ABSTRACT

Title of dissertation: THE WRITING PROCESS OF COLLEGE STUDENTS
                            WITH AND WITHOUT LEARING DISABILITIES:
                            A PROTOCOL ANALYSIS.

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The number of students with learning disabilities attending college has increased. Nevertheless, evidence shows that many college students with learning disabilities have difficulty completing their education. One of the most significant factors that affect the performance of college students with learning disabilities is difficulties with written language. A study was conducted to analyze the written product as well as cognitive processes college students with and without learning disabilities used while completing a writing task. This included analyzing the holistic quality of writing, number of words written, and planning and revising strategies used during writing. Twenty-three self-regulatory variables in the processes in planning, monitoring, and revising were used to identify the cognitive processes college students with and without learning disabilities applied while composing. Think-aloud protocols, written essays, and videotapes were used to examine the writing processes of two groups of college students, ten students in each group.

College students without learning disabilities wrote essays that were qualitatively better (more appropriate to the writing task in terms of content, organization, style, and grammar) than college students with learning disabilities. In addition, college students without learning disabilities showed statistically significant positive correlations between holistic writing scores and the planning variables of generating ideas, prior knowledge activation, and self-instruction; the monitoring variables of monitoring content, process control, and self-questioning, as well as the reviewing variables of rereading plans, rereading essay, evaluating text and revising text. These results are consistent with the position that self-regulatory behaviors influence writing quality. Moreover, college students with learning disabilities showed no statistically significant positive correlation between holistic writing scores and any of the planning, monitoring, and reviewing variables.

The correlations obtained revealed that students who did more planning, monitoring, and reviewing of their writing were more likely to have higher writing scores. There were no statistically significant differences by group in the number of words written, or the amount or types of written planning and actual revising done while composing.

THE WRITING PROCESSES OF COLLEGE STUDENTS WITH AND WITHOUT

LEARNING DISABILITIES: A PROTOCOL ANALYSIS

By

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Statement of the Problem

The purpose of this study was to examine the writing processes of college students with and without learning disabilities (LD), with specific emphasis on the planning, composing and revising strategies these students used as they wrote. This study was designed to provide a better understanding of how these two groups of students wrote and how each group differed from the other. Such information will contribute to a better understanding of appropriate written language instruction for college students with LD. Before more fully describing this study, I first examined the following topics: the increasing number of students with LD in postsecondary education, the importance of writing, the nature of writing, the writing abilities of college students with and without LD, and the appropriateness of using protocol analysis to study the writing process.

Students with LD in Postsecondary Education

Postsecondary opportunities for students with LD have increased since Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, the Individuals with Disabilities Education Act (IDEA) of 1990, and the IDEA Amendments of 1997 mandated access to postsecondary education for students with disabilities (Mull, Sitlington, & Alper, 2001). According to the 1995-1996 National Postsecondary Study Aid investigation, approximately 6% to 9% of all undergraduate students reported having a disability (National Center for Education Statistics, 2000). Of this group, 25% to 29% indicated they had a learning disability. The number of college students with LD appears to be increasing if a recent study by Henderson (2001) is representative. In this

investigation, 2 in every 5 freshmen reported having a learning disability in 2000. This is a 16% increase since 1988, making this the fastest growing group of reported disability among college students.

Although the number of students with LD attending college has risen, there is evidence that many students with LD at postsecondary institutions have difficulty completing their education (Mull et al., 2001). Murray, Goldstein, Nourse, and Edgar (2000) found that 80% of college students with LD did not graduate from college five years after high school, as compared to 56% of students without disabilities. This suggests that once students with disabilities are admitted into college, they may require extra time or assistance to successfully make the transition from high school to college. They may also need other special services so that they can successfully graduate with a college degree.

Difficulties with completing college are likely due to the academic and cognitive challenges young adults with LD face (Dalke, 1988). For instance, college students with LD demonstrate a variety of difficulties that affect their academic performance. To illustrate, significant differences were found between freshmen students with and without LD on all 17 clusters of the Woodcock-Johnson Psycho-Educational Battery (Dalke, 1988; Hoy & Gregg, 1986). Thus, students with LD encounter a variety of problems that impact their college academic performance (Gregg, 1983).

One of the most pervasive problems that affects the performance of college students with LD is difficulties with written language (Gregg, 1983; Morris-Friehe & Leuenberger, 1992; Plata, Zelhart, & House, 1995; Vogel, 1985b; Vogel & Moran,

1987). As many as 90% of students with LD experience trouble with written language (Vogel, 1985b). It is important, therefore, to understand the difficulties these students experience in order to provide instruction and assistance in the area of writing so that these students can successfully complete their college studies, as well as be successful in the job market.

<div align="center">The Importance of Writing</div>

Written language is a basic instrument for communication and self-expression. People write to convey their ideas to others, and to explore their thoughts about specific topics. Writing can allow this thinking process to operate at a much deeper level than is possible when speaking about a subject. Writing draws on a variety of resources and is at best "a collecting, correcting, clarifying discovery process" (Clairborne, 1974, p. 26). Writing not only involves thinking and communicating, but also risk-taking and problem-solving.

How important is writing? Clairborne (1974) concluded that "recorded history begins with the birth of writing; in most societies, so do science and philosophic thought." (p. 19). Clairborne further affirmed that among all of man's creations, writing ranks as the supreme intellectual achievement of humankind. Though early classical rhetoricians were primarily more concerned with spoken language than writing, they came to believe that writing was a way to communicate with others, as well as a means to preserve the historical and traditional culture of a literate society (Applebee, 1984). Writing was once only accessible to the elite, however, this is no longer the case. Today, people who do not write are at a great disadvantage. They lose numerous opportunities for both education

and employment. This is most evident in our society's constant use of documents, reports, job applications, email, and so forth.

In school, writing is a primary means for acquiring subject matter. Students achieve this by using writing to explore, organize, and refine ideas about their subject matter (Durst & Newell, 1984). It is a complex process in which writers must sort through ideas, explore relationships, consider alternatives, and clarify values, all while dealing with a subject, text, and a reader (Grabe, 1996). Students use writing to take notes to study later, answer comprehension questions on assignments and tests, and gather relevant information for summaries, reports, and essays. Students frequently use writing to illustrate their understanding of subject matter. However, students must learn these various writing skills.

Writing ability is not naturally acquired, it is a learned behavior. Defining writing as a set of skills to be learned helps educators and researchers to understand and identify what aspects of the writing process may be problematic for some students. This also reinforces the concept that writing must be learned through instruction, practice, and experience in planning, translating, and reviewing (Flower & Hayes, 1980b, 1981; Hayes & Flower, 1980a; Swartz, Flower, and Hayes, 1984). This is especially critical at the postsecondary level, as college students are frequently expected to demonstrate their knowledge and comprehension of subject material in essays and research papers. It is perhaps the first time in their lives that college students must complete large amounts of reading and rapidly synthesize and communicate ideas from texts in a variety of writing assignments.

In their major courses, college students are typically required to demonstrate their competence with the types of writing they will eventually apply in their chosen profession. For example, they may be asked to produce memos, letters, schedules, documents, reports, and professional articles for a variety of purposes and audiences (Craig, 2001). In Craig's 2001 study of 109 entry, skilled, and professional workers, 86 responded that they spent up to 50% of their work hours writing. The increased importance of writing in most jobs place many weaker writers at risk, as they face tremendous obstacles that may hinder their educational and occupational potential. It is important that college students have clear perceptions of their writing abilities as well as understand the underlying processes of writing.

The Nature of Writing

For many years, writing was considered a linear process and was analyzed as such. Instead of looking at what writers did while composing, emphasis was mostly on the final written product. However, with the seminal work of Flower and Hayes (1980a, 1980b, 1981b) and Scardamalia and Bereiter (1987), writing is now viewed as a recursive process that involves planning, composing, and revising. Their research focused on identifying how skilled writers write and the processes underlying their competence.

Flower and Hayes (1977) described writing as a "highly goal-oriented, intellectual performance" (p. 449) that is approached as a problem-solving and decision-making task. While composing, a writer's thoughts flow in a series of non-linear moves from one problem and/or procedure to another. In studying writing as a problem-solving process, Flower and Hayes (1980a) described the underlying cognitive processes writers used to

process information in order to achieve their goals. They found that more skilled writers engaged in a more elaborate process of constructing problems than did less skilled writers, as reflected in their attention to the purposes and goals of writing.

One process that appears essential to skilled writing is planning (Bereiter & Scardamalia, 1987; Flower & Hayes, 1980b, Hayes & Flower, 1980a). Skilled writers are expected to be able to plan and monitor the selection, integration, and presentation of information. Without planning, writers may fail to focus on the development of rhetorical goals or the needs of the reader. In fact, planning provides structure and direction to writing. Planning throughout writing also provides continuous interaction between goals and actions.

Hayes and Flower (1980a) identified three planning processes: generating, organizing, and goal-setting. During the generating process, relevant information for the writing task is retrieved in mental or written form from long-term memory. The retrieved information is then organized into a writing plan (e.g., categorical, hierarchical, and so forth). During goal-setting, rhetorical purposes, such as the needs of the audience, are considered. Though these subprocesses are described here separately, they can be activated at anytime throughout the composing process.

Flower and Hayes (1980a) found that more mature writers typically do most of their planning while writing rather than before they start writing. Their plans are more conceptual in that the plans represent ideas to be used in a composition whereas less experienced writers use their plans to generate content for a first draft. They further found that rhetorical (whole text) planning is a distinctive feature of mature writing, constructed

mostly, but not exclusively, in the early stages of writing. Planning is a critical area to examine with college students with LD as inexperienced or poor writers often approach writing as a content-generating process, by writing all they know about a topic in one step, minimizing the role and importance of planning in their writing (Bereiter & Scardamalia, 1987).

Translating is defined as the process of transforming ideas, images, or thoughts into correct and acceptable sentences. How well writers are able to translate determines how well they are able to communicate their ideas. The process of translating requires a great deal of effort in order to transform the writing plan into formal prose. It is not just a process of converting an outline or sentence parts into complete sentences, however. It also involves selecting the appropriate words, arranging ideas in a logical order, and giving clarity and form to the purpose of the writing task (Scardamalia & Bereiter, 1987).

Flower and Hayes (1980a) found that more skilled writers often made substantive changes in their plans while translating mental or written notes to written sentences, whereas inexperienced writers did not. The less experienced writers depended on having knowledge readily assembled for translation. Throughout composing, the more skilled writers used a variety of procedures to draw on, elaborate, and refine available knowledge (Flower & Hayes, 1980a; Scardamalia & Bereiter, 1987).

Reviewing text production is also considered an important part of the writing process (Flower & Hayes, 1980a). Reviewing is a critical aspect of writing, as it provides a vehicle for enhancing the quality of the final written product. Reviewing involves reading text to evaluate and review what has been planned or written. If the evaluation is not

favorable, then reviewing leads to revising. Reviewing is a conscious process in which writers read what they have written and systematically evaluate and/or revise their text (Flower and Hayes, 1981a). Reviewing may spur additional reconstruction of the writer's intentions as it can lead to new cycles of planning and translating.

The process of reviewing is enacted differently by skilled and less skilled writers. Skilled writers consider evaluating and revising as a more global process, examining a variety of issues, including syntax, content, structure, and audience (Flower & Hayes, 1980a; Sommers, 1977). On the other hand, less skilled writers treat reviewing mostly as an editing task, focusing mostly on the mechanical aspects of writing, such as spelling, usage, and so forth (Hayes, Flower, Schriver, Stratman, & Carey, 1987). Hayes and Flower (1981) also noted that many novice writers are not able to detect problems in their writing and only reviewed their compositions for grammatical errors (if they reviewed their papers at all). To these writers, revision meant error correction. However, as studies with more skilled writers have shown, revision is much more than a cleaning-up activity (Fitzgerald, 1981).

In summary, the cognitive processes of planning, translating, and reviewing are not locked into a fixed sequence, but are tools that writers can use at anytime throughout the composing process. These tools are learned and refined through both instruction and perceptive observation (Flower & Hayes, 1980a). For college students, especially those with LD, it is critical that they learn the skills and strategies needed to apply these processes successfully.

Writing Abilities of College Students with and without LD

Teachers in higher education expect college students to write a variety of compositions such as summaries, essays, reports, and research papers. College instructors rely heavily on students' ability to read and comprehend text and then integrate information from these texts into written form for various writing assignments. Students need a minimum level of writing proficiency in order to fulfill college-level course requirements (Pardes & Rich, 1996). College teachers assume that their students have learned how to write well during elementary, middle, and secondary school. However, this is often not the case.

Researchers have found that more than one-half of new college students were unable to write a paper with few errors (ICAS, 2000). In addition, results of research studies show that many college students do very little planning and self-initiated writing (Perl, 1979; Pianko, 1979). Researchers have further found college students often do not use outlines, revise their papers for content, or edit their papers for errors (Perl, 1979; Pianko, 1979).

Students with LD are more likely than college students without LD to experience difficulty with writing (Gajor, 1989; Gajor & Harriman, 1987; O'Hearn 1989; Vogel & Moran, 1982). The cognitive processes of attention, memory, and reasoning are necessary for good writing. Students with LD often experience difficulties with these processes, resulting in poor written language skills (Gajor & Harriman, 1987). In fact, writing is an academic domain that is particularly difficult for many college students with LD, especially in the areas of mechanics, style, coherence, development, and content

organization (Gajor, 1989; O'Hearn, 1989; Vogel & Moran, 1982). These students' papers tend to be shorter, more poorly organized, and less developed than their counterparts (Gajor, 1989; O'Hearn, 1989; Vogel & Moran, 1982).

Perhaps most importantly, the overall quality of their writing is poor when compared to the writing quality of students without LD. The overall writing quality is influenced by numerous errors in spelling, grammar, punctuation, capitalization, word usage, and sentence construction (Ganschow, 1984; Gregg, 1983; Gregg, Hoy, McAlexander, & Hayes, 1991; Richards, 1985; Schumaker, Klare, Cronin, & Moses, 1981; Vogel, 1985a, 1985b; Vogel & Moran, 1982). Statistically, significant differences have also been found between college students with and without LD on standardized tests measuring writing skills (Morris & Leuenberger, 1990).

The findings described above have focused only on the written products produced by college students with LD. Surprisingly, there are no studies examining how students with LD go about the process of composing. Research must look beyond the errors in the end products of writing and look at the processes considered central to effective writing. The relative absence of scholarship in investigating the writing processes of college students with LD is unfortunate, as composing is critically important to their success or failure. This study examined the writing processes of college students with and without LD, with emphasis on the planning, composing, and revising strategies these students apply when they write. The primary method that I used to investigate these processes was protocol analysis.

The Use of Protocol Analysis

Writing is a dynamic process in which writers employ tactics involving planning, translating, and reviewing. However, measures designed to assess writing products (e.g., holistic, analytical, and so forth) do not provide an adequate window into how writers go about the business of composing. By focusing on the written product, researchers interested in the writing of college students have not been able to develop an adequate picture of how these students compose. Protocol analysis provides a tool for examining the writing processes they do employ. This technique gives researchers a 'window' on the writing processes of planning, translating, and reviewing, allowing them to capture in rich detail what writers think while composing (Hayes & Flower, 1980a). For example, when analyzing a think-aloud protocol, one can discover how a writer generated ideas. If a researcher only looks at the final product, then there is no way of identifying how or in what order the ideas were generated.

There are different forms of think-aloud protocols: concurrent (information is verbalized about cognitive processes used while performing a task) and retrospective (information is verbalized about cognitive processes used after a task is completed) (Ericsson & Simon, 1980). This study used concurrent think-aloud protocols. By reading through a protocol, a researcher can detect if the order a writer generated ideas was different from the order the ideas were presented in the finished product. Such information is useful in writing instruction. This kind of information can not be obtained by merely observing a writer in action or by interviewing a writer. Think-aloud protocols allow researchers to examine the steps a writer used to produce written text and not

focusing solely on the final written product. The final written product only shows what was produced, but not how the written product was produced (i.e., the approach the writer took while composing).

A protocol is a record of a subject's attempts at performing a task. In a concurrent think-aloud protocol, a subject verbalizes while completing the task (Ericsson & Simon, 1980). The verbalizations are recorded and then transcribed. The transcript is what the researcher uses to observe both the cognitive and metacognitive processes a writer uses and the development of a writer's ideas.

The contents of the protocols are coded into different categories. In writing, the broad processes of planning, translating, and reviewing can be coded as well as subcategories (e.g., planning – generating ideas, goal-setting). Think-aloud protocol analysis is appropriate in descriptive research when answering questions like, "What is involved in the process of producing written text?" Studying composing by analyzing protocol data has contributed significantly to understanding the organization of cognitive processes underlying the act of writing. This can be achieved if subjects are asked to report, not explain, their thoughts of contents held in short-term memory.

Think-aloud protocols are a valuable source of information about the strategies a writer uses specifically when combining content knowledge with writing strategies. Such information could reveal what writers know and how they use the knowledge when writing, thus, emphasizing the writing process, not the final written product. Bracewell and Breuleux (1994) demonstrated that it is possible to integrate think-aloud protocols and the written text. They emphasized that with the use of an appropriate coding scheme

to collect data, think-aloud protocols provide the most direct evidence of the ways writers orchestrate cognitive processes while writing. Think-aloud protocols allow researchers to see changes in cognitive activities during the writing process (Breetvelt, van den Bergh, & Rijlaarsdam, 1996). For these reasons, the use of think-aloud protocols matched the purpose and goals of the study.

<div align="center">Purpose of Study</div>

University professionals involved in the development and implementation of academic and support programs for students with LD are concerned about the academic challenges posed by this population. It is imperative to gain a better understanding of the characteristics and needs of college students with LD in order to make sound decisions regarding instructions, programs and support services. Vogel and Adelman (1992) found that students with LD entered college with significantly poorer preparation, especially in English. They also tend to have poor time management skills, difficulty in completing tasks, and poor study skills. These may be the reasons why students with disabilities are less likely to obtain an associate's or bachelors' degree (National Center for Education Statistics, 2000).

Our society places considerable value on writing and people who have difficulty mastering writing find themselves at a great disadvantage, especially college students, as many course grades heavily depend on written work (papers, reports, exams, and so forth). In postsecondary education, difficulties with writing are likely to contribute to problems in successfully navigating the academic requirements of college. It is important, therefore, to obtain a better understanding of the writing capabilities of college students

with LD and how their approach to composing differs from their more skilled counterparts.

The studies of the writing skills of college students with LD reviewed in this chapter focused almost exclusively on what was produced and not how it was produced. No studies were located that analyzed the writing process of high school students with LD. There is no information to assist a researcher in identifying the writing processes of students with LD prior to college. Data collection procedures in these studies emphasized analyzing the final written product, revealing primarily the numbers and types of errors college students with LD make when writing. However, scores and frequency counts tell us little about the act of composing. Instead, we need to better understand what students do while they compose.

The purpose of this study was to investigate how college students with and without LD plan, write and revise when writing. This study involved describing the writing processes of college students with and without LD, using a cognitive model of writing. Data collection included the analysis of verbal protocols, videotapes, and written documents. As a result, the goal of this study is to develop a clearer understanding of the writing processes college students with LD and without LD use when they complete a writing task typical in a college setting.

Objectives of the Study

1. To compare the writing quality of college students with LD to college students without LD.

2. To compare the length of writing of college students with and without LD.

3. To examine the amount and types of planning processes employed before the writing process by college students with and without LD.

4. To examine the amount and types of revising employed during the writing process by college students with and without LD.

5. To examine the proportion of use of self-regulatory behaviors used by college students with and without LD during the writing process.

6. To examine the types of correlations between holistic writing score and the proportion of use of self-regulatory behaviors used by college students with and without LD.

Research Questions

1. Is there a statistically significant difference in the quality of expository writing of college students with and without LD?

2. Is there a statistically significant difference in the length of the written products of college students with and without LD?

3. Are there statistically significant differences in the number and types of written plans college students with and without LD generate prior to writing?

4. Are there statistically significant differences in the number and types of revisions made by college students with and without LD?

5. Do college students with and without LD differ significantly in their self-regulatory behaviors (i.e., planning, monitoring, revising) while composing, as measured by the think-aloud protocols?

6. Are there any statistically significant positive correlations between holistic writing scores and the use of self-regulatory processes (i.e., planning, monitoring, revising) used by college students with and without LD while writing?

Expected Outcomes

In this study, college students with and without LD wrote on a topic typically found in college courses. An analysis of their writing processes was conducted with the use of think-aloud protocols. As this is an exploratory study of the writing processes of college students with and without LD, hypotheses were not proposed. However, previous research suggests several possible outcomes. It is possible that the writing quality of college students with LD may be lower than the writing quality of college students without LD, due to numerous errors in grammar, spelling, organization, and complexity. It also may be found that both groups of college writers use little time for planning while writing and make few revisions.

Definitions

Holistic scoring: scoring written language impressionistically as a unified whole.

Learning Disabilities: (NJCLD 1988 definition) Learning disabilities is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or math. These disorders are intrinsic and presumed to be due to CNS dysfunction. LD can occur concomitantly with other handicapping conditions.

Protocol analysis: (Ericsson & Simon, 1980) collecting and analyzing a detailed, time-ordered recording of a subject's behavior, including a transcript of the recording of the writer's verbalizing during composing.

Chapter Two: Review of the Literature

Introduction

This chapter reviewed the writing literature in terms of topics critical to the content of this study, including cognitive models of skilled writers (i.e., Beaugrande, 1984; Flower & Hayes, 1980; Hayes, 1996; Scardamalia & Bereiter, 1987; and Zimmerman & Risemberg, 1997), the writing processes of nondisabled college writers versus college students with learning disabilities (LD), as well as the use of protocol analysis as a method for analyzing writing processes. As more and more students with LD enroll in college, there is not only a need to understand the writing challenges they face, but also to find ways to help them become more successful. This is especially true in the area of writing. In order to help students with LD become more successful writers, it is important to understand how they write in order to provide instruction that will enable them to improve their writing.

Cognitive Models of Writing

Linear models of writing (pre-writing, writing, and rewriting) have not provided convincing descriptions of the writing processes in that these models do not take into account the documented dynamics of the writing process (Hayes & Flower, 1980a). Linear models of writing better served as models of the emerging written product in which composing was considered as a series of discreet stages of prewriting, writing, and rewriting. However, as a recursive procedure, researchers have established that when people write, they use a variety of cognitive processes, such as making plans, retrieving ideas from memory, making inferences, creating and developing concepts (Hayes &

Flower, 1980a). A writer must activate and apply a number of skills to carry out these tasks. Researchers have recently begun to identify and understand these cognitive processes.

Since the 1970's, there has been an increase in the amount of research conducted to identify and understand the cognitive processes people use while writing (Hayes & Flower, 1987). This has been facilitated by the development of cognitive process theories of writing that include content generation, organization, and revising (Ericsson & Simon, 1980). When analyzing the writing process, it is important to gain insight into the relationships between the organization of cognitive activities during the writing process and quality of the written product. The theoretical framework most influential in writing research since the 1980s has been the writing-process theory developed by Flower and Hayes (1980a).

The Model of Flower and Hayes

Flower and Hayes (1980a) developed a model of the writing process by observing college students and expert writers. They were seeking to describe features common to all writers and needed a way to identify the processes writers used and how these processes were organized in order to produce a text. Their approach to the study of writing was a shift away from focusing only on the written product, which had dominated earlier writing research, to looking at the process of writing itself. This was based on cognitively oriented research that focused on the interconnections among thinking, learning, and writing.

Flower and Hayes (1980a) argued that composing processes were best seen as

cognitive processes and used cognitive process theory to analyze the process of writing as a set of distinctive thinking activities. Thus, they studied writing as a process of discovering and problem-solving in which ideas are actively constructed to satisfy communication goals. Accordingly, writing involves using and coordinating different processes in order to satisfy goals that vary due to content, task, and audience. Flower and Hayes (1980a) looked at the processes which contribute to understanding the types of cognitive problem-solving processes used by mature writers.

The approach Flower and Hayes (1980a) used to study the act of writing involved observing writers in action through the use of a process tracing method (think-aloud protocols). Think-aloud protocols involved asking writers to think aloud as they composed to provide "a description of the activities, ordered in time, in which a subject engages in while performing a task" (Flower & Hayes, 1980a, p. 4). The use of think-aloud protocol analysis allowed them to develop a model of writing that described the organization and interaction of the cognitive processes involved in composing. This model provided a powerful description of writing, as it was able to account for considerable individual variation in writing. For example, it was flexible enough to describe writers who planned extensively as well as those who did very little planning.

In their studies, Flower and Hayes (1981a) asked both expert and novice writers to write about their work for Seventeen magazine. The novice writers were university students and the expert writers were rhetoric and writing teachers attending a seminar at a university. Prior to the study, the writers knew that they would be writing for an hour and were told to compose aloud. When thinking aloud, they were asked to verbalize their

thoughts, not to analyze their thinking processes. The writing sessions were tape recorded and transcribed. In addition, all of the researchers' notes and written materials produced by the writers were included as part of the analysis. Flower and Hayes (1981a) examined all these materials for evidence that might reveal something of the process by which writers created their essays. In addition, the writers' comments were coded and placed into categories of generating, organizing, and translating. What Flower and Hayes (1981a) found was that the expert writers considered all aspects of the rhetorical problem (the rhetorical situation – audience, topic, and assignment, and the writer's own goals – construction of meaning, production of text), whereas the novices saw only a task of "filling up the paper." Based on two years of research, Flower and Hayes (1981a) proposed the writing process model described below.

The Flower and Hayes' model consists of three interacting components: the task environment (the writing assignment, text produced so far, physical environment, intended audience), the writing process (the subprocesses of planning, including generating and organizing ideas, as well as setting goals; translating, which included generating written text from internal representations; and reviewing, which included reading, evaluating and revising), and the writer's long-term memory (knowledge of topic, audience, and genre) (Fig.1). They proposed that these are all controlled by "a monitor" that determines when the writer moves from one process to another; thus, the writer is able to switch back and forth among the processes. A great part of skill in writing is the ability to direct one's own composing process. This may also vary from writer to writer and from writing task to writing task. If a writer is undertaking an easy

Figure 1

TASK ENVIRONMENT

The Rhetorical
Problem

Text
Produced
So Far

Topic

Audience

THE WRITER'S LONG-TERM
MEMORY

Knowledge of topic,
audience, and
writing plans

WRITING PROCESSES

Generating

Evaluating

Organizing

Revising

Goal Setting

MONITOR
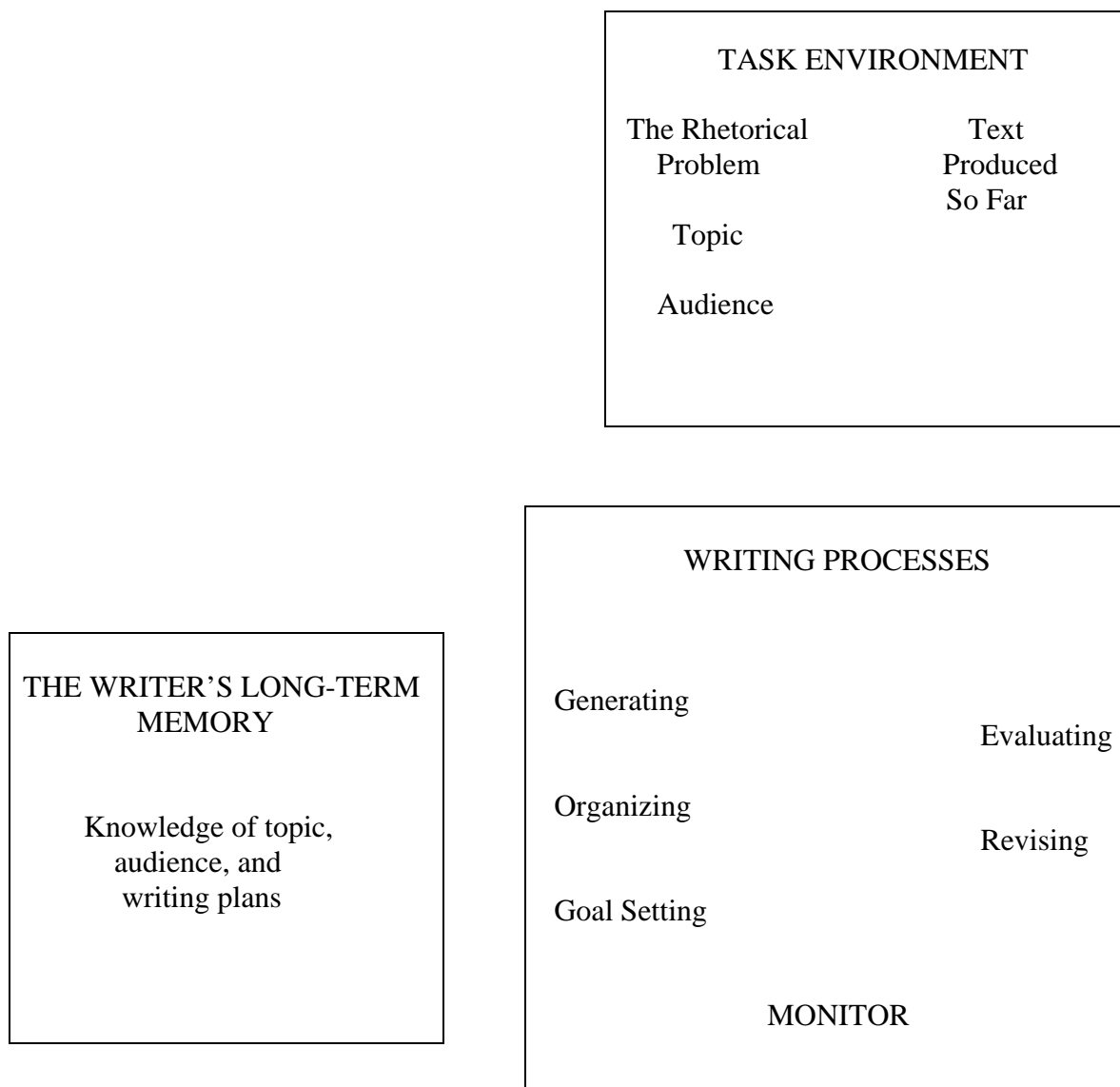
From: Hayes, J.R., & Flower, L.S. (1983). Uncovering cognitive processes in writing: An introduction to protocol analysis. In P. Mosenthal, L. Tamor, & S.A. Wellesley (Eds.), *Research on writing: Principles and methods* (pp. 206-220). New York: Longman.

task, like writing a short letter, little or no planning may be necessary. If the task is more difficult or unfamiliar, the writer may want or need to do more planning.

When analyzing protocols, Flower and Hayes (1980a) found recursiveness among the generating, organizing, and editing processes throughout all phases of composing. Generating was mostly employed at the beginning of composing, followed by organizing and translating. For example, writers often returned to generating and editing during the entire writing process. A person may plan, generate, and revise a paragraph, then proceed to a second paragraph. Or after writing a while, a writer may realize that s/he needs to go back and add an additional paragraph; thus, returning to planning, generating, and revising again.

Flower and Hayes (1980a) found that expert writers spent more time planning, less time actually writing, and did more global planning than novice writers. Flower and Hayes (1981b) identified plans as being procedural and/or content-specific: plans for generating ideas, plans for producing a paper, and plans for controlling the composing act. These plans interacted during composing. The expert writers produced 60% of their ideas, not in response to the topic alone, but in response of their elaboration of the rhetorical problem (purpose of writing, sense of audience), whereas the novice writers produced over 70% of their ideas in response to the topic alone. The more expert writers had more high-level rhetoric, content, and process plans as they focused more on planning what to say and how to say it. Flower and Hayes (1980a) interpreted this as evidence that expert writers are more aware of the fact that the nature of their audience severely constrains what they need to say. Thus, the way a writer represents a rhetorical

problem affects both the process and product of writing. Flower and Hayes (1981c) observed that inadequate representation of the rhetorical situation may lead a writer to have difficulties with finding a focus and translating.

Through their work, Flower and Hayes (1981a) identified four features of composing:

1. Writing consists of distinctive processes (planning, translating, and reviewing).

2. The processes of writing are hierarchically organized and embedded in other processes (processes are recursive).

3. Writing is a goal-directed process (global for affecting an audience and local that guides the act of writing).

4. Writers continually create new goals and subgoals.

This theory considers writing as a dynamic, recursive process of developing and editing text within various constraints.

Flower and Hayes (1980a) concluded that writers do not write in a linear fashion, meaning that they do not typically write by planning first, then drafting, and finally revising. They described writers as being like switchboard operators dealing simultaneously with the constraints of knowledge, written speech, and the rhetorical problem. These constraints shape the writers' goals, influencing both what they write and how they write it. Accordingly, writers must juggle many constraints in order to satisfy the demands of the writing task, the audience, and their personal goals.

Studies that examined the Flower and Hayes model

The model of Flower and Hayes has provided a framework for additional studies. Since Flower and Hayes proposed their model of the writing process, there have been a

number of studies that examined specific aspects of the model. These studies provided evidence of the cognitive processes used in writing as described by Flower and Hayes (1980a).

It was the purpose of several research studies to analyze the amount of cognitive effort used in planning, translating, and revising as measured by time. Kellogg (1987c) employed the 1980 writing process model of Flower and Hayes in his study as he examined the amount of cognitive effort required for planning, translating, and revising. Like Flower and Hayes (1980a), Kellogg worked from the understanding that all these processes are recursive and would be activated and terminated during all phases of composing. Kellogg (1987c) defined the writing process as "collecting information, planning ideas, translating ideas into text, and reviewing ideas and text" (p. 271). Kellogg (1987c) expected to find a mixture of these processes during each phase of writing. Kellogg (1987c) hypothesized that planning, translating, and reviewing would occur throughout all phases of writing, as suggested by Hayes and Flower (1980a).

A second purpose of Kellogg's study was to determine if the use of outlines and rough drafts affected the efficiency of the writing process, the quality of writing, and the amount of time devoted to planning, translating, and revising. Kellogg (1987c) examined two cognitive strategies (organizing ideas into an outline and composing a rough draft with revisions) that could lessen a writer's work load. It was anticipated that if writers used outlines during prewriting, then a great deal of planning is completed before writing commences. It would also decrease the need for planning while writing, allowing writers to focus more on translating and reviewing. Using a rough draft may further allow writers

more time for planning and translating during the early phases of composing.

Kellogg (1987c) used directed retrospection to gauge estimates of the time devoted to each process. Directed retrospection is a technique where subjects are videotaped while they complete a task. Then they are asked to view the tape and comment on the processes they used. This was achieved by having the subjects view the tape immediately after completing the writing task.

In preliminary studies, Kellogg (1987c) established the validity of the use of directed retrospection to reflect actual thought processes. Eighteen college students were assigned to write a persuasive business letter in favor of a minibus system for people with disabilities under one of four conditions: outline vs. no outline, rough vs. polished draft. The subjects were also trained in directed retrospection with which they identified their thoughts during writing as planning, translating, reviewing, or other.

The largest difference noted between conditions in the time spent composing was during the first third of writing. Subjects in the rough draft group focused more on planning and translating, whereas subjects in the outline group spent most of their time translating. The subjects who used outlines produced the longest letters and wrote letters judged to be the most effective and best developed. The use of written outlines increased the time spent translating ideas into text and improved the quality of writing. Kellogg (1987b, 1987c) emphasized that encouraging students to use outlines may help writers juggle planning, translating, and reviewing during all phases of composing, and help improve overall writing quality.

In another study, Kellogg (1987a), compared the conditions of high and low

background knowledge about a topic to composing time and cognitive efforts to the writing process. He hypothesized that planning, translating, and reviewing would be intermixed during writing, with the percentage of time spent planning expected to decrease and the percentage of time spent translating and reviewing expected to increase during the writing process. It was also hypothesized that a highly knowledgeable writer may adopt a strategy of allocating processing time differently than a less knowledgeable writer. As topic knowledge is tied to generating and organizing ideas, a more knowledgeable write may spend less time planning and reviewing and use more time translating than a less knowledgeable writer.

As with his previous study, Kellogg (1987a) used directed retrospection to obtain estimates of the time devoted to each process. In the first two experiments, thirty college students were placed on low- or high-knowledge conditions on the basis of a test related to the writing topic. As the subjects wrote a persuasive essay, they were asked to consider what they were doing whenever they heard a signal (mean interval time of 30 seconds). It was found that the subjects in both knowledge groups spent about 50% of their time translating, and the amount of time spent planning decreased while the amount of time spent reviewing increased throughout the writing process. This supports the model of Flower and Hayes (1980a) in that writers do not do all of their planning, translating, and reviewing in a linear manner. There was no evidence that high-knowledge writers adopted strategies for allocating processing time and cognitive effort differently from the low-knowledge writers.

In a second study, different writing topics were assigned to the subjects in the low-

and high-knowledge conditions. A topic familiar to most college students (tuition costs) was given to the high-knowledge subjects and an unfamiliar topic (an anti-greed club) was given to the low-knowledge subjects. Kellogg found similar results in that the subjects in both conditions devoted about 50% of their time to translating across all phases of composing. Both a decrease in planning time and an increase in reviewing time were observed for both conditions. No difference was found between knowledge conditions on measures of efficiency and quality of writing. Topic knowledge did not alter the way in which the subjects wrote. The results provide evidence that writers with varying amounts of knowledge intermix planning, translating, and reviewing during all phases of composing. Finally, the results provide additional evidence for the theoretical contentions of Flower and Hayes (1980a) that writing is a recursive, not linear process.

Breetvelt, van den Bergh, and Rijlaarsdam (1994,1996) also expanded on the work of Flower and Hayes. They hypothesized that changes in the writing process reflect differences in the changing task situation. One of the indicators of the changing task situation is timing. This means that cognitive activities do not randomly occur during the writing process. Some cognitive activities have a higher probability of occurring at the beginning of task execution, such as reading information for generating ideas; whereas reading for revising has a higher probability of occurring at the end of the writing task. Time is a key variable in the model of Breetvelt et al. (1994,1996) which is lacking in the model of Flower and Hayes (1980a). This also provides a means for explaining variances between writers.

Using think-aloud protocol analysis, Breetvelt et al. (1994) studied 11 cognitive

activities (as derived from the 1980 model of Flower and Hayes) and text quality. The 11 cognitive activities were: reading the assignment, self-instruction, goal setting, generating, structuring, giving comments, pausing, writing, rereading the text written so far, evaluating, and revising. They wanted to describe the strategic information that coincided with the cognitive activities of planning, translating, and revising. Twenty ninth-grade students wrote an argumentative essay while thinking aloud. The think-aloud protocols were segmented into three equal units of protocol fragments based on the model of Flower and Hayes (1980a).

The results revealed that the various cognitive activities occurred throughout the writing process and the frequency of activity occurrences changed over time. In addition, the results support the model of Flower and Hayes in that 87% of the variance in the quality of students' writing was accounted for by the 11 categories. Some cognitive activities were more likely to occur at different points of the composing process. For example, reading the assignment and generating text occurred more at the beginning of the writing process, then decreased. On the other hand, the amount of rereading slowly increased.

Likewise, cognitive activities correlated with text quality. Reading the assignment was positively correlated to text quality at the beginning of the writing process, but negatively correlated at the end of the process. In their 1996 study, Breetvelt et al. found that the correlation between rereading and text quality was negative at the start of writing, but positive by the end of it. Breetvelt et al. (1994,1996) concluded that the relation between text quality and the occurrence of cognitive activities is time dependent, meaning it

depends on the moment in the writing process as none of the 11 cognitive activities correlated equally with text quality over the three phases. The relationship of the cognitive processes emphasized the importance of the monitor of the Flower and Hayes model (1980a) to effect changes between cognitive activities and text quality, as the "monitor" decides which activity is undertaken at a given moment. Breetvelt et al. (1994) emphasized that differences between writers can be determined as skilled and unskilled writers differ with respect to the moment they engage in certain cognitive activities.

In addition to studies on the amount of cognitive activity used during the writing process, several research studies focused on specific aspects of the writing process model of Flower and Hayes (1980a) In a 1984 study, Benton, Kraft, Glover, and Plake examined potential differences among good and poor college writers in a series of specific information-processing tasks based on the 1980 Flower and Hayes model. They examined cognitively oriented theories of writing in order to determine the types of processing activities used during the writing process. In their review for this study, they found that previous models of the writing process generally outlined three major interactive cognitive processes: planning, translating, and reviewing. Specific tasks in planning (generating, organizing) and reviewing (reading, editing) were administered in order to identify information-processing components. They expected that observed differences between good and poor writers would be observed in processing tasks that reflect the various components of the writing process.

Two hundred fifty undergraduates enrolled in a basic educational psychology course volunteered to complete a writing task for credit. The subjects wrote on the topic, "How I

chose my major." The essays were scored on a 6-point scale by two independent raters. The writers of the 15 best and 15 weakest papers were identified and asked to participate in a further study. In this study, the subjects completed a random order of three tasks in one session each. To tap the generating subprocess of planning, the subjects completed an iconic memory task where they were asked to recall eight random letters in a 2 x 4 arrangement. To tap the organizing subprocesss of planning, the subjects completed an ordered letters task where they were asked to recall a sequence of consonants and five randomly selected consonants. It was hypothesized that the good writers would outperform the poor writers on all three tasks as reflected by the ability to manipulate information for completing a task.

The three tasks were administered to examine potential differences between good and poor writers in their ability to recall and manipulate information in working memory. The analysis included the number of letters correctly recalled. Significant differences were found between the good and poor writers on the letter reordering task. Benton et al. (1984) suggested that these results may indicate differences in how good and poor writers are able to manipulate information in working memory.

In an additional study, specific tasks were given in order to analyze the process of reviewing (reading, editing). The subjects completed a word reordering task (six 10-word sentences), a sentence reordering task (six paragraphs), and a paragraph assembly task (essays). All words, sentences, and paragraphs were randomly arranged. The subjects were asked to unscramble the words, sentences, and paragraphs. Significant differences were found in that the good writers processed the information in short-term memory

much more rapidly than the poor writers. However, the faster processing speed of the good writers did not influence accuracy.

Although the tasks did not require specific knowledge of writing processes and content, it is possible that there were differences in the knowledge of how to write between good and poor writers. Such differences would be reflected in the planning subprocesses of generating, organizing, and goal-setting, as well as in the translating and revising processes. Benton et al. (1984) concluded that writing requires many cognitive processes and one subprocess, organization, is critical for good writing. They stated that information-processing tasks can reflect the subprocesses of the cognitive processing model of Flower and Hayes (1980a), differentiate between good and poor writers, as well as have the potential to predict writing abilities.

In their 1987 study, Hayes, Flower, Schriver, Stratman, and Carey used the 1980 writing process model of Flower and Hayes to develop a model of the revising process. This was an elaboration of the review process of the Flower and Hayes 1980 writing process model. Hayes et al. (1987) defined revising as "the whole process by which the reviser attempts to improve a text" (p. 188). This was done through task definition, evaluation, strategy selection, and modification of text or the writing plan. Thus, writers detected problems in text, diagnosed the problems, selected strategies for fixing the problems, and modified the written text. Hayes et al. (1987) wanted to determine how writers revise and how expert and novice writers differ in their revising process.

In their study, seven expert and seven novice writers revised faulty text in a letter. The expert writers were teachers and professionals and the novice writers were college

students. The purpose was to create a more realistic writing task that called for a full range of high- and low-level revisions (voice, perceived audience, grammar, and so forth). The subjects corrected a letter while thinking aloud. The only restriction placed on the subjects was not to completely rewrite the existing letter. The comments made in the protocols were compared to the actions taken by the writers. The comments appeared to fall into one of several activity categories: reading the letter completely before attempting to revise, establishing process plans or goals that are more specific than the directions before revising content or purpose, suggesting the gist of the letter, considering content or purpose, and noting problems in the first read.

Hayes et al. (1987) found that the expert writers established different plans and revision goals than the novice writers. For instance, the expert writers were more reflective at revising, made more revisions, and attended to more global revisions. The expert writers eliminated 91% of the errors in the papers and saw revision as a whole-text task (both global and local). In addition, the expert writers were also more attentive to rhetorical content, possible readers' needs, and global problems with the text.

On the other hand, novice writers only eliminated 60% of the errors and concentrated mostly on sentence-level revisions. Novice writers treated writing as a unitary process in which planning, translating, and revising were conducted simultaneously. However, even with repeated readings of the text, novice writers often failed to detect problems in the texts. As a result, the expert and novice writers differed in their detection of errors, as well as the number of problems they diagnosed and eliminated. However, Hayes et al. (1987) cautioned that the amount of revising different types of writers do does not always

result in improvement.

With their data, Hayes et al. (1987) developed a model of revising that consists of two major components: the processes a writer uses in revising and the categories of knowledge that influence the processes. Revising was the integration of the two components.

This model showed that the ability to detect problems in text is separate from the ability to fix these problems; thus, a writer might be able to find errors, but might not always be able to correct them. In Hayes's subsequent 1996 model, revising consisted of three components: basic writing skills, memory resources, and a learned task schema (Wallace & Hayes, 1996). A writer must use two kinds of revising strategies: those that modify or control the revision process and those that modify the text (revise and rewrite the text). Hayes (1996) explained that revising and rewriting are not separate, but points on a continuum.

With more writing research being conducted on the social aspect of writing and the use of new writing mediums, especially word processing, Hayes (1996) believed that there was a need to develop a new framework that could be used to interpret a wider range of writing activities, because writing was increasingly being defined as a communicative act (social activity) that requires a social context and a medium. Hayes thought it was important to develop a model that would more accurately reflect current thinking. His new model had two major components: the task environment and the individual. The task environment was expanded to include a social environment (the audience and other texts that a writer may read while writing, as well as collaborators)

and the physical environment (the text the writer has produced so far and the writing medium used). According to Hayes (1996), the individual components of the writing process include motivation/affect (beliefs, attitudes), cognitive processes (text interpretation, reflection, and text production), working memory (phonological memory, semantic memory, visual/spatial capabilities), and long-term memory (knowledge of topic, genre, linguistics, and audience). He further indicated that writing depends on an appropriate combination of cognitive, affective, social, and physical conditions. Writing is a generative activity that requires motivation, but it is also an intellectual activity that requires cognitive processes and working memory too.

Hayes' 1996 model differed from the 1980 Flower and Hayes model in that the new model placed more emphasis on the central role of working memory in writing and included the importance of motivation. The model also included visual-spatial tasks of interpreting spatial information and writing mediums. In addition, the cognitive process aspects of the old Flower and Hayes model were expanded to be more reflective of current thinking.

The new cognitive process component of the model was influenced by a study conducted by Kaufer, Hayes, and Flower (1986). They concluded that many processes occur throughout the entire process of writing and they argued that the labels of planning, translating, and reviewing were too restrictive and did not accurately show all that was happening while one composed. Instead, the cognitive processes component included text interpretation, reflection, and text production. Text interpretation was defined as a function that creates internal representations from linguistic and graphic inputs, such as

reading and scanning graphics. Reflection was defined as an activity of internal representations to produce an internal representation. It was more than just simply planning, as it also included problem solving, decision making, and inferencing. Text production was defined as the function that takes internal representations and produces written, spoken, or graphic output. Hayes (1996) felt this new terminology was more reflective of the current understandings of the writing process.

Other Cognitive Writing Models

Like Flower and Hayes, Scardamalia and Bereiter (1987) viewed writing as an act of problem solving in which a writer must decide what to say and how to say it. The problem solving process consists of interactions between content (knowledge) and the writing process. Based on Vygotsky's theory that transition from oral to written expression is a major step and is more complex than previously thought, they felt that new models were necessary because previous models of writing were too general and did not truly explain, in a developmental fashion, why and how skilled and less skilled writers composed differently. They also felt that models of writing needed to do more than just describe the writing process, they need to be explanatory and easily verified by experimental evidence. Furthermore, Scardamalia and Bereiter (1987) argued that the writing processes of a young writer and a mature skilled writer could not be the same.

Scardamalia and Bereiter (1987) developed two contrasting models of the mental processes that occur during writing. The models were based on the concept that at a certain level, everyone's language processes are the same, but at another level, everyone's language processes are different. The models also offered both more specific

features of mature/immature writers as well as instructional implications. One model, knowledge telling, was based on the concept that writers use content knowledge (memory) and discourse knowledge to retrieve readily available information from memory and write in a form that generally meets the requirements of the writing task (similar to the generating component of the Flower and Hayes 1980 model). The other model, knowledge transforming, embeds knowledge telling in a process that involves interaction between the content and rhetorical spaces where the writer attempts to solve the composing problem.

In their first model, knowledge telling, writers use a retrieve-and-write process by retrieving content from memory and translating the content into sentences. The main concern is what to say next, a 'think-say' process, and results in writers simply planning as they write and telling all that they know about a topic, exhibiting a linear process of writing. This is a simplified version of the generating ideas process proposed by Flower and Hayes in 1980. This is a basic process where novice writers exhibit characteristics of knowledge telling with little attention to goal setting, planning, needs of the audience, organization of text, problem solving, or revising. The role of planning and revising are minimized. One of the observable characteristics was that the text was generated as ideas came to mind and the text tended to stick to simple topics. A frequent problem of knowledge-telling is not having enough content.

The second model, knowledge transforming, indicated what more competent writers typically do. With knowledge-transforming, a writer transforms knowledge as a result of reflective thinking during writing. Writers rework their ideas into more fully developed

thoughts. They may also define goals, construct a plan for writing, organize their writing, and use strategies for finding and fixing problems in the text and for monitoring the entire process. There is continual revision and rethinking. The problem anticipation and resulting goals lead to plans for resolving the perceived problems. Knowledge-transforming would be evident in expository writing on a topic like describing the development of students' reading skills and needing to explain concepts like decoding skills. Scardamalia and Bereiter (1987) argued that knowledge transforming is not a universal process for all writers.

The major difference between the models is how knowledge is brought into the writing process and what happens to that knowledge during writing. The models are linked as writing progresses from telling what one knows about a subject to a more sophisticated process of deciding what to say and how to say it. This involves developing a greater sense of the purpose for writing. These models provide insights into the understanding of what children, beginning writers, poor writers, and expert writers do when they compose.

Through think-aloud protocol analysis, Scardamalia and Bereiter (1987) found that what children say usually appears on paper "as is" whereas adults say a lot more than they write. Much of adult writers' planning consists of setting goals, reevaluating and modifying their writing. The texts written by the younger subjects (students in grades 6 and 10), their self reports, and the think-aloud protocols all gave evidence that immature writers showed a lack of planning, such as little evidence of goal setting, planning and problem solving. The less-skilled writers produced fewer elaborated sets of pre-writing

notes, had difficulty generating enough useful information, and were less capable of making major revisions. Scardamalia and Bereiter (1987) argued that these problems occur with less-skilled writers as they may lack the specific knowledge and abilities that comes from practice. What the adult writers exhibited was consistent with the model of Flower and Hayes (1980a) in that writing is a recursive process where writers continually evaluate ideas and text with respect to rhetorical goals as they are modified during text production. Like the monitor in the model of Flower and Hayes (1980a), the executive control in Scardamalia and Bereiter's model helps to describe the processes that occur during writing. In a study conducted by Burtis, Bereiter, Scardamalia, and Tetroe (1984), knowledge transforming was found to be completely absent from the think-aloud protocols of elementary school writers, thus, the young writers did not demonstrate use of any knowledge-transforming skills.

However, it must also be understood that not all expert writers use knowledge transforming. Through think-aloud protocol analysis, it was noted that occasionally expert writers did use knowledge telling when they wrote about a personal experience or on a task in a familiar genre (e.g., writing a thank-you note). Such a task may make fewer demands on cognitive processes. They already had experience with such tasks, so they did not need to do as much high-level planning, as knowledge was automatically activated. Scardamalia and Bereiter (1987) suggested that this occurs when appropriate genre knowledge is available, allowing writers to bypass processes like defining the rhetorical problem and knowledge transformation.

Another model of writing developed in the 1980's was that of Beaugrande.

Beaugrande (1984) used text analysis to gain insights into the cognitive processes of writers. He conducted extensive reviews of research related to all levels of the writing process and concluded that models of the writing process should be more functional and integrative. Drawing from cognitive psychology, he developed a multi-level, interactive model of text and discourse processing that would more accurately reflect the writing process of expert writers. He argued that only an interactive model with cooperating components would truly show the relationship among the various domains. In a model of this type, the processes have unlimited combinability.

Beaugrande (1984) defined his model as a "parallel-stage interaction" model in which problem solving is carried on through parallel actions in a number of different problem spaces. This means that what happens as a result of processing at one level may alter the knowledge status at another level. Beaugrande (1984) defined text production as complex, normally spontaneous, content-sensitive, and open-ended. Using a linguistic viewpoint, his model of the writing process showed writers going through several processing domains: goal planning, problem solving, topicalizing (coordinating plans and goals with content), concept-elaborating (enriching and integrating central concepts), lexicalizing (interfacing topics and concepts with language), grammaticalizing (morphology and syntax), and sound/letter layout (surface text). These levels were not meant to be separate or fixed. According to Beaugrande, writers used various resources (motivation, familiarity of topic) and could adjust their writing accordingly in different domains. For instance, they might use less complex sentences in order to write more clearly or with more ease.

Like the model of Flower and Hayes, Beaugrande's model embodied the premise that skilled writers must have flexible access to a wide range of mental representations of actual and intended text. Beaugrande (1984) found that successful writers realized that discourse was a part of a broader interaction, whereas unskilled writers typically saw the "filling up the paper" as the only goal. Studies that test and verify this specific model were not located.

<div align="center">Social Cognitive Model of Writing</div>

Since the 1980's, there has been a shift in perspective from cognitive to social emphasis in the study of the composing process (Nystrand, 1989). Writing involves more than just the planning, translating, and revising of ideas. Text is not just the result of composing, it is also considered the medium for communication as people mostly write to communicate with others. Writers not only produce text, they also interact with the text and reader (Nystrand, 1989). As discussed in the previous section, Hayes' 1996 model included components that reflect this more current perspective.

It may appear that this line of thinking was a return to writing as product, as the written product is something that can vary depending on the specific social context in which writing takes place (Galbraith & Rijlaarsdam, 1999). However, the emphasis on process was expanded to not only focus on the process within an individual, but also on the reader's comprehension of the text. This is a process of negotiations between the writer, reader, and written text. Thus, writing can only be understood from the perspective of a social context and not just a product of an individual.

Social cognitive theory is unique in its integration of important self-regulatory

components within a single model of writing that reflects writing as a social, environmental, and behavioral act (Zimmerman & Risemberg, 1997). Social cognitive researchers have used the major self-regulatory processes of environmental influences and self-evaluative standards to explain student differences in writing performance. Social cognitive theories have evolved to include behavioral, environmental, and cognitive aspects of writing. These are absent in previous models of writing.

For example, in Flower's (1994) social cognitive perspective, reading and writing were more than just decoding and producing text. It is a social and rhetorical situation in which readers and writers use language for personal and social purposes. Flower (1994) argued that novice writers appear to just produce text, whereas expert writers engage in discourse as a rhetorical action. Accordingly, a person uses social conventions and problem solving strategies in order to compose. The strategies used are elicited by social interactions with parents, teachers, readers, peers, and text.

The social cognitive theory emphasizes the need to recognize the various social factors that influence writing. To understand the construction of meaning, writers must look at rhetorical, social, and cultural contexts of language. Such meaning making is found during planning, translating, and revising. Writers use goals and strategies while composing and negotiating social and cognitive influences. For example, a teacher's expectations might conflict with a student's personal needs or cultural values. It is the writer's task to negotiate all these forces.

Zimmernman and Risemberg (1997) drew upon the work of Flower and Hayes (1980) and Scardamalia and Bereiter (1987). They argued that self-regulatory strategies

are essential in explaining how writers compose and acquire greater skills in writing. Zimmerman and Risemberg (1997) believed that writing requires high levels of self-regulation, as writing is usually self-planned, self-initiated, and self-sustained. Zimmerman and Risemberg (1997) referred to self-regulation of writing as self-initiated thoughts, feelings, and actions that writers use to attain various literary goals. Writers use a variety of strategies to regulate their actions, thoughts, and processes. Even though writing has a solitary nature, there are also social, motivational, and behavioral processes involved. Thus, they viewed writing as a social cognitive process where writers must be aware of readers' needs and expectations.

Zimmerman and Risemberg (1997) and Zimmerman (2000) presented a social cognitive model of writing that postulated that writers acquire new writing skills through four processes: observation (modeling), emulation (enact model), self-control (self-directed practice) and self-regulation. Zimmerman and Risemberg (1997) went on to identify three forms of self-regulation: environmental (physical and social setting), behavioral (self-monitoring activities), and covert (personal beliefs, goals). The environmental process refers to the writers' self-regulation of the physical or social setting in which they compose. For example, a writer may select a comfortable place to write that has few distractions. The behavioral processes pertain to writers' self-regulation of motor activities associated with writing. For instance, a writer might decide to use a computer or write multiple drafts by hand. Finally, the covert processes involve the writers' self-regulation of cognitive beliefs and goals. A writer might decide to write a certain number of pages per day, write for a certain number of hours per day, or write at

a specific time each day. Each of these interacts reciprocally via a feedback loop that writers monitor and react to.

According to Zimmerman and Risemberg (1997), self-regulated writers attempt to use all three forms of self-regulation in conjunction with each other. Writers are self-regulated to the degree that they are metacognitively motivated and actively participate in the learning process. Students as a whole monitor the effectiveness of their learning methods and respond to this feedback in various ways. This is a proactive view of learning to write, where students personally initiate strategies to improve their writing outcomes.

In their study of this model, Zimmerman and Risemberg (1997) found that students who use self-regulatory processes wrote more effectively and exhibited higher levels of self-efficacy. They further argued that novice writers benefit from instructional methods that emphasize triadic forms of self-regulation, such as those presented in their model.

In a similar perspective, Smagorinsky (2002) offered a social cultural perspective on the process of learning and writing. This was a shift away from the study of the individual, focusing instead on the study of the social group and cultural history. He believed that writing involves more than the generation, organization, and translation of ideas into text. He argued that this helps scholars to understand how knowledge is constructed and relayed to others. This is evident by the increase in research on dialogue journals and peer collaboration. The importance of writing is on the relationship of speech to learning, the social role of the reader, and joint activities of the participants. The emphasis of a social cultural perspective is on developing meaning as a social

construct negotiated by writers and readers through the medium of text.

Smagorinsky (2002) developed a social cultural perspective from his research and the use of think-aloud protocols. According to Smagorinsky, the writer initiates and sustains written discourse, then elaborates text to make it meaningful to the reader. The text produced is the medium of communication, not just a composition. Writers and readers interact as they have reciprocal roles in written discourse.

Smagorsinky's conception of the composing process was based on Vygotsky's theory that learning occurs between people as a communicative process. Meaning is constructed through collaborative activities, not just from teacher to student. Learning is a social activity which occurs in a community of learners and language becomes the primary medium through which learning occurs. Smagorinsky's model draws on Vygotsky's belief in that learning takes place in a zone of proximal development (ZPD). This means that teachers should extend beyond what the students can do without assistance, but still link to what students already know. With writing, there is interaction of language between novice and more expert writers to communicate ideas and understand knowledge. Negotiations continually occur between the writer and reader of the text, as writing is a reciprocal process.

College Writers

The cognitive process writing models of Beaugrande (1984), Flower and Hayes (1980), Hayes (1996), Scardamalia and Bereiter (1987), and others provide a snapshot of the writing process as well as evidence that expert writers plan, translate, and revise throughout the entire process of composing. Are these factors also present in the writing

of college students? Do these students possess the necessary skills to meet the writing demands of college courses? Over the years, most research has focused on the finished compositions of younger students, with few studies on the writing process of adult writers. This section focuses on the writing processes of college students, including college students with LD.

Composing Behaviors of College Writers

Since the 1970's, investigators have focused on analyzing the writing processes of college students. There have been attempts to examine both what students write and how they go about the process of writing. The studies emphasized writer-based, not reader-based processes. One of the first and most comprehensive studies to identify the writing processes of different types of college students was conducted by Pianko (1979). Pianko wanted to determine if different groups of college writers (remedial/traditional, freshmen/adult, and male/female) at a community college followed the same patterns of writing as younger writers and to determine ways of characterizing the writing processes for different types of students. The students wrote five 400-word essays (descriptive, narrative, expository, argumentation, and a topic of their choice) and were interviewed after one of the writing sessions. The researcher examined the processes of prewriting, planning, composing, rereading, stopping, contemplating the finished product, and handing in the assignment. Most of the analysis involved timing: prewriting time, composing time, composing rate, and rereading time. Students' writing, drafts, purpose for writing, and knowledge of ideas were examined as well.

For all students, Pianko (1979) found that the prewriting, composing, and revising

times were short. The mean prewriting time was 1 minute, mean composing time was 39 minutes, and rereading and revising time was 3 minutes. The students did not use an outline, and 55% of the students chose to write a narrative for their own choice of topic. Although no description was given of a remedial, traditional, or adult writer, when comparisons were made, it was found that older, more experienced students were able to reflect more on what they were writing and used more time for prewriting, pausing, rereading, and revising their paper. The interview data revealed that college students often had negative attitudes about writing in that they did very little self-initiated writing, wrote only one draft, and felt that writing was not important. In a study of basic college writers, Perl (1979) found similar negative feelings toward writing when interviewing college students. Pianko (1979) felt these negative attitudes might be partially reinforced by constraints placed on students by the school (e.g., limited time to write in class or little importance placed on writing by teachers).

Perl (1979) specifically analyzed what writers in her class did while they wrote. Perl (1979) considered writing as a process of constructing and discovering meaning. The focus of the study was on the holistic analysis of writing. Five freshman students in a basic writing course wrote four papers (two expository, two personal) while composing aloud. At ten-second intervals, the researcher coded the students' responses into categories of planning, commenting, interpreting, assessing, questioning, writing and talking at the same time, writing silently, writing aloud, reading (words, sentences, entire draft), editing (adding, deleting, changing spelling, changing sentence structure, changing verb form), and periods of silence. Using this elaborate coding scheme, the following

information was obtained: the amount of time spent for prewriting and writing, the strategies used during prewriting, and the behaviors that occurred while each sentence was being written. In addition, information was collected about editing - when editing occurred, the frequency of editing behavior, the nature of editing operations, and when and how often periods of silence occurred.

In her analysis, it was found that the average time spent prewriting was four minutes. Perl (1979) observed that the students began writing with little sense of where they were heading and they commented that they would "figure it out" as they went along. During composing, the students used a recursive feature, a back and forth movement from what they wanted to say, the words written on paper, and their intended meaning. The students did not write in a linear manner, but did stop and edit as they progressed through the composition. The students moved back and forth from what they would write next and what they had already written.

While editing, the students were concerned with various types of revisions: lexicon (spelling, word choice), syntax (grammar, punctuation, sentence structure), and discourse (organization, coherence, audience). Although a variety of items were considered for revision, the students still had syntactic and stylistic errors in their finished papers. On the basis of these observations, Perl (1979) concluded that the students knew little about how to edit their work and only thought of editing as error-hunting. Although this study supported the findings from Pianko (1979), the reliability of the study was limited due to the fact that the only evaluator was also the students' teacher. There was also no reliability verification of the coding scheme used.

Kellogg and Mueller (1989) examined whether word processing would amplify writing performance and at the same time alter the process of writing for college students. In their study, sixteen college students were placed into two groups. One group wrote an essay by hand and the other group used a word processor. The papers were analyzed for quality (content and style) and fluency (words per minute). Kellogg and Mueller (1989) also examined whether there was a change in the organization of cognitive processing during writing under the two conditions. They hypothesized that using a computer would result in more fluent writing and writing of higher quality. They also predicted that processing time and/or cognitive effort would be allocated differently during the writing process in the two writing conditions. They anticipated that planning would be more difficult on a computer whereas translating would be easier on a computer.

While the writers composed, a tone (noise) occurred on a random basis. The writers indicated what they were thinking at the moment by pressing one of four buttons labeled planning, translating, reviewing, or other. The percentage of time that the writers reported for each type of cognitive process provided an estimate of processing time.

The findings did not support all of the hypotheses. Using word processing did alter the pattern of cognitive processes in that planning consumed the most effort and translating the least. In contrast, when writing in longhand, the students exhibited approximately the same degree of cognitive effort in planning, translating, and reviewing throughout writing. Furthermore, word processing not only failed to increase writing performance, it did not influence fluency (words produced per minute of composing time) or processing time. Students in the computer condition made twice as many

spelling errors and had papers rated lower in cohesion. In both conditions, students allocated over half of the processing time to translating and equal amounts of time to planning and reviewing. Across phases, planning time decreased and reviewing time increased. The results indicate that the type of writing tool used affects the allocation of cognitive effort to writing processes.

The results of this study led Kellogg, Krueger, and Blair (1991) to investigate whether composition type (narrative, description, or persuasive) and method (longhand or computer) affected the cognitive effort used in writing processes. Sixteen college students wrote two randomly assigned tasks (test taking and drinking), one in longhand and the other using a computer. It was proposed that narratives would be more compatible and habitual with conscious thinking, as people use narratives to interpret everyday experiences. It was hypothesized that composing a narrative text would demand less cognitive effort and yield a more fluent and coherent composition than a descriptive or persuasive text.

The students in the narrative condition gave a chronological account of an event that involved test taking or drinking. Those in the descriptive condition described a person or place involved in test taking or drinking. Those in the persuasive condition took a stand for or against a proposition regarding test taking or drinking. The students were trained in identifying their thoughts as planning ideas, translating ideas into text, reviewing planning, or other. At random intervals, the students pressed a button labeled "planning", "translating", "reviewing", or "other" in order to indicate their thoughts at the moment.

The results indicated that narrative writing required significantly less effort than

descriptive and persuasive writing. Narrative papers were written with less effort, greater fluency, and with greater coherence than persuasive papers. Descriptive texts were comparable to narrative writing in fluency and cohesiveness. This implies that writing narrative compositions may be easier than writing descriptive or persuasive compositions across the writing processes of planning, translating, and reviewing.

In this study, it was hypothesized that writing on a computer would be more fluent and the resulting document would be of higher quality compared to writing by hand. The results did not support the hypotheses as word processing did not improve the quality of writing nor influence the number of words written. The major difference noted between the methods of writing was evident in how cognitive effort was allocated. When writing in longhand, the writing processes of planning, translating, and revising were equally distributed. When writing on a computer, more effort was required in planning and revising and less for translating. Although the subjects who wrote on a computer spent less time translating, they made more typographical (spelling) errors which ultimately influenced writing quality.

With studies conducted on the writing processes of planning, translating, and reviewing; reviewing (revising) has been the focus of a number of research studies. Research has shown that revising, like the other processes of writing, is recursive (Humes, 1983; Sommers, 1980). Emphasis on revision did not emerge until the 1970s and 1980s when the cognitive models of writing included revision as part of the entire writing process. Revising is a process that can occur anytime during composing (Fitzgerald, 1987; Witte, 1983). Many researchers have investigated the effects of

revision on the quality of final drafts and found that inexperienced writers typically consider revision as a task of just changing words and sentences (McCutchen, Hull, & Smith, 1987), whereas more skillful writers view revising as a more global task involving factors such as purpose, audience, and organization of text (Flower et al., 1986; Wallace & Hayes, 1991).

Most studies conducted on the revising skills of college writers commonly had students write and revise an essay (Beach, 1976; Faigley & Witte, 1981; Sommers, 1980). It was found that writers of different abilities made different kinds of revisions with different frequencies (Hayes et al., 1987). Scardamalia and Bereiter (1986) found that the ability to revise distinguished between expert and novice writers in that more competent writers made more revisions that affected the overall meaning and improved compositions. The more experienced writers revised more frequently and considered revising as a process of making major changes in their drafts (Beach, 1976; Beach & Eaton, 1984; Faigley & Witte, 1981; Sommers, 1980). The less experienced writers typically viewed revising as a process of error correction by making minor word and sentence changes in their writing. Interestingly, in a study by Sommers (1980), the students gave multiple meanings for the word "revision," with the major emphasis being rewording. Overall, the students saw revising as a "housecleaning" task, mostly by deleting text.

Faigley and Witte (1981) used a taxonomy of revision to account for revisions at the global and surface levels. Like previous studies, Faigley and Witte (1981) found that college freshmen (less experienced) made fewer global (meaning-changing) revisions and

more surface (word) changes than more advanced students. Hull (1987) also used a taxonomy to identify revisions in syntax and semantics. She found that when revising their own papers and those of others, less skilled college writers made more errors and corrected fewer errors in writing than more skilled writers.

The studies reviewed here support the theory that the processes of writing are recursive, with planning, translating, and revising occurring throughout the entire process. Even with focus on specific aspects of writing (outlining or word processing), the composing process was not significantly altered.

Limitations of studies

Although the results of these studies support those of other researchers, the limitations of the studies must be taken into account when interpreting the results. Several researchers (Beach, 1976; Pianko, 1979; Perl, 1980) raised concerns about the small sample size in their studies, how the subjects were selected (Hayes et al., 1987), and the use of one's own students as subjects (Perl, 1979). The studies also imposed artificial constraints on the students in that they were only give a limited amount of time to write. This was also a concern in a study by Cooper, Cherry, Copley, Fleischer, Pollard, and Sartisky (1984). In their study, they indicated that a study of writing processes should allow participants ample time to write before drawing any definitive judgments about the process of writing. Flower and Hayes (1980a) also expressed concerns about the artificiality of the writing situation in their study and suggested that this could be one reason why inexperienced writers in their studies did not demonstrate higher levels of planning. Sommers (1980) recommended permitting students to select topics ahead of

time and encourage them to plan as they normally do. A more realistic writing situation might bring about a more precise view of a writer's composing process. In addition, the setting of the studies varied widely from a small community college to a four-year university. Replicating the studies and generalizing results with the same type of students in a similar setting would be extremely difficult, even more so with studies that do not include specific subject selection criteria.

Composing Skills of College Students with Learning Disabilities

Research on the composition skills of college students with LD is limited in number and scope. The few available studies focused on the mechanical aspects of writing process, such as the number of words written or the number of spelling and grammatical errors; with even fewer studies that focused on the content of writing. Examination of whole-text writing patterns of college students with LD is much less common. Studies typically contrasted types of writers (college students with LD and without LD) in terms of their written product, but the examination of writing processes was rare. In most of these studies, students wrote an essay and then a holistic scoring guide or analytical scale was used to evaluate their papers. However, these methods provide no information regarding the relationship between the product and process of writing. The majority of these studies analyzed writing in terms of frequency counts, such as sentence length, number of sentences written, and T-units. The primary approach was to count and compare the writing errors (error analysis) made by students with and without LD. The earliest studies using this approach were conducted by Gregg (1983), and Vogel and Moran (1982).

Gregg (1983) and Vogel and Moran (1982) used T-unit analysis in their study of writing. The t-unit had been the major method used to explore written syntactic maturity. They defined a t-unit as a clause plus any subordinate clause or nonclausal structure that is attached to or embedded in it. These researchers also analyzed students' writing with additional measures as they argued that t-unit analysis was not sensitive or broad enough for identifying all types of error patterns. They noted that t-unit development occurs slowly, making it difficult to document statistical differences across ages and between groups.

Wiig and Fleischman (1980) agreed with this observation. They indicated that investigations of the syntactic abilities of college students with LD could include t-units used, but that more was needed, such as students' knowledge of the rules of relativization (clauses using the words who, whose, and which). Gajor (1989) and Gajor and Harriman (1987) also recommended that other measures be used in addition to t-unit analysis, such as the number of different words used in a composition. They concluded that the number of different words in a composition was the best predictor of holistic ratings of compositions. Gajor (1989) found that in comparison to students without LD, students with LD were not as fluent in word production or in the number of different words used in their compositions. Using only holistic ratings, students with LD often received lower scores on compositions (Plato, Zelhart, & House, 1995).

Vogel and Moran (1982) analyzed the essays of college students with and without LD. The papers were scored using a holistic scale. In addition, measures were collected on writing mechanics (spelling, punctuation, capitalization), word selection, spelling,

complexity, variety of sentence structure, and t-units. They found that the essays of students with LD were weaker in development, organization, style, and mechanics than those produced by students without LD. Using an additional measure, the Diagnostic Evaluation of Expository Paragraphs (DEEP), the students with LD performed significantly lower on mechanics, spelling, punctuation marks, and compound/complex sentences than their non-LD peers. The best scores for students with LD were lower than the average score of students without LD. Vogel and Moran (1982) concluded that sentence production errors, in particular, impacted the written communication competency of students with LD. They also noted that the numerous problems with the mechanical aspects of writing frequently inhibited student success with higher-order demands of planning and organizing text.

Gregg (1983) expanded on the research of Vogel and Moran (1982) by including a sentence combining test to compare error patterns of writers with LD with those of basic and nondisabled writers. Gregg (1983) specifically included basic writers, as prior studies only differentiated between good and poor writers, but did not consider if basic writers would differ from writers with LD and nondisabled writers. Gregg (1983) hypothesized that basic writers' problems come from inadequate instruction, whereas the errors of students with LD reflect cognitive processing deficits.

Holistic scoring and t-unit analysis were used to evaluate expository essays. Significant differences were found in the frequency of dropped endings, spelling, and punctuation between the writers with LD and the basic and regular writers. On the sentence combining test, the students with LD had difficulty manipulating linguistic

structures and scored significantly lower in their ability to combine kernel sentences. Gregg (1983) found that the ability to manipulate linguistic structures differentiated students with LD from basic writers. She argued that this would lead to problems with writing fluency and coherency. She concluded that college students with LD might require different instruction in the areas of aided composition and sentence combining.

Vogel (1985) compared the complexity of essay writing of college students with and without LD. Sixty-six college students with and without LD wrote an expository essay. The essays were then holistically scored and ten variables from a computerized assessment program, the Syntactic Density Scoring (SDS) guide, were used to analyze papers. The measures employed in this study were the number of words and subordinate per t-unit; word length of various types of clauses; as well as the number of modals, prepositional phrases, adverbs of time, and verb forms used.

The two groups of students did not differ significantly in their holistic scores nor in T-unit length, but they did differ in productivity (students with LD wrote shorter papers) and they used fewer prepositions and gerunds per t-unit than students without LD. They also had more word omissions and used inappropriate parts of speech more often than the students without LD. Vogel (1985) concluded that SDS and T-unit analysis might not be appropriate for assessment, as they may not be sensitive enough to uncover differences in writing performance of students with and without LD. Vogel (1985) also suggested using several writing tasks and measures to analyze syntactic maturity, as syntax may vary with task and audience.

Gregg and Hoy included three specific groups of students in their 1989 study.

They wanted to obtain information about how three types of college students (normally achieving, LD, and underprepared) produced text, as they thought a diverse student population might require different instructional strategies. They were especially interested in text coherence because an essay lacking in text coherence would be more difficult for a reader to comprehend.

The three groups of students wrote narrative essays that were scored with a holistic rating scale. The students with LD demonstrated the greatest discrepancy between comprehension and written production. They appeared to understand text structures, but experienced difficulty in the production process. However, the results of the coherence rating measure indicated that students with LD understood the principles of organization of written text better than underprepared students.

Recently, Gregg, Coleman, Stennett, and Roberts (2002) conducted a large research study to examine specific linguistic features commonly found in academic (expository) writing and to analyze the relationships of these features among four groups of college students: LD, ADHD, LD and ADHD, and with no disability. The students wrote an essay that was scored holistically. The group without disabilities had significantly higher scores than the other three groups. Of the other three groups with disabilities, the group with LD and ADHD had significantly lower scores than the students with LD or ADHD. This indicated that a dual disability may place this group of students at a greater risk for experiencing difficulties for producing quality written text.

Sixteen categories of linguistic features (i.e., tense markers, place and time adverbs, questions, passives, adjectives) were also analyzed in the students' papers. Frequency

counts, not error counts, constituted the data. Significant differences were found in word count and word forms used by groups of students with disabilities and the group without disabilities. Even with spelling, punctuation, and grammar errors eliminated, the writers with disabilities still scored significantly lower than writers without disabilities. The resulting data supported the hypothesis that writers who were fluent in word usage and syntactic structures were better able to produce quality writing. The research showed a high correlation between word count and writing quality. This suggests that writers whose cognitive and linguistic disabilities affect word usage and complexity might be at risk in terms of the quality of their writing.

Summary

The studies reviewed in this section provided information regarding the writing ability of college students with LD in comparison to students without LD, specifically in areas of weaknesses as identified by the number of errors. However, little is known about the actual processes students with LD use to write. The methodologies used to write the essays may not have captured students' normal writing, as most of the tasks were based on obtaining writing samples under highly artificial conditions.

The conclusion researchers drew from past research was that there is insufficient understanding of the writing processes of college students with LD. This was reinforced in two literature reviews of studies with college students with LD (Hughes & Smith, 1991; Li & Hamel, 2003). In both reviews, the researchers expressed their disappointment in only locating a few studies investigating the writing of college students with LD in general, with the tendency for the research to focus primarily on the

mechanics of writing. No studies were found that focused on higher-order concerns of writing, such as planning and organizing. Li and Hamel (2003) urged future researchers to conduct studies to identify the cognitive processes college students with LD use with text production so that instructional interventions can focus on the real issues of writing difficulties.

There are obvious problems in these studies, not only with comparing the characteristics of the written text produced by students with LD with other students, but also with methodology and measurement. These include the use of different measurement instruments and identification procedures for identifying students with LD, although most of the studies reviewed indicated that the Wechsler Adult Intelligence Scale (WAIS and WAIS-R) was used to verify a student's normal intelligence and a discrepancy between intelligence and achievement. This raises concerns as there are still inconsistencies among definitions, diagnostic criteria, assessment procedures, and educational policies. There is no precise definition of LD used. LD is a global term and is still misunderstood as the definition used includes both homogeneous (difficulty in learning) and heterogeneous (symptoms and levels of severity) characteristics (Lyon, Gray, Kavanagh, & Krasnegor, 1993). This makes operationalization of the definition of LD difficult.

There have been different methods used for determining LD, with the most commonly used definition being a discrepancy between ability and achievement (Lyon et al., 1993). Regardless of how a discrepancy is determined, it is still a judgment call of how to identify an unexpected underachievement. This is especially challenging with adults due to the 'hidden' nature of LD. Many adults with LD tend to demonstrate difficulties with

all higher order conceptual/linguistic tasks, showing difficulties in both processing and perception (Smith, Dowdy, Polloway, & Blalock, 1997). Although researchers need to view each student as an individual in terms of strengths and weaknesses, a composite picture is needed of students with LD who are being served in college programs in order to develop appropriate instruction. This is because only analyzing students' final written products does not assist with identifying those areas of the writing process that need instruction.

In order to provide proper writing instruction to college students with LD, there needs to be a better understanding of the writing processes they use. When developing a process-oriented approach to writing, it is essential to interpret differences in text quality resulting from differences in writing processes or cognitive activities. As most college writing instructors do not have training about learning disabilities, it is important to understand how students with LD write in order to provide better instruction, and provide these students more opportunities to be successful. Think-aloud protocols have been used successfully to identify the writing processes people use. To better understand the writing processes used by college students with LD, my study will employ think-aloud protocols. The methodology of think-aloud protocols is examined next.

<div align="center">Think-Aloud Protocol Analysis</div>

One method used to gather information of cognitive processes is verbal reporting. Thinking aloud is one of several process-tracing methods that allow researchers to observe and record writers' behaviors. Bereiter and Scardamalia (1983) and Ericsson and Simon (1980) identified four types of tracing methods: behavorial protocols (record what

subjects do while they perform a task), retrospective reports (subjects are asked to tell how they performed a task after it has been completed), directed reports (subjects perform a task and only report on specific aspects of the task as instructed by the researchers), and think-aloud protocols (subjects perform a task and report on anything they think about while performing the task). Think-aloud protocols have been used extensively in research and were found to be a "valuable and thoroughly reliable source of information about cognitive processes" (p. 247) (Ericsson & Simon, 1980). Verbal reports are recognized as major sources of data on subjects' cognitive processes while performing tasks and have become a standard method of research (Ericsson & Simon, 1980).

Think-aloud protocols were first used by cognitive psychologists to identify the psychological processes and strategies used in a problem-solving task. Think-aloud protocols were first introduced with students with LD in the area of reading comprehension. In other areas, research studies have shown that the think-aloud technique is effective as a diagnostic tool for assessing the processing difficulties of students with LD (Short, Cuddy, Freibert, & Schatschneider, 1990). Short et al. (1990) found verbal protocols could be used as instructional tools to design interventions and to model effective learning strategies. Likewise, Pressley and Afflerbach (1995), in their study of reading, found verbal procotols revealed the dynamics of comprehension difficulties, such as inferring meaning from a text. The protocols also provided information about a reader's monitoring of a text (how they proceeded and comprehended a text). In their study, Pressley and Afflerbach (1995) found patterns of

constructing meaning, monitoring, and evaluating before, during, and after reading. They found that good readers overview the text, formulate hypotheses about what the text will be about, use a variety of strategies to monitor and remember their reading, use prior knowledge of the world to what they read, and evaluate as they read a text. In addition, Pressley and Afflerbach (1995) found that even though the process of reading is complex, there is orderliness and continuous interaction of the process. Think-aloud protocols have provided evidence that such a method can make a writer's thoughts concrete while composing and aid in answering such questions as what is the writer is thinking, as well as what patterns are revealed in the writer's thoughts during composing (Bereiter & Scardamalia, 1983). In this study, I asked participants to think aloud while composing in order to tap into information about their approach to a writing task.

When obtaining think-aloud protocols for writing, subjects are instructed to verbalize what they are thinking while they are composing. A distraction-free room is needed as the subjects are videotaped or audiotaped. The researcher provides the subjects with a practice exercise to give them experience in verbalizing. Examples of practice exercises include explaining how to solve a math problem, giving directions to a place, or explaining how to draw a figure. Additional instructions are provided as needed, as well as pen and paper or computer access. The subjects are also informed of the time limit of the task.

It is the researcher's responsibility to remind the subjects to verbalize if they fall silent. It needs to be emphasized that the subjects are only to report their thoughts while composing, not to be concerned if their answers are right or wrong. While the subjects

are writing, the researcher observes and takes notes. All the written materials and verbal reports become data to be analyzed. The verbal reports are then transcribed into written form (protocols). The researcher uses the protocols and other available data to assess the writing processes underlying text production.

There have been concerns whether verbalizing alters the writing process in any way, since most people do not verbalize while they write. This was the focus of a literature review of Ericsson and Simon (1980). In their review of over 30 studies, they found that thinking aloud did not change the structure and course of the task processes, although it might slightly decrease the speed of performing a task. When subjects articulated information that was already available to them, then thinking aloud did not change the course and structure of the task being performed (Ransdell, 1995). In their review of studies that used think-aloud protocols, Ericsson and Simon (1980) found that the research results did not indicate that the physical act of speaking affected the cognitive processes involved with writing.

Ericsson and Simon (1980) identified two types of verbalizations: concurrent (information is verbalized at the same time the subject is attending to a task) and retrospective (subject is asked about cognitive processes that occurred at an earlier time). Ericsson and Simon (1980) noted concerns that verbal reports might have the greatest effect on performance when the verbalization is concurrent with the task being performed. However, they found retrospective reports produced many more inconsistencies between verbalization and task due to the time lag between task performance and reporting. The failure of subjects to report some information, however,

did not demonstrate the uselessness of verbal reports. Inaccurate or incomplete reports could be the result of requesting information not related to the task, so think-aloud data should reflect exactly what is being thought about (Russo, Johnson, & Stephens, 1989). Ericsson and Simon (1980) did find that the verbalizations of highly skilled individuals were less complete than those of less skilled writers. This was due to some procedures were so automatic for the highly skilled writers that they did not allocate cognitive attention to them while completing a task. Thus, these reports are a valuable source of information about writing and cognitive processes (Smagorinsky, 1989). Ericsson and Simon (1980) concluded that verbal reports are just as consistent as other types of empirical data. Thus, concurrent think-aloud protocols were used in this study to obtain verbal reports of cognitive processes participants used while composing and not to ask the participants to reflect on their writing at a later time when recall would be greatly diminished or flawed.

One advantage of think-aloud protocols is that this method provides researchers with a detailed record of what happens in a writer's mind during the act of composing. Protocols provide direct evidence about the processes writers use and allow researchers to detect processes that are less visible with other methods (Hayes & Flower, 1983). Ericsson and Simon (1980) found no evidence that think-aloud protocols changed the course the verbal reports and task outcomes. Ericsson and Simon (1980) also found that thinking aloud did not alter syntactic complexity or quantity of words written. They recommended using writers' verbal protocols in conjunction with other data, such as directed retrospection and interviews, when constructing a detailed description of the

composing process. Bereiter and Scardamalia (1983) also suggested using verbal protocols, written products, interviews, and videotapes of subjects while they wrote, as these procedures complement each other.

Even though some writers are not comfortable composing aloud and not all activities may be verbalized, many researchers still supported the use of protocols as a means to differentiate between what experienced and less experienced writers attend to when they write (Ericsson & Simon, 1980). Consequently, protocols can be a source of information about the strategies a writer uses to solve the unique problems presented by each writing task. Information gained from the protocols can be used as a foundation for teaching inexperienced writers how to write.

Protocols have frequently been used to describe the activities a subject employed in performing a task in areas like writing. In 1971, Janet Emig conducted a groundbreaking study that looked at how a written product was created, instead of just judging the final product. She pioneered the use of protocols in the study of writing. In her study, eight high school seniors composed orally while simultaneously composing on paper. Emig (1971) made observations and notes while recording the students' composing processes. After the writing task was completed, she interviewed the students about what and how they wrote. She found that the use of outlines made no difference in the quality of writing produced by students. This study led to a number of future studies that analyzed writing processes as well as the development of various models of cognitive processes of writing (Flower & Hayes, 1980a; Scardamalia & Bereiter, 1987).

Protocol analysis was created to collect writers' comments on the writing process

while they were actually writing. With thinking aloud, writers are asked to verbalize all

their thoughts, no matter how trivial they may seem. The data from the think-aloud

sessions, along with the writer's essay(s), are examined in detail for evidence revealing

the processes the writer uses to create his/her essays, as well as his/her ability to deal with

the constraints imposed by the writing task (Flower and Hayes, 1981a). The data are rich

with evidence and require no self-analysis on the part of the writer. The protocols reveal

the products of cognitive activities rather than the cognitive activities themselves. The

writing processes used during composing and identified from the protocols are then

matched with the writer's notes and text. Thus, Hayes and Flower (1987) used thinking-

aloud protocols extensively and supported their use in that:

> Protocol data are shown to be a powerful means of both testing and building
> theories – not merely theories about simple processes, but theories about
> higher-level processes as well (p. 182).

It was the use of protocol data that led Flower and Hayes to develop their model of the

composing process. With their work in reading, Pressley and Afflerbach (1995) also

supported the use of protocol analysis as protocols could:

> Provide data on cognitive processes and reader responses that otherwise
> could be investigated only indirectly; second, verbal reports sometimes
> can provide access to the reasoning processes underlying sophisticated
> cognition, response, and decision making; third, verbal reports allow for
> the analysis of affective processes of reading in addition to (or in relation
> to) cognition processes (p. 4).

Think-aloud protocol analysis provides much information about the planning, goal

setting, decision making, and revising that make up a large part of a writer's composing

process. For instance, Flower and Hayes (1981a) found that writers identified major

goals, they then proceeded to identify subgoals to help them accomplish their major

goals. A writer's pauses indicate a variety of planning types – planning goals, planning what would come next in a text, and planning to revise their text (Schumaker et al., 1984). Protocols can reveal the difficulty writers have in framing their writing at both the global and sentence levels and not just from an inadequate representation of the rhetorical situation and problem (Flower & Hayes, 1980a). This type of analysis aided researchers in identifying cognitive processes used by writers. This would allow the researcher to gauge the amount of attention provided to planning, translating, and reviewing.

Having concerns about the intrusiveness of protocols, Schumaker et al. (1984) videotaped students while they composed, but without their thinking aloud. Each student reviewed the videotape with the researcher after the session. However, before this occurred, the students were shown a list of activities they possibly could have used during writing. Using the list and videotape, students made specific observations about the mental activities they used during composing with a high degree of certainty. With this method, the researchers indicated they were able to determine which group of students paused longer as well as the purpose of their pausing.

Besides claims that verbal protocols are intrusive, protocols have especially been singled out as being incomplete and conducted in unnatural conditions (Ericsson & Simon, 1980). However, protocols are more complete than most other methods for identifying subprocesses of the composing process and the organization of these subprocesses. With their rich data, protocols have much promise for research. Even though protocols may be relatively incomplete, it is the investigator's task when analyzing a protocol to take the evidence provided by protocols, along with knowledge of

the task and human thought processes, to develop a model of the underlying psychological processes subjects use in performing a task (Hayes & Flower, 1980a).

Cooper and Holzman (1985) contend, however, that cognitive processes in writers are ill-defined and too complex for protocols to be used to study these processes. They stressed that so much of what occurs during writing does not get verbalized. Nisbett and Wilson (1977) expressed similar concerns in that people can not directly observe their cognitive processes, nor can verbal reports be verified. Again, it must be understood that only the results (products) of content and mental activities are available at the conscious level. Hayes and Flower (1983) have acknowledged the criticisms about the use of verbal reports in that people are not conscious of their cognitive processes and can not report about them. Hayes and Flower (1983) and Ericsson and Simon (1980) have also emphasized that verbal protocols are successful for only those aspects of writing that a writer is able to articulate.

Regardless of these criticisms, think-aloud protocols are still the best method researchers have for analyzing the writing processes of student writers. Previous research studies have shown that protocols are rich with data and can provide evidence that distinguish the writing processes of experienced and inexperienced writers. Think-aloud protocols in particular can yield a dynamic assessment of writing performance. In their review, Ericsson and Simon (1980) concluded that people can self-report the contents of short-term memory and that there is enough validating data to accept that verbal protocols do reflect actual composing processing.

Model and Theoretical Basis of Study

Writing research methodologies have followed patterns established by cognitive science and educational psychology (Sitko, 1998). The most frequently cited model of composing processes is the model developed by Flower and Hayes (1980a). This model was one of the two theoretical bases for this study. The processes and subprocesses specified in their model were studied via think-aloud protocols, where students thought out loud while they composed. I examined how frequently students employed the components in the Flower and Hayes model (1980a) as they composed.

Skilled and less skilled writers have differed in their activation and deployment of the components in the Hayes and Flower's model (Benton et al., 1984; Flower & Hayes, 1980a; Hayes et al., 1987; Scardamalia & Bereiter, 1987). For example, Zimmerman and Risemberg (1997) found novice writers were more likely to use the knowledge-telling strategy of Scardamalia and Bereiter (1987) in that these writers exhibited little recursiveness during the writing process (little rereading, few revisions). Awareness and identification of such differences has both guided instructional design and research. In this study, I examined college students' use of the following strategies identified in the Flower and Hayes's model: planning (generating ideas, organizing ideas, goal setting), text generation (translation), monitoring and reviewing (evaluating and revising).

The other theoretical basis of my study was self-regulation. Researchers (Azevedo & Cromley, 2004; Butler & Winne, 1995; Flower & Hayes, 1980a) have studied the ways in which people regulate their own cognitive processes. One result of such research was the use of the data from protocol analysis to develop self-regulation models of learning. The

models typically include self-generated thoughts, feelings, and actions used for monitoring and regulating one's cognition while completing a task. Models of self-regulation learning include the assumption that students can actively regulate their behavior and through various regulatory processes, achieve their goals and perform better (Zimmerman, 1989).

Self-regulated learning is an interaction of personal, behavioral, and environmental processes (Zimmerman, 2000). It is cyclical and adaptive in nature. It is a goal-oriented, self-directed process of planning and reflection that occurs by monitoring and regulating one's learning including cognitive, motivational, emotional and social factors (Butler & Winne, 1995; Zimmerman, 1998). Proficient learners are self-regulating and they stand out from their peers by the goals they set, the accuracy of their self-monitoring, and the resourcefulness of the strategies they use (Zimmerman, 1998).

Self-regulated learners develop internal procedures to monitor their planning, composing, and revising. It is a process by which learners transform their mental abilities into academic skills through self-generated behaviors needed to achieve goals (Zimmerman, 1998). Self-regulated learners are able to set goals for extending knowledge and sustaining motivation (Winne, 1995). The monitor in the model of Flower and Hayes (1980a) and executive control in the models of Scardamalia and Bereiter (1987) have been used to describe these processes during writing. Monitoring is at the center of self-regulated task engagement as it is the cognitive process that assess the progress made toward goal setting and achieving goals (Winne, 1995). The cognitive demands during monitoring can be overwhelming if the number of cues and strategies is

enormous. Proper instruction and feedback can support monitoring by coordinating the amount of information provided with student knowledge about tasks and strategies (Winne & Butler, 1994). The specific monitoring skills analyzed in this study included monitoring content, process control, strategy identification, and self-questioning.

Research has been conducted to understand how students learn in order to provide assistance in the development of critical processes such as goal setting, time management, learning strategies, self-instruction, self-evaluation, as well as self-motivated beliefs like self-efficacy (Zimmerman & Risemberg, 1997; Zimmerman, 2000). Students need to develop and use self-regulatory processes so they can succeed in school. This is important because self-regulated learners are aware of their own knowledge, beliefs, motivation, and cognitive processing and can draw upon their knowledge and beliefs to interpret task requirements, then set goals and apply strategies to produce results (Butler & Winne, 1995). How students interpret tasks influence the goals they set and how they engage in the task.

Researchers have noted that college settings place increasing demands on student autonomy and independence, thus, requiring more self-regulation of self-monitoring and problem-solving as college students must deal with frequent multiple tasks (Rubin, McCoach, McGuire, & Reis, 2003). For example, Vanderstoep, Pintrich, and Fagerlin (1996) found that knowledge, motivation, and self-regulation distinguished high and low achieving college students. In addition, Zimmerman and Bandura (1994) found differences in self-regulatory subprocesses between skilled and less skilled college

writers, especially in the areas of planning and revising. The skilled writers had more specific goals, higher self-efficacy, sustained more attention and motivation, and monitored their work more closely. This influenced writing course grades and the higher the self-regulation and self-efficacy, the more confidence the students had about their academic achievements. The differences noted indicate that processing metacognitive knowledge and skills are not sufficient as a writer must also be able to self-regulate the use of such knowledge (Zimmerman, 1995).

This study is exploratory in nature and a first in focusing on the writing processes of college students with and without LD through the use of think-aloud protocols. It used the well-established theory of Flower and Hayes (1980a) that writing is a recursive process of planning, translating, and reviewing. It is important to identify the self-regulation processes college students use while writing as writing requires extensive self-regulation and even though these processes are complex, they are learnable. The self-regulation processes of planning and revising (as defined by Flower & Hayes) college students do while writing have already been identified as the most important forms of self-regulation writers need (Zimmerman & Risemberg, 1997). The writing process theory of Flower and Hayes (1980a), along with an emphasis on the processes of planning and reviewing, was examined with the use of self-regulatory variables identified by Azevedo and Cromley (2004). This is crucial in order to identify how college students with and without LD approach a writing task, not only analyzing the final written products. This would aid instructional practices as too often college students with LD as they construct knowledge and beliefs based on a long history of negative and often

frustrating experiences with writing (Butler, 1995). Such beliefs affect how students approach and monitor tasks (Butler & Winne, 1995).

To date, no studies using verbal protocols have been conducted with college students with LD. Doing so may present a better understanding of college students' writing abilities. My study used think-aloud protocols to infer the writing processes of college students with LD. College students with and without LD demonstrated their understanding of the writing process while carrying out a writing assignment typical of a college writing course. Self-regulatory variables were used to identify specific areas (planning, monitoring, and reviewing) that college students with and without LD used while composing. Correlations between self-regulatory variables and holistic writing scores were also calculated to determine the influence self-regulation (monitoring) has on the writing process.

As more and more students with LD are attending college, it is vital that researchers and educators understand the writing processes these students use so that they may receive instruction in those specific areas of writing identified as being problematic. As evident in this review chapter, traditional college writing instruction has focused on the product of writing rather than the processes of writing. Research is needed to provide researchers and teachers with better information regarding the writing processes of college students with LD.

<div align="center">Summary</div>

The purpose of this review was to examine literature related to the writing processes of college students with LD. Cognitive models of writing were presented and studies

reviewed to identify the complexity of the composing behaviors of writing, especially those of college writers. In addition, research incorporating protocols analysis to identify the processes of writing was examined. Questions were raised in this review regarding the writing processes of college students with LD. Further investigation is needed to identify the processes college students with LD use specifically for planning, translating, and reviewing.

Chapter 3

Method

The purpose of this study was to examine the writing processes of college students with and without learning disabilities. This study involved an analysis of how both groups of students compose an essay on a computer. This included asking participants to think aloud while engaged in each of these processes. The data were correlated with students' performance scores on the resulting writing products. The data collected were then used to identify the writing processes college students with and without LD use as they write.

Two groups of college students participated in the one hour think-aloud protocol study. The students were videotaped while they composed an essay on a computer. The written products were analyzed for quality and length. In addition, the amount and quality (level, types) of planning and revising done with the written product were analyzed. In addition, the amount and type of self-regulatory behaviors used during the writing process were investigated. Finally, correlations were conducted to determine relationships between holistic score and self-regulatory behaviors. This section includes a description of the setting and participants, measures, procedures, and analysis.

Setting and Participants

Setting

The study was conducted at a two-year postsecondary institution in the metropolitan Washington, DC area. The college has more than 100 degree and certificate programs

and serves nearly 50,000 full- and part-time students. The Disability Support Services (DSS) department on this campus provides students with disabilities with services, accommodations, and programs in compliance with the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. The DSS office personnel assist students with disabilities with counseling, registration, classroom and testing accommodations, assistive technology, and the College Access Program.

The College Access Program (CAP) is a developmental academic program specifically designed for eligible students with specific language based learning disabilities. The College Access Program is an "intensive one- to two- semester program that helps students with LD develop reading and writing skills, learning strategies, and study techniques they need to function independently, both in the classroom and in the job market." (College Access Program brochure, 2001). To be eligible for the College Access Program, students must meet the following criteria: diagnosis of a specific learning disability as the primary disability, average or above average intellectual ability, reading comprehension level of at least sixth grade, and absence of an emotional or behavioral disorder as the primary disability (College Access Program brochure, 2001). The students in CAP complete an integrated group of courses in English, reading, and study skills. These classes are smaller than typical classes at this institution, use individualized and small group instruction, and feature a multi-sensory approach to learning.

Students

Ten college students with LD and 10 college students without LD enrolled in developmental and regular English classes, respectively, participated in the study. The following background information was collected on the students with and without LD: age, gender, ethnic background, primary language, time lapsed since high school, and enrollment in a developmental writing course, English 002, for students with LD and enrollment in the first credit English course, English 101 for students without LD. The student characteristics are listed in Table 1 (p. 79). In addition, all subjects, with and without LD, demonstrated that they possessed basic word processing skills through a text editing task. This task is explained in the Materials section. The student characteristics are listed in Table 1 (p. 79).

To verify their eligibility to participate in the study, the students with LD had to be accepted into the college's CAP program and had previously submitted documentation of their LD that met the institution's guidelines. The students were responsible for providing the Disability Support Services office with medical and educational documentation to verify the presence and impact of a disability. The guidelines this institutions uses to determine eligibility for services include a psycho-educational or neuropsychological evaluation of a specific learning disability by a licensed professional. All testing must be current, in most cases within the past three years, following guidelines similar to those of major national testing agencies (Educational Testing Service, 1998). The assessment battery should include measures of:

Table 1

Student characteristics.

Variable	Students with LD	Students without LD	% of total
Number	10	10	100
Gender			
Male	7	5	60
Female	3	5	40
Age			
Range (in years)	18-21	18-46	100
Mean	19.20	23.70	
SD	1.23	9.74	
Ethnicity			
White	6	2	40
African-American	1	3	20
Hispanic	2	1	15
Other	1	4	25
English-p. language			
Yes	8	7	75
No	2	3	25
Time since high school			
1 year	4	4	40
2 years	3	1	20
3 years	2		15
4 or more years	1	4	25

1. Aptitude: average or above average broad cognitive functioning (IQ scores of 85 or above) must be demonstrated with an individually administered intelligence test administered during high school, such as the Wechsler Adult Intelligence Scale (WAIS-R, WAIS-III) (Wechsler, 1981).

2. Academic achievement: a comprehensive academic achievement battery, such as the Woodcock-Johnson Psycho-Educational Battery-Revised (Woodcock, 1997) documenting achievement deficits related to potential. This includes current levels of academic functioning in relevant areas, such as reading, oral and written language, and mathematics.

3. Clinical summary: a diagnostic summary providing a diagnosis of a specific learning disability, interpretation of testing data, and indication of how pattern in cognitive ability, achievement, and information processing reflect the specific learning disability, and recommendation of specific accommodations based on disability-related deficits.

All students are placed in developmental or regular English classes based on their scores on either the ACCUPLACER test (published by the College Board), the SAT (Stanford Achievement Test), or the TOEFL (Test of English as a Foreign Language). The test is a computerized test designed to provide placement and advising information. The ACCUPLACER has three sections: reading comprehension, sentence skills (sentence structure and grammar), and mathematics (arithmetic to college-level mathematics). It is a self-paced, untimed test given on a computer. The test is adaptive in that it determines which questions will be given next based upon previous answers. The college uses the Total Right Score and has determined specific cut scores used for placement decisions.

Reliability data were obtained through the test-retest technique. The ACCUPLACER test has test-retest reliability coefficients ranging from .76 to .90 for the reading test and .73 to .83 for the sentence skills test. A large scale study of predictive validity of

ACCUPLACER test scores and students' subsequent course grades was conducted across 50 institutions. The median correlations of test scores with grades were: Reading Comprehension (developmental reading), .18, Sentence Skills (developmental English), .15, and Sentence Skills (college English), .20. (Accuplacer Manual, 2003).

The validity data of the ACCUPLACER tests were extremely low. The researcher contacted the College Board to inquire about validity data regarding course placement, but none were located. Thus, the researcher decided to use standardized test scores for determining group eligibility, specifically Woodcock-Johnson Psycho-educational test scores for students with LD and SAT or TOEFL scores for students without LD (Table 3). For four participants from English 101 classes, Accuplacer scores were the only source of placement information available. To qualify for the first credit freshman English course, EN 101 – Techniques of Reading and Writing, students needed SAT verbal scores of 550-599 or TOEFL scores of 575 or above (paper) or 231 or above (computer). If students do not have the necessary qualifying scores, then they were placed in developmental reading and/or developmental English courses. The qualifying scores of the subjects in this study are listed in Table 2 (p. 82). All scores for the students without LD are from admissions placement tests and the scores for students with LD are from their admission placement tests for the College Access Program.

The students with disabilities were recruited from the second developmental English classes (EN 002 - Basic English II) in the College Access Program (CAP). These are sections of English 002 reserved for students with LD. The students were freshman

Table 2

Qualifying Scores of Students

Subject number	Students with LD WAIS Verbal, Performance, and Full range scores	Students with LD W-J range of standard achievement scores	Students without LD SAT, TOEFL, other
S1	89,90,88	69-101	
S2			SAT: 580
S3			TOEFL: 575 (paper)*
S4	105,111,108	50-104	
S5			SAT: 570
S6			SAT: 570
S7			TOEFL: 253 (computer)
S8	72,99,85*	24-77	
S9	99,98,99	59-120	
S10	76,99,86*	59-86	
S11			Accuplacer: 91
S12	114,87,101	77-111	
S13	102,91,97	69-101	
S14	95,111,103	80-107	
S15			SAT: 580
S16	113,102,108	74-115	
S17			Accuplacer: 90
S18	96,83,90	90-113	
S19			Accuplacer: 106
S20			Accuplacer: 93

* English is not the primary language for three students.

students taking EN 002 for the first time. The course description in the 2004-2005

college catalog is

> The second-level developmental course, designed to improve writing skills,
> emphasizes writing multi-paragraph essays, including additional study of sentence
> structure, grammar, and punctuation. Successful completion of the course includes
> passing the EN 002 Competency Exam. Intended for native speakers of English who
> need further preparation prior to taking credit courses in English (p. 203).

The students without disabilities were recruited from the institution's regular credit

English classes (EN 101 - Techniques of Reading and Writing). The students were

freshman students taking EN 101 for the first time. The course description in the 2004-

2005 college catalog is

> Experience in using the essential tools of communication. Selected readings analyzed
> intensively for both meaning and evaluation. Weekly written assignments correlated
> to develop logical thought in correct and effective expression." (p. 204).

The participants were informed that they would be participating in a study of how

college students write and that they would be paid $35.00 for their participation. The

subjects who agreed to participate in the study signed a consent form committing

themselves to the one-hour session and agreeing to be videotaped. They were also

informed that they would be providing think-aloud protocols as they wrote an essay.

Materials

All materials for this study were field-tested and modified based on the results of field

testing. The following materials were used:

1. Test for demonstrating basic word processing skills: each subject was asked to

   edit a short story that had revision marks. For example, a passage with words

   crossed out, words to be inserted into the text, spelling corrections, sentences to

moved, and words to be capitalized. This task assessed students' skill in using word processing. They were given a printout of a paragraph (with revision marks) and they were instructed to make revisions, save and print the revised file. The subjects needed to insert, delete, and replace text, with 80% accuracy. Each operation the subjects were asked to do was scored as correct or incorrect.

2. Warm-up activity for think-aloud protocols: each subject was asked to think aloud and write briefly on the topic of explaining what college students use the Internet for in their college courses.

3. Expository (explanatory) writing: the following writing topics were evaluated by college students to determine their suitability and the most suitable topic served as the writing stimulus for this study.

   a. Explain how alcohol or drug addiction affects one's physical, mental, and family life.

   b. Explain how students react to the pressure of final examinations.

   c. Explain how democracy is different from other forms of government.

   d. Explain how community service helps different groups of people.

   e. Explain why the Internet is so popular.

   f. Explain why some people are very successful students/workers.

These topics were selected from the researcher's own teaching experience as well as from college texts (Watkins-Goffman & Berkowitz, 1990; McWhorter, 2003). Prior to the field test and the actual study, approximately 100 non-participating students from four English 101 classes were asked to use a Likert-type scale to rank these six topics in terms

of interest, with 1 indicating the most interesting topic, 2 indicating the next most interesting topic, and so forth. The topic with the lowest rating (1) was used in the study. Based on the survey of 100 students, 46 chose the topic "Explain how alcohol or drug addiction affects one's physical, mental, and family life" as their first choice and as the most interesting.

<div align="center">Procedures</div>

The study was advertised in the developmental and regular English classes at the college, as well as on student bulletin boards. The researcher visited several English 101 classes to explain the research study. Interested English 101 students contacted the researcher through e-mail for additional information and to register for the study. All interested English 101 students who contacted the researcher participated in the study. A flier explaining the study was distributed to students in the College Access Program's (CAP) English 022 In addition, the researcher visited the developmental writing course (English 002) in the College Access Program. All students in this course registered for the study on the spot.

This study was conducted in fall 2004 and spring 2005. A classroom with computers was reserved for the writing task and think-aloud protocols. The experimental procedures were applied on an individual basis. Students were informed that they would be paid \$35.00 for their participation. They signed a consent form agreeing to participate in the study as well as agreeing to be videotaped (Appendix A). The session included three activities. First, the participants completed a short, basic word processing task. Participants were provided with a print-out of a paragraph that had revision marks. The

researcher opened the file that contained the paragraph that was to be revised (Appendix B). The researcher gave the following instructions: "Please read the paragraph and make the revisions noted on the hard copy of the paragraph. When you are finished please print a copy of the paragraph with the changes you made." This task determined that the students had sufficient word processing skills (80% accuracy) to complete the task that they were asked to do in the study. All students completed this task with at least 80% accuracy.

The next activity was a warm-up practice activity with think-aloud protocols while writing a short paragraph. The researcher opened a blank word processing document for the students. The researcher gave the following instructions: "Before I ask you to write an essay, we are going to practice with a short warm-up exercise. Please take a moment to write a short paragraph of four to five sentences and think aloud on the topic "Explain what college students use the Internet for in their college courses." I want you to try to say as much as you can about what you are thinking about while writing." The brief think-aloud activity prepared students for the actual think-aloud protocol and writing task. With this brief exercise, all students demonstrated understanding of thinking aloud while composing.

The third activity was the actual writing task. The participants were given the writing topic, scrap paper (for planning sheets, outlines), a dictionary, and a computer disk. The participants were given the following instructions: "It is important to say as much as you can out loud while you are writing, even if it has nothing to do with the task. I realize it is impossible to say everything you are thinking while you are writing, so just try to say as

much as you can. If you fall silent, I will remind you to continue talking. Please try to write as good an essay as you can." The writing topic was "Explain how alcohol or drug addiction affects one physical, mental, and family life." At anytime when a student stopped verbalizing for more than a minute or two, the researcher would probe with questions, like "What are you thinking about?" or "What ideas are you thinking about now?" These questions are similar to instructions used by Azevedo and Cromley (2004).

<div align="center">Measures</div>

The measures that were used in this study are described next. They provide various indexes of students' writing and the processes they employed while composing.

Holistic Assessment

Compositions produced by participants were evaluated on a 1-6 point Likert-type scale assessing overall quality (i.e., holistic writing scale). Holistic assessments involve a qualitative rating of the essential features of a piece of writing (Charney, 1984). Evaluators (trained English professors) analyzed each paper by making a general, overall judgment of the quality of writing. With this procedure, essays were given a numerical score that best represented the evaluators' opinion of the overall quality of the essays, giving equal weight to content, organization, grammar, and style.

Prior to the analyses of the papers, anchor papers were obtained from non-participating students in one Fall 2004 EN 101 class. Two groups of two independent raters sorted these papers by identifying three papers that best represented papers of high, average, and low quality. The researcher identified those papers the four raters agreed on.

Using the papers that all four raters agreed upon, one paper was selected to represent an anchor point for a high score (a score of 6), an average score (a score of 3), and a low score (a score of 1) (Appendix C). This was combined with the descriptors developed by Plata, Zelhart, and House (1995) (Figure 2) in order to provide scorers with concrete examples of the points on the holistic scale used in this study.

When rating papers, the scorers were read the following directions: "Read each writing sample in order to obtain an overall impression of its quality. After reading the writing sample, give the sample a rating on a scale of 1 presenting the lowest quality, scores of 3 representing an average rating of writing quality, and 6 representing the highest quality of writing. Factors of content, organization, grammar, and style should be considered equally."

The scorers for this study were not familiar with the purpose or design of the study. In addition, all identifying information was removed with the exception of an identifying subject number. The evaluators were two English professors trained in the use of holistic scoring procedure previously described. The evaluators were given a representative sample of low (1), average (3) and high (6) scoring essays as anchor points for scoring (Appendix C). Sample papers from non-participating students were used to establish interrater agreement. Each paper was read and scored by two independent evaluators. The score for each paper was the average for the two evaluators. Interrater agreement (no more than a two-point difference) was .85. Three discrepant papers were read by a third evaluator (English professor) and scores were averaged to obtain a single score for each composition.

Figure 2

_____

Holistic Scoring Guide

_____

Level   Characteristics

_____

6   Very well organized, often carefully reasoned
           Very good sense of unity
           Frequent sentence variation
           Good word choice that may be unusually striking, vivid, or creative
           Virtually free of grammatical or mechanical errors

5   Well organized, good sense of unity
           Frequent sentence variation
           Word choice that may be vivid or striking
           Few, if any, grammatical or mechanical errors

4   Paper is organized, although it may be weak in logic, example, or
           unity, has some sentence variation
           Sense of unity, although transitions may be lacking
           Appropriate word choice for college level writing, although word
           choice may sometimes be elementary

3   Paper attempts to organize the topic but fails due to such errors as
           faulty logic, lack of precise example, or superfluous ideas
           Little sense of unity, has some sentence variation
           Repetitious or poor word choice
           Errors in grammar and mechanics that distract the reader from the
           content and continuity of the paper

2   Paper attempts to develop topic but fails due to such errors as
           faulty logic, lack of precise examples, or superfluous ideas
           Very little sense of unity
           Little or no sentence variation
           Repetitious or poor word choice
           Numerous errors in grammar and mechanics

1   Lack of topic development; lack of logical organization; lacks
           examples, lacks unity
           Little or no sentence variation, repetitious or poor word choice
           Numerous errors in grammar and mechanics

From: Plata, M., Zelhart, P., & House, G. (1995). Comparative writing performance of college
students with and without learning disabilities. *Journal of Research and Development in
Education, 29,* 20-26.

Additional Data

In addition to holistic scores, the total number of words written was determined. In the area of planning both the number of plans (i.e., thought units - ideas) and the level of plans produced were determined. Specific data to be collected included the number of thought units developed during the planning process. The identification of a thought unit was based on the guidelines developed by De La Paz and Graham (1997). These are specified below:

1. A thought unit corresponds to a predicate (verb phrase) and tells one idea.

2. Sentences that can be divided into more than one verb phrase are counted as two thought units.

3. Coordinated sentences are divided and counted as two thought units. Coordinating conjunctions include for, and, but, or, yet, and so.

4. A subordinate clause that is followed by a main clause is counted as two thought units.

5. Relative clauses and complements are counted as two thought units.

6. Infinitival complements ("to" + a verb) are not counted as two propositions unless a motivation or a reason is stated in the "to" clause.

7. When the word "like" is used as "as if" it is counted as two propositions.

This information was obtained from any written plans students developed. All written plans were collected and the number of thought units on each planning sheet was counted. All of the written plans students develop were independently scored by a rater

unfamiliar with the purpose and design of the study to determine scores and reliability. Interrater agreement ($r = 1.00$) was established by Pearson's correlation coefficient.

In addition, the level (maturity) of plans produced was determined using the guidelines developed by Berninger, Whitaker, and Feng (1996), with the addition of a score of 0 for no plans developed. The guidelines Berninger et al. (1996) used for coding planning units include:

0. No advanced preplanning (nothing on paper).

1. Little advanced preplanning (only one word or phrase written).

2. Listing (list of propositions or words).

3. Questions or topics with no subordination (list of questions or topics to be addressed).

4. Topics with emerging subordination (topics with examples, but relationship is not specified).

5. Mapping or outline (at least two topics and examples for each).

All of the written plans were independently scored by an independent rater unfamiliar with the purpose and design of the study to determine levels and interrater reliability of the researcher and independent rater ($r = 1.00$) using Pearson's correlation coefficient.

In addition, the number and types of revisions made was determined. The number of revisions (addition, deletion, or change of a word or sentence) made was counted and categorized by type (word, sentence). Forty percent of the videotapes were independently scored by an independent rater to determine scores and interrater reliability ($r = 1.00$).

Think-aloud Protocols

The subjects were videotaped during the writing session in a reserved computer classroom on the campus of the selected postsecondary institution. The verbalizations on the videotapes were transcribed into written form by the researcher (see sample transcribed protocol in Appendix D). Reliability was established for 40% of the transcriptions by a second person to ensure accuracy of the transcriptions. This was achieved by the second rater using the audiotapes and videotapes to verify the accuracy of the transcripts. Any discrepancies found were discussed. Very few discrepancies were noted. The think-aloud protocols were divided into units and then categorized.

The coding scheme was based on the writing process model of Flower and Hayes (1980a), as well as specific coding categories developed by Breetvelt, van den Bergh, and Rijlaarsdam (1994), and Azevedo et al. (2004). From these classifications, five categories and 22 subcategories were identified. Table 3 (p. 93) presents the coding scheme for this study. All examples in the coding scheme were taken from transcripts of the pilot study. All transcripts were coded by the researcher, with 40% independently rescored by a second coder in order to establish rater reliability. The second coder was instructed on the use of the coding scheme. This was achieved by the researcher explaining and demonstrating the use of the coding scheme with a transcript. The researcher and second coder discussed and coded two transcripts together. Then the researcher and second coder discussed the codings. Next, the second rater coded eight protocols independently (see sample coded protocol in Appendix E). Interrater agreement was .80. Interrater agreement was determined by dividing the number of agree upon codings by the total

Table 3: Coding scheme (Flower & Hayes, 1981; Azevedo & Cromley, 2004).

_____

Coding Category	Coding Subcategory	Example
Planning		
Reading the assignment	Reading the question	"Explain how you..."
Generating ideas	Ideas written before or verbalized during writing	"Parents can both be affected by.."
Organizing ideas	Placing written ideas into categories	"This idea should go with.."
Setting goals	Stating what needs to be done	"I need to write about.."
	Stating ideas that help with the task	"I think I should write three paragraphs"
Self-instruction	Explaining what the writer will do	"I want to think of .."
Task Definition	Defining what needs to be done	"The essay needs to include.."
Procedural explanation	Explaining what the writer normally does while writing	"You always want to have an introduction"
Prior knowledge activation	Searching memory for information	"I know a person who used drugs."
Text Generation	Composing written text	Actual transcription
Monitoring		
Monitoring content	Analyzing words used	"I'm using that word too much."
Process control	Monitoring writing process	"I'm deviating from the topic."
Strategy identification	Identifying strategy used	"I'm using a transition here."
Giving comments	Ideas given, but not written	"Sometimes children use.."
Self-questioning	Writer poses a question	"What else can I add?"
Help seeking behavior	Writer seeks assistance	"How long should this be?"
Pausing		
Reviewing		
Rereading prompt	Rereading writing topic	"Explain how.."
Rereading plans	Rereading written plans	"I wrote..."
Rereading sentence	Rereading parts or all of essay	"The students should.."
Rereading paragraph		
Rereading essay		
Evaluating text	Critiquing for possible Revising	"I need to change this word."
Revising text	Making actual revisions	"I'm deleting this sentence."
Other	Any uncategorized activity	

_____

 number of codings.

Pilot Study

A pilot study was conducted during summer 2004 with three students (2 female, 1 male). Two of the students were from EN 101 classes and the other student (LD) was from a developmental English class (EN 002). They were paid participants. The three students participated in the text editing task, warm-up think-aloud activity, and writing task. The students were audio and videotaped.

The purpose of the pilot study was to conduct a test run of the materials and procedures prior to the actual study. Logistical concerns were a major focus of the study in terms of equipment, location, sound and lighting, timing, and flow of the study. It was found that ample time between sessions was necessary as proper set up time was essential, especially when the study location changed. In addition, less time and more precise instructions were needed to decrease the time needed for the warm-up activities. Lastly, additional subcategories were added to the coding scheme used in the study. It was understood that the use of a priori coding scheme was a starting point and that it would be adapted as a result of the pilot study. This was because not all observed behaviors fit into the initial coding system. As a result of the pilot study, several categories were added to the coding scheme. The categories of task definition and procedural explanation were added to the coding category of planning. In the area of monitoring, the categories of monitoring content, process control and strategy identification, and help seeking behavior were added. Lastly, in the area of reviewing, the category of rereading essay was divided into subcategories of rereading sentence,

rereading paragraph, and rereading essay.

Sample size was an important consideration in this study. As with any research study, sample size affects the reliability and validity of the results. A power analysis of sample size was conducted using the standard level of significance (.05), power (.80), and a moderate effect size (.50). Sample size was determined to be 34 (Hinkle, Wiersma, & Jurs, 1998). In educational research, sample size can vary greatly depending on the type of research conducted (Gay, 1987; McMillian & Shumaker, 1993). Sample size could also increase Type I error rates (the chances of rejecting a true hypothesis), especially when conducting multiple tests on a large number of independent and dependent variables. In this study, the conventional $p < .05$ alpha level was used as the analyses did not include multiple tests with significant findings or repeated measures. I was unable to meet the sample size suggested by the power analysis as the sample size as this study was greatly influenced by the number of available participants, budget constraints, as well as limitations of scheduling, location and equipment.

Analyses

The following analyses were used to answer the five research questions.

Research question 1: Is there a statistically significant difference in the quality of the writing of college students with and without LD? To determine if college students with and without LD differ in the quality of their writing, a one-way ANOVA was conducted. The independent variable was group membership (LD vs. non-LD) and the dependent variable was holistic quality scores.

Research question 2: Is there a statistically significant difference in the length of the writing of college students with and without LD? To determine if college students with and without LD differ in the number of words used in their writing, a one-way ANOVA was conducted. The independent variable was group membership (LD vs. non-LD) and the dependent variable was the number of words written.

Research question 3: Are there statistically significant differences in the written plans college students with and without LD generate prior to writing? Students' written plans yielded two measures: the number of planning ideas (i.e., thought units) and level of plans. If a student did not create a written plan, then his or her scores for each of these variables was scored as 0. To determine if college students with and without LD differ in the number and types of written plans developed, two one-way ANOVAs were conducted. The independent variable was group membership (LD vs. non-LD) and the dependent variables were the number of planning ideas and the level of plans. If significant differences were found, appropriate follow-up tests were conducted.

Research question 4: Are there statistically significant differences in the amounts of revising done by college students with and without LD? To determine if college students with and without LD differ in terms of the types of revisions they make while writing, two one-way ANOVAs were conducted. The independent measure was group membership (LD vs. non-LD) and the dependent variables were the number and level (word, sentence) of revisions made per essay. The number of revisions (word and sentence) was divided by the total number of words written.

Research question 5: Do college students with and without LD differ significantly in their self-regulatory behaviors (Table 3) while composing, as measured by the data protocols? Using the method of analysis developed by Azevedo and Cromley (2004), the average and median number of instances that college students with and without LD engaged in the self-regulatory processes identified through the think-aloud protocols and observations by the examiner were calculated. Frequency scores were converted to percentages. For each self-regulatory process, a median split test was conducted to obtain the proportion of frequencies above and below the median. For each of the 22 subcategories listed in Table 3 (p. 93), a 2 x 2 (group membership, scores above and below the median) chi-square tests were conducted to determine significant differences in the distribution of the students' use of the variables related to the four main writing process categories.

Research question 6: Are there any statistically significant positive correlations between holistic writing scores and the use of self-regulatory processes by college students with and without LD? To determine if there are statistically significant correlations between holistic score and the use of self-regulatory behaviors, correlations between holistic score and the 22 self-regulatory behaviors by group were conducted to identify any significantly positive correlations between group holistic scores and any of the 24 self-regulatory variables.

Chapter 4

Results

This chapter presents the results of a study conducted on the writing processes of college students with and without LD. The purpose of the study was to investigate the writing processes college students with and without LD use while composing an essay. The analyses included the written product (quality and length), specific writing processes (planning, revising), and the self-regulatory behaviors used to regulate the writing process. The subjects were asked to think aloud while engaged in a one-hour writing task. The subjects were videotaped while they composed on a computer. The data obtained from the think aloud protocols were correlated with the students' performance scores on the resulting written products. Twenty students participated in the study which took place over a four-month period.

Two separate analysis of variance (ANOVA) tests were conducted with the two groups of subjects (independent variable) and two measures from the written products (dependent variables – length and holistic scores). In addition, two separate ANOVA tests were performed with the two groups of subjects as the independent variable and the writing process of planning (number and level) as the dependent variable. In addition, two separate ANOVA tests were conducted on the process of revising (number and type) as the dependent variable. All means and standard deviations for the ANOVA tests are listed in Table 4 (p. 100). Next, chi-square analyses were conducted with the two groups of subjects (independent variable) and the self-regulatory behaviors (dependent variables) used during the writing process. Finally, correlations were conducted to determine any

significant correlation between holistic scores and self-regulatory behaviors by group. All means and standard deviations of the analyses are presented in Table 4 (p. 100).

Written Product

To determine if there was a significant difference in holistic writing scores between group, an analysis of variance (ANOVA) test was conducted. The ANOVA indicated a statistically significant difference between group, $F(1,18) = 5.865$, MSe = 1.228, $p = .026$ (effect size = 0.96). On a holistic scale of 1 to 6, scores ranged from 1.0 to 4.5 for students with LD and 3.0 to 5.0 for students without LD. The mean holistic writing score of students without LD was significantly higher than students with LD.

The second ANOVA indicated no statistically significant difference between group and length of writing (number of words written), $F (1,18) = .052$, MSe = 18478.278, $p = .823$. The number of words written ranged from 289 to 864 for students with LD and 375 to 633 for students without LD. The number of words written by group was not normally distributed (scores were skewed; > 1.0 for each group). The results of a nonparametric test (Mann-Whitney) also indicated no statistically significant difference between group and length of writing, $F = .257$, $p = .280$.

Planning

In the area of planning, the first ANOVA indicated no statistically significant difference between group and the number of plans, $F (1,18) = .005$, MSe = 88.894 (number), $p = .758$. Out of the twenty participants, nine subjects developed handwritten plans. The number of plans ranged from 0 to 26 for students with LD and 0 to 32 for students without LD. The number of plans developed was not normally distributed

Table 4

Means and standard deviations

		Holistic Score	Number of words	Number of plans	Level of Plans	Word revisions	Sentence revisions
Group 1	M	3.00	450.90	5.20	1.90	.009	.001
	SD	1.22	177.75	8.09	1.85	.105	.003
Group 2	M	4.20	464.70	5.50	1.40	.112	.006
	SD	0.98	75.23	10.60	2.27	.064	.010

(scores were skewed; > 1.0 for each group). The results of a nonparametric (Mann-Whitney) test also indicated no statistically significant difference between group and the number of written plans, $F = .456$, $p = .529$. The second ANOVA indicated no statistically significant difference between group and the level of plans, $F (1,18) = .291$, MSe = 4.294, $p = .596$. The level of plans ranged from 1 to 4 for students with LD and 1 to 5 for students without LD.

Revising

In the area of revising, the first ANOVA revealed no statistically significant difference between group and revising (word, sentence). The data was adjusted for length by dividing the number of word and sentence revisions by the total number of words written), $F (1,18) = 1.028$, $p = .379$. Due to a finding of no statistical significant differences, follow-up tests were not conducted. All participants made word revisions to their essays, with 14 subjects making sentence revisions. For each subject, the number of word revisions was divided by the total number of words written. The number of

sentence revisions was divided by the total number of words written. The number of revisions made by groups were not normally distributed (scores were skewed, > 1.0 for each group). The results of a Mann-Whitney test also indicated no statistically significant difference between group and the number of word (F = .322, p = .331) and sentence revisions (F = .173, p = .370).

Self-regulatory behaviors

A series of chi-square analyses were performed to determine whether there were significant differences in the distribution of students' use of self-regulatory variables across groups. I examined how students regulated their writing by calculating how often they used each of the self-regulatory variables related to planning, translating, monitoring, and reviewing. There were 648 codings for the students with LD and 1,492 codings for students without LD. The coding frequencies of each participant in presented in Appendix F. The codings are listed in Table 3 (p. 93). Frequencies for each self-regulatory variable were coded from the think-aloud protocols of all subjects. The method of analysis of Azevedo and colleagues (2004) was used in the chi-square analyses in this study. 2 (group) x 2 (above and below median) chi-square analyses were conducted for each dependent variable. The results of the chi-square analyses are presented in Table 5 (p. 102). No chi-square results were calculated for several variables (see Table 5) as the proportion of subjects using a specific self-regulatory behavior variable was constant above and below the median (r = 0). This meant that a variable was either not used by all subjects or was used the same number of times by the subjects. For example, all subjects read the assignment once before proceeding with writing their

Table 5

Raw Frequencies and Proportion of Subjects Using Self-Regulated Variables Above the Median by Group.

| Variable | Students with LD | | Students without LD | | χ^2 | p |
	Raw score	Frequency	Raw score	Frequency		
Planning						
Read assign	[10]	a	[10]	a		
Gen. ideas	[50]	4	[122]	5	.978	.613
Org. ideas	[0]	a	[4]	a		
Set goals	[31]	5	[59]	4	1.511	.470
Self-inst.	[9]	7	[2]	4	1.818	.178
Task def.	[50]	4	[101]	5	.202	.653
Pro. explan.	[8]	a	[12]	a		
PKA	[9]	5	[54]	4	1.111	.574
Monitoring						
Mon.content	[7]	4	[41]	7	2.318	.314
Process control	[10]	a	[49]	a		
Strategy id.	[7]	3	[25]	5	.833	.361
Give comm.	[58]	6	[132]	5	.800	.371
Self-ques.	[3]	2	[27]	6	3.333	.068
Help s. beh.	[12]	7	[14]	4	1.818	.178
Pausing	[4]	a	[0]	a		
Reviewing						
Reread prompt	[3]	a	[6]	a		
Reread plans	[2]	a	[9]	a		
Reread sent	[87]	6	[128]	5	1.591	.451
Reread par	[17]	3	[20]	5	.833	.361
Reread essay	[2]	a	[4]	a		
Eval. text	[7]	4	[54]	5	.202	.653
Revise text	[17]	5	[19]	7	.833	.361

a No chi-square analysis was conducted as one variable was constant.

essay.

Planning. There were 167 codings in the area of planning for students with LD and 364 codings for students without LD. Chi-square analyses revealed no statistically significant differences in the number of subjects who used any of the eight planning variables above the median.

Monitoring. There were 77 codings in the area of monitoring for students with LD and 288 codings for students without LD. Chi-square analyses revealed no statistically significant differences in the number of subjects who used any of the six variables related to monitoring.

Revising. There were 135 codings in the area of revising for students with LD and 240 codings for students without LD. Chi-square analyses revealed no statistically significant differences in the number of subjects who used any of the seven variables related to reviewing.

No statistically significant differences were found between group and frequency of the self-regulatory variables. The standard 0.05 level of significance was used with these analyses. It was noted that using this level would increase the chance of making Type I errors (rejecting a null hypothesis). Thus, there would be a great chance of noting a significant difference when no difference actually existed. However, this was not the case with the chi-square analyses as no statistically significant differences were found. In addition, given the small sample size of this study, it was unlikely that any statistically significant differences would be found. A more in depth look at the chi-square frequencies is presented in the next chapter.

Correlation of scores and self-regulatory behaviors

Correlations were conducted of holistic writing scores (by group) and the frequency of use of the 23 coding categories used to code the verbalizations in the student protocols. This was done to determine any significant positive correlations between group and the 23 variables. The standard 0.05 level of significance was used with Spearman's rho correlation analysis. Due to the expectation of positive correlations between holistic scores and the self-regulatory variables, one-tailed tests were performed. The results are presented in Table 6 (p. 105). Statistically significant positive correlations were found for the students without LD.

As noted in Table 6, the students without LD had statistically significant positive correlations between holistic score and the planning variables of generating ideas, self-instruction, and prior knowledge activation. These students also had statistically significant positive correlations between holistic score and the monitoring variables of monitoring content, process control, and self-questioning. With the revising variables, the students without LD had statistically significant positive correlations between holistic score and rereading plans, rereading essay, and evaluating text and revising text.

The students with LD had no statistically significant positive correlations between holistic score and any of the planning, monitoring, and reviewing variables.. Although planning, translating, and reviewing occurred throughout all phases of writing, the occurrence of the self-regulatory monitoring process was much less frequent for students with LD, possibly impacting the quality of their writing.

Table 6

Correlations of groups by holistic writing score and self-regulatory behavior

Self-regulatory behavior	Students with LD	Students without LD
Reading the assignment	a	a
Generating ideas	.519	.572*
Organizing ideas	a	.445
Setting goals	.091	.332
Self-instruction	.447	.603*
Task definition	.369	.239
Procedural explanation	.193	.456
Prior knowledge activation	-.229	.561*
Translation	-.243	.347
Monitoring content	-.110	.705*
Process control	-.100	.579*
Strategy identification	.015	.408
Giving comments	-.115	.174
Self-questioning	-.415	.566*
Help seeking behavior	.068	-.237
Pausing	-.353	a
Rereading prompt	-.172	-.380
Rereading plans	.489	.643*
Rereading sentences	.022	.206
Rereading paragraphs	.464	-.269
Rereading essay	.089	-.619*
Evaluating text	.004	.630*
Revising text	-.080	.653*
Other	.291	.205

* Correlation is significant at the 0.05 level (1-tailed).
a. Cannot be computed because at least one of the variables is constant.

Chapter 5

Discussion

Concerns about college students' writing performance have led to the need to provide additional writing instruction to college students, especially those with LD. In order to help these students acquire the writing skills needed to successfully complete their college studies, it is important to understand how college students write without just focusing on the final written product. In this study, I examined what college students with and without LD wrote as well as how they went about completing a writing task they might encounter in college courses. The purpose of the study was to analyze if there were differences in how college students with and without LD composed an expository essay. The analyses focused, in part, on the written products, including measures of holistic quality, length of essays, planning and revising. Think-aloud protocols were also obtained to identify the self-regulatory behaviors college students with and without LD used during the writing process. This chapter includes a discussion of the findings from this study, researcher's observations, the limitations of the study, and recommendations for further research.

Study Findings

All participants composed an essay on a computer while thinking aloud. They were told that they should write an essay as they normally would for a college course. They completed a warm-up activity to verify that they had sufficient word processing skills and demonstrated that they understood the process of thinking aloud while composing. After this, they were given an hour to write an essay. The think-aloud protocols were analyzed

to identify the processes college students with and without LD used during the writing process.

With regard to the first research question, statistically significant differences were found in the overall quality of writing between college students with and without LD. As reported in the Chapter 4, the essays written by students without LD were qualitatively better than the essays written by students with LD. This means the essays the students without LD wrote were more appropriate to the task in terms of overall content, organization, style, and grammar. The holistic writing scores for students without LD were more closely clustered at the higher end of the scoring scale (3.0 to 5.5), whereas scores of students with LD were clustered more at the lower end of the scale (1.0 to 4.5). Three of the students with LD chose to write narrative essays instead of expository essays. As a result, they did not fully answer the question, and two of these three essays received the lowest rating scores (1.0). This provides some support for the findings from Pianko (1979) and Kellogg et al. (1991) that students with LD preferred to write a narrative. This is characteristic of the knowledge-telling model (Scardamalia & Bereiter, 1987; Zimmerman & Risemberg, 1997) suggesting that some students with LD choose to write on a simpler, more familiar topic, without considering the reader's point of view. Inadequate representation of the rhetorical task might have led these students to experience difficulties with finding a focus (goal) and managing the writing process (Flower & Hayes, 1981c).

The significant difference in holistic scores supports the results of studies reviewed in Chapter 2 (Gregg et al., 2002; Morris & Leuenberger, 1990; Plato et al., 1995; Vogel &

Moran, 1982). In these studies, students with LD demonstrated difficulty in the development and organization of content, and experienced numerous problems with the mechanics of writing. This led to problems with writing fluency and text coherency.

With regards to the second research question, no statistically significant differences were found in the length of writing for college students with and without LD. The mean length of writing for students with LD was 451 words and 465 for students without LD. These results did not indicate a significant difference and do not support other studies that found that the writing of college students with LD was shorter than the writing of college students without LD (Gajor, 1989; O'Hearn, 1989; Vogel, 1985; Vogel & Moran, 1982).

The third research question involved the number and level of plans developed. No statistically significant differences were found in the number and level of plans developed. Of the twenty participants, nine students developed written plans, all handwritten. Six students with LD developed written plans compared to three students without LD. Four of the six students with LD who developed written plans wrote essays with holistic scores above the group mean (3.3), two of the essays contained more than the mean number of words by group and the other two essays that contained fewer words than the mean number of words by the group (451). The other two students with LD who developed written plans, wrote essays that contained fewer words than the mean number of words by the group and wrote essays with holistic scores below the group mean. In this study, the production and use of written plans (outlines) assisted some, but not all students with LD in producing more writing or writing of better quality. In contrast, three students without LD developed written plans. Two of these students wrote essays that

contained more than the mean number of words by group (465) and all three subjects had holistic scores higher than the mean holistic score by group (4.0). For some students, these results contrast with those of Kellogg (1987c) who found that outlines improved the quality of writing of college students.

With the fourth research question, no statistically significant differences were found in the amount of revising done. All 20 subjects made word revisions throughout the writing process, with 14 subjects making a few sentence revisions. These results did not support those of Beach (1976), Beach and Eaton (1984), Faigley and Witte (1981), Flower et al. (1986), Hayes et al. (1987), McCutchen et al. (1987), Scardamalia and Bereiter (1986), Somers (1980), and Wallace and Hayes (1991) who found that more skilled writers attended to and made more global revisions (elements of style, purpose, and audience). The revising process of the participants focused on rereading and making word revisions as they went along. Only four of the 20 participants reread their essays, making very few, if any revisions to their writing. However, this might be indicative of the time limitations of the study.

The fifth research question is central to this study, as no study had been previously conducted that looked at the process of writing with students with LD. There were 23 coding categories: eight for planning, six for monitoring, and seven for reviewing. There were also a category for *translation* and one for any uncategorized activity (labeled '*other*').

The results of chi-square analyses indicated no statistically significant differences by group in the use of the self-regulatory variables at or above the median. However,

looking at the data, it was observed that during the process of planning, more than 50% of students with LD verbalized thoughts that fit in the categories of *self-instruction* (stating ideas that would help with writing, such as "First of all, the best way to do that is to do personal antedotes"), *giving comments* (stating ideas about the process or product, such as "The first paragraph is always difficult for me"), and *help seeking behavior* while monitoring the writing process (asking the researcher for assistance with the task, such as "How long do you want this?"), and *rereading sentences* during the process of reviewing (rereading what was just written). The use of these variables may indicate that students with LD tried to give themselves suggestions about what and how to write, and often reread sentences to see how they sounded. They might have been unsure about some aspects of the assignment or their own capabilities, as many of them sought assistance. Despite attempts to help themselves, the students with LD did not produce text of higher quality than the students without LD.

On the other hand, more than 50% of students without LD verbalized thoughts in the categories of *monitoring content* (analyzing what was just written, such as "I am not sure if these ideas are related"), *self-questioning* while monitoring the writing process (asking themselves questions about what they were writing, such as "How can I explain this more clearly?"), and *revising text* when reviewing their writing (making actual revisions to their writing). The use of these categories would indicate that students without LD more proficient with checking content, monitoring their activities, and revising text. The use of these self-regulatory variables most likely assisted the students without LD with their production of text of higher quality.

With the sixth research question, statistically significant correlations were found between holistic score and the planning variables of *generating ideas* and *self-instruction,* and *prior knowledge activation* for students without LD. Thus, students without LD who spent more time generating ideas and self-directing what they did produced text of higher quality. There were also statistically significant correlations between holistic scores and the monitoring variables of *monitoring content, process control,* and *self-questioning*. Thus, students without LD, who monitored and questioned themselves more about their writing, produced text of higher quality. In addition, statistically significant correlations were found between holistic scores and the revising variables of *rereading plans, rereading essay, evaluating text* and *revising text*. Students who did more analyzing and revising of their writing, produced text of higher quality. The students without LD who did more planning, monitoring, and revising were more likely to have higher holistic writing scores.

To put this data into perspective, the researcher looked at the patterns of the frequency of the self-regulatory variables of the writers of the essays that received the lowest holistic score (1.0) and those essays that received the highest holistic score (5.5). There were two essays that received holistic scores of 1.0 and two essays that received holistic scores of 5.5. The two essays that received the lowest holistic scores were written by students with LD and the two essays that received the highest holistic scores were written by students without LD.

Using the frequency data obtained from the think-aloud protocols, the following patterns emerged. In the area of planning, the two students with the highest holistic score

had more instances (than the students with the lowest holistic score) of generating ideas, setting goals, self-instruction, task definition, and prior knowledge activation. The students relied on establishing a process for writing an essay, guiding themselves through the writing process, and brought forth knowledge of prior writing experiences and instruction.

In the area of monitoring, the two students with the highest holistic score had more instances of monitoring content, process control, strategy identification, and self-questioning. The students gave more evidence of more control of both the writing process (keeping the process flowing) and content (appropriateness of their ideas to the task). The students were able to question themselves more about what they were writing and how they were writing their essay.

Lastly, in the area of reviewing, the students with the highest holistic score had more instances of rereading sentences, and evaluating and revising text than the students with the lowest holistic score. The students did more editing and revising of their essay. However, these results need to be interpreted carefully as several students with LD ran out of time and might have done more reviewing of their essays if given more time.

In conclusion, statistically significant differences were found in holistic writing scores between students with and without LD. However, no statistically significant differences were found in the length of writing, number and level of written plans, and the amount of revising done. There were statistically significant positive correlations between holistic writing score and the self-regulatory variables of planning (generating ideas, self-instruction, and prior knowledge activation), monitoring (monitoring content, process

control, and self-questioning), and revising (rereading plans, rereading essay, evaluating text, and revising text) for the students without LD and no statistically significant positive correlations between holistic writing score and any of the planning, monitoring, or reviewing variables.

The significant correlations found between holistic score and planning, monitoring, and reviewing variables for students without LD support the view that self-regulation is an important aspect of good writing. These findings are also consistent with Flower and Hayes' construction of a "monitor" that evaluates the result of activities undertaken by the writer. Self-regulation of monitoring (especially of planning and reviewing) is a distinguishing characteristic of high and low achieving college students (Vanderstoep et al., 1996).

<div align="center">The Writing Processes of College Students With and Without LD</div>

The think-aloud protocols revealed that college students with and without LD used writing processes that were recursive in nature. This was reflected in both what they wrote and said during the study. The protocols indicated that writing was not done in a fixed, linear manner of planning, writing, and reviewing. Throughout writing, there was evidence of cyclical patterns of planning, translating, and revising, with starts and stops, and back and forth movements with varying frequencies. This reflected the writing process model of Flower and Hayes (1980a). However, the think-aloud protocols showed that the two groups of students approached the writing task differently.

In the process of planning, three students without LD developed written plans; however, most of the subjects in this group developed procedural, process, and content-

specific (rhetorical) plans verbally as they proceeded through the writing task (Flower & Hayes, 1981b). There was consistent evidence of the steps the students needed to take in order to write a well-developed essay as well as how to write an essay that would answer the question satisfactorily.

While writing an essay, most of the college students without LD reflected on what they had learned in their English classes, specifically as to what they think should be included in order to produce a good essay. These writers demonstrated the various processes of the Flower and Hayes model (1981a). All aspects of the task environment, the writer's long-term memory, and the writing process were brought into the writing task. Flower and Hayes (1981a) stated that all these interacting components are controlled by a 'monitor' which allows a writer to move from one process to another. A large part of good writing is the ability to direct one's own writing process. The students without LD gave evidence of this by being able to monitor both the product and process of their writing. This is supported by the statistically significant positive correlations between holistic score and the different planning variables (generating ideas, self-instruction, and prior knowledge activation) monitoring variables (monitoring content, process control, self-questioning) and revising variables (rereading plans, rereading essay, evaluating text and revising text). These students exhibited sufficient control of the task and given constraints (topic, genre, time).

Patterns of the writing process used by college students with LD emerged and showed that the writing process these students used differed in that most of the subjects (six out of ten) developed written plans that were content-specific, mostly with a

few examples of their ideas. Few procedural plans were developed and most of these students wrote in a fairly straight forward manner. For some of the students with LD revising meant rereading sentences just written, but without making any substantial changes to their writing. Several students with LD ran out of time and were not able to finish or revise their essays.

The students with LD did very little reflecting on past experiences of writing essays, demonstrated little awareness of audience, and many gave little or no evidence of their understanding of what a good essay should include. These components are integral parts of the writing process model of Flower and Hayes (1980a), especially the task environment, and the writer's long-term memory. One student wrote over one typed page with no paragraphs and another student wrote only one paragraph all together. Three of the ten subjects chose to write a narrative instead of an expository essay, telling about a friend they once knew who had a problem with alcohol or drugs. Two of these students' papers received the lowest holistic scores. Flower and Hayes (1981a) indicated that weaker writers tend to view a writing task as merely a process of "filling up the paper." Several students with LD were very concerned about writing "enough", with no indication of satisfying the demands of the writing task (rhetorical problem), such as answering the question satisfactorily or using appropriate writing conventions.

Though some of the aspects of the task environment, the writer's long-term memory and the writing processes were brought to the task, the ability to direct all these processes was hindered for some of the students with LD. Although planning, translating, and reviewing occurred throughout all phases of writing, the occurrence of the self-regulatory

monitoring process was much less frequent for students with LD, possibly impacting the quality of their writing.

Researcher's Observations

Several observations were made during this study. All subjects were aware of what the study would entail prior to their scheduled appointment time. Once at the study location, no student refused to participate for lack of knowing what would be asked of them or after they read the writing topic. The researcher did not observe any subjects having difficulty with the word processing task or the warm-up think-aloud activity.

It was observed that several students with LD had difficulty in starting the writing task. It was possible that these students used considerable effort in defining their task and how to go about it. Several other students proceeded to start writing immediately and indicated in their verbal protocols that they were not sure where they were heading. Very few students with LD reflected on prior writing experiences in comparison to students without LD and several students ran out of time and did not complete their essays.

It was also observed that revising occurred throughout the writing process which was confirmed in earlier studies (Fitzgerald, 1987; Humes, 1983; Sommers, 1980, Witte, 1982). The subjects in this study viewed revising primarily as a process of making surface error corrections, mostly minor word changes. The revising process of the participants focused on rereading and making word revisions as they went along.

Limitations of the Study

To date, there has been little research on the writing processes of college students with and without LD, with no studies examining how college students go about the process of

writing. Although this study was exploratory in nature, valuable information about how college students with and without LD approach writing was presented. However, the limitations of the study need to be considered when the question of generalizability of the results is raised.

The methodology the subjects used to write the essays may not have captured their "normal writing" as the writing task was done in a unique situation. Although it was emphasized to students that they should write an essay as they normally would, the study was done under artificial conditions (time limit, being videotaped, and talking aloud). The think-aloud protocols provided a means of looking at the invisible process of writing, but as discussed in Chapter 2, these constraints might have slowed down the writing process (Ericsson & Simon, 1980). As with any research study, it was hard to judge if the participants actually wrote an essay as they normally would or if they were taking extreme measures to produce an essay that they felt would satisfy the researcher.

The number of subjects in a study and subject selection is a concern in many investigations (Beach, 1976; Hayes et al., 1987, Pianko, 1979; Perl, 1980). In this study, the number of participants used was greatly influenced by the availability of participants, as well as availability of space and equipment, scheduling constraints, and budget concerns.

Specific guidelines (see Chapter 3) were followed when selecting subjects for both groups, based on the institution's policies and procedures used for class placement of students. Like most colleges and universities, a variety of standard tests scores are used in the acceptance and placement process. The researcher used various test scores to ensure

that the selected students qualified for a specific course, thus, qualifying for the study. The sample size of qualified participants with LD significantly influenced the number of participants in the study and the inability to have an adequate number of participants needed based on a power analysis.

The term, learning disability, tends to be used homogeneously in research to describe college students with specific learning disabilities. As a result, the students in a study, such as this one, may not be truly representative of the student population. In my study, students with LD were identified as having a learning disability prior to acceptance at the college and subsequent acceptance into the college's College Access Program (CAP). The college does not conduct tests to confirm the presence of a learning disability. As a result, the disability support specialists use information from a variety of sources when determining accommodations a student with LD may need. Every college or university can establish their own guidelines for deciding and assigning accommodations. The researcher for this study worked within the guidelines the institution had established.

<div align="center">Implications for Further Research</div>

The findings of this study help to contribute to the knowledge base about the self-regulatory behaviors of college students with and without LD. The findings are also important for diagnostic and instructional purposes. Diagnostically, it indicates the need to further evaluate both processes and products of writing. Further research will need to investigate techniques to enhance the process of writing.

With more and more students with LD attending college and with much emphasis on writing in college courses, instructional interventions are necessary to help struggling

writers be successful. College instructors can not assume that entering students are all skilled writers. Interventions need to focus on the process of writing, not just the final written product. As previously discussed, the written product is only one element of the entire writing process. Instruction in the basic rules of grammar, spelling, punctuation, and organization does not sufficiently improve the quality of writing (Pianko, 1979). Writing is not a fixed, linear process, but one with starts and stops, and with movements back and forth throughout all phases of writing. Writing can not be viewed as a one-step process that simply involves writing all one knows about a topic (Flower & Hayes, 1981a).

Planning is one of the most important focuses of self-regulation writers need, another important focus is revising (Zimmerman & Risemberg, 1997). Just listing ideas is not enough to enhance writing. The retrieval and organization of information is an essential component of good writing. The role and importance of planning need to be emphasized throughout the entire writing process. Flower and Hayes (1980b) suggested that competent writers need skill in developing plans in three areas: what to say, what to do, and what to write. Intervention studies could identify those planning processes that enhance the writing processes of college students, with and without LD.

Revising is a necessary skill for writers to have so that they can distinguish between what they said and what they wanted to say. It is important for students to understand that revising is not just error hunting and that the ability to detect problems is different from the ability to fix problems. Revising means making changes from editing grammar to

reformulating an entire text. In this study, students limited revising to minor grammar and word correction. This is an important area for writing instruction to inform students that revising is more than just looking for grammatical errors.

It would be worthwhile to explore the different functions of various writing processes and when they occur. Breetvelt et al. (1994) hypothesized that some cognitive activities might be dominant during certain moments in time, meaning that some cognitive activities have a higher probability of occurring at the beginning of the writing process than at the end. They explained that writers are not classified by an overall frequency of a cognitive activity, but by the distribution of an activity during the writing process. For instance, Breetvelt et al. (1996) found that writers who did more structuring at the beginning of writing were more likely to produce better quality writing. They also found rereading and text quality to be either positive or negative, depending on when rereading occurred during the writing process. Thus, the relationship between text quality and the probability of occurrence of cognitive activities seem to be time dependent.

One specific activity that interested this researcher was rereading text, not only when this activity occurs, but its purpose as well. Rereading sentences was negatively correlated with text quality for students with LD. Breetvelt et al. (1996) found rereading at the beginning of the writing process might be due to a lack of ideas and rereading later may serve as a way to keep the writing process on track. Accordingly, rereading is not only a means of revising, but it is also a process of generating ideas. Besides rereading, students need to be shown explicitly how to carry out the specific aspects of revising and be given guided practice in applying this skill. This will also help build their repertoire of

revising beyond minor surface changes. Many instructional strategies can be implemented to aid students with revising, such as peer editing, and guided self-assessment forms (Cooper et al., 1984; Wong, Butler, Ficzere, & Kuperis, 1996).

Although much goes on that writers cannot verbalize, a picture emerged in this study of how college students with and without LD write. Though this was an exploratory study, the findings of this research study helps to shift the focus of research to the process of writing and away from the product of writing. Based on this study and prior research, ongoing research is needed to examine in more depth the self-monitoring strategies students use during the writing process. Results must be interpreted cautiously, however as the time constraints imposed by the study may have resulted in an approach to writing that is not representative of normal writing activities. Additional research is needed to replicate the findings and address the limitations of the study. In this study, a small sample of students wrote on only one topic. Future studies should include a choice of writing topics as well as a larger pool of subjects.

Conclusion

College students, with and without LD, need a high quality writing environment where they can experience different types of writing that are task specific and reflective, with emphasis on meaning, modeling, and integration across content areas (Butler, 1995; Gregg, 1983; Pardes & Rich, 1996). Students should have writing experiences that will encourage them to do more writing and to understand that writing is an interaction with a reader. With guided practice, college writers can become more experienced and competent, especially with higher-order skills such as thinking about the needs of the

reader (Scardamalia & Bereiter, 1986). However, this would mean that writing courses would need to shift the focus from the mechanics of writing to the higher-level cognitive processes of writing. Without such metacognitive knowledge, students will remain dependent on others to tell them what to write and how to write.

The college environment demands that students must be able to monitor their learning independently in a multitude of courses and with a variety of tasks. In order to be successful, writers must possess knowledge about writing strategies and processes, and also be able to monitor and regulate strategy use consistently and independently.

Appendix A

Study on Writing Processes of College Students

Dear Student,

    As part of the requirements for a doctoral degree, I am completing a study on the writing processes of college students. I am asking participants to write an essay while verbalizing their thoughts (one hour). This will be done while writing on a computer. Before writing the essay, I will check to make sure participants have sufficient word processing skills (a five-minute task). This involves demonstrating word processing skills of adding, deleting, moving, and saving text. I will also ask participants to complete a brief think-aloud activity (five minutes) to ensure that each participant is able and comfortable with thinking aloud while writing. This involves thinking aloud while writing a short paragraph (four to five sentences) about the topic "What do college students use the Internet for?" The actual writing activity involves writing an essay on the topic "Explain how alcohol or drug addiction affects one's physical, mental, and family life" (one hour). The session will be audio and video recorded. In addition, you will give the researcher written permission to obtain scores of tests of academic achievement.

    By agreeing to consent to this study, you will: a) complete a basic word processing task, b) complete a practice think-aloud activity, and c) write an essay to the best of your ability. All information collected in this study is completely confidential. Your name will not be used in any reports or presentations of the results of this study. Participation in this study poses no more than minimal risk to you as the study is not connected to any course requirements or grades. You have the right to withdraw from the study, ask questions, or refuse to answer specific questions at anytime without penalty or consequences. All materials you provide will be reviewed by another researcher (college faculty or graduate student) and all materials will be kept by the student researcher at the end of my study. You will be paid $35.00 upon completion of the study. If you have questions about your rights as a research subject or wish to report a research-related injury, please contact: Institution Review Board Office, University of Maryland, College Park, Maryland, 20742; (e-mail) irb@deans.umd.edu; (telephone) 301-405-4212.

Researcher: Cynthia Edwards
Advisor: Dr. Steve Graham (301-405-6493)
Department of Special Education (301-405-6515)
1308 Benjamin Building
University of Maryland
College Park, MD 20742

_____ I agree to be audio and videotaped during my participation in this study.
_____ I do not agree to be audio and videotaped.
Name of student: _____
Signature of student: _____
Date: _____

<u>INFORMED CONSENT FORM</u>

I state that I am over 18 years of age and wish to participate in the research being conducted by Ms. Edwards in the Department of Special Education at the University of Maryland, College Park as part of her doctoral dissertation. The purpose of this study is to analyze the writing processes college students use. This study consists of a word processing task (five minutes to verify that I have the necessary word processing skills), a brief think-aloud activity (five minutes on the topic "What do college students use the Internet for?"), and the actual writing activity (one hour on the topic "Explain how alcohol or drug addiction affects one's physical, mental, and family life."). I also give the researcher permission to obtain standardized test scores.

By agreeing to consent to this study, I will: a) complete a basic word processing task, b) complete a practice think-aloud activity, and c) write an essay to the best of my ability. All information collected in this study is completely confidential. I understand that the data I provide will be grouped with data other students provide for reporting and presentations and that my name will not be used. I will only be identified by an assigned subject number. My name will not be used in any reports or presentations of the results of this study. I understand that all materials I submit will be reviewed by another researcher (college faculty or graduate student) and will be kept by the student researcher at the completion of the research study. Participation in this study poses no more than minimal risk to me as the study is not connected to any course requirements or grades. I have the right to withdraw from the study, ask questions, or refuse to answer questions at any time without penalty or consequences. I will be paid $35.00 upon completion of the study.

If you have questions about your rights as a research subject or wish to report a research-related injury, please contact: Institution Review Board Office, University of Maryland, College Park, Maryland, 20742; (e-mail) irb@deans.umd.edu; (telephone) 301-405-4212.

Researcher: Cynthia Edwards
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University of Maryland
College Park, MD 20742

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_____ I do not agree to be audio and videotaped.

Name of student: _____

Signature of student: _____

Date: _____

Appendix B

Pain Unforgettable

James Hutchinson

One evening in 1968 while I was working the swing shift at the General Tire Recapping Plant, I experienced the greatest pain of my life because of a terible accident. Raw rubber was heated up in a large tank. prior to its being fed into an extruder. I was recapping large off-road tires. The lowering platform was in the up position, the chain snapped, it sent the heavy platform crashing down into the tank. This caused a huge wave of steaming water to surge out of the tank. Unfortunately, I was in its path. The wave hit my back just above my waist. The sudden pain took my breath away. I could not move. My clothes were steaming, I screamed. Co-workers ran to my aid and stripped the hot clothing from my back, taking skin as they did. I laid face down on the plat floor, naked and shaking for what seemed like an eternity. The paramedics arrived to take me to the hospital. The painful experience is still with me like a bad nightmare.

Make the following corrections:

1. Correct the spelling of the word "terible."

2. Delete the period after the word "tank."

3. Move the sentence "I was recapping large off-road tires." to right after the second sentence on the second line.

4. Add the word "When" to the beginning of the sentence that starts with "The lowering platform was in the up position..."

5. Change the word "take" to "transport" in the second to last sentence.

Appendix C

<u>LEVEL 1</u>

Alcohol or drug are easy to get addict to. They can be affected physical, mental, and family life. In fact, there are different reasons for people to stop using them still they are destroying people's life.

Drug is the number one to deteriorate a life of a person. Each time after using you can be out of your mind, you definity lose self control. It has different reaction to people, some people just crazy others would just sleep. It deterote you mind, you mentality of reflection gets slower. Alcohol on the hand has also it point to deterorate after a lot drinks. You can see that person acting differently. It can get to the point you will not realize anything or you will forget everything. It can cause you a lot of trouble because after a lot drinks it will be hard to go to work the next day. It gives you a bad thinks of you from your family. Your realiation will end during friends and because you will get addict to it.

LEVEL 3

I dramingly remember my uncle lying on the bed in the hospital. His face was so pale that he looked dead. After two weeks, my uncle was dead because the fatty liver was caused by over consuming alcohol. Alcohol or drug addiction have a great impact on your family; it fatally ruin yourself.

I once watched a video about alcohol addction how the addction ruins yourself physically. If you stop consuming alcohol, you will shake your hands. Moreover, you feel withdrawn. Symptoms are variable. You are losing immune system, and your health is declined. Eventually, you end up dying, otherwise you are in rehab- facility.

Addictors are mentally challenged. They feel isolated because you can't concentrated anything and do nothing. Literally, you are getting away from society and reality. Futhermore, You will be more violated than you don't consume alcohol. It is like your body wants more alcohol, and your body responds to only alcohol. When you don't drink alcohol, you feel depressed. It is like you are losing the purpose of your life.

Your family are also suffered from you. After a day and day, your family are more stressed. They, your parents, feel anxiety. They don't trust you anymore. Addictors are losing themselves; they are not themselves that they used to be lovely, or trusty sons or daughters.

LEVEL 6

Addiction

Alcohol and drug addiction is one of the largest issues facing society today. Addiction to any substance, especially a harmful one, takes a large toll on the body, mind, and family. It is these three aspects that bear the weight of an addiction.

Substance addiction is more immediately noticeable on the body. The body can build up a tolerance, needing more and more of the substance to achieve the desired effect, making the addiction an increasingly larger problem. A person with a drug addiction will most likely experience frequent illness, as their immune system is progressively destroyed. Combined with the drug specific side effects, like alcohol's destruction of the liver, or tar build-up in the lungs due to smoking, the whole bodily state gradually deteriorates.

Unlike the body, the mind can react quite differently to an addiction. Different substances have different effects on the mind, ranging from depression to euphoria, paranoia to hallucinations. However, they all share a few common traits. All drugs are poison to the mind, especially drugs like alcohol, and overtime, the mind disintegrates into a sub-state that is irreversible. This sub-state is noticable in the lack of common sense, overall intelligence, and distance from reality that can be found amongst drug addicts.

Perhaps the most tragic aspect of an addiction, with effects different from either the body or the mind, is the effect on the addict's family. An addiction can completely shred

the fabric of family bonds. Substance addiction often leads to apathy toward family issues, loss of caring between individuals, and loss of trust. Sadly, some drugs, like alcohol and tobacco, can be exposed to other family members, placing their own bodies and minds in jeopardy.

Finally, substance addiction is obviously completely destructive to an individual's life. Their body breaks down. Their mind disintegrates, and their family becomes distant, leaving the addict alone, completely vulnerable and in jeopardy. This is why it is imperative that substance addiction be avoided.

Appendix D

Transcribed think-aloud protocol

<u>Verbalized</u>	<u>Typed</u>
S: The topic now is explain how alcohol	
or drug addiction affects one's physical,	
mental, and family life. Now, we start by	
trying to create a thesis statement and	
the thesis statement will revolve around	
drug addiction. We can start by	
explaining what drug addiction is and	
the drug addiction will be like somebody	
being so dependent on a particular type	
of substance, ok, um, drug, drug addiction	Drug addiction
is a situation, ok, situation, where	is a situation where
someone, someone, is dependent on	someone is dependent on
a particular substance. Ok, now, drug	a particular substance.
addiction affects one's physical, mental,	
and family life. Ok, which affects the	which affects the
physical, mental and family life. Ok,	physical, mental and family life.
now here is the thesis statement I have.	

Appendix E

Coded think-aloud protocol of a student without LD

S: / Ok uh the first thing you want to do

before um you start your essay you want   GOAL

to think about what you are writing

about what so the topic is um/ explain

how alcohol and drug addiction affects   READING ASSIGNMENT

one's physical, mental and family life./

First of all um the best way to do that is

do personal antidotes. I think to me is

the best way is to uh is to relate to the   SELF-INSTRUCTION

topic that you are about to write about so

maybe you have some personal

experiences/ and chances are most people   PKA

do because we live in America and sadly

it is sad sad but true./ Yeah, and um first of   COMMENT

all you want to list of what you want what

I mean you're writing a topic an essay or   GOAL

an explanatory essay/ um you want to write

down the conclusion/ introduction a body   GOAL

few body paragraphs and the conclusion.

Coded think-aloud protocol of a student with LD

R: Tell me how you're thinking about

doing this. How you're going to set it up.

S: Drugs and Alcohol in Society. Drugs are

very common in society. Many people

do not know about their consequences

because they just enjoy consuming it.

Many researches say that the majority

of deaths on the roads are by cause of

drugs.

R: Tell me what you're doing and what

you're thinking here.

S: /Um, I'm trying to make an introduction./   GOAL

R: Ok.

S: /and trying to make a thesis statement./   GOAL

/Um, well, like basically, um, like,

three reasons for drugs are dangerous   TASK DEFINITION

physically in one paragraph, mentally in

another, and the last one family life./ I'm   GOAL

trying to organize this.

R: Ok.

Appendix F

Frequencies of codings of participants

sub.	group	read assign	gen. ideas	org. ideas	Set goals	self inst.	task def.	pro. expl.	pka	trans.	mon. cont.	proc. con.	strat. iden.
1	1	1	0	0	5	1	1	0	2	16	0	0	0
2	2	1	0	0	11	2	7	24	16	62	8	5	3
3	2	1	1	0	7	3	10	2	2	49	0	2	1
4	1	1	5	0	3	0	6	0	0	33	0	2	0
5	2	1	16	0	5	1	16	9	5	48	7	12	5
6	2	1	34	0	15	9	23	4	22	44	11	13	15
7	2	1	29	2	2	1	12	26	0	47	3	7	0
8	1	1	3	0	1	0	4	0	2	12	1	0	0
9	1	1	9	0	7	1	8	2	0	48	1	2	4
10	1	1	4	0	2	0	6	0	1	11	0	1	0
11	2	1	0	0	3	0	6	0	0	7	0	0	0
12	1	1	9	0	3	1	10	3	2	23	4	0	2
13	1	1	4	0	3	1	4	0	2	10	0	0	0
14	1	1	4	0	4	2	4	0	0	10	0	0	0
15	2	1	16	2	6	4	6	8	4	33	3	5	1
16	1	1	8	0	2	2	4	1	0	12	0	2	0
17	2	1	1	0	4	1	3	2	3	28	6	1	0
18	1	1	4	0	1	1	3	2	0	15	1	3	1
19	2	1	21	0	3	0	14	0	1	15	3	2	0
20	2	1	4	0	3	0	4	2	1	17	0	2	0

Frequencies of codings of participants

sub.	group	give com.	self ques	hsb	pause	reread promp	Reread plans	reread sent	reread par.	reread essay	eval text	rev text	Other
1	1	4	1	1	2	0	0	7	0	0	0	1	1
2	2	48	5	1	0	2	0	47	1	0	8	3	24
3	2	4	2	8	0	2	0	38	13	3	0	1	9
4	1	20	0	4	0	2	1	26	8	1	3	3	9
5	2	35	3	0	0	1	0	38	2	0	4	2	12
6	2	18	9	0	0	0	2	34	0	0	28	8	18
7	2	2	0	0	0	0	7	28	0	0	7	1	3
8	1	3	0	1	0	1	0	0	0	0	0	0	0
9	1	10	0	0	0	0	0	41	5	1	1	10	13
10	1	1	0	2	1	0	0	0	0	0	2	1	9
11	2	4	0	0	0	0	0	0	0	0	0	0	2
12	1	5	0	2	0	0	1	8	0	0	0	2	12
13	1	8	0	0	0	0	0	3	0	0	0	0	1
14	1	0	0	0	0	0	0	0	4	0	0	0	2
15	2	11	3	0	0	0	2	7	0	0	7	1	7
16	1	1	0	1	1	0	0	1	0	0	1	0	2
17	2	3	4	3	0	0	0	19	3	0	0	3	2
18	1	6	2	1	0	0	0	1	0	0	0	0	3
19	2	2	0	2	0	1	0	1	0	0	0	0	0
20	2	5	1	0	0	0	0	1	1	1	0	0	4

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