

**How an Understanding of Cognition and Metacognition
Translates into More Effective Writing Instruction**

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Abstract

This discussion paper investigates the pedagogical implications of the cognitive process writing model proposed by Flower and Hayes (1981). The research of Flower and Hayes (1981) provides insights into how writers go about planning, generating, and revising during the process of writing. Flower and Hayes (1981) believed that this shift in focus, from product to process, had important instructional implications. They further stated that good writing instruction should provide an understanding of the cognitive processes that make up the writing process. This paper attempts to address the following question: How does one move inexperienced writers to the point at which they can begin to engage in the decision-making practices that are used by experienced writers? Sitko (1998) found that one way to engage students in the decision-making process was to provide instruction in metacognition. Explicitly teaching students metacognitive strategies, such as summarizing (self-review), questioning, clarifying, and predicting allowed writers to develop certain strategies to the point of automaticity. Palinscar and Brown (1986) found that teaching students basic metacognitive skills and then reminding them to use those skills was beneficial in improving their ability to monitor their own thinking. Once metacognitive strategies become automatic students are able to devote more of their working memory to the hierarchical stages of writing involving planning, generating, and reviewing. This paper identifies instructional protocols instructors might use to effect students' metacognitive awareness of the hierarchical decision-making strategies.

Introduction

In this discussion paper, we attempt to address the following question: How does one move inexperienced writers to the point at which they begin to engage in the decision-making practices used by experienced writers? In their early study, Flower and Hayes (1981) identified the composing process “as a series of decisions and choices” (p.365). For the authors, however, it was not enough to know that experienced writers make decisions and choices when composing. They were interested in discovering “what guides the decisions writers make as they write” (p.365). Their five-year study made use of protocol analysis which led to the formulation of their theory of the cognitive processes that were involved in the composing process. Flower and Hayes (1981) made the following points:

1. Writing is best understood as a set of distinctive thinking processes, which writers orchestrate and organize during the act of composing;
2. The processes of writing are hierarchically organized, with component processes embedded within other components;
3. Writing is a goal-directed process. In the act of composing, writers create a hierarchical network of goals and these in turn guide the writing process;
4. Writers create their own goals in two key ways: by generating goals and supporting sub-goals which embody a purpose; and, at times, by changing or regenerating their own top-level goals in light of what they have learned by writing (p. 366).

The research of Flower and Hayes (1981) provides insights into how writers go about planning, generating, and revising during the process of writing. Flower and Hayes (1981) believed that

this shift in focus, from product to process, had important instructional implications. They further stated that good writing instruction should provide an understanding of the cognitive processes that make up the writing process.

Flower and Hayes' (1981) cognitive process of writing is still considered one of the seminal pieces of research in the field of writing today. Their research focused on the strategies experienced writers make use of when composing. From this research, Flower and Hayes (1981) came up with a non-linear writing process that they determined to be recursive. In other words, experienced writers were observed planning, generating and revising at all times throughout the writing process. These writers did not follow a linear path; in fact, they kept going back to different sections of their paper when new information was discovered. This process of revision allowed them to rethink their earlier assumptions and adjust as needed. Because they understood that writing is a continuous dialogue requiring that decisions be made throughout the process, these writers did not wait until they had completed the paper before revising. They integrated revision into the process. Similarly Galbraith (1996) found that writing leads to the:

construction of a complex hierarchy of goals and sub-goals which guide the selection and construction of ideas to be included in the text. Furthermore, this is a dynamic, recursive process in which the writer continually evaluates ideas and text with respect to rhetorical goals, and in which goals are modified as text is produced (p. 122).

The author further states that it is the active construction of ideas and goals that make it possible for writers to develop their own understanding of the composing process and to be able to monitor their writing.

In order to make the move from writing as an inexperienced (novice) writer to writing as an experienced writer students have to be able to monitor their own writing and make writing decisions based on their monitoring. Hillocks (1986), in his meta-analysis, found that in order for writers to become more efficient at writing, they have to be able to think about what it is that they are writing; they have to understand what they are writing, and why they are writing. In addition, writers have to understand who they are writing for (audience). In the planning and generating stages, writers must assign a purpose to the assignment, access prior knowledge, and conduct research to discover new information. If writers do not understand the purpose of the writing exercise, then it is extremely difficult for them to know how to begin writing or how to end up where they want to be when they are finished.

Training in metacognition allows novice writers to begin to understand the effects that thinking about writing has on the writing process. For the purposes of this paper, metacognition will be defined as an ability to monitor the quality of one's own thoughts and the products of one's efforts; "it is the control processes which active learners engage in as they perform various cognitive activities" (Raphael et al, 1989, p. 346). In metacognition all learning is deliberate, learners are conscious of their own cognitive processes (Flavell, 1976), and use a series of checks and counterchecks to constantly monitor their understanding. If they do not understand something then they go back over the material until they do understand; "metacognitive knowledge consists primarily of knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises" (Flavell, 1976). It is this series of monitoring one's understanding that defines metacognition.

Hacker (1998) quotes Kluwe who refined the concept of metacognition into two characteristics: thinkers have to know something about their own and others' thought processes, and, thinkers can notice and change their own thinking. Hacker (1998) also separated metacognitive thinking into three types: "metacognitive knowledge (what one knows about knowing), metacognitive skill (what one is currently doing), and metacognitive experience (one's current cognitive or affective state)" (p. 3). He goes on to say that metacognition focuses on the process of solving the problem. Hacker (1998) found that writers must learn how to plan, organize, draft, revise, and edit; and to consider audience, purpose, and genre during the writing process.

In addition, writing instruction must account for the difference between novice writers and experienced writers in terms of memory requirements. In her research, McCutchen (1996) identified the "capacity limitations which contribute to individual and particularly to developmental differences in writing" (p. 300). In particular she was interested in the part that *working memory* plays in the writing process. McCutchen (1996) said that it is:

within working memory that information (from the environment and from long-term memory) is stored during processing. Moreover, due to overall resource limitations within the system, trade-offs exist between working memory's storage and processing functions. As more resources are devoted to processing functions, fewer resources are available for storage of information (p. 300).

She further states that both comprehension of the text, and composition of the text, require significant demands on the storage capability of the working memory. When these demands exceed the resources, storage can be affected, and information lost. This lack of ability to

monitor comprehension will affect the overall writing performance. In addition, McCutchen (1996) said that keeping track of the three main processing demands of planning, translating, and reviewing (Flower & Hayes, 1981), can mean inexperienced writers will have trouble keeping up with the processing demands needed to compose text. As well, McCutchen (1996) says that working memory capacity may affect not only the processes of writing, but could also affect the nature of the processes that writers make use of. Inexperienced writers can become more adept at monitoring their thinking processes when provided with good instructional environments (McCutchen, 1996). With the help of instructors who provide the needed external support for the many writing processes, inexperienced writers can internalize the processes that are used by more experienced writers.

It is also important that writers learn to manage the intricate structure of decisions that writing demands. Because working memory does not permit a writer to attend to all required processes and decisions simultaneously, the writer must develop a facility for managing decision-making. That is, within the hierarchical structure of embedded decisions that comprise the writing process, the writer must find a protocol for determining which decision has priority at any given point. Flower and Hayes (1981), in the development of their writing model, took into account strategies that facilitated the development of metacognition. They believed that metacognition provided a way to account for individual differences in how writers compose. Flower and Hayes (1981) further theorized that there were a “relatively small number of cognitive processes that were able to account for a diverse set of mental operations during composing” (p.188). Their model led to the investigation of the effectiveness of cognitive-oriented approaches to writing instruction. MacArthur, Graham and Fitzgerald, (2006) say that

“the purpose of such instruction is to change how writers’ compose by helping them employ more sophisticated composing processes when writing” (p. 188).

In our paper, we are going to discuss the cognitive processes that inform writing and how this awareness of the connections between writing, thinking, and learning can be exploited in instructional practice. To that end, we will investigate ways to foreground the three major processes of writing (i.e., planning, sentence generation, and revision) in writing instruction. We will also be discussing the value of teaching writing as rhetorical problem solving.

Background Information

In investigating writing instruction, Hillocks (1986) observed that one purpose of writing research was to discover “to what extent are the findings about process compatible with findings about instruction” (p. 223). Hillocks (1986) found that writers operate with a repertoire of knowledge when writing, including the use of lexical, syntactical, and generic forms to generate a discourse. He also found that writers have to call upon a number of strategies to translate their ideas into written discourse. In his analysis, Hillocks (1986) differentiates between two types of knowledge: 1) declarative, or knowledge of what; and, 2) procedural, or knowledge of how. Each of these is required for the development of text. However, Hillocks (1986) found that traditional approaches to teaching composition have concentrated on the declarative knowledge of grammar (the naming of parts of speech and sentences), at the expense of procedural knowledge. The research that Hillocks (1986) examined found that approaches that focused on procedural knowledge (sentence-combining, scales, inquiry) were more successful than those which focused on declarative knowledge.

Raphael, Englert, and Kirschner (1989) suggested that there are three types of knowledge: declarative, procedural, and conditional. While Hillocks (1986) identified knowledge as either declarative or procedural, he did not define the terms in the same way that Raphael et al. (1989) did, nor did he identify conditional knowledge. For Raphael et al. (1989), declarative knowledge “includes information about task structure and task goals” (p.347). According to Raphael et al. (1989), declarative knowledge about writing also requires the understanding that “writing includes prewriting activities such as considering audience and purpose, drafting and revising, and copy-editing” (p. 347). Where, for Hillocks (1986), declarative knowledge was defined as the knowledge of *what*, which he limited to the knowledge of grammar, Raphael et al. (1989) defined declarative knowledge as the steps that the writer takes into consideration when writing.

In addition, Raphael et al. (1989) defined procedural knowledge as including “information about how the various actions or strategies are implemented. Procedural knowledge includes the repertoire of behaviour available from which the learner selects the one best able to help reach a particular goal” (p. 347). The authors further stated that, in writing, “procedural knowledge includes the writers’ knowledge that there are strategies to use such as inserting key words and phrases to signal potential readers about location of information, or that writers can revise by taking out or adding information to their papers” (p. 347). These strategies contribute to the development of meaning in the text. Hillocks (1986) defined procedural knowledge as the knowledge of *how* to make use of writing strategies to improve the overall text. Raphael et al. (1989) seemed to identify two types of knowledge where Hillocks (1986) had identified only one. For Raphael et al. (1989), procedural knowledge was the knowledge of which strategy to use when composing. However, Raphael et al. (1989) also identified a third

category which they called *conditional* knowledge. For the authors, conditional knowledge “addresses the conditions under which one elects to use a particular strategy, suggesting that an expert with full procedural knowledge could not adjust behaviour to changing task demands without conditional knowledge” (p. 347). Conditional knowledge involves knowing when and why. The authors identify conditional knowledge “as those strategies actually implemented during the writing process, as opposed to strategies talked about in the abstract” (p. 347).

Cognitive Model of Writing

Cognitive models of writing, such as the Flower and Hayes model (1981), describe the act of composing as “a conscious, intellectual effort by which writers determine what they want to accomplish and how they want to accomplish it” (Brand, 1989, p. 21). Flower and Hayes (1981) attempted to unite thinking and writing in one process by showing how experienced writers produced text. Their model was in direct contrast to previous linear models that followed a step-by-step process of prewriting, writing, and rewriting or drafting, revising, and editing (Murray, 1968). The linear model led to product, while Flower and Hayes (1981) promoted process over product. They suggested that experienced writers monitor their texts continuously, and return to previous stages in order to bring the various elements of the text into alignment. Brand (1989), in her discussion of the cognitive process of model of writing, said “the cognitive process model attempts to show how writers bring complex and recursive mental acts to bear on the general stages of composing” (p. 21).

Novice Writers and Experienced Writers

For a number of reasons, these *mental acts* are more demanding of novice writers than they are of experienced writers:

- 1) As Hillocks (1986) said writing requires a knowledge of lexical, syntactical, and generic forms. According to Gagne, Yekovich and Yekovich (1993), the awareness of these forms has already been automatized by experienced writers, while novice writers often refer to external resources to ensure that they are adhering to rules of grammar and usage.
- 2) Writing also requires knowledge of procedure and strategy (Hillocks, 1986; Raphael, Englert, & Kirshner, 1989). Again, according to Gagne et al. (1993), experienced writers have usually internalized a repertoire of procedural strategies, while novice writers have not.

Novice writers

Novice writers tend to write primarily in a linear, non-reflective process; this procedure is called ‘knowledge-telling’ (Bereiter & Scardamalia, 1983, Kellogg, 2008). Scardamalia et al., (1984) say that the writing novice writers do is limited to “reducing writing assignments to topics, then telling what one knows about the topic. This knowledge-telling strategy takes account of semantic and structural constraints, but it does not involve operating upon representations of goals for the texts” (p. 174).

Scardamalia et al., (1984) further found:

- a. Novice writers tend to present information in the order in which it is thought of.
- b. When given an ending sentence involving multiple constraints, they tend to deal with these constraints as if they constituted topics that must be dealt with one at a time.

- c. Their texts tend to lack coherence except at the sentence-to-sentence level, which suggests a forward-acting or additive approach to text generation.
- d. Students' texts are typically devoid of substantive revision, suggesting a failure to rethink first-made decisions. (p. 174).

For Kellogg (2008) the initial stage of knowledge-telling is when novice writers decide what they want to say and then say it. At this stage writers do not take into account the reader's needs when composing. In addition, novice writers need to be able to comprehend what the text is saying at any given point in the composition process before they can take into account how the text would be read by another person. The novice "focuses on his/her thoughts not on how the text itself reads" (p.6). Bereiter and Scardamalia (1987) documented that the focus, for the novice writer, is their own representation of the text rather than the text of reader representation. The text is essentially a restatement of the author's thoughts.

Experienced Writers

Flower and Hayes (1981) found that the planning episodes that experienced writers take part in leads them to reflective activity. These activities include "elaborating and reformulating goals and plans for achieving goals, critically examining past decisions, anticipating difficulties, and reconciling competing ideas" (Scardamalia, et al., 1984).

Unlike the novice writers, who engage in 'knowledge-telling', the more experienced writer engages in 'knowledge-transforming' (Kellogg, 2008) which involves changing what the author wants to say as a result of generating the text. Kellogg (2008) goes on to say that "reviewing the text or even ideas still in the writer's mind can trigger additional planning and

additional language generation” (p. 6-7). During the process of knowledge-transforming, “the act of writing becomes a way of actively constituting knowledge representations in long-term memory rather than simply retrieving them as knowledge-telling” (p. 7). Bereiter and Scardamalia (1987) said that the verbal protocols at this stage of knowledge-transforming reveal extensive interactions among planning, language generation, and reviewing.

Hayes-Roth and Hayes-Roth (1979) found that experienced writers were able to translate high-level goals into sub-goals and to develop strategies for handling the overload on working memory when in the planning stage. In addition, the experienced writers’ ability to generate sub-goals appears to be an active process rather than a static one (Sitko, 1998), so that “the end product is more likely to be surprising to an experienced writer than to a novice [writer]” (Sitko, 1998, p. 97). Sitko (1998) goes on to say that the planning episodes of more experienced writers often take into account purposes for writing, account for the needs of different readers, and take advantage of the conventions of the genre they have selected. In addition, experienced writers are better at revising both their own texts and the texts of other writers (Sitko, 1998).

Novice Writers compared to Experienced Writers

Experienced writers establish priorities and goals before beginning the writing process (Brand, 1989) but these goals can be modified during writing. In comparison, novice writers, usually have problems setting goals, or set goals that are too abstract, or not abstract enough. As a result, novice writers are often “unwilling or unable to modify their goals in mid-process in light of what they may uncover about their topic or their composing process” (Brand, 1989, p. 23). Bereiter and Scardamalia (1987) found that novice writers often oversimplify the writing task, and, simplistically view writing as putting down what they know about the topic

(knowledge-telling). Kozma (1991) said that the reason novice writers write down everything they discover about a topic is because they do not know how to sort the information that they find. He goes on to say that “novices have few cues to use in effectively searching their long-term memory” and that “this gives them few criteria to use in sorting the information they retrieve...” (p. 33).

Flower and Hayes (1981) found that novice writers spend more time dealing with the surface structure of the text. This over reliance on the surface structure of writing means novice writers are often bound to the text they produce making them reluctant to go from surface decisions to more global decisions concerning what it is they want to say in their compositions (Kozma, 1991). The distraction caused by the over-emphasis on surface details leads to a breakdown in cognitive and metacognitive functions which compromises the novice writers ability to understand what needs to be done and why (Gourgey, 1998). Experienced writers, on the other hand, make “more sentence-and-theme-level changes based on incongruities between their text and their intentions, and their revisions are more likely to change the meaning of their composition” (Kozma, 1991, p. 33).

Sitko (1998) summarizes the differences between the experienced and the novice writer when she says:

in summary, inexperienced writers fail to search their memories or their environments for help in generating content, they organize what they write primarily into lists; they do not identify audience as a crucial rhetorical influence on their purpose and goal, nor do they review globally or consider reader needs as criteria for rewriting. They appear to lack

awareness that memory search, organization guided by purpose, and attention to the readers are required for effective writing (p. 98).

Implications for Teaching Writing

Flower and Hayes (1981) theorized that there were a number of cognitive processes that experienced writers use when composing during the planning, generating, and reviewing stages. However, they did not give any indication as to what those discrete processes might be, nor did they provide any indication of the strategies that novice writers might use to become more effective writers. In short, the study of experienced writers, without any explanation as to how their skills were acquired, does not help the novice writer to become more expert. There is a need for writing instructors to develop teaching strategies that allow novice writers to understand the nature of expert practice and how to use it in their own writing practice. It is the contention of the authors that the way to move students from inexperienced writers to experienced writers is through explicit teaching of metacognitive strategies. This paper will discuss six research-based metacognitive strategies that can be taught. The advantage of these strategies is that they can be used by writers to facilitate their own learning.

Table 1

Metacognitive Strategies That Are Teachable in the Classroom

Metacognitive strategies that are teachable in the classroom	Explanation of teaching strategies

Monitoring thinking processes	Teachers have to model self-monitoring of thinking processes to assist students in developing their own thinking processes (Gourgey, 1998). For instance, teachers might perform a task and reflect on it aloud so students can observe the process.
Self-selecting metacognitive strategies	Teachers assist students in learning how to select their own metacognitive strategies. Students who self-select strategies are more successful than those who adopt teacher-imposed strategies.
Internalizing self-monitoring techniques	Teacher uses scaffolding techniques which initially offers support then gradually reduces the support as students learn how to self-monitor.
Analyzing and simplifying problems	Teacher uses explicit instruction to teach students how to analyze and simplify problems.
Developing higher order questions.	Teachers train students to ask higher order questions rather than those that have only one answer.

Developing working memory	Teachers assist students in the automation of lower-level functions
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There is a strong modelling component that is built into the teaching of each of the six metacognitive strategies. Teachers must model the metacognitive strategies to allow students to both recognize the strategy and learn to implement it. This model of cognitive apprenticeship (Bereiter & Scardamalia, 1987; Ciardiello, 1998; Collins, Brown & Holum, 1991) works to make thinking skills visible. Each strategy is introduced with a detailed explanation of the purpose, benefits, and values. Collins, Brown and Holum (1991) state that few students learn how to be active learners on their own. The cognitive apprenticeship is crucial. In the cognitive apprenticeship model, teachers scaffold learning through the use of modeling think-aloud protocols, guided teacher practice, and independent student practice (Ciardiello, 1998).

The six metacognitive strategies discussed below help novice writers to learn how to control their own cognitive thinking processes; to enhance their motivation to learn; and, to interact positively with the metacognitive element of self-questioning (King, 1994). The six strategies to be discussed are: monitoring thinking processes; self-selecting metacognitive strategies; internalizing self-monitoring techniques; analyzing and simplifying problems; developing higher-order questions; and, developing working memory.

Monitoring Thinking Processes

In order for novice writers to develop the ability to monitor their thinking processes, teachers need to model that monitoring (Ciardiello, 1998; Gourgey, 1998). By using a series of think-aloud exercises, teachers can model the ways in which they approach problems in their writing and can identify strategies for solving those problems. It is important for teachers to talk about their own cognitive processes and to highlight the decision-making process that governs when, and why, they use different strategies (Ciardiello, 1998; De La Paz & Graham, 2002; Graham & Harris, 1997; Pintrich, 2002).

McDaniel (2010) theorized that good writing was the result of good thinking and, conversely, that writing was the means by which good thinking was developed. He attempted to show first-year college students how to think about their writing, as they were writing, by providing them with a model of his thinking processes. This led to an improvement in his students writing, and he came to the conclusion that first-year students “do not think about their writing while they are writing but rather just plunge on word after word, sentence after sentence, and paragraph after paragraph until they have said all they can say on the topic” (p. 2). Bereiter and Scardamalia (1987) refer to this approach as ‘knowledge-telling’. Novice writers tend to put all of the information they have in their long-term memory into their compositions without making decisions about what should be included and what should be left out. Novice writers do not always operate with an awareness of audience; they need explicit instruction in goal-directed planning so that they can look at the text in terms of audience and purpose (Sitko, 1998). Instructors have to model the higher order thinking processes if novice writers, like first-year

university students, are to learn to attend to features other than the word-level and sentence level changes.

Palinscar and Brown (1984) studied seventh graders and discovered that these students had the ability to learn how to use metacognitive strategies. The authors analyzed the thinking habits of experts and “isolated four concrete, teachable learning activities: summarizing (self-review), questioning, clarifying, and predicting” (p. 120) that could be taught to novice writers. Palinscar and Brown (1984) theorized that, by asking students to summarize text, instructors are able to teach students to focus their attention on the major points of the text rather than the trivial. The use of summarizing would also allow writers to monitor their activities to see if comprehension was occurring. In addition, Palinscar and Brown (1984) found that assignments that require students to compose questions on course content taught them to concentrate on main ideas and to monitor their comprehension. Students who were asked to clarify the text as they read, learned to critically evaluate the content and to compare it to prior knowledge. Finally, having students make predictions about text taught them to develop, and test inferences.

After less than three weeks of metacognitive training, Palinscar and Brown (1984) found that their students had made significant gains in their ability to comprehend text. The authors concluded that it was the explicit teaching of metacognition that led to the gains since the control group did not have the same gains as the experimental group. It appears that teaching students basic metacognitive skills, and subsequently reminding them to use those skills, is beneficial. The ability to monitor their own thinking allows students to be aware of both the process and the product.

Teaching Students to Self-Select Metacognitive Strategies

Novice writers need to be taught explicitly how to identify the purpose of their writing, how to set goals for their writing, how to anticipate the readers' needs, and how to monitor their own writing process (Sitko, 1998). By allowing students to set their own metacognitive strategies in terms of planning, generating, and revising during the writing process, teachers give them the freedom to situate abstract tasks in authentic contexts (Collins et al., 1991). The strategies chosen become more automatic and are more effective than strategies that are imposed by the teacher (Gourgey, 1998). Gourgey (1998) said that having writers select their own strategies makes sense since "the point of metacognition is self-regulation, not regulation by others" (p. 84). Gourgey (1998) recommends that teachers encourage their students to generate and use their own strategies and self-questions. This practice leads to more effective independent learning. Teachers begin by supervising students as they practice the strategies, helping them to question their choices, and guiding them to discover solutions on their own. Metacognition allows writers to monitor their purpose for writing at specific points in the writing process, to recognize the decisions that are relevant at those points, and to differentiate important content from trivial details. In order for novice writers to learn to manage the writing process independently, teachers must first model the strategies, and then relinquish responsibility for self-monitoring to the student. When novice writers begin to recognize the effect of their decisions, they will construct a series of protocols for managing the decision-making on their own.

Sitko (1998) says that it is not enough to teach writing strategies for planning, organizing, drafting, revising, and editing text; writers must learn how to monitor their own thinking if

metacognition is to take place. Experienced writers have many strategies that they can use when composing, and though most of these strategies are automated, experienced writers are, nonetheless, aware of the strategies they use for writing. They set goals for writing, they determine purpose, they identify their audience, they activate background knowledge, and they organize their ideas. They know that revising involves adding, deleting, substituting, and modifying text to meet their purpose (Sitko, 1998).

In contrast, novice writers do not have the experience necessary to set goals, determine purpose, think of an audience for their writing, or activate background knowledge. Since novice writers have not yet automatized the writing skills necessary for text construction, they must devote more of their short-term memory to the monitoring of textual structure. They do not employ metacognitive strategies because they have not yet developed writing strategies to the same extent as the more experienced writers. Novice writers need strategy instruction on redefining tasks, they need help in structuring the writing process (setting goals and subgoals), and they need meaningful writing experience to learn ways to reduce the load on their short-term or working memory. Sitko (1998) says that instruction for novice writers needs to focus on providing writers with the understanding of how they will incorporate different strategies in their writing and how they can evaluate each strategy's usefulness in their own text.

Providing Scaffolding Supports

Teachers can provide support for novice writers through the following scaffolding procedures: mental modelling, think-aloud protocols, guided teacher practice, and independent practice (Ciardiello, 1998). Gourgey (1998) noted that students need scaffolded instruction, during which teachers provide strong initial support but then gradually reduce it as students

become more proficient in their ability to ask clear questions and to summarize main ideas. Scaffolding is intended to allow students to take a more active role in leading group discussions. When discussing scaffolding, Vygotsky (1978) said that children learn new information and skills within their *zone of proximal development*, beyond the level of independent functioning but within reach of attainment with adult assistance. Teachers provide mental scaffolding by describing the reasoning process as they perform an instructional action (e.g., explaining to novice writers how they monitor comprehension when composing Ciardiello, 1998). Scaffolding is designed to help students acquire an integrated set of skills through processes of observation and guided practice (Collins et al., 1991).

Students can be taught to improve metacognitive proficiency through repeated guided practice. It is not unusual to encounter students who resist learning how to think metacognitively because they are used to being passive learners (Gourgey, 1998). In addition, Gourgey (1998) found “these students do not understand how to be more active in their learning or why it is important, and feel uncomfortable with the extra effort required” (p. 95). She did say, however, that it is possible for students to improve their metacognitive skills but it takes time and patience on the part of both the instructor and the student. For these students, teachers need to scaffold their experiences until students gain confidence in monitoring their own learning.

Instructing Students in Analyzing and Simplifying Problems

In order to reduce the likelihood that novice writers will be overwhelmed by complex rhetorical problems, writers can be taught to analyze and simplify problems by breaking the problems down into simpler steps (Gourkey, 1998). Gourkey (1998) said that teachers should instruct students to explore alternative approaches to the text when things are not working, and

should model strategies that students might use to reformulate ideas and verify solutions. These strategies can be taught through the self-monitoring and evaluation of one's work. "The role of the teacher is to oversee the problem-solving process and interpose questions to remind writers to self-monitor, such as, 'What are you doing and why?' or 'Is this working or should we try something else?'" (Graham & Harris, 1997; Gourgey, 1998). By providing opportunities for writers to develop hands-on experience in monitoring progress, instructors allow writers to discover alternative approaches to problems rather than simply seeking to recall what they had been told. This process appears to be more effective than the traditional lecture format of instruction (Graham & Harris, 1997; Gourgey, 1998).

In breaking down the problem into simpler steps, novice writers were able to attend to the "deep structure" of the paper rather than the surface details (Gourgey, 1998). This shift in focus is an important stage in the student's development as a writer. Research on novice writers indicates that they generally focus on surface errors rather than addressing questions that contribute to the development of meaning (Gourgey, 1998). In assigning a disproportionate importance to surface errors, the novice writer leaves little time for clarifying goals, for seeking to understand concepts and relationships, for monitoring their understanding, and for choosing and evaluating whether they are reaching their stated goals. The use of metacognition allows students to differentiate important content from trivial details (Ciardiello, 1998; Gourgey, 1998).

Providing Training in How to Ask the Proper Questions

Ciardiello (1998) defines a 'good question' as one that incorporates "any of the cognitive processes: memory, convergence, divergence, and evaluation" (p.212). The author goes on to say that "question generation is both a cognitive and metacognitive strategy" (p.212). In

addition, the process of asking questions serves a dual purpose: getting the reader to concentrate on the material while also allowing him/her to constantly check to see that he/she understands the material (Ciardiello, 1998). Ciardiello (1998) says that “the process of question generation requires students to search and inspect the text, identify the main ideas, and make connections among ideas as a basis for raising a relevant question” (p. 212).

Teachers can train students to ask knowledge-seeking and hypothesis-generating questions which have no standard responses and which can be answered in a number of different ways. Questions with no right answers stimulate divergent thinking and encourage independent learning (Ciardiello, 1998). Students need direct instruction in the form of modelling and procedural prompts in order to generate high-level questions (King, 1992). Ciardiello (1998) found that “few students of all ages, even those as advanced as graduate students, ask thought-provoking or higher level cognitive questions in class” (p. 212). The author hypothesizes that many students do not have the knowledge or skills to be able to ask higher-order cognitive questions. To get students to think about higher-order questions, Collins et al. (1991) and Ciardiello (1998) both reported that teachers need to explain the purpose and value of asking questions in class.

Developing Working Memory

Writing is made up of a set of hierarchical goals (Flower & Hayes, 1981; Sanders, Janssen, van der Pool, Schilperoord, & van Wijk, 1996) that range from the lower level syntactical features to higher order cognitive analysis. Novice writers tend to focus on the lower level features of text production (knowledge telling) to the exclusion of higher-order functions, such as ordering of information from the most important to the less important (Flower & Hayes,

1981; Sanders et al., 1996). Since novice writers tend to use their working-memory for lower level functions, they have limited capacity for metacognitive processes (Jeffery & Underwood, 1996). By automatizing some of those lower level functions, writers can free working memory resources to attend to higher order questions.

Sitko found that novice writers tend to be more successful when they are taught to manage their working memories (1998). Kellogg (2008), in discussing the implications of memory load for writing, stressed three points that can aid novice writers in developing their working memory. For Kellogg (2008), the required degree of cognitive control in working memory relies on the following:

- 1) Maturation of the executive component of working memory (i.e., because there is a limited capacity for short-term memory, thus information must be moved to long-term memory. The executive attention must not only be given to language-generation, but also be available for planning ideas, reviewing ideas, and coordinating all three processes);
- 2) Reducing the load on working memory by providing rapid, effortless access to domain-specific knowledge in long-term memory (automaticity); and,
- 3) Reducing the working memory cost of planning, sentence generation, and reviewing processes so that executive attention can be devoted to managing their deployment (p. 14-15).

In order for writers to keep multiple representations of the text in their working memory, they must find a way to reduce the demands made on their short-term memory. For first-year

students, this entails “learning domain-specific knowledge that can be rapidly retrieved from long-term memory rather than held in short-term working memory and by automating to some degree the basic writing processes” (Kellogg, 2008, p.3). Kellogg (2008) believes that this can best be achieved by using a training method of cognitive apprenticeship (Vygotsky, 1978) with an emphasis on deliberate practice.

The writing process, as formulated by Flower and Hayes (1981), is divided into three sub-processes of planning, translating, and reviewing. The relationship between these sub-processes is guided by the goals that the writer brings to the process. Brand (1989) believes that constraints are built into writers’ goals and affect the process of reaching the goals. She identifies three constraints: “insufficiently integrated knowledge, inadequate written speech, and excessive or unfamiliar rhetorical demands” (p. 22). She goes on to say that because the human mind can only store so much information, it is possible for the writer to experience information overload which can result in cognitive strain. In order to reduce the amount of cognitive memory necessary to write; experienced writers make decisions about what to prioritize, and rely on cognitive processes that are so automatic that they require little thought (e.g., spelling, grammar conventions).

Kozma (1991) made similar statements about the role of memory when he said that “the [writing] process is constrained by information in long-term memory such as topic-relevant information, knowledge, and expectations of audience, and grammatical rules and rhetorical strategies” (p. 32). He went on to say that the writing process is also constrained by limited capacity in short-term memory. When novice writers are forced to use their short-term memory for non-automated skills related to grammar or spelling, “the space that is available for planning

and rhetorical analysis is reduced. If capacity [of the short-term memory] is reached, ideas may be lost, goals may be forgotten, and performance will deteriorate” (p. 32).

Significance of Research

For teachers, writing instruction can take two forms: 1) product-oriented instruction which focuses on the written product the students produce rather than on the processes by which they produce them (Hayes & Flower, 1986), or, 2) process-oriented instruction through which the teacher attempts to increase students’ awareness of the writing process itself. Teachers accomplish this by engaging students in activities designed to improve the understanding of the relationship between cognitive processes and specific writing skills (Hayes & Flower, 1986).

Educational practice needs to be informed with the research that indicates that teaching writing processes and cognitive processes together can improve student performance in writing. This can be accomplished by teaching students to compare the practices of expert writers to their own practices, focussing on the distinction between the two (Flower & Hayes, 1981), and then discussing the effect that the difference in practice has on the written product. The aim of such instruction is to enable students to approach writing tasks with the ability to solve the rhetorical problem independently.

Conclusion

Flower and Hayes’ (1981) research into the cognitive process of writing identified a series of goals and sub-goals that experienced writers use when composing text. However, Flower and Hayes (1981) did not identify any specific writing strategies that would lead students to write more effectively. In their later research, Hayes and Flower (1986) found that teachers

were focusing on activities (journal keeping, free-writing, getting peer response, revising etc.) to the detriment of the writing process itself. By focusing on activities, teachers turned from the process of writing to the product of writing. Hayes and Flower (1986) found that the teachers failed to recognize that some of the activities were not even useful to some students. Teachers who insist that all students use the same activities to generate text defeat the purpose of process writing.

The six metacognitive strategies discussed in this paper share one common attribute. It appears that direct explicit instruction through modelling is necessary if novice writers are going to learn how to self-monitor. In the zone of proximal development (Vygotsky, 1978), novice writers need a *knowledgeable other* to help them move from the beginning of the composing process to the end point, or destination. It is not enough, however, for the *knowledgeable other* to give novice writers a model to follow. Models, on their own, will not provide novice writers with an understanding of the individual decisions needed to progress through the text. Because models are a finished product (i.e., students are given the model to follow), the understanding of the process the writer used to get to his/her destination is not there. However, when *knowledgeable others* provide modelling, they are able to explain their process of writing which provides novice writers with an understanding of the process. Offering models without the explanations does not provide novice writers with the concrete exemplars that are necessary for understanding.

Palinscar and Brown (1984) discovered that it was possible to teach students to monitor their own writing and make writing decisions based on their monitoring. In three weeks, the authors were able to teach seventh grade students a number of metacognitive strategies that are

used by more experienced writers. These strategies included: “summarizing (self-review), questioning, clarifying, and predicting” (p. 120). The authors found that teaching students basic metacognitive skills, and then reminding them to use those skills, was beneficial in improving their ability to monitor their own thinking. Similarly, McDaniel (2010) was able to teach his first-year college students how to think about their writing during the composition process by providing them with a model of his thinking processes. Palinscar and Brown (1984) and McDaniel (2010) found that explicitly teaching students metacognitive strategies allowed them to develop certain strategies to the point of automaticity, thus freeing their working memories to attend to the new challenges that arise from the emerging text.

Experienced writers learn how to plan, draft, revise and edit, and are knowledgeable about monitoring these processes during their writing. Novice writers are not as skilled in the processes of planning, drafting, revising, and editing. Thus, novice writers need explicit instruction if they are to learn how to use appropriate text structures and how to monitor their writing process. Torrance (1996) said that the best way to help novice writers monitor their writing process is to make use of cognitive processing strategies. Sitko (1998) suggested that “metacognitive instruction in how to monitor and control their learning will help them [novice writers] evaluate and integrate strategies into their own repertoire so that they can control the complex cognitive and social processes involved in producing text” (p. 113). However, teachers have to move beyond mere teaching of strategies; they also have to teach the how, when, and why of each strategy. It is important that teachers be trained, through the use of explicit examples, to use metacognitive modelling techniques in the classroom. Using the modelling techniques, teachers can demonstrate how to select the best strategy, how to monitor one’s understanding of the text, and how to revise one’s initial strategy selection (Borkowski, 1992).

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