

Crafting an Argument in Steps: A Writing Process Model for Graduate and Professional Students with LD

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The paper discusses argument pedagogy for graduate and professional students with learning disabilities (LD) in the context of academic writing. To understand the nature and types of writing problems that graduate and professional students with LD experience, the author presents results of a university-wide survey with the students who did and did not report LD. The results show that students reporting LD reveal higher needs in five recognized stages of the writing process: selecting knowledge, synthesis of ideas, translation into text, reviewing, and monitoring. They exhibit especially strong differences in the synthesis stage, which includes argument building, development, and organization, and in the reviewing stage, including sentence structure, clarity, punctuation, and formatting. These findings indicate that not only do LD students display needs in high-order and low-order cognitive tasks, but that different stages of highly cognitive tasks cause different degrees of difficulty for them. The results support the five-stage writing process model. Based on this model, the paper proposes a Recursive Step-By-Step Approach that facilitates the process of argument crafting. By dissecting argument building into feasible steps, students with LD can approach the argument writing task, avoiding procrastination and writing blocks.

Keywords: ***A*rgument Writing, Graduate Students, Learning Disabilities, Writing Problems, Writing Process Model, Writing Stages, Writing Strategies**

Introduction

For some lucky students, crafting an argument for a research paper is an enjoyable and creative process. Yet others complain that they struggle with argumentative writing and find themselves procrastinating until the looming deadline. Students with learning disabilities (LD) are not an exception. Most of the current research on LD writing problems focuses on school-age children and adolescents, addressing strategies to help them cope with their learning and writing-related problems. Indeed, this focus on K-12 children is motivated by growing needs of educators working with LD students. As a result of the Common Core State Standards adopted by 45 states, 87 percent of public school students are now required to create clear, informative, argumentative, and persuasive writing (Graham & Harris, 2013). This change in K-12 student assessment strains special education specialists working with an increasing number of LD students. According to the U.S. Census Bureau survey in 2014, 2.4 million American public school students are identified with learning disabilities under the Individuals with Disabilities Education Act. This number comprises about

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5% of the public school student population and is consistent throughout the K-12 education system (Cortiella & Horowitz, 2014).

The persistent nature of learning disabilities suggests that the prevalence of LD among adults should be no less than among children. According to the U.S. Census Bureau survey, 3.4% of the adult population ages 18-64 years (2% of male population and 1.4% of female population) self-reported as having a learning disability in 2010 (Cortiella & Horowitz, 2014). However, little research addresses the needs of this population. Even less research discusses graduate and professional students with LD because graduate students frequently choose to hide their learning or writing-related problems from their higher education institution. According to the National Center for Learning Disabilities report in 2014, 52% of young adults who were diagnosed with a learning disability and received special assistance in high school do not consider themselves as having a disability two years after their high school graduation. This percentage increases to 69% when the young adults self-identify themselves eight years after their high school graduation (Cortiella & Horowitz, 2014). According to the same report, only 24% of young adults who received special education services in high school considered themselves as having a disability and informed their institution in postsecondary education settings. These numbers suggest that the longer young adults are out of school, the less they disclose their disabilities and, therefore, do not request assistance and accommodations from their institution. However, their disabilities do not disappear.

Most of the studies agree that students with LD experience persistent problems with low order cognitive skills such as spelling, grammar, and sentence composition (Mortimore & Crozier, 2006). However, the recent literature reveals a dispute regarding higher order cognitive skills, such as synthesis of ideas, argument building, and organization of ideas. Some studies demonstrate that LD students perform beyond expectations on high-order writing tasks and compensate for their reading problems with high-order cognitive skills (Bruck, 1992; Carter & Sellman, 2013; Goldman & Hasselbring, 1997; Snowling, 2000). Yet other studies show that most students with LD report problems with high-order cognitive processes (Farmer, Riddick, & Sterling, 2002; Hatcher, Snowling, & Griffiths, 2002; Mortimore & Crozier, 2006). On top of these concerns, many LD students struggle with organization of their writing process, timekeeping, and deadlines, which add to general anxiety about writing (Onwuegbuzie and Collins, 2001, Solomon and Rothblum, 1984). These problems impede the students' writing process, academic achievements, and career success.

The scarcity of research on graduate students with LD does not enable K-12 special educators to properly prepare their students for college and graduate studies. Moreover, the lack of research on the graduate population with LD leaves unanswered the question of the type of difficulties that graduate students with LD experience. In this paper, I address the question of whether argument-driven writing persists as a challenge into higher education, specifically graduate and professional school. The current study raises three questions:

(1) Do graduate and professional students with LD exhibit specific needs with argument writing?
(2) If these needs exist, what are those needs and what nature do they have?
(3) What strategies might help students with LD address these needs?

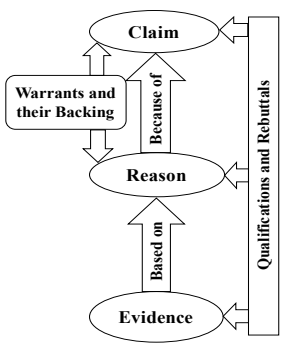
In this article I present the results of a survey addressing the types of writing problems that graduate and professional students with LD self-report. I find that not only do students with LD express consistent problems with writing and argument writing specifically, but that these problems are substantially more pronounced. Furthermore, by extending existing cognitive writing process models to argument writing (Bereiter & Scardamalia, 1987; Flower & Hayes, 1981; Galbraith, 2009; R. Kellogg, 1994), I propose a heuristic model that addresses argument building in steps. The re-iteration of the steps allows students with LD to accomplish their task and develop an argument with maximal efficiency.

Classical Approach to Argument Writing

Arguments are used in all genres of academic writing including essays, research papers, grant proposals, and dissertations, where different parts of the argument tie together to persuade the reader in the claim. An argument is fundamental to these genres, where an unclearly stated problem, poorly formulated thesis, or insufficient evidence causes the opposite, dissuading the reader.

The classical theories of argument (Booth, Colomb, & Williams, 2009; Brooks, 2008; Toulmin, 1958, 2003; Weston, 2009) explain that the writer needs to "make a claim, back it with reasons, support them with evidence, acknowledge and respond to other views, and sometimes explain your principles of reasoning" (Booth et al., 2009, p. 108). Figure 1 presents a relationship of the argument parts introduced by Toulmin (1958) and Booth and colleagues (2009) and the main components of the argument.

Figure 1. **The structure of an argument based on Toulmin, 1958 and Booth and colleagues, 2009.**



(1) A claim, frequently called *thesis* or *thesis statement*, which presents the writer's proposition, which should pass the test of "agree" or "disagree"

(2) Reason, a sub-claim or supporting point, which supports a claim

(3) Evidence in the form of representative quantitative or qualitative data laying foundation for the writer's proposition

(4) Warrants, which explain how the provided reasons support the claim

(5) Backing is any form of support for the warrants

(6) Qualifications, also called acknowledgements, which determine the limiting factors for the claim or the boundaries for the argument to stay true

(7) Rebuttals, also called reservation or responses, which strengthen the argument by acknowledging and refuting the possible counterarguments.

As shown in Figure 1, the components of a sound argument relate to each other to create unity in such a way that the reader does not see where one component ends and the next one begins. As Booth et al. (2009) state, "As you become an experienced writer, you will plan your argument and your paper as a single process."

Unfortunately, planning a writing argument as a single process is exactly what makes the process so intimidating. To be able to reach the level of experienced writers who craft their arguments as a single process, novice writers need to learn to separate argument writing into steps. This process could be compared to learning how to drive a car. Novice drivers need to study what to do to start the car, make it move in the right direction avoiding obstacles, keep the right speed, and follow the road rules. They learn step by step, first acquiring and mastering road rules, then practicing driving skills. Later they realize that many processes happen simultaneously in driving, but these skills come with practice. Creating an argument is a similar process. Only after writers master crafting arguments in steps, are they able to intuitively write an argument as one process.

Argumentative writing becomes even less feasible for students who develop long research papers, dissertation prospectuses, and dissertation chapters. Indeed, many students find the process of argument writing overwhelming. The analysis of the individual writing consultations in 2012-15 in the graduate writing center at Yale University revealed that 53% (1332 out of 2492) of the sessions centered their discussion around the argument in drafts brought to consultations. These discussions included restatement of the argument claim, examination of the focus of the argument, consideration of evidence power, development of separate argument parts, and logical and clear organization of the argument in general.

The composition of an argument in longer pieces of writings is difficult because the argument creation process goes beyond the task of putting argument components together. Deane and Song (2014) in their case study on argumentative reading and writing, show that argument creation process extends to five phases:

1. Deep understanding of the subject
2. Substantial reasons and evidence supporting the argument
3. Examination of different points of view in response to the argument
4. Clearly organized presentation of the argument
5. Careful consideration of the target audience

The five phases add to the complexity of argument writing. Without knowledge of a subject, writers are not able to provide evidence for a claim. Without substantial reasoning and evidence, readers will not be convinced. To convince readers, writers should consider different points of view and be proactive in addressing them. Moreover, the logic of an argument should be clearly presented so that readers can follow these ideas. Importantly, writers should be well aware of the audience to tune the evidence, reasoning, and logic to the specific group. All these tasks, which are similar to the tasks of argument generation, are cognitive tasks.

In addition to these higher-order cognitive tasks, which include intellectual effort of knowledge extraction, synthesis, and remembering, writers of successful arguments need to address lower-order cognitive tasks of spelling, word choice, grammar, revision, and editing. Although not directly related to argument building, these tasks are equally important since they facilitate accurate presentations of writers' ideas to the audience.

Finally, successful argument writing includes a number of tasks related to motivation, integrity, and interpersonal interaction. Argument crafting, similar to the

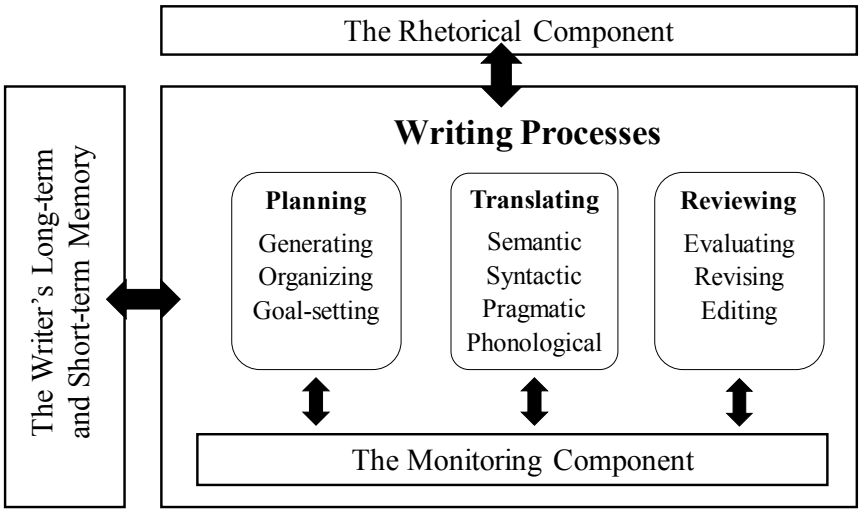
writing process, involves setting writing goals and deadlines, time-management, and avoiding procrastination. Each of these tasks affects the creation of an argument and writing in general. In the next section, I will consider the current models used for the writing process and will discuss how argument writing is imbedded into that process.

The Writing Process Model and Argument Writing

When talking about the writing process, we often refer to the three-stage process of "pre-writing," "drafting," and "revising." Yet writing is a complex rhetorical, linguistic, and cognitive process where these stages intervene, overlap, and complement each other. The current models incorporate all three processes to address the tri-facet nature of this process.

Most models of the writing process are heavily based on Flower and Hayes (1981), represented in Figure 2, where writing involves distinctive, goal-directed thinking processes, which can be embedded within any other, and which writers "organize during the act of composing" (Flower & Hayes, 1981, p. 366).

Figure 2. **Writing model adapted from Flower and Hay, 1981.**



Indeed, Flower and Hayes's model reflects the interaction between rhetorical, linguistic and cognitive processes, where rhetorical problems determine a communicative situation through setting goals defined by audiences, writers' knowledge, and their art as writers. Setting rhetorical goals has been shown to distinguish expert and novice writers where novice writers respond by primarily describing what they know about the topic compared to expert writers who use writing to achieve their communicative goals and address the reader (Bereiter & Scardamalia, 1987; Flower & Hayes, 1981; Hayes & Nash, 1996). Using protocols where writers recorded all they

were thinking and doing while writing, Flower and Hayes (1980) report that novice writers create 70% of their ideas in response to the topic alone, whereas expert writers generate 60% of their ideas in response to their rhetorical goals. These findings demonstrate that expert writers rely on setting rhetorical communicative goals, which are part of the writing process.

The bulk of the writing process is conducted through cognitive processes, which are split into three stages in Flower and Hay's model: planning, translating, and reviewing. The planning stage is a process of creating an internal representation of the intended writing. Applying this model to argument creation, we can say that planning is the stage where writers generate the argument components, organize its parts, and set goals for developing these parts into a coherent argument.

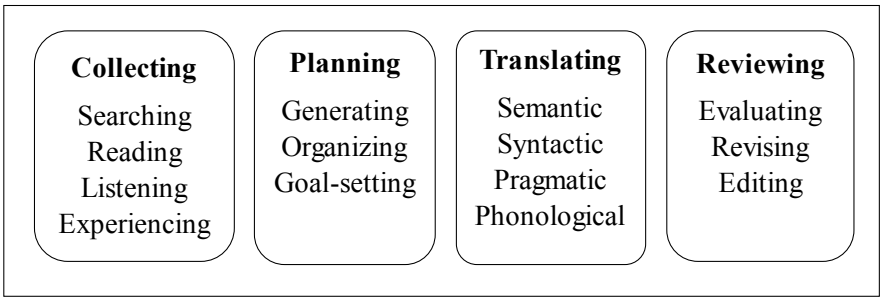
The translation stage is a process of producing written text based on the linguistic component. During this stage, writers employ semantic, syntactic, pragmatic and phonological principles to translate ideas into writing. To linearize ideas into text, writers repetitively accesses their lexical storage to retrieve vocabulary items and make choices based on semantic principles. Moreover, writers use syntactic rules and constraints to build complete grammatical sentences out of the endless number of possibilities to arrange retrieved words. Writers also map the generated text in a coherent way following the pragmatic and discourse principles of "given" versus "new" information and "topic" versus "comment" contrasts. The phonological process of intonation, emphasis, and stress allow writers to formulate ideas in the most coherent way and highlight the information structure. All these linguistics sub-processes allow writers to encode the internal representation of the claim, reasons, and evidence into paragraphs of text tuned to the audience and following the style.

The reviewing stage is a process during which writers evaluate the created text and revise for content, organization, grammar, style, sentence structure, punctuation, depending on what stage they are staying. For argument writing, this stage is the end and the beginning of the cycle where writers decide what could be done to improve the argument and frequently redirect their effort to planning or translation stages.

Flower and Hayes's model also includes a monitoring component, referred in this article as a monitor, which moderates the processes and determines when writers need to stop planning and start translating or stop translating and start reviewing. This component is especially important in developing an argument since writers constantly balance planning, translating, and reviewing to include all components of the argument, tie them together, and respond to the rhetorical goals.

According to more recent developments of Flower and Hayes's model, the writing process is extended to involve four cognitive phases including collection of information, planning of ideas, translating those ideas into written text, and reviewing ideas and written text, as shown in Kellogg's (1994) cognitive model in Figure 3.

Figure 3. **Cognitive model adapted from by Kellogg (1994).**



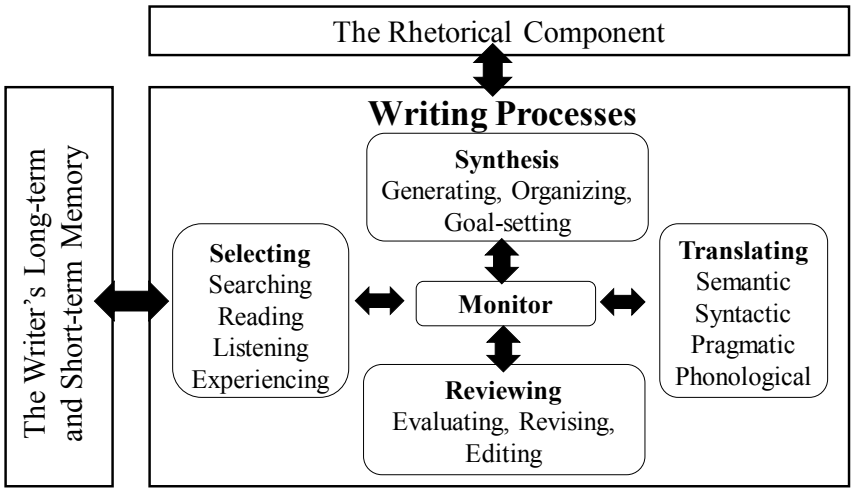
The major enhancement of Kellogg's model is in splitting the process of planning into two phases: collecting and planning. When collecting information, writers research the topic, read various sources, discuss the topic with colleagues, and think about the topic. In contrast to collecting information, planning refers to brainstorming, generating and organizing ideas, assembling pieces of knowledge together, and arranging them to build an internal representation. During this stage, writers choose to visualize their ideas, draw diagrams, create lists, or outline.

The separation of the two stages is important for argument since researching a topic and collecting evidence to support a claim differ from brainstorming and generating ideas. An argument that is not backed by extensive reading and profound research is not convincing in academic writing.

During recent years, the process of knowledge extraction and the role of long-term and short-term memory have received noticeable attention. Models of knowledge activation in the neural network provide additional evidence for how knowledge is produced, supporting the knowledge-constituting model by Galbraith (Baaijen, Galbraith, & de Glopper, 2010; Galbraith, 1999, 2009). This model advances the previous models by explaining that idea generation involves the synthesis rather than the retrieval of content during the writing process. This model accounts for how writers produce novel ideas on the basis of what they already know and accounts for how writing can serve as a tool for idea generation. For the purposes of this paper, I adopt the knowledge-constituting model, but preserve the rest of the components from Flower and Hayes's (1981) and Kellogg's (1994) models, as shown in Figure 4.

Figure 4 shows that the writing process phases include (1) selecting of knowledge; (2) synthesis of ideas matching the goals set by the writer; (3) translation of ideas into text; (4) reviewing of created ideas and written text. These four phases are controlled by the monitoring component in (5) and interact with the rhetorical component and the long- and short-term memory.

Figure 4. **The writing process model adapted from Flower and Hayes (1981), Kellogg (1994), and Galbraith (2009).**



This writing process model encompasses rhetorical and linguistic processes and has been a significant advance in understanding the hierarchical and complex nature of the writing process compared to the linear models constituting of states: "pre-writing," "writing," and "revising." Writers do not finish one stage before beginning the next one, but rather constantly and recursively select information, plan their ideas, translate these ideas into text, and evaluate generated ideas. Writing allows to extract deep unconscious ideas, translate them into conscious concepts, and linearize them for the reader. This complex writing process triggers thinking and is often used as a tool for thinking. In other words, writing not only facilitates, but also stimulates the thinking process. Indeed, writing for generating ideas is used by many writers who put down their ideas to evaluate them. Berninger, Garcia, and Abbott (2009) present and support the ideas that writing is, "a window for conscious access to the unconscious thinking processes of the writer." Understanding the complex cognitive nature of the writing process is essential in understanding how a writer approaches writing and could be used in teaching writing and more specifically creating an argument.

In the rest of the paper, I use the writing process model to classify the types of tasks involved in the writing process and argument writing. I address the question of whether graduate and professional students with LD experience difficulties with writing tasks and introduce the step-by-step recursive model as a strategy to cope with the argument building problems.

Writing Needs of Graduate and Professional Students with LD

To address the question of whether graduate and professional students with LD experience difficulties with argument writing tasks, I analyzed data of an anonymous survey at the graduate writing center at a large highly competitive university.

The survey was distributed to graduate and professional students through the university email messaging system and was sent to 6683 students inviting them to voluntarily complete an online anonymous questionnaire designed for program quality improvement purposes. Each recipient was allowed to respond to the survey once. Out of those potential recipients, 1292 graduate and professional students responded to the survey; this number comprises 19.3% of all addressees, a high response rate for an anonymous survey. The respondents included 42 students who self-reported as having LD, 975 students who self-reported as having no LD, and a group of 275 who preferred not to answer this question. The analysis of the data includes responses of those participants who self-reported as having or not having LD.

Participants

The participants of the survey represented 12 professional schools and 65 departments in the Graduate School of Arts and Sciences. They were asked to share their highest level of completed education, year of study, proficiency with English, age, field of study, and gender. The summary with the statistical analysis of the participants' information is presented in Table 1.

Table 1. ***Statistical analyses of the differences between the students with and without LD***

	Chi-square, df	P-value	Statistical Significance
Education	0.9282, 3	0.8186	ns
Year of Study	4.847, 4	0.3034	ns
Proficiency with English	1.033, 1	0.3094	ns
Age	0.1814	0.1693	ns
Field of Study	8.153, 2	0.017	*
Gender	11.72, 2	0.0029	**

The analysis shows that students who reported LD do not differ significantly from the students who reported no LD with respect to their education, year of study, proficiency with English, or age, as listed in Table 1. Tables 2-4 present the distribution of the students' responses in percentages on the highest level of their education completed before their graduate program, the year of study, and their proficiency with the English language.

Table 2. ***The highest education of the survey participant reporting or not reporting LD***

	Bachelor	Master's	Prof. School	Doctoral
Reported No LD	53.70%	38.00%	4.50%	3.80%
Reported LD	54.80%	35.70%	7.10%	2.40%

Table 3. ***The year of study of the survey participants reporting or not reporting LD***

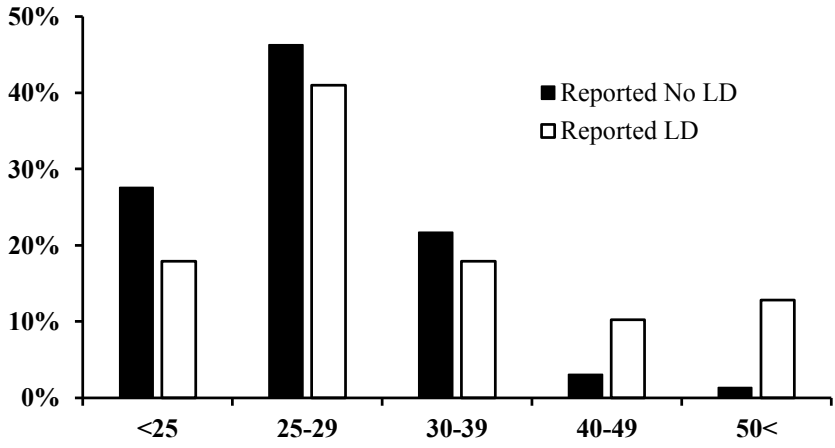
	1st	2nd	3rd	4th	5th +
Reported No LD	39.0%	25.1%	12.4%	10.3%	13.1%
Reported LD	45.20%	28.60%	16.70%	2.30%	7.10%

Table 4. ***The English proficiency of the survey participants reporting or not reporting LD***

	Native Speakers	Non-native Speakers
Reported No LD	79.30%	20.70%
Reported LD	85.70%	14.30%

The age of respondents was collected as an interval variable where participants could choose one of the five categories: under 25, between 25-29, between 30-39, between 40-49, or 50 or more. To compare the age of the two groups with and without LD, a non-parametric Kolmogorov-Smirnov test was used. This test has a stronger statistical ability to analyze the cumulative frequency distributions of interval variables. Although students reporting and no reporting LD did not reveal any statistical difference ($p>.05$), the histogram with the distribution of the students in Figure 5 shows that there were more students with LD who were 40 years old and older.

Figure 5. **Age distribution between the groups with and without LD.**



While student information regarding education, year of study, proficiency with English, and age revealed no statistical difference between the two groups, the information about the field of study and gender showed statistical significance ($p<0.05$) as described below.

All professional and graduate school departments were divided into three categories of humanities, social sciences, and sciences based on their field of study, as in Figure 6.

Figure 6. **The field of study of the survey participants**

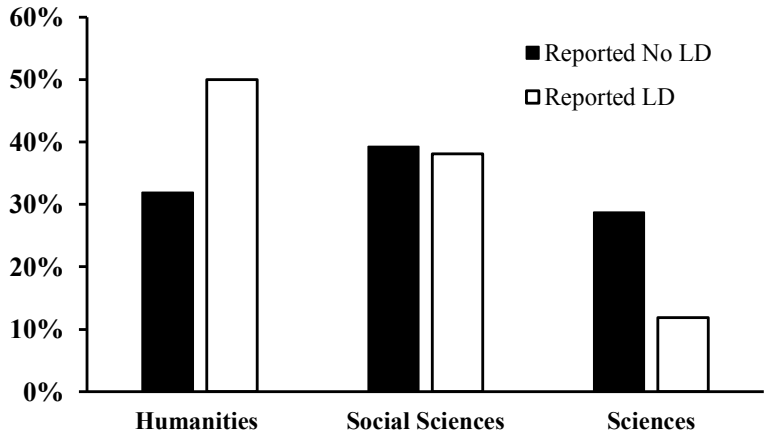
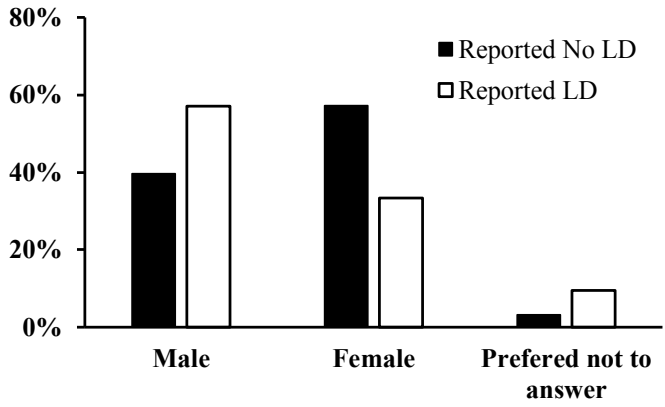


Figure 6 shows that the number of humanities students with LD was higher than without LD, while the number of science students with LD was lower than without LD. This difference is statistically significant ($p=0.0017$). The data suggest that the number of students who self-report LD is higher in the humanities than in the sciences. Indeed, the highest number of professional students with LD (15%) reported from the School of Art and the lowest number was from the School of Forestry and Environmental Studies. Furthermore, 50% of the Graduate School of Arts and Sciences students with LD were from the humanities and only 12.5% from the sciences.

Another difference is found in gender distribution ($p=0.0029$). Students without LD represented a higher number of female participants (40% male, 57% female, and 3% preferred not to respond), while students with LD had a higher number

of male participants (57% male, 33% female, and 10% preferred not to respond), as shown in Figure 7.

Figure 7. **Gender of the survey participants**



The higher number of male participants in the group with LD is supported by the national statistics on LD adult population (18-65 year of age). The national report shows that the proportion of males to females with LD is 59% to 41% (Cortiella & Horowitz, 2014). The gender distribution in the survey is very similar to the national report statistics showing that the pattern in the survey follows the normal and expected distribution for the LD population.

Design and Results

To understand what cognitive writing tasks cause most difficulty for graduate and professional students, I used the tasks associated with each of the phases of the writing process model discussed in the previous section and grouped into five categories such as (1) selecting, (2) synthesis, (3) translating, (4) reviewing, and (5) monitoring. Twenty five different writing tasks were selected to represent the five categories of the writing process practices.

During the survey, the students were asked to select the writing process tasks that presented difficulty for them. They were prompted by the list of the tasks grouped in two questions to avoid a very long list. The two questions were similar and were formulated to elicit responses in the way most familiar for graduate students: (1) what writing process issues are the most difficult for you; (2) what writing tasks are the most challenging for you. The participants could select as many problems as they considered relevant for each of the questions. The problems selected by the participants with and without LD were combined and analyzed statistically.

Figure 8 summarizes the responses and presents them in five groups of tasks to show how many students in the two groups identify the tasks as challenging.

Figure 8. **Writing process activities selected as problematic by graduate/ professional students.**

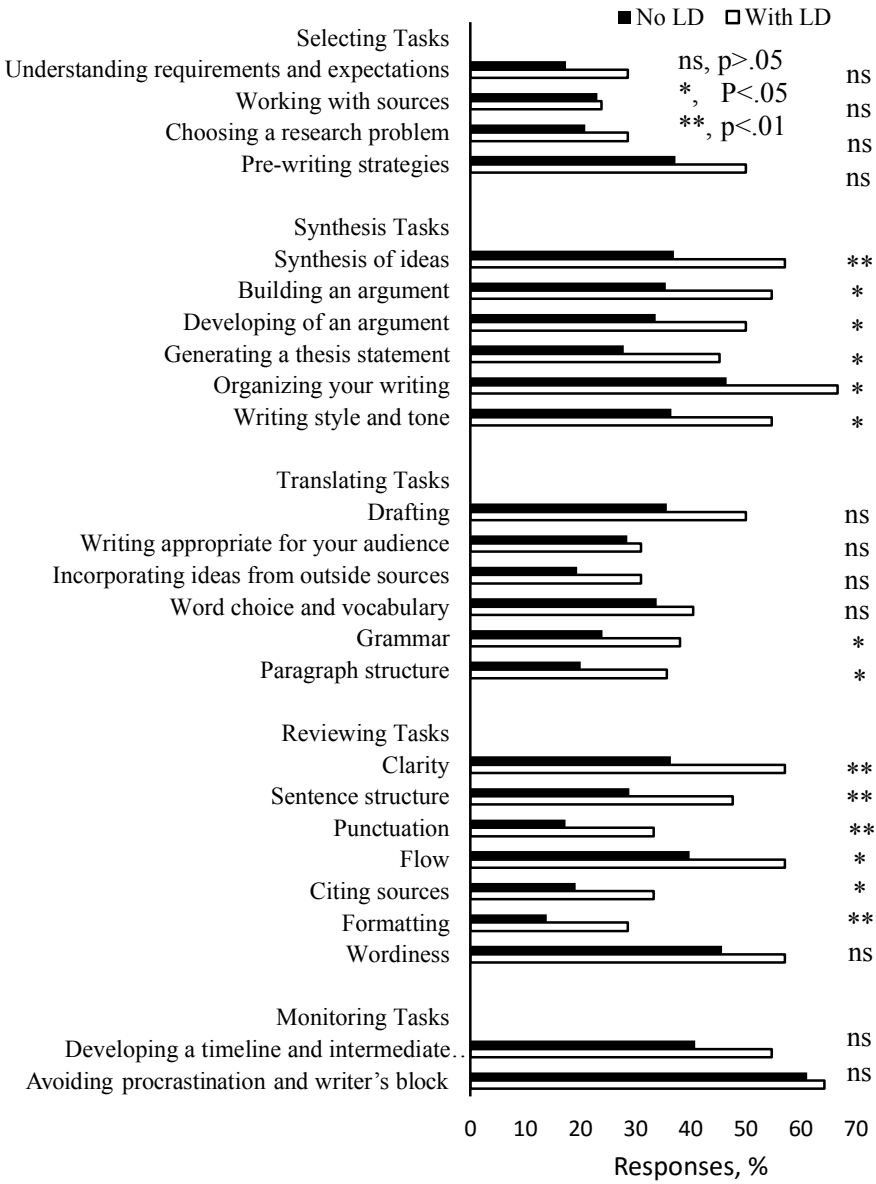
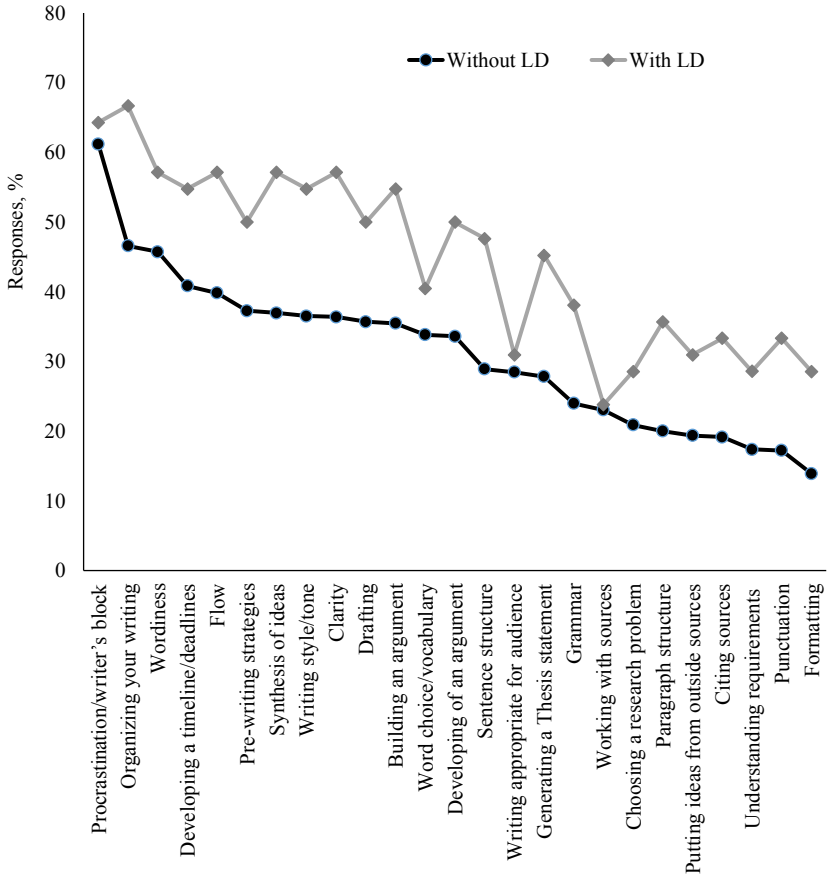


Figure 8 shows that the group of students reporting and not reporting LD are statistically different in all synthesis tasks, in some translating tasks (grammar and paragraph structure), and in almost all reviewing tasks (except wordiness). The results also show that the two groups of the participants are not different in selecting information tasks, most of the translating tasks, and monitoring tasks.

The two groups of tasks that are strikingly different for the students with and without LD are synthesis and reviewing. In the synthesis group, the students with LD exhibit particular difficulties with organizing their writing, synthesis of ideas, and building an argument. In the reviewing group, the students with LD reveal challenges with sentence structure, punctuation, and formatting. Most of the translating tasks are not statistically different, and they stay in the medium range of difficulty for both groups. Interestingly, monitoring and selecting tasks contrast with each other. In both categories of tasks, the results for the students with and without LD are not statistically significant. However, the level of task difficulty is different: while monitoring tasks present high difficulty for both groups, selecting tasks do not.

Figure 9. **Writing-related difficulties of the graduate students with and without LD.**



Furthermore, the pattern of difficulties of the students with and without LD is not similar. As shown in Figure 9, writing-related issues of the graduate students with LDs are more pronounced than the issues of the students reporting no

LD. Indeed, in every task, the percentage of students with LD is higher than that of the students without LD. Students reporting no LD experience most difficulties with monitoring tasks, moderate difficulties with synthesis tasks, and low difficulties with selecting, translating, and reviewing tasks. At the same time, the students reporting LD exhibit strong difficulty with monitoring and synthesis tasks, substantial difficulty with reviewing tasks, and moderate difficulty with selecting and translating tasks. The only three tasks where the two groups show similar levels of difficulty are avoiding procrastination, writing appropriate for the audience, and working with sources. All other categories present extensive difference.

Discussion and Implications

The survey results reveal a pattern of difficulties corresponding to the five categories of tasks in the writing process model: selecting, synthesis, translating, reviewing, and monitoring. The students reporting LD reveal stronger difficulty with tasks across the five groups, as summarized in Table 5.

Table 5. ***Mean of difficulty for the five task groups***

Task Groups	Reporting LD	Reporting no LD	Significance
Selecting	32.745	24.648	ns
Synthesis	54.761	36.16	*
Translating	37.698	26.895	ns
Reviewing	44.896	28.74	*
Monitoring	59.525	51.0	ns

Notes:
White = low difficulty (mean is less than 30%)
Light grey = moderate difficulty (mean is between 30% and 40%)
Dark grey = substantial difficulty (mean is between 40% and 50%)
Black = strong difficulty (mean is more than 50%)

The two groups that reveal most differences between the students with and without LD are synthesis and reviewing. There is no surprise that the students with LD exhibit strong difficulties with reviewing tasks, such as sentence structure, punctuation, citing sources, and formatting, since these problems might be a result of poor symbol recognition. Other tasks in this group, such as clarity, flow, and wordiness, require combined effort of synthesis and reviewing skills, and, therefore, present a challenge for the students.

Although the results of the study are preliminary and should be tested with a higher number of LD participants, the findings help us understand the nature of the writing problems of LD students. The most interesting finding is related to the synthesis category tasks, which are reported as very difficult by LD students and moderately difficult by the students without LD. These results support the studies of Farmer et al. (2002), Hatcher et al. (2002), and Mortimore & Crozier (2006) by showing that

the students with LD self-report writing issues related to the macro structure including argument building, structure, and organization.

Some studies including Bruck (1992), Goldman and Hasselbring (1997), Snowing (2000), and Carter and Sellman (2013) show that students with LD can perform equally well on highly cognitive tasks. They state that students with LD demonstrate high-order conceptual performance that far exceeds what could be predicted based on their performance on low-order tasks including spelling, capitalization, and punctuation. Based on Carter and Sellman (2013), LD students' difficulties with the higher level writing processes can only be attributed to the problems with phoneme/grapheme (and grapheme/phoneme) mapping, short term memory, and retrieval from long-term memory, rather than problems with generating and synthesis of ideas (Carter & Sellman, 2013). Those studies suggest that students with LD are not expected to exhibit high-level writing problems. The present results challenge those findings by showing that graduate and professional students reveal difficulty with writing high-order cognitive tasks.

Furthermore, the findings provide an additional argument for the five task categories of the writing process model. The difference in difficulty with each task category shows that these categories are separate phases in the writing process. Based on this evidence, selecting and synthesis categories should, indeed, be considered as separate phases in the process. These findings strongly support Kellogg's (1994) and Galbraith' (2009) writing process models. At the same time, the difficulty with monitoring tasks highlights the importance of Hayes and Flower's (1981) monitoring component, which moderates cognitive writing processes and determines when the writer needs to switch tasks.

To summarize, the findings indicate that graduate and professional students with LD require additional assistance with writing-related tasks, especially with synthesis, argument building, and organization. Therefore, it is important to understand how to enhance these writing tasks in graduate and professional students, as well as how to prepare K-12 students and college students to cope with these tasks. In the next section, I propose a Recursive Step-by-Step Approach, a strategy to facilitate argument crafting.

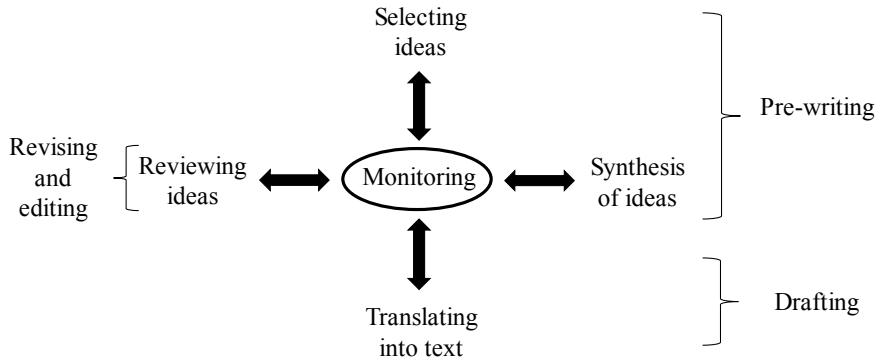
Recursive Step-by-step Approach to Argument Writing

When we assemble a 1000-piece puzzle out of an arsenal of separate fragments in all colors and shapes, mixed in a box, we need to start with a strategy. The first step is to take the pieces out of the box and place them face up. Then we start with corner pieces and follow up with the sides. After the puzzle's "frame" is created, we put together the middle part, section by section and scene by scene. These scenes are further merged to create larger parts of the puzzle that could be attached to the "frame." The process of synthesis and crafting an argument, especially in long papers, is similar to assembling a puzzle and requires specific strategies. Our initial arsenal contains the data that we have collected, contextual knowledge, separate ideas, and segments of proof. Our goal is to create the frame for our argument, then generate sections and scenes that match with the frame, and finally embellish all of its parts so that the argument appeals to the reader with a strong convincing power. I propose a

Recursive Step-by-Step Approach based on the writing process model and the cognitive sub-processes happening at each stage discussed in Figure 4.

In short-paper arguments, the first step is to generate a claim and present reasons and evidence for the claim. To do that, writers select knowledge and ideas from recent readings and notes or retrieve them from long-term memory. Based on the selected knowledge, they synthesize an early version of a claim and produce some reasons. They translate them into text and review the text to match our communicative goals. Writers control the process by monitoring how much text they have created and what should be added or changed; then they repeat the cycle by selecting factual evidence that should prove the validity of their reasons and explain the claim. Writers synthesize the pieces of evidence, translate them into text, and review. They continue this process until they feel that the claim, reasons, and evidence are presented in a narrative that digests the argument to the reader and matches the reader's expectations. Thus, the process of building a short argument works as in Figure 10.

Figure 10. **Argument building for a short writing based on cognitive models.**



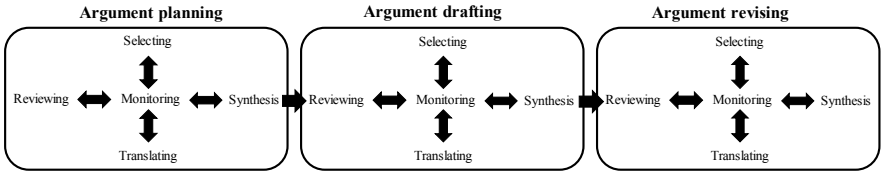
The model in Figure 10 is particularly useful for students with LD, who frequently suffer from short-term memory problems. The re-iterative nature of the model facilitates the process and helps the students accomplish the task without overloading their short-term memory.

However, when writers craft an argument in a long paper, retrieval or selection of all necessary knowledge for a claim is problematic. The same way simultaneous synthesis of all reasons and parts of evidence would require significant cognitive resources. Writers of a long argument need to approach the task by using writing process as a tool to derive all argument parts. Only through this process can they evaluate their ideas and build up the argument. Since these concurrent processes are aggravated for LD students, the Recursive Step-by-Step Approach can be used to lead LD students through the process.

The Recursive Step-by-Step Approach assumes that argument building is conducted in three stages: argument planning, argument drafting, and argument revising. Each stage consists of five sub-processes, which include selection, synthesis,

translating, reviewing, and monitoring. The monitoring sub-process is especially important since it controls other sub-processes to determine when a writer should stop one sub-process and proceed with another, or return to a previous one. These sub-processes are re-iterated a number of times until the product of the stage is achieved and the argument takes its shape, as in Figure 11.

Figure 11. **Recursive Step-by-Step Approach to argument building.**



The model in Figure 11 shows that the five sub-processes are controlled and reiterated. For example, selecting ideas can be followed by either synthesis, or translating, or reviewing depending on the goal. The same way translating can be followed by either selection of additional ideas, or synthesis, or reviewing. Finally, the sub-processes in each stage can repeat until the writer is ready to move to the next stage. At each of the three stages, the same sub-processes apply, but they operate differently at each level of writing: at the planning stage they operate on ideas, at the drafting stage they operate on the preliminary draft, and at the revision stage they operate on the complete draft. Each of the stages is discussed in the following sections.

Argument Planning

When the writer embarks on creating an argument, the first step is to generate relevant, valid ideas that lay a foundation for articulating a claim and its support. The importance of planning is supported by several experimental findings showing a direct correlation between planning of writing and quality of final drafts (Kellogg, 1988; 1990). In addition, planning the argument distinguishes expert writers from novice writers. Bereiter and Scardamalia (1987) report that experts' protocols typically contain ratios of thought to text of around 4 to 1 while novice writers display the ratio 1 to 1. This finding suggests that if proceeded by careful planning, drafting is easier and warrants better results.

This stage is especially sensitive to the state of the short-term memory. Bourdin and Fayol (1994, 2000, 2002) have shown that low-level processes involved in spelling and punctuation can impair retrieval. Through their idea-generation experiments with children and adults, they conclude that spelling and punctuation have a residual effect on information retrieval from the long-term memory if short-term memory is overloaded by other resource-demanding processes. This finding has an important implication for writers with LD whose short-term memory is usually overloaded with spelling and sentence transcription processes. The Recursive Step-by-Step Approach allows the LD writers to "inactivate" those processes through successive application of the same sub-processes.

The five sub-processes during this stage feed each other and stimulate argument planning. The process of conceptualizing ideas for the argument does not entail creating a logical and complete narrative, but rather generates a list of key phrases, a network of notions, interrelations, and conclusions. Figures or tables with empirical data, schematics, or bullet point lists are the best strategies at this stage. Present software applications might also be useful solutions for many writers with LD. These concept mapping applications prompt the generation of ideas and are excellent venues for creating schematics and networks of ideas. Also, note-taking and writing applications might ease free-writing ideas.

Free-writing (Bolker, 1998) is another effective tool. Writing itself is a helpful tool for generating ideas. Through the free-writing process, the argument saturates in the writer's mind and allows the writer to evaluate ideas as they come with writing. Table 6 is an example of a possible scenario for the first stage of Argument Planning.

Table 6. ***Argument Planning checklist***

Input: Ideas from the long-term memory, readings, and notes on the readings	
1.	Generate a network of ideas and free-write on the topic of the argument by using computer applications (FreeMind or Mindjet for visual writers; Scrivener or Evernote for textual writers).
2.	Using readings and notes, generate the list of facts, visuals, explanations, and quotes to support reasoning of the argument.
3.	Evaluate generated ideas and evidence; draft and revise the claim and reasoning.
4.	Add sentences or some sentence fragments to go with different ideas; develop each point if necessary.
5.	Expand the list of points into an outline by synthesizing and evaluating ideas.
6.	Free-write on different points of the outline by re-working the outline into an extended outline or preliminary draft.
Output: a preliminary draft containing a claim, reasoning and some evidence.	

Argument Drafting

Writers can use the drafting process for sharpening their argument through adding ideas, reasons, and evidence. Baaijen and colleagues (2010) show that writing is a process of discovery. Using data with key-strokes logs, they show that text production guides writer's understanding of the topic, helps find answers to their questions, and allows them to formulate explanations. The same way, writers can use the drafting process as a way to facilitate deeper thinking.

During the drafting stage, the writer generates more cohesive and coherent ideas, synthesizes these ideas into longer and better quality text, reviews, and continues to re-iterate these sub-processes. Even though the final product of this stage is linear, the process of drafting is not. Writers can move through the argument and elaborate on its parts in any order. This un-ordered drafting allows the writer to be

more creative in the process and to avoid getting "stuck" on particular sentences and paragraphs. Table 7 shows a possible checklist for the argument drafting process.

Table 7. ***Argument Drafting Checklist.***

Input: a preliminary draft containing a claim, reasoning and some evidence.
1. Re-read and select ideas from the preliminary draft by copying them to a new document.
2. Evaluate and sharpen the claim statement; keep the claim statement available while working with the reasoning and evidence to remind yourself what you prove.
3. Synthesize ideas from the preliminary draft and other available sources to develop evidence for your argument.
4. Based on the existing evidence, develop reasoning for the claim.
5. Consider each reasoning as a section and work section by section, but not necessarily in the order of the argument.
6. Compile and organize the sections with reasoning and evidence into a draft.
7. Review the draft to make sure that it contains the necessary parts.
Output: a draft of the argument which elaborates on the claim, reasoning, and evidence

Argument Revising

Reviewing is as important as pre-writing and drafting; it should be planned and conducted accordingly. During revision, writers make sure that the draft meets rhetorical goals and matches the reader's expectations. Similar to other stages, argument revising consists of the same five sub-processes: selecting, synthesis, translating, reviewing, and monitoring. Each of the sub-processes plays a crucial role and should not be skipped. Compared to the planning stage, where ideas come from the long-term memory and readings, and the drafting stage, where ideas are generated from the preliminary draft, here writers retrieve ideas from the existing draft.

A few tools could be used to accomplish this task, which include marking ideas on margins, color coding argument parts, and reverse outlining. The first technique, marking ideas on the margins, is the closest to what writers perform when they read someone else's reading. Making notes, placing questions, and summarizing ideas are common practices. Treating yourself as a different writer is a way to give yourself unbiased feedback. While revising the document on the screen or reading the document on paper, the writer makes comments in the left and right margins. The notes on the right margins may summarize the main ideas of each paragraph and guide the reader through the argument. The comments on the left margins might be used as directives for improvement, e.g., add another piece of evidence, make the transition from one point to the next clearer. The strategy of color coding aims to visually enhance the presence of all component of a good argument. By coloring the claim into "red," reasons into "green," and evidence into "yellow," the writer can see if the draft has enough evidence for every reason and how the parts of the argument are distrib-

uted through the paper. Finally, a reverse outline strategy is a way to see the argument in its unity. When writers create an outline for the existing paper, they may notice argument inconsistencies that may not be visible when the draft is read page by page. Each of the three techniques allows the writer to generate ideas from the draft to better synthesize, re-organize, and translate into revised text. Table 8 presents a checklist for the Argument Revision process.

Table 8. ***Argument Revision checklist.***

Input: a draft of the argument which elaborates on the claim, reasoning, and evidence
1. Use one of the two techniques to retrieve ideas from the existing draft: marking ideas on the margins or color coding of the argument parts.
2. Analyze the parts, logic, and flow of the argument by creating a reverse outline.
3. Generate more ideas if any points require additional backing or strengthening.
4. Review the argument by making sure that qualification and rebuttals are presented.
5. Share the argument draft with your peers, colleagues, and other readers to receive feedback.
6. Review your argument to respond to the readers' comments.
Output: The final draft

Conclusion

The present paper shows that argument-driven writing persists as a challenge throughout the graduate and professional school. Using the cognitive writing process model, the paper analyzes five major categories of tasks: selecting knowledge, synthesis of ideas, translating into text, reviewing, and monitoring. The survey with graduate and professional students demonstrates that students with LD experience difficulty with all types of writing tasks, but they report particular difficulties in synthesis and reviewing tasks, difficulties that differentiate them from their peers without LD. This means that students with LD experience high-level writing problems, including argument building, structure, and organization; and low-level writing problems, including sentence structure, punctuation, and formatting.

To address the high-level writing issues of LD students, I propose a Recursive Step-by-Step Approach, an argument building model, which expands the features of the writing process model to argument crafting. By simulating cognitive processes in argument building, the writer improves the outcome of each stage. The model simplifies the complex writing process into a linear model of three stages, but allows recurring processing within each stage. By dividing the process into specific tasks and repeating them within each stage, writers with LD can refresh their short-term memory frequently and perform selection, synthesis, translating, and reviewing processes. Thus, the re-iterative nature of the model can help writers with LD gradually improve their abilities to create an argument and their writing skills.

The findings of the paper and the proposed argument-writing model have an important implication for educators of K-12 and college specialists, who should

pay equal attention to the development of high-order synthesis tasks, as they do to low-order translation and reviewing tasks. Synthesis of ideas, creation of a thesis statement, crafting an argument, and organization of ideas are imperative tasks in many genres of K-12, college, and graduate writing. Without these skills, students with LD cannot succeed in their academic and professional careers. Moreover, the Recursive Step-by-Step Approach allows K-12 educators to guide their students with LD through the complicated process of argument writing and prepare them for academic programs.

References

Baaijen, V., Galbraith, D., & de Glopper, K. (2010). Writing: the process of discovery. In *Proceedings of the 32nd Annual Conference of the Cognitive Science. 32nd Annual Conference of the Cognitive Science* (pp. 1774-1779). Wheat Ridge, US: Cognitive Science Society.

Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Berninger, V. W., Garcia, N. P., & Abbott, R. D. (2009). Multiple processes that matter in writing instruction and assessment. In G. A. Troia (Ed.), *Instruction and assessment for struggling writers: Evidence-based practices* (pp. 15-50). New York, London: The Guilford Press.

Bolker, J. (1998). *Writing your dissertation in fifteen minutes a day: A guide to starting, revising, and finishing your doctoral thesis.* New York: Henry Holt and Company.

Booth, W. C., Colomb, G. G., & Williams, J. M. (2009). *The craft of research, Third edition.* University of Chicago Press.

Bourdin, B., & Fayol, M. (1994). Is written languagr production more difficult than oral language production? A working memory approach. *International Journal of Psychology*, *29*(5), 591-620.

Bourdin, B., & Fayol, M. (2000). Is graphic activity cognitively costly? A developmental approach. *Reading and Writing: An Interdisciplinary Journal*, *13*, 183-196.

Bourdin, B., & Fayol, M. (2002). Even in adults, written production s still more costly than oral production. *International Journal of Psychology*, *37*(4), 219-227.

Brooks, C. (2008). *Fundamentals of good writing: A handbook of modern rhetoric.* Harcourt, Brace.

Bruck, M. (1992). Persistence of dyslexics' phonological awareness deficits. *Developmental Psychology*, *28*(5), 874-886.

Carter, C., & Sellman, E. (2013). A view of dyslexia in context: implications for understanding differences in essay writing experience amongst higher education students identified as dyslexic. *Dyslexia (Chichester, England)*, *19*(3), 149-64.

Cortiella, C., & Horowitz, S. H. (2014). *The state of learning disabilities: Facts, trends and emerging issues.* New York .

Deane, P., & Song, Y. (2014). A case study in principled assessment design: Designing assessments to measure and support the development of argumentative reading and writing skills. *Psicologia Educativa*, *20*, 99-108.

Farmer, M., Riddick, B., & Sterling, C. (2002). *Dyslexia and inclusion: Assessment and support in higher education.* Taylor & Francis, Inc.

Flower, L., & Hayes, J. R. (1980). The cognition of discovery: Defining a rhetorical problem. *College Composition and Communication*, *31*(1), 21-32

Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication, 32*(4), 365-387.

Galbraith, D. (1999). Writing as a knowledge-constituting process. In M. Torrance & D. Galbraith (Eds.), *Knowing what to write* (pp. 139-160). Amsterdam, NL: Amsterdam University Press.

Galbraith, D. (2009). Writing about what we know: Generating ideas in writing. In R. Beard, D. Myhill, J. Riley, & M. Nystrand (Eds.), *The SAGE handbook of writing development* (pp. 48-64). SAGE Publications.

Goldman, S. R., & Hasselbring, T. S. (1997). Achieving meaningful mathematics literacy for students with learning disabilities. *Journal of Learning Disabilities*, *30*(2), 198-208.

Hatcher, J., Snowling, M. J., & Griffiths, Y. M. (2002). Cognitive assessment of dyslexic students in higher education. *British Journal of Educational Psychology*, *72*(1), 119-133.

Hayes, J. R. (2009). From idea to text. In R. Beard, D. Myhill, J. Riley, & M. Nystrand (Eds.), *The SAGE Handbook of Writing Development* (pp. 65-79). SAGE Publications Ltd.

Hayes, J. R., & Nash, J. G. (1996). On the nature of planning in writing. In *The Science of Writing: Theories, Methods, Individual Differences and Applications* (pp. 29-56). Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Kellogg, R. (1994). *Psychology of writing*. New York; Oxford: Oxford University Press.

Kellogg, R. T. (1988). Attentional overload and writing performance: Effects of rough draft and outline strategies. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *14*(2), 355-365.

Kellogg, R. T. (1990). Effectiveness of prewriting strategies as a function of task demands. *American Journal of Psychology*, *103*(3), 327-342.

Kellogg, R. T. (2001). Competition for working memory among writing processes. *The American Journal of Psychology*, *114*(2), 175-191.

Mortimore, T., & Crozier, W. R. (2006). Dyslexia and difficulties with study skills in higher education. *Studies in Higher Education*, *31*(2), 235-251.

Toulmin, S. E. (1958). The Uses of Argument. *Ethics*, *70*(1), 264.

Toulmin, S. E. (2003). *The uses of argument* (Updated edition 2003). *Cambridge, Cambridge University Press.* Cambridge University Press.

Weston, A. (2009). *A rulebook for arguments* (Fourth edition). Hackett Publishing.