most characteristic of children's writing, and knowledge-transforming, a more sophisticated strategy characteristic of more skilled writers. The knowledge-telling model, which has been very widely used to describe the writing of young writers (Alamargot & Fayol, 2009; McCutchen, 2006; Kellogg, 2008) is quite flexible. With the knowledge-telling strategy (diagrammed in Figure 1), the writer is assigned or chooses a topic and a genre and then probes memory to create a series of statements about that topic. As the name suggests, this strategy is focused on presenting the writer's knowledge about the topic and not at all on shaping or adjusting that knowledge to the reader's or the writer's needs. In contrast, writers using the knowledge-transforming strategy engage in a problem solving process in which they try to shape their knowledge to meet their reader's and/or their own needs.
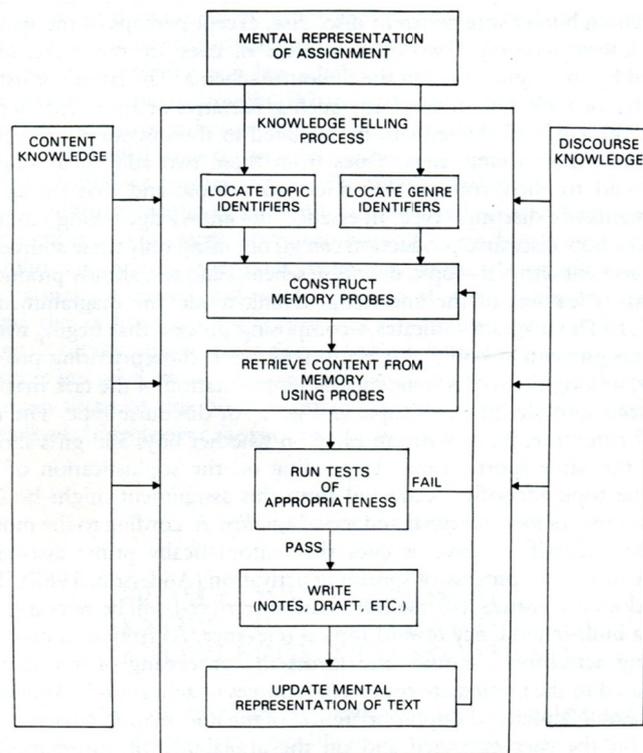

Figure 1. Bereiter and Scardamalia's knowledge-telling model (1987).

The previous research suggests that topic and genre are important in how children organize their texts. This article will focus on one genre: exposition, and on the role of topic in the global organizations of children's expository writing. In particular, it will explore the development of children's control over the topical structure of their writing, that is, the development of the young writer's ability to stay on topic or to switch from topic to subtopic and back again.

The article consists of four parts. The first part reviews the work by Fuller (1995) and by Donovan (2001) who analyzed children's expository texts and identified commonly occurring structures. The second part proposes writing strategies, embodied in cognitive models, that can create the three most common text structures that Fuller and Donovan found. The third part demonstrates that independent judges can agree about which of the strategies could have produced which of the texts. The final part provides evidence that the structures, and by implication the corresponding strategies, have distinct developmental trajectories.

1.   Children's Text Structures

My interest in developing specific models for children's writing was stimulated by the work of Fuller (1995)[1] and Donovan (2001) who classified children's expository texts on the basis of their topical structure. Fuller (1995) analyzed texts of 270 children in grades one through nine who responded to the prompt, "I like _____ because ____." Donovan (2001) analyzed texts of 222 children in kindergarten through grade five who responded to the prompt, "Write about the topic you have chosen for other students and teachers to read." These two researchers classified children's text structures somewhat differently. In this paper, I will focus on three frequently occurring structures, versions of which have been identified by both researchers.

Writers create a text structure, which Fuller called a *chain*, by linking each "new sentence to a local topic in the immediately previous sentence, but the emergent text is not psychologically coherent, that is it does not create a global topic for the paragraph as a whole" (Fuller, 1995 p. 26). In the example shown in Figure 2, the topic shifts in four clauses from *coloring* to the name of the writer's cat. The structure most closely related to the chain in Donovan's categorization appears to be what she calls the *simple couplet*. Donovan says that the simple couplet "is comprised of two statements, a statement of fact, or observation about something, followed by a statement of information serving to describe or extend the first" (Donovan 2001, p. 429). Thus, a simple couplet is a chain consisting of just two statements.
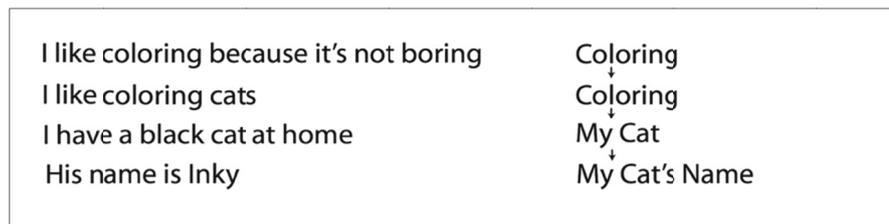
I like coloring because it's not boring   Coloring
                                       ↓

I like coloring cats   Coloring
                                     ↓

I have a black cat at home   My Cat
                                     ↓

His name is Inky   My Cat's Name

Figure 2. An example of a "chain" from Fuller (1995).

The second structure, Fuller defines as a text with "a global topic . . . the hub about which all new comments are generated, creating a "wheel" structure: each new sentence is like a spoke off the central hub, or unifying element" (Fuller, 1995, p. 27). The example of a wheel shown in Figure 3 consists of statements all about the main topic: Ashley. Donovan identified a structure that appears to be very similar to or identical with Fuller's wheel. Donovan called it an *attribute list*, and defined in this way: "The random listing of two or more facts related to a single topic . . ." (Donovan 2001, p. 429).
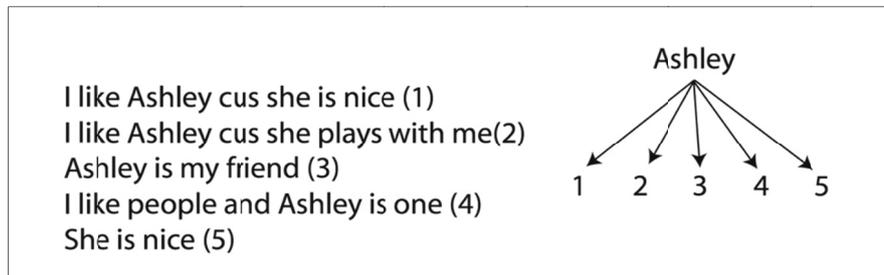
I like Ashley cus she is nice (1)
I like Ashley cus she plays with me(2)
Ashley is my friend (3)
I like people and Ashley is one (4)
She is nice (5)

Ashley
1   2   3   4   5

Figure 3. An example of a "wheel" from Fuller (1995).

Fuller defined a third text structure as follows: "These are wheel structures with fanning—elaboration on at least one spoke of the wheel. The elaboration relates to the topic of the spoke, while the spokes relate to the topic of the hub" (Fuller, 1995, p. 28). Fuller called this structure a *wheel with fanning*. In the example shown in Figure 4, the fans are elaborations about types of dinosaurs (Rex, Stegosaurus) that are the spokes related to the general topic "dinosaurs." The

wheel with fanning appears to include two of Donovan's structures: one that she called a *complex couplet* in which each spoke is elaborated by a single sentence and another that she called a *hierarchical attribute list* in which the elaborations may consist of several sentences (see Figure 5).
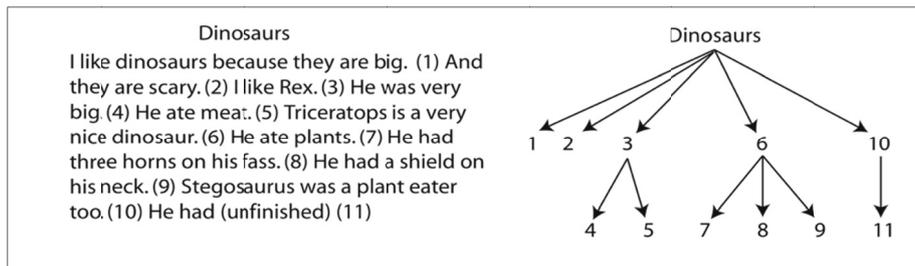

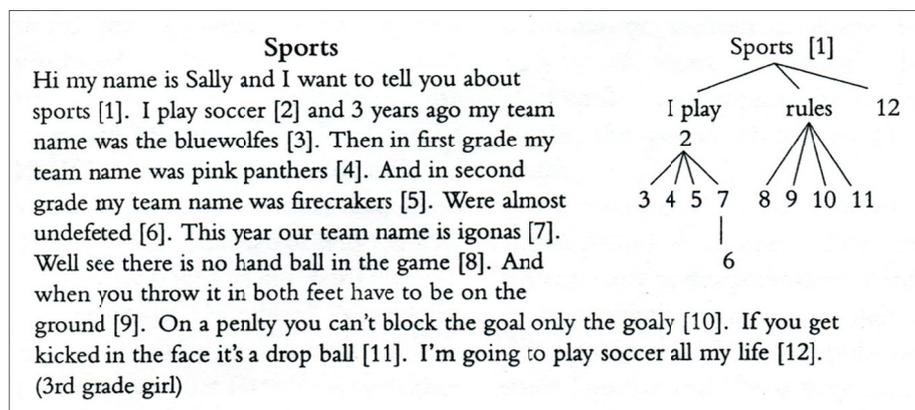**Figure 4.** An example of a "wheel-with-fanning" from Fuller (1995).

Figure 5. An example of a hierarchical attribute list (from Donovan, 2001).

Both Fuller's data and Donovan's data demonstrate not only that global structures can be found in young children's writing but also suggest developmental trends in the frequencies of occurrence of the text structures. Fuller reported that most first grade texts were "chains or wheels" (p. 46), but that seventh- to ninth- grade

students produced an increasing number of "wheels with fanning" (p. 69). Donovan (2001, Table 7) found that 17.1% of first graders' texts were simple couplets, while 45.7% were attribute lists, and none were complex couplets or hierarchical attribute lists. In contrast, Donovan reported that complex couplets and hierarchical attribute lists constitute about 35% of all text structures produced by the fourth- and fifth-grade students in her study.

Bereiter and Scardamalia (1987) laid out a scenario that could explain how all of these structures could be produced by their knowledge-telling model (pp. 7-9). They illustrated the working of the model with a hypothetical example of a child writing about whether boys and girls should play on the same sports teams. They proposed that the task might suggest to the writer a list of topic identifiers (i.e., cues) such as *boys, girls, and sports* and a genre identifier *statement of belief*. Bereiter and Scardamalia noted that "the cues actually extracted will depend on the sophistication of the writer" (p. 8) thus allowing for an important degree of flexibility to account for individual differences and developmental changes. They went on to say, "Suppose, for instance, that the first sentence produced in our example is 'I think boys and girls should be allowed to play on the same sports teams, but not for hockey or football.' The next cycle of content generation might make use of the same topical cues as before, plus the new cues *hockey* and *football*, and the discourse schema cue might be changed to *reason*." If each new sentence that the child writes can introduce new topic cues, the presence of these new cues could allow for the occurrence of chain structures, assuming that the writer pays more attention to the newer cues than to the older ones. And if each new sentence can change the discourse schema/genre cue, say to *elaborate* or *create a subtopic*, then these changes could allow for wheels with fanning. As one can see, the knowledge-telling model is quite flexible. This flexibility makes it easy for researchers to code the texts that children create as examples of knowledge-telling. However, this flexibility has a potential cost. If there were developmental changes within the category of texts coded as knowledge-telling, these changes would neither be predicted by nor accounted for by the knowledge-telling model. It is for this reason that I propose the following models.

2.   The Models

The three models I will describe are all variants of Bereiter and Scardamalia's (1987) knowledge-telling model and can be thought of as kinds of knowledge-telling. The models, each of which provides graphic representations of the sequence of processes involved in a particular writing strategy, are shown in

Figures 6, 7, and 8. For all of the models, each cycle of content generation is assumed to produce a main clause. Further, the models share four features: a *writing task*, a *proposing process*, a *transcription process,* and a *termination procedure*. The *writing task* is intended to represent the writer's goals for the text to be produced. These goals may be derived from a writing assignment or chosen independently by the writer. The goals may include a topic or event to be written about, a genre (expository, narrative, etc.), and other specifications such as length, tone, and so forth. The complexity of the writing task will vary with the sophistication of the writer. The *proposing process* includes the generation of ideas and their translation into language. The *transcription process* produces written text corresponding to the comments that have been proposed. Finally, the *termination procedure* is the method the writer uses to decide when the text is done. I assume that, for most of the writers in Fuller's and Donovan's samples, the decision to stop writing is made either because the child has run out of ideas to write about or because the child has run out of motivation to write. Motivation would be expected to depend in part the difficulty of the transcription process. The amount that the young writer considers appropriate likely depends on a negotiation between the teacher, who may prefer to see more, and the child, who may prefer to write less. More advanced writers may base their decision to stop writing on the completion of more sophisticated writing goals (e.g., whether an argument has been completed or a question answered).

2.1 The Flexible-Focus Model

The flexible-focus model was designed to create texts with chain-like structures. In this model, (see Figure 6) the focus box represents the writer's current focus of attention. At the beginning of a writing episode, focus will be strongly influenced by the writing task. However, once writing begins, the writer's focus of attention may also be captured by comments that the writer makes about the focus. Thus, the topic of each main clause may be either the topic of the previous main clause or the topic may be the comment the writer made about the topic of the previous main clause. Essays produced by the flexible-focus strategy lack a global focus. They start with the assigned topic but subsequent main clauses may change topic when the writer's attention is captured by the comment in the previous main clause.

To illustrate how the flexible-focus model works, I will describe how a writer using the flexible-focus strategy might have created the essay shown in Figure 2. The writer's initial focus of attention was on coloring and in her first three main clauses (*I like coloring*; *because it is not boring*; and *I like coloring cats*) were

focused on coloring[2]. Then her focus turned to her cat (*I have a black cat at home)*, presumably influenced by making the comment about coloring cats. Next, her focus turned to her cat's name (*His name is inky*). Finally, she decided that she had produced enough text for an essay and stopped.
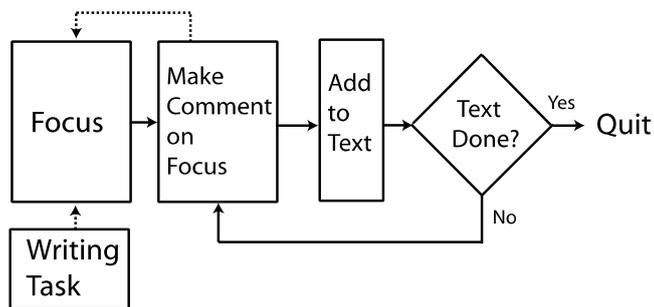
Figure 6. The flexible-focus model[3].

Notice that chains as defined by Fuller (1995, see above) are a subset of the structures that can be produced by the flexible-focus model. In both structures, the topic changes from the beginning to the end of the text. However, as Fuller's defines chains, successive statements never have the same topic. In contrast, in structures produced by the flexible-focus model, successive statements may sometimes have the same topic.

2.2   Fixed-Topic Model

The most important feature of the fixed-topic model is that the topic of each statement in the essay remains the same throughout the essay. I assume that this happens because the writer's understanding of essay writing requires that the topic should be the one specified in the writing task[4]. I further assume that the writer controls the topic either by rejecting off-topic comments when they are proposed (a process represented by the "On Topic?" decision box in Figure 7) or by suppressing off-topic statements before they are proposed. Suppression might be accomplished using a variety of mechanisms such as giving special salience to the initial topic, by suppressing distracters such as the current comment, or by inspection of the physical writing assignment (if available) or of the text-written-so-

far. Whether off-topic statements are eliminated before proposal, after proposal or both could be determined by studies using protocol or keystroke capture methods.
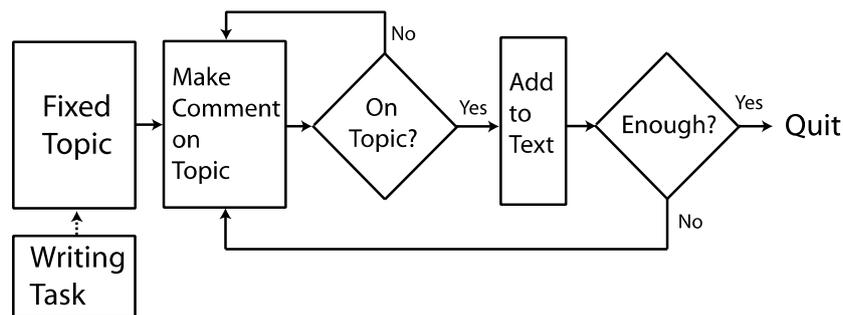

Figure 7. The Fixed-Topic Model.

To illustrate the operation of the fixed-topic model, I will suggest how a writer using the fixed-topic strategy might have produced the essay shown in Figure 3. First, the writer chose a topic, her friend Ashley, and established Ashley as the intended topic of all of the comments in her essay. She then created a sequence of comments about Ashley and wrote them down. Any proposed comment that was not about Ashley was rejected by the "OnTopic?" decision box. Finally, she decided that she had made enough comments and stopped.
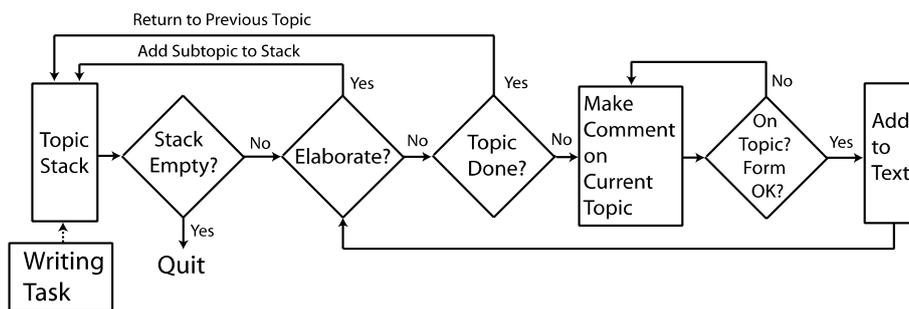
2.3   The Topic-Elaboration Model

The topic-elaboration model is more complex than the first two models. It includes three interacting processes that allow writers to introduce subtopics. These are the elaboration decision box, the "Topic Done?" decision box, and the topic stack. The topic stack replaces the first box in the fixed-topic model, the one that maintains focus on a single topic. A topic stack is a pushdown list of topics and subtopics. It starts out with one item in the stack, the main topic, which is treated as the current topic for commenting. When the writer decides to introduce a subtopic (subtopic A), it is placed on top of the stack becoming the current topic and pushing the main topic down in the stack. If the writer decides to elaborate subtopic A by discussing subtopic B, then subtopic B is placed on the top of the stack and it becomes the new current topic, pushing down both subtopic A and the main topic. When the "Topic Done?" decision box determines that enough has

been written about the current topic, that topic is popped off the topic stack and the topic that was last pushed down becomes the current topic. Thus, the topic stack is a "last in, first out" (LIFO) data structure.

The topic-elaboration model is different from the other two models because it evaluates comments for well-formedness. The decision to include the evaluation of well-formedness in the topic-elaboration model and not in the flexible-focus and fixed-topic models is a response to Berninger and Swanson's (1994) observation that on-line revising develops relatively late in young writers and may become important only in the junior-high-school grades.

To illustrate how the topic-elaboration model works, suppose that a student decides to write an essay on dinosaurs, such as that shown in Figure 4. 'Dinosaurs' is entered as the current topic in the topic stack. Since the stack is not empty, the writer comments on the current topic, proposing the statement, 'I like dinosaurs because they are big,' finds this statement on topic and well formed and adds it to the text. He then decides not to elaborate on the comment but to add more comments on the current topic. The writer then added, 'And they [dinosaurs] are scary.' And 'I like [the dinosaur] Rex.' At this point, the writer decided to elaborate on the subtopic Rex. Now the topic *dinosaurs* is pushed down in the topic list and replaced by the topic *Rex* as the current topic. He then added the statements 'He was very big.' and 'He ate meat.' Next, the writer decided that he had said enough about *Rex* and resumed the previous topic, *Dinosaurs*. He then decided to elaborate on that topic again and added the subtopic *Triceratops* to the topic list and made several comments about the new current topic. The writer proceeded to add a third subtopic, *Stegosaurus,* but ran out of time before he could finish elaborating it.

Figure 8. The Topic-Elaboration Model.

In many essays in the Fuller corpus, writers return to the main topic after elaborating on subtopics. Returning to the main topic is evidence that the main topic is still active in the topic stack for that writer. Notice, however, that in the essay shown in Figure 4, the writer did not explicitly return to the main topic. In this case the evidence that the main topic is still active is that there is a sequence of subtopics all directly related to the main topic. However, suppose that there were just one subtopic following the introduction of the main topic. For example, suppose that the author of the 'dinosaur essay' stopped immediately after writing about Rex. In such cases, it would be impossible to determine whether the writer was using the flexible-focus strategy or the topic-elaboration strategy. In all such ambiguous cases, I have coded the writer as using the simpler flexible focus-strategy. The text structures that the topic-elaboration model can produce appear to be the same as those Fuller calls *wheel-with-fanning* and they include Donovan's *complex couplets* and *hierarchical attribute lists*.

3.   Evaluating the Strategies

It is important to do two things to show that the strategies proposed here are potentially useful tools for understanding children's writing. The first is to demonstrate that judges can agree in associating texts with the strategies, that is, that they can agree that text 1 was most likely produced by strategy A, that text 2 was most likely produced by strategy B, and so on. This issue will be discussed in the section on reliability. The second thing of importance is that the strategies have different developmental trajectories. This issue will be discussed in the section on grade-level trends.

To do these things, I analyzed the 270 expository essays of the Fuller corpus. I chose the Fuller corpus because it is more representative of the U.S. population than the Donovan corpus,[5] because it included a wider range of grades, and because it was more readily available.

3.1   Reliability

In preliminary efforts to measure reliability, judges were asked to sort essays according to the strategies that likely produced them: flexible-focus, fixed-topic, topic-elaboration, or none-of-the above. These efforts failed to provide acceptable levels of reliability. Such failure could mean that the relation between the three strategies and the texts that they could produce was intrinsically unclear. Or it

could mean that the judgment task I designed for the judges posed unmanageably high cognitive demands. There is evidence that making reliable judgments about something as complex as an essay is difficult even for experienced teachers of writing (Hayes, Hatch, & Silk, 2000). To test the possibility that acceptably reliable judgments could be obtained if the judges had a less demanding task, I redesigned the judgment procedure to make it as simple as possible. First, I removed 11 of the 270 essays from the evaluation process that I judged could not be scored as expositions. These are the essays labeled *other* in Figure 10 and will be described later. This left 259 essays in the pool to be sampled in the measurement of reliability. I then divided the judgment procedure into two phases. In the first phase, the judges were asked to make local rather than global judgments, that is, judgments about individual clauses rather than about whole essays. As I will discuss below, I used these local judgments to associate many of the essays with particular strategies. In the second phase, judges were asked to associate the remaining essays to strategies by making global judgments.

Phase 1: Associating essays with strategies using local judgments.
Collecting the local judgments. I randomly selected 40 essays (a 15% sample of the Fuller corpus) for inclusion in a test booklet. I divided each of the 40 essays into a sequence of main clauses and identified the topic of the initial main clause as the main topic (M) as shown in Figure 9. Two judges independently decided whether the topic of each clause was the "main" topic (M), whether it was a related topic (R), or whether it was something else (O,) such as a meta-comment about the writing process (e.g., "this is spelled wrong"). In this analysis, I ignored clauses for which the judges coded the topic as *other* (O). Agreement between the two judges in identifying clause topics was 87.2 % and Cohen's Kappa was .703.

M	R	O	Main Topic: Japan
[x]	[ ]	[ ]	I like Japan
[x]	[ ]	[ ]	because it is very interesting about the history and what is happening now.
[ ]	[x]	[ ]	I have a Japanese friend name Takashi.
[ ]	[x]	[ ]	He is nice.
[x]	[ ]	[ ]	I wonder if I will go to Japan.
[ ]	[ ]	[x]	Do you?

Figure 9. Example of an item in the evaluation sheet.

Using the local judgments to identify strategies. The three strategies tend to produce essays with distinctively different patterns in the sequence of topics in their main clauses. In contrast to the other strategies, the fixed–topic strategy produces essays in which all of the clauses are M-clauses. I will call this the FT pattern (for fixed-topic). Similarly, in contrast to the other strategies, the topic-elaboration strategy can (but does not necessarily) produce essays in which R-clauses are sandwiched between M-clauses. The fixed-topic strategy can't produce this pattern because it never produces R-clauses and the flexible-focus strategy can't produce it because once it leaves the main topic it never returns to it. I will call this the TE pattern (for topic-elaboration). Finally, both the flexible-focus and the topic-elaboration strategies can produce essays that start with M-clauses followed by R-clauses that **are not** followed by M-clauses. I will call this the FF/TE pattern (for flexible-focus or topic-elaboration). Other patterns are logically possible. For example, an essay might consist of R-clauses followed by M-clauses. However, only the three patterns described above appeared in the Fuller corpus.

I used each judge's topic decisions to classify the 40 essays into the three patterns. If a judge identified all the clauses in an essay as M-clauses, I coded the essay as FT pattern for that judge. If a judge identified one or more R-clauses in an essay preceded **and** followed by M-clauses, I coded the essay in TE pattern for that judge. Finally, if the judge identified one or more initial clauses as M-clauses and all the following clauses as R-clauses, I coded the essay as FF/TE pattern. In this way, I assigned a pattern code to each of the 40 essays for each of the judges. Agreement between judges in identifying the three patterns was 90% and Cohen's kappa was .796.

Phase 2: Differentiating flexible-focus from topic-elaboration structures in FF/TE pattern essays

As I noted above, the fixed-topic strategy is the only one that can produce FF pattern essays, and the topic-elaboration strategy is the only one that can produce TE pattern essays. However, FF/TE pattern essays can be produced by either the flexible-focus strategy or by the topic-elaboration strategy. To have a more complete assessment of the reliability with which judges can assign the three strategies to essays, then, we need to know the reliability with which judges can assign FF/TE pattern essays to either the flexible-focus or topic-elaboration strategies. The critical difference is that with the topic-elaboration strategy, the related topics are all related to a single superordinate topic, but with the flexible-focus strategy, there is no unifying superordinate topic. To differentiate topic-elaboration structures such as that shown in Figure 4 from flexible-focus structures

such as that shown in Figure 2, the judges had to evaluate essays globally to determine whether the sequence of topics is related to a superordinate topic or not.

The task, then, was to find how well judges could agree in attributing FF/TE pattern essays either to the flexible-focus strategy or the topic-elaboration strategy. Using my own phase 1 judgments, I identified all of the FF/TE pattern essays in the Fuller corpus. There were 30 such essays; 10.4 % of the 270 essays. Acting as Judge #1, I attributed 13 of them to the flexible-focus strategy and 17 to the topic-elaboration strategy. For the test, I randomly selected 10 of the 13 essays I attributed to the flexible-focus strategy. I also selected 10 of the essays I attributed to the topic-elaboration strategy that I matched as closely as possible by grade of the writer to the flexible-focus essays. The 20 essays were arranged in random order and printed in the test booklet. The second judge was asked to read each essay and decide whether it was produced by the flexible-focus strategy or the topic–elaboration strategy. Agreement between the judges was 80% and Cohen's kappa was .60.

3.2   Estimating overall reliability

By applying phase 1 and phase 2 judgments in sequence, judges could associate one of the three strategies (flexible-focus, fixed-topic, or topic-elaboration) to each essay. To estimate the reliability of their combined judgments, I used the estimates of the reliability of phase 1 and phase 2 judgments together with my estimate of the frequencies of the three essay patterns. To estimate the pattern frequencies, I applied my own phase 1 judgments to the Fuller corpus (minus 11 texts scored as *other*). My phase 1 judgments identified 136 essays as FT pattern, 93 as TE pattern, and 30 as FF/TE pattern. To estimate overall reliability, I used the formula below. In this formula, I have assumed that phase 1 and phase 2 reliability estimates apply equally to all alternative decisions. This implies that, in phase 1 for example, the same percent of agreement would be obtained by judges in identifying FT patterns, TE patterns, and FF/TE patterns.

(1) Overall Reliability = (frequency(FT pattern) x phase 1 reliability +
　　　　　　　　　frequency(TE pattern) x phase 1 reliability +
　　　　　　　　　frequency(FF/TE pattern) x (phase 1 x phase2) reliability)
　　　　　　　　　/Total # essays evaluated
　　　　　　　　= (136 x .90 + 93 x .90 + 30 x .90 x .80) / 259 = 87.9%[6]

This rough estimate suggests that judges using the procedures described above can assign essays to the strategies with reasonable reliability.

3.3   Grade-level trends in the production of text structures

Using the procedures described above, I classified each of the essays in Fuller's corpus as consistent with the *flexible-focus strategy*, the *fixed-topic strategy*, the *topic-elaboration strategy,* or *other[7]*.

Figure 10 shows the distribution of essays by strategy and by grade. A χ^2 test showed that the change in the distribution of strategies with grade level was significant (χ^2=47.57, *df*=24, *p*<.005). Most of the change reflects the shift from the fixed-topic strategy to the topic-elaboration strategy.
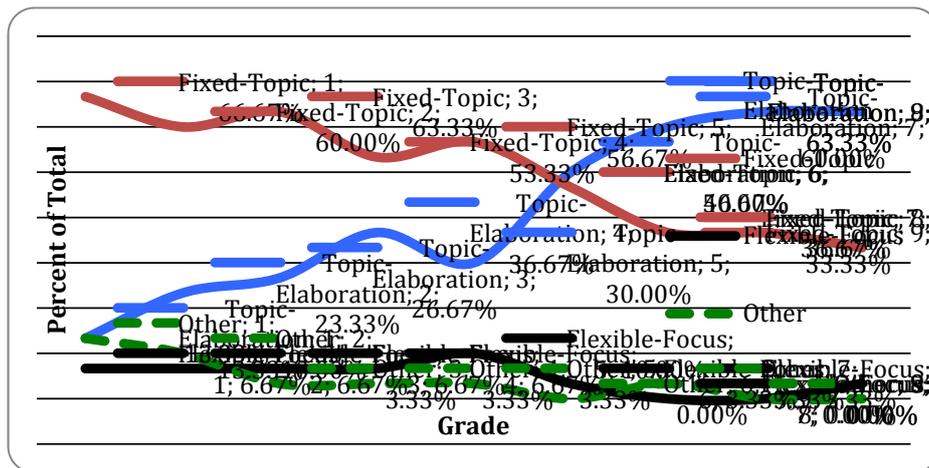

Figure 10. Distribution of text structures by grade.

The major results evident in Figure 10 are:

Most of the text structures created by the 1st to 9th grade children were consistent with either the fixed-topic or the topic-elaboration strategy.

As grade level increased, the percent of text structures consistent with the text-elaboration strategy increased from 13% to 63% and that the percent of structures consistent with the fixed-topic strategy decreased from 66% to 33%. The text-elaboration strategy appears to become the writers' dominant strategy after grade 5.

Essay structures consistent with the flexible-focus strategy never exceeded 10% in any grade and appear to be rare after the 6th grade.

These results reflect some interesting developmental changes in writing processes. The relatively small percentage of flexible-focus structures observed in the Fuller corpus suggests that most writers in grades 1 through 9 have sufficient control of attention to maintain focus on a main topic while writing an essay. The rarity of these structures after grade 6 is consistent with the widely observed age-related improvement in the ability to focus attention (Diamond, 2006).

The shift from fixed-topic to topic-elaboration structures appears to reflect an increasing ability of writers to handle subgoals and, in particular, to be able to return to a main goal, that is, writing about the main topic, after the distraction of carrying out a subgoal, that is, writing about a subtopic. It is known that even preschool children can make use of subgoals. For example, Klahr and Robinson (1981) have shown that preschool children can keep up to two subgoals in mind while solving simple problems. However, this ability appears to be mastered much later in the context of writing tasks perhaps because writing makes heavy demands on cognitive resources. Like the ability to use the fixed-topic strategy, the ability to use the topic-elaboration strategy may depend on development in the writer's ability to focus attention.

The results presented here should not be generalized to other genre. Different genre have different structural characteristics and different developmental trajectories. For example, Hidi and Hilyard (1983), who studied 3rd and 5th grade children, found that the children's narratives were significantly better formed and more cohesive than their opinion essays. Langer (1986) found that the structural patterns that children use for writing stories, for example, the use of sequence, were well established by third grade. This was not true for the writing of reports. In the early grades, she observed that reports were much more poorly structured than stories but improved in structure more rapidly than stories which remained relatively stable in structure over time. Results such as these suggest that the models proposed here for expositions are probably inappropriate for narratives or for opinion essays. However, the results of this study suggest that efforts to create detailed models for other genre could produce useful results.

4. Conclusions

The thesis of this paper is that the *knowledge-telling* model may be viewed as a family of models, each of which describes a specific strategy for producing texts.

This article provides evidence that when young children write expository texts from their own knowledge, they typically employ one of three strategies: the flexible-focus strategy, the fixed-topic strategy, or the topic-elaboration strategy. These strategies produce texts that have distinct and identifiable features and show distinct developmental trajectories.

To confirm the general thesis put forth here—that there is interesting structure to be discovered within the knowledge-telling strategy—would require the study of other populations of children. But more importantly, it would require research with other types of writing prompts and other genre. At present, I am studying narrative texts written by the same children who wrote the expository texts described above. In addition, it might be especially informative to study argumentative tasks similar to those used by Bereiter and Scardamalia (1987).

Dividing the knowledge-telling strategy into more specific sub-strategies may have the following advantages:

1. Helping to identify writers' developmental status with more precision (Can the writer maintain attention on a fixed topic?)
2. Suggesting the kinds of cognitive skills (maintaining attention on a single topic, handling sub-goals) that writers needs to acquire to become more successful.
3. Informing instructional strategies to help writers acquire these skills. For example, procedures for influencing the writer's task definition such as those used by Wallace and Hayes (1989) might prove helpful. Similarly, procedures for helping writers to attend to the differences between different text structures could help them to improve their skill in revision.

The results presented here suggest that more precise modeling of writing processes can help to identify writing strategies and associated cognitive processes that might otherwise escape our attention.

Notes

1. Fuller's work was described briefly in Berninger, Fuller, and Whitaker (1996).
2. Additional comments might have been proposed and then rejected by an evaluation process. However, we don't have evidence concerning this possibility since Fuller's data includes only the student's written comments.
3. The line between the "make comment" box and the focus box is dotted to indicate that this connection represents a flow of information rather than a flow of control that is indicated by solid lines.
4. Evidence bearing on this issue might be obtained by asking young writers about their writing processes or by asking them to evaluate the appropriateness of essays with chain and wheel structures as responses to a writing assignment. If my assumption is correct, one would expect that students who produce wheel structures would judge chains as inappropriate responses to the assignment.
5. The Fuller corpus was a subset of Berninger and Swanson's sample of 900 first- to ninth-grade students selected to be representative of the U.S. population in ethnicity and socioeconomic level (Berninger & Swanson, 1994). Donovan's sample was chosen from students attending an elite public school (Donovan, 2001).
6. Eleven of the 270 essays were not considered because they were not scorable as expositions.
7. Of the eleven texts categorized as other, one was too poorly constructed to evaluate and three consisted of a single sentence. These four texts were written by students in grades one and two. In five cases, students wrote narratives rather than expositions. Four of the five narratives were written by students in grades one through three. Finally, two students wrote essays that had whole-text organizations that could not be produced by any of the three strategies described here. By whole-text organization, I mean that statements late in the text led the reader to reinterpret statements early in the text. For example, the writer might describe an individual and then reveal that the description was ironic.

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