High-achieving High School Students' Strategies for Writing from Internet-based Sources of Information

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Abstract: This study investigates Grade 12 students' global and local strategies for writing from the Internet. Analysis of screen captures, think-aloud protocols, and interviews showed two global writing strategies: 1) Students created mediating planning documents; they alternated between researching online and creating mediating planning documents, then drafted a text, and then revised. 2) Students created no (or almost no) mediating documents; they wrote directly from the source documents, alternating frequently between researching, drafting, and revising. Each global strategy comprised several sub-ordinate strategies (e.g., search using a combination of content and rhetorical keywords; take hard copy notes; draft a text out of the sequence in which it appears in the final text; use automatic spelling and grammar checkers to guide review). Some of these strategies are similar to those used in print-based writing from sources. However, using the Internet also resulted in new researching and writing strategies. We argue that writers created task environments and used strategies that maximized the affordances of the Internet, electronic writing medium, and internal cognition, and minimized their constraints. This work extends classical cognitive work on writing as well as more recent work on writing from sources.

Keywords: writing from sources; discourse synthesis; strategies; persuasive writing; Internet

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The purpose of this paper is to identify the strategies used by high-achieving Grade 12 students as they research a topic online and write a persuasive essay based on what they read. The ability to write from sources is a determinant of school success that can make important contributions to deep and transferrable student learning (e.g., Cerdán & Vidal-Abarca, 2008; Wiley & Voss, 1999). Much of the existing writing-from-sources research has focused on students' use of textual paper sources (e.g., Kirkpatrick & Klein, 2009; Mateos, Martín, Villalón, & Luna, 2008). Today however, students turn to the Internet as a source of information and much of students' writing is based on Internet sources (e.g., Lenhart, Simon, & Graziano, 2001; McClure & Clink, 2009). Internet sources differ from print-based sources in ways that may change the nature of reading and writing tasks, and the behaviours and strategies needed to perform those tasks successfully (e.g., Coiro & Dobler, 2007; Leu, Kinzer, Coiro, & Cammack, 2004). Previous studies have investigated students' strategies for components of online writing (e.g., searching); this is one of the first papers to investigate skilled writers' overall strategies for writing, and how they orchestrate lower level strategies to constitute an overall writing process.

1. Literature Review

1.1 The Writing Process from a Cognitive Perspective

Skilled writers approach writing as a goal-driven problem-solving process (Hayes, 2012; Kellogg, 2008). They are knowledgeable about the writing process (Englert, Raphael, Fear, & Anderson, 1988; Graham, 2006; Hayes, 2012), exhibit high degrees of meta-cognition and self-regulation (Englert et al., 1988; Kellogg, 2008; Pressley & Harris, 2006; Zimmerman & Risemberg, 1997) - particularly for guiding planning and revising (Graham, 2006) - and possess a range of effective writing skills and strategies (Graham, 2006; Pressley & Harris, 2006). When writing, skilled writers set both content and rhetorical goals and use strategies to achieve those goals (Bereiter & Scardamalia, 1987). An enduring definition of 'strategies' has been that provided by Pressley, Forrest-Pressley, Elliot-Faust, and Miller (1985, in Pressley & Harris, 2006):

> A strategy is composed of cognitive operations over and above the processes that are natural consequences of carrying out the task, ranging from one such operation to a sequence of interdependent operations. Strategies achieve cognitive purposes (e.g., comprehending, memorizing) and are potentially conscious and controllable activities (p. 266).

In the context of writing, strategies include such activities as goal setting, considering one's audience, planning prior to writing, re-reading text after a break, and so on (Harris & Graham, 1996).

The writing process is informed by long-term memory as it may hold content, rhetorical, or procedural knowledge necessary for the writing process (e.g., Graham, 2006; Pressley & Harris, 2006). The writing process also relies on working memory

(e.g., Kellogg, 1988, 1990; Torrance & Galbraith, 2006). High cognitive load can induce writing problems, whereas reductions in cognitive load can lead to better writing; cognitive load depends on the task and on individual memory, knowledge, and strategy use (e.g., Kellogg, 1988, 1990; Torrance & Galbraith, 2006). Finally, research has demonstrated that there are significant individual differences in writing processes (e.g., Hayes, 2012) and writing-from-sources processes (Rijlaarsdam & van den Bergh, 2006); for example, some writers plan ahead of drafting whereas others interleave planning with drafting (Hayes, 2012).

1.2 Writing from Sources

When *writing from sources*, writers ideally read a variety of types of sources from a variety of perspectives and form a nuanced and complex understanding of a situation (Britt & Rouet, 2012). Indeed, writing from sources can be an important source of learning (Boscolo & Borghetto, 2002; Britt & Rouet, 2012; Cerdán & Vidal-Abarca, 2008; van Meter & Firetto, 2008; Wiley & Voss, 1999). Sophisticated reader-writers may develop intertextual models while reading, for example, noting that the author of one source *disagrees* with the author of another source (Britt & Rouet, 2012). To write, they must then develop their own knowledge claim which accounts for the information and perspectives presented in the sources (Britt & Rouet, 2012; Haller, 2010). When writing from sources, students must sometimes re-work material from the source texts to meet their own rhetorical goals (e.g., Britt & Rouet, 2012; Haller, 2010). Less skilled writers may have trouble generating a text which integrates source material and is driven by the writers' own goals (Mateos et al., 2008). Instead, they often re-present source material, for example, by summarizing each source one after another (Flower et al., 1990; Kirkpatrick & Klein, 2009; Spivey, 1997), by using one source's structure as a frame in which to fit other material (Nash et al., 1993; Segev-Miller, 2007), or by failing to integrate source material with their knowledge claim (Haller, 2010). Writers may also use 'patchwriting', which the Citation Project defines as "working too closely with the language and syntax of the source when they [reader-writers] attempt to paraphrase" (Jamieson & Howard, 2013, p.113). Jamieson and Howard (2013) show that patchwriting is a ubiquitous strategy in first-year academic writing. Howard (1993) argues that patchwriting represents an intermediate step during which writers are new to a discipline and its associated terminology and ideas; patchwriting, from this perspective, represents a first foray into academic writing within a discipline. It may also reflect a misunderstanding on the part of students about the nature of academic research and writing (Jamieson & Howard, 2013).

In order to write a well-integrated text from sources, writers can use strategies such as marking information in the source texts (Spivey, 1997) or transferring information into notes or an outline prior to writing (Flower et al., 1990; Kirkpatrick & Klein, 2009; O'Hara, Taylor, Newman, & Sellen, 2002; Risemberg, 1996; Spivey, 1997). Notes and outlines serve as intermediate texts between source texts and to-be-written texts. Writers must be selective; they choose information from sources that is relevant,

signaled to be important, and/or repeated in several sources (Britt & Rouet, 2012; Spivey, 1997). Segev-Miller (2007) studied the intertextual processing strategies of teachers' college seniors and developed a taxonomy of the strategies she observed. She identified three major categories: planning (e.g., planning use of strategy, planning work schedule), evaluating (e.g., evaluating source texts, evaluating product text), and executing (e.g., selecting, transforming, revising). Of particular note is the fact that writers transformed material *conceptually* (e.g., creating ("inventing") a macroproposition), *rhetorically* (e.g., synthesizing source texts), and *linguistically* (e.g., linking sources through the use of linguistic devices) (Segev-Miller, 2007).

Some researchers theorize that strategies such as note-taking and outlining may be effective because they allow the elaboration of goals and transformation of ideas and language to occur incrementally, thereby reducing cognitive strain on short term memory (cf., Flower & Hayes, 1980), or in contemporary terms, reducing cognitive load on working memory (Kellogg, Olive, & Piolat, 2007; Kellogg, 2008; Sweller, 2010). The timing of activities is also important. Rijlaarsdam and van den Bergh (2006) examined the relationship between writers' activities at various times during writing and their text quality; they demonstrated that the correlations between activities and text quality depended on the timing of the activities. For example, the correlation between reading the assignment or documentation (sources) frequently and text quality was strong and positive early in the writing process, but the correlation became medium and negative later in the writing process.

In argumentation/persuasion – the genre used in this study - the rhetorical goal is to put forward and defend a claim (thesis), using reasons and evidence (Britt & Rouet, 2012; van Eemeren & Grootendorst, 1999). Counterarguments should also be acknowledged and addressed (Britt & Rouet, 2012; Nussbaum, 2008). In writing arguments from sources, case studies suggest that there is a complex and recursive interplay between task understanding, claim formation, source and source information selection, writing process, and written product (Haller, 2010). For example, Haller (2010) describes a student who saw a writing task as requiring the development of a discipline-specific argument with many elements (e.g., data, warrants, counter arguments) and who had disciplinary knowledge and experience. He searched in academic databases, chose academic sources critically, transformed material from the sources to meet his own purposes, used source material to support many argument elements, introduced counter arguments, and ultimately wrote a well-developed argument with a complex structure (Haller, 2010). Another student, who sought to make the task simpler, searched in public databases, chose sources written for the general public, chose source information simply and as data, and wrote a paper with a less well developed rhetorical structure (Haller, 2010). Thus, strategies used by writers cannot be separated from other factors involved in the writing process (e.g., writer's genre knowledge, disciplinary knowledge, task understanding).

1.3 The Internet

The writing environment is an integral part of writing (Hayes, 2012; Hayes & Flower, 1980; Leijten, Van Waes, Schriver, & Hayes, 2014). Internet sources differ from print sources in ways that may change the nature of reading and writing tasks, and the strategies needed to perform those tasks successfully (Coiro & Dobler, 2007; Leu et al., 2004). The Internet contains vast amounts of information (Adair & Vohra, 2003), that is more extensive and often more current and primary than that available in the school library, and more varied in terms of language, culture, political angle, region (Hoffman, Wu, Krajik, & Soloway, 2008; The New London Group, 2000), and authors' knowledge, credibility, stance, and goals (Kuiper & Volman, 2008; Leu et al., 2004). Information on the Internet is multi-modal (Leu et al., 2004), though many print texts are also multimodal (Hayes, 1996). The Internet also has interlinked pages (Coiro & Dobler, 2007; Kuiper & Volman, 2008), and a document's relationship to other documents may not be clear (Coiro & Dobler, 2007).

In order to write from Internet sources, students must search for sources. Students may begin by trying to get an overview (Silva, 2011). Kuiper et al. (2005) reviewed the literature and identified four search strategies used by students: (1) entering keywords into a search engine, either alone, or in combination via Boolean operators; (2) browsing, by following the links provided in an index; (3) entering a specific website address; and (4) following links on a website. The effectiveness of searches depended on a user's prior knowledge of the topic, knowledge of the Web, and skill, as well as the type of information being sought. Students were good at browsing for very general information; conversely, they were often focused on getting a narrow and correct 'right answer'. They were not as good at selecting a broad base of information on which to form their own opinion (Kuiper et al., 2005, 2008). As a first step, or to provide an overview of a topic, secondary and post-secondary students often consult Wikipedia (Li, 2012; Menchen-Trevino & Hargittai, 2011). Students may continue to search for sources using popular search engines such as Google as well as library databases (Li, 2012). In Li's (2012) study, students' searches became more focused and specific as searching continued.

Students must then select from among the sources returned by a search. Although the amount of information available on the Internet is indeed one of its benefits, the number of sources and amount of information can also be overwhelming (for university students, Head & Eisenberg, 2010; and for professors, Jankowska, 2004). Kiili et al. (2008) found that upper secondary-school students evaluated potential online sources for writing in terms of relevance and credibility; students evaluated sources on the basis of relevance far more frequently than credibility. McClure and Clink (2010) found that university students were good at evaluating sources on the basis of timeliness / currency. Students had some ability to evaluate authority, although there was a range in students' ability to evaluate authority of the sources and address it appropriately. Students were largely unconcerned with bias in their sources.

In a dissertation (conducted after the dissertation on which this study is based), Zheng (2013) found that college writers' prior topic knowledge guided their searching and reading of source information. For example, as writers responded to the question of whether old buildings should be preserved or new buildings should be built, writers searched for information on buildings with which they were already familiar. Students also searched based on rhetorical and content cues present in the writing assignment prompt. For example, one search was "destroying historical landmarks – pros and cons". That search strategy demonstrates an awareness on the part of participants of the genre in which they were writing. Indeed, Bulger, Mayer, and Metzger (2014) found that students' digital literacy proficiency was most strongly predicted by academic expertise. There was an interaction between domain knowledge and technological knowledge, such that high technological knowledge helped compensate for low domain knowledge.

In terms of students' reading, Li (2012) found that students skim read their online sources, or used the 'find' function to read only sections of text that the students believed to be relevant. This is problematic, in that sections of text may not accurately reflect the meaning of text as a whole (Li, 2012) or may not reveal bias in the source, which is sometimes only evident in small sections of the source (McClure & Clink, 2010). Silva (2011) found that university students (n = 3) tended to summarize as they read, and do some evaluating, but that they did not tend to set concrete goals, make inter-textual connections, or articulate rhetorical elements.

Once a source has been read, a writer must select certain information from that source to include in his or herfinal paper. Undergraduate students may take notes prior to writing, though actually having the notes available during writing does not affect essay quality (Desjarlais & Willoughby, 2007). Li (2012) found that many of the university student participants took notes in which the title, URL, and topic of a source (sometimes including keywords) were noted. Li (2012) contrasted this form of note taking with the integrative and transformative note-taking typically encouraged in writing-from-sources tasks. Approximately half of the students surveyed in Head and Eisenberg (2010) indicated that they developed working outlines.

In terms of the relationship between researching and writing, some participants intermingle researching and writing, and write directly from sources. In Zheng (2013), 1 of the 12 participants used a strategy of immediately transferring information from the source to the essay. She conducted searches in order to meet immediate information needs. The other 11 participants searched and read first, and then wrote their essays. In Li (2012), at least a few of the students researched in order to meet their drafting needs, and wrote directly from those sources.

Students' written products have also been studied. Zheng (2013) found that when including source information in texts, students picked, restated, summarized, paraphrased, and synthesized information. Sentences based on source information served as claims (39.02%), evidence (56.10%), and far less frequently, counter arguments (4.88%). Information picking and information restating were the most

common ways that students incorporated source information; synthesizing information represented only 5.58 % of the instances in which web information was incorporated. When information was synthesized, it was done in order to construct evidence or reach a conclusion. Cerdán and Vidal-Abarca (2008) found that designing writing tasks such that students have to integrate content from across sources in order to answer questions can result in more integrated processing and deeper learning than tasks in which students can rely on content from a single document.

Finally, working with online documents requires high degrees of self-regulation and meta-cognition (Yang, 2002). For example, having to alternate between displays while writing adds to a writer's cognitive load and affects writing (Olive et al., 2008). Experienced writers may attempt to reduce such constraints, for example, by printing some documents or by cutting and pasting relevant material into a single document (Attfield, Fegan & Blandford, 2009; Li, 2012; Leijten et al., 2014). Zheng (2013) argued that a number of students' strategies were used to reduce the cognitive load associated with working online (though cognitive load was not measured). For example, they selected sites with comprehensive information in order to reduce the number of sites they had to read; once they had selected sources, they read and engaged deeply with those texts; they assessed information in relation to current knowledge, in order to discontinue working with insufficient information; they offloaded information to external sources (e.g., notes); and monitored their searching and reading behaviours to ensure, for example, that they stayed on task. Other strategies capitalize on tools offered by the digital environment. In a case study of a professional writer, Leijten et al. (2014) documented the writer's use of the comments function in Microsoft Word to manage his writing goals. He also inserted placeholder quotes (e.g., '"blah blah"') to mark places where he needed to add information.

The notion of managing a task environment follows from the classic model of Hayes and Flower (e.g., 1980) and from recent revisions to the model (e.g., Leijten et al., 2014); the authors noted the importance of the task environment (e.g., task-related sources, prompt, text produced thus far) to the writing task. It is likely that the Internet and electronic writing medium, as an environment, offer both affordances (cf. Gibson, 1979) and constraints to writers.

At the outset of this literature review, writing was discussed as a goal-directed problem-solving process, which relies on both long-term and working memory. Writing arguments from sources is a particular type of writing, in which authors must generate a macroproposition and transform source material in order to support that macroproposition; writers use a variety of strategies to do so, such as writing notes and outlines. The writing environment affects writing and the Internet is significantly different from the print environment in which much writing-from-sources research has been done (e.g., Kirkpatrick & Klein, 2007; Mateos et al., 2008; Risemberg, 1996; Spivey, 1997). The studies that have addressed students' writing from the Internet have addressed aspects of the writing process (e.g., searching, Kuiper et al., 2005), have studied students' strategies indirectly (e.g., through questionnaires (Head & Eisenberg,

2010) or process logs (Li, 2012)) or have studied students' strategies in the context of another purpose (e.g., instruction, Silva, 2011). Two dissertations - Zheng (2013) and the one on which this is based (Kirkpatrick, 2012) - studied students' strategy use as they wrote, using a variety of data sources. The studies discussed in this literature review range considerably across populations, subject sizes, and methodologies. Although it is somewhat difficult to generalize across such studies, the purpose of the literature review has been to lay the groundwork for the research that follows.

Indeed, the goal of this project is to identify and describe high-achieving Grade 12 students' global and local writing strategies for researching online and writing a persuasive essay based on what they read. It is one of the first studies to do so. The research question is, *What are high-achieving Grade 12 students' strategies for writing arguments from online sources of information?*

2. Method

2.1 Recruitment and Participants

This research was conducted in an urban secondary school in Ontario, Canada, following review and approval by a Research Ethics Board. The English Department Head at one of the highest-achieving schools in the city (EQAO, 2011) nominated students with the highest grades in their English courses (Table 1). High-achieving students were selected in order to gain a picture of *effective* writing strategies.

The writers in this study were intended to be very good writers who would likely use effective strategies, but writers who were nonetheless high-school students, completing a high-school-type writing task. Selecting these students (as opposed to professional writers, for example) was intended to provide a picture of strong writing *at the high-school level,* in order to later provide guidance for other students at the high-school level.

Interested students received letters of information from the Department Head and returned consent forms to the researcher. Nine Grade 12 students participated. A small number of participants was chosen in order to allow for in-depth analysis. Demographic information is provided in Table 1. The 'Strategy Used' will be discussed in the Results section.

2.2 Materials

Students completed the writing-from-sources task on a Toshiba Satellite laptop computer.

Students were provided with an electronic Microsoft Word document (Microsoft Corporation, 2007) which contained links to 23 online sources about the testing of cosmetics products on animals; the sources are listed in Appendix A.

Table 1: Participants

Name (pseudonym)	Age	Gender	Ethnicity	First / Home Language	Strategy Used
P1: Mark	17	Male	Caucasian	English	Create Mediating Documents
P2: Kieley	18	Female	Caucasian	English	Create Mediating Documents
P3: Sarah	17	Female	Caucasian	English	Write Directly From Sources
P4: Kristen	17	Female	Caucasian	English	Write Directly From Sources
P5: Joy	18	Female	Caucasian	English	Create Mediating Documents
P6: Aisha	17	Female	Caucasian of Egyptian descent	Arabic	Write Directly From Sources
P7: Rebecca	17	Female	Caucasian	English	Write Directly From Sources
P8: Ishaan	-	Male	-	-	Create Mediating Documents
P9: Abbey	18	Female	Caucasian	English	Create Mediating Documents

These resources were chosen by the researcher, such that they varied in form (e.g., textual, images, video), content, perspective on the issue, authorship (e.g., organizations, government sites, private citizens, and corporations), length, and readability. Sites well-known to students (e.g., Wikipedia) were also included. Students could use these sources or search online for their own. Microsoft Word (Microsoft Corporation, 2007) was used for students to take notes and write their texts. Pencils, pens, lined paper, and a printer were also available to all students. While students completed the writing activity, Camtasia Studio 6.0 was used to record students' think-aloud protocols, faces, and computer screens. This software creates a file that replays the recorded computer screen in the main window (including mouse movements), with the webcam recording and accompanying audio recording of the student in a smaller floating window.

2.3 Procedure

The writing task was intended to be similar to the types of persuasive writing-from-sources tasks often assigned in school. The topic was intended to interest and engage students.

Each student completed the writing activity independently on the laptop provided, in approximately three one-hour sessions. This writing task took place for the purposes

of this research project only; it was outside of participants' class time and activities. Many participants indicated (informally) that they chose to participate because they were interested in the process of research and the technology being used in the project. Participants received $20 in acknowledgement of the time they devoted to the task.

The first session began with a practice think-aloud activity. Following this, the participant received the following instructions:

> Please write an argument essay – also known as a persuasive essay – about what Canada's policy on cosmetic testing on animals should be. Imagine that you are writing this to a government official, such as your local member of parliament (MP). This is a highly controversial topic, and individuals and groups have different opinions about what should be done. You have been provided with several online sources about the topic. You may use these sources, or you may search online for your own sources. Please write your essay in Microsoft Word. It should be one to two pages, single-spaced. You should provide a list of the websites that you consulted at the end of your paper, and may want to cite these throughout the paper as well. Throughout the activity, please 'tell me what you are thinking and what you are doing' (Coiro & Dobler, 2007, p.225). If you are reading, or writing, you may do so silently. But try to speak throughout any other activity, or if you pause during your reading or writing. Your task is not to explain to me what you are doing, but rather to reveal what is going through your mind. Again, the task is to write an argument essay about what Canada's policy on cosmetic testing on animals should be.

If necessary, students were reminded to continue thinking aloud throughout their writing. As noted above, Camtasia Studio 6.0 (Techsmith Corporation, 2009) was used to record think-alouds and computer screens. In the second session and third sessions, the student continued the task.

Once each student's writing was complete, the student was interviewed about his/her writing processes and strategies (e.g., 'What was your goal in this writing?', 'Can you tell me how you completed the assignment?'). The purpose of the interviews was to triangulate the data; the think aloud protocol, text product, and interview each provide clues to the students' strategies. The interview allowed students to directly report their goal as they conceptualized it, and their strategy for pursuing this goal. It also allowed them to express their perspective on the writing task. The interview questions are included in Appendix B.

2.4 Data Analysis

The primary researcher first reviewed all the data, to get a "*general sense* of the information and to reflect on its overall meaning" (Creswell, 2002, p. 191). The main source of data was the recordings, which contained both the think-aloud protocols and screen recordings. Note that many of students' writing artifacts were electronic and

were thus also captured in the screen recordings. Students also created some hard-copy documents. Field notes and think-aloud data allowed us to determine the match between think-aloud data and what was being written in hard copy, thus the hard-copy documents as well as the electronic documents were considered alongside the recorded think-aloud protocol. Finally, the interview data converged with the recorded data and the text products, and thus triangulated the findings.

Once the primary researcher had a sense of the data as a whole, she iteratively watched the recordings and developed codes. All video data was watched several times during the development of the codes. Each code represented a strategy used by participants (e.g., search using content keywords). These codes were developed primarily on the basis of what participants did and said in the recordings. For example, a recording showed a participant typing "animal testing cosmetics" into a Google search bar while saying "I'm going to look for information about testing". The code "search using content keywords" was developed. The researcher also considered interview data and prior research on writing when developing the codes. The codes were hierarchical in that they were grouped into four major activities: research, create mediating planning documents, write, and revise. Like the codes, these major activities were identified on the basis of the recordings, and were also apparent in the interviews and in previous literature. The full list of codes is presented in Tables 2 and 3.

Once the codes were developed, the researcher began coding the recorded data. Each participant's video data was considered in 5 minute segments. Five-minute segments were used because they were long enough to capture participants' activities (e.g., a coder could determine what a participant was doing in that segment and for what purpose) and long enough that they resulted in a manageable number of units for analysis. On the other hand, they were short enough that meaningful changes in activity were captured; that is, the coding series revealed how participants' activities changed across time. In terms of frequency, the coding scheme is a somewhat rough representation of strategy use; it did not capture whether a strategy was used once or three times during a given five-minute segment. However, examining the series of codes of each participant, individually, allowed us to see when strategies were used by each participant; they also allowed comparisons between the global strategies of different participants (i.e., by comparing the series of codes).

For each segment, a strategy was coded as used (check mark) or not used (blank). The coding sheet can be seen in Table 2. When a participant stopped working electronically and started working in hard-copy, this would be captured by the relevant codes (e.g., "take hard-copy research notes"). After the initial coding, some codes were deleted (e.g., each instance of 'wrote notes' was also coded as 'take electronic research notes' or ' take hard-copy research notes', so 'wrote notes' was deleted). The *codes* used represent particular strategies used by participants. The *pattern* of codes – the way that the strategies are used across time – represent the global strategy used by participants.

Table 2: Patterns of Strategy Use by Participants: Create Mediating Documents (green) and Write Directly from Sources (red)

		First Session (in 5 min. segments)														Second Session (in 5 min. segments)														Third Session (in 5 min. segments)				
Activity	Strategy	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25
Research	Set short-term or long-term research goals	✔ ✔	✔ ✔	✔		✔	✔ ✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔ ✔		✔	✔	✔	✔	✔	✔ ✔	✔			✔					
	Go to one of 23 provided websites	✔ ✔	✔ ✔	✔	✔	✔			✔	✔	✔																							
	Search using content keywords	✔ ✔	✔ ✔				✔ ✔	✔			✔		✔	✔		✔	✔			✔	✔	✔		✔	✔	✔			✔					
	Search using rhetorical AND content keywords			✔																														
	Search using genre words																																	
	Read /view websites	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔	✔	✔ ✔		✔	✔		✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔	✔ ✔	✔	✔ ✔	✔			✔					
	Explicitly evaluate a website positively or negatively	✔ ✔	✔	✔	✔	✔ ✔	✔	✔	✔		✔		✔			✔ ✔	✔				✔	✔	✔	✔	✔	✔				✔					

Create Mediating Documents	Take electronic research notes							✔	✔	✔	✔							✔	✔	✔	✔	✔	✔	✔												
	Take hard-copy research notes																																			
	Write electronic outline							✔	✔	✔								✔	✔	✔	✔	✔	✔	✔												
	Write hard-copy outline																																			
	Print research notes																							✔												
Draft	Draft sentences electronic-ally				✔	✔	✔	✔	✔	✔	✔ ✔	✔ ✔	✔	✔				✔	✔	✔	✔	✔	✔	✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔	✔ ✔	✔	✔	✔	✔	✔
	Draft sentences in hard copy																																			
	Draft the text in the sequence in which it appears				✔	✔	✔	✔			✔ ✔	✔ ✔	✔	✔				✔	✔					✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔	✔ ✔	✔	✔	✔	✔	✔
	Draft the text out of the sequence in which it appears							✔	✔	✔									✔	✔	✔	✔		✔												
	Re-read sources to draft				✔	✔		✔												✔			✔	✔ ✔	✔	✔	✔	✔	✔	✔						
	Research to draft						✔				✔	✔		✔		✔	✔			✔	✔			✔	✔	✔			✔							
	Thesaurus / Dictionary				✔	✔					✔		✔											✔			✔								
	Word-processing functions					✔	✔	✔ ✔	✔ ✔	✔	✔	✔ ✔	✔				✔	✔ ✔	✔ ✔	✔	✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔	✔ ✔	✔	✔	✔	✔	✔	✔

Revise	Read and re-write entirely new draft																																	
	Edit only				✔	✔	✔		✔ ✔	✔	✔	✔ ✔	✔				✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔	✔	✔	✔
	Edit / revise at mid-level				✔			✔	✔	✔	✔		✔						✔	✔			✔	✔	✔	✔								✔
	Revise globally / deeply					✔																	✔											
Ongoing	Use self-regulation and meta-cognition	✔	✔ ✔	✔	✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔		✔	✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔ ✔	✔ ✔	✔	✔ ✔	✔	✔ ✔	✔	✔	✔
	Problem solve on ethical grounds	✔		✔		✔	✔																			✔								

Note: The green check marks indicate Mark's process and the red check marks indicate Kristen's process.

The primary researcher coded the data first, as described above. To establish interrater reliability, a representative subset of 30% of the data was selected for a second coder to code independently. The second coder was a doctoral student familiar with writing research. This data was selected in 20 minute blocks of time, and the blocks were selected so that they included all participants and included different stages of participants' writing. Each 5-minute segment was considered separately. An inter-rater reliability ratio was calculated for each code for each participant as follows, 'agreements on occurrence / (agreements + disagreements on occurrence)'. The ratios for each code were then added across participants to get an overall reliability ratio for each strategy code.

A few codes were difficult to distinguish reliably and were thus collapsed (e.g., 'search using general-content keywords' and 'search using specific-content keywords' were collapsed into 'search using content keywords'). There were two codes – 'research to draft' and 'use word-processing functions' – which had low reliability. The primary researcher reviewed the meaning of the codes with the coder and asked her to review and recode the relevant data for these codes. She did, which resulted in high inter-rater reliability for those two codes as well. Final inter-rater reliability ranged from 73% to 100%. It is presented in Table 3.

3. Results

3.1 Overview

During coding, and on the basis of the final codes used for each participant, it became apparent that participants were using one of two global strategies. The distinct feature of the first global strategy, used by five participants, was the creation of mediating documents and the reliance on those documents for content for their texts. The five students who used this process - Mark, Ishaan, Kieley, Joy, and Abbey - alternated between researching online and creating mediating planning documents (notes, outlines), then drafted a text, and then revised. An example of a coding sheet for a student (Mark) who used the approach of creating mediating documents prior to writing is presented in Table 2 (green check marks; top row of check marks within each row). The distinct feature of the second global strategy, used by four participants - Sarah, Kristen, Aisha, and Rebecca - was that students wrote directly from the source documents; they created no or minimal mediating documents. Students who used this strategy alternated between researching, drafting, and revising. An example of the coding sheet for a student (Kristen) who used the approach of writing directly from sources is presented in Table 2 (red check marks; bottom row of check marks within each row).

The difference between the two global strategies is seen in the codes related to creating mediating documents (see Table 3). Students who used the strategy of creating mediating documents will have codes that relate to taking notes and writing outlines.

Table 3. Strategy Use by Participants

	Strategy Use by Participants (percentage of five minute segments in which strategy was used)										
		Create mediating documents					Write directly from sources				
Major Activity	Strategy	Mark	Ishaan	Kieley	Joy	Abbey	Sarah	Kristen	Aisha	Rebecca	Interrater Reliability
Research	Set short- or long-term research goals	37	17	52	21	23	46	59	40	83	74%
	Go to one of the 23 provided websites	27	17	16	13	3	19	7	14	17	78%
	Search using content keywords	20	9	32	13	10	46	45	37	61	73%
	Search using rhetorical AND content keywords			13				3	17	17	100%
	Search for websites using genre keywords								11		100%
	Read/View websites	67	34	71	47	32	88	65	80	91	91%
	Explicitly evaluate a website (positively or negatively)	37		45	18	23	62	34	11	70	75%
Create Mediating Documents	Write electronic research notes	37*	17*		8	29				4	87%
	Write hard-copy research notes			29	24		23*				100%
	Write electronic outline	33*	17*			23			17		83%
	Write hard-copy outline			26	16		23*				83%
	Print documents	3									not available
Draft	Draft sentences electronically	43	69	45	24	58	69	76	57	57	89%
	Draft sentences in hard copy				19						100%
	Draft the text in the sequence in which it appears	43	49	45	47	58	58	59	37	26	88%
	Draft the text out of the sequence in which it appears	3	23	26	11	3	15	24	31	29	78%

Revise	Reread sources to draft (during drafting, to generate content, reread sources that were retrieved earlier during research)	3	23	23	11		69	38	34	26	88%
	Research to draft (during drafting, to generate content, search/retrieve additional sites)			16	11		62	41	31	57	95%
	Use electronic thesaurus/dictionary		6					21	11		100%
	Use word-processing functions, such as bolding, underlining, colour, bullets	70	63	35	26	52	54	55	26	48	83%
	Re-write entirely new draft				26**						100%
	Edit only (with respect to surface/local features of the text that do not affect meaning)	67	77	42	39	58	62	66	57	61	81%
	Edit/revise at mid-level (with respect to local meaning)	10	26	29	3	32	27	34	40	13	83%
	Revise globally / deeply (with respect to global structure, gist of text, and / or major rhetorical move)			6	3	3	4	7	11	9	89%
Ongoing	Use self-regulation and meta-cognition	87	74	71	71	74	73	79	77	91	86%
	Problem solve on ethical grounds	3	3	16	5	26		14	34	9	83%

Note. *Participants were working on the same document; it was coded as both notes and outline. **Joy wrote a first draft in hard copy and a second draft electronically.

Students who write directly from sources have no or fewer codes related to taking notes or writing outlines. Where students who wrote directly from sources did create mediating documents, they did so late in the process (Sarah), did so early and then abandoned them (Rebecca), or created rhetorical outlines with little content (Aisha). More information on this will be provided later.

The difference between the two groups is most apparent by reviewing the distribution of codes related to reading, writing, researching for new sources while drafting, and reading open sources while drafting (see Table 3). As an example, see Table 2 and compare the pattern for Mark (who created mediating documents) and Kristen (who wrote directly from sources). Mark takes notes and makes an outline before focusing on drafting. Once drafting, he does not read open sources or research for new sources, because he is relying on his outline. Compare that to Kristen, who creates no mediating documents, begins drafting early, and continues to read / view sources, read open sources, and research for new sources, throughout her writing process. The patterns of Mark and Kristen represent the patterns of others who created mediating documents and wrote directly from sources, respectively. Students who created mediating documents researched for new sources or read open sources during 22% of their drafting segments; students who wrote directly from sources read open sources or researched for new sources during 87% of their drafting segments.

Each of the two global strategies was supported by numerous sub-ordinate strategies. The strategies used to support each of the global strategies are discussed in detail below.

3.2 Strategy of Creating Mediating Documents

Brief description. Students who used the mediating-documents strategy - Mark, Ishaan, Kieley, Joy, and Abbey - first researched, then researched and created mediating planning documents, then drafted, and then revised. The relationship between researching and creating mediating documents was recursive, in the sense that the research process shaped the mediating documents and the mediating documents shaped the research process. This strategy was easily discernable from the coding sheets; for these participants, early time segments were coded with the researching and mediating documents codes, later segments were coded with the drafting codes, and final segments were coded with the revising codes. Students who used this strategy described it clearly in their interviews. Ishaan said:

> I started off by finding some good sources and doing some research on the topic. Then, like, *I took all the major points and I organized them into kind of a, like, in a certain pattern [notes/outline], so I could take points from there and use them in the essay. Then I just started writing, and I kept, like, referring to those notes* and also to other new sources as I went along. And I pretty much did that until the end, and then I just reviewed and checked everything and corrected anything that I wanted to change (interview).

Researching. Researching among students who created mediating documents was characterized by searching for, reading, or viewing websites. Note that reading text was far more frequent than viewing images. All of the students who created mediating documents both consulted the provided sources and searched for their own sources.
Initial researching was broad; participants who created mediating documents wanted to "become more informed" (Joy, interview) and wanted to form an opinion on the topic and a claim for their paper. For example, Ishaan said, "that [Wikipedia] kind of provided an overview of the whole topic. And immediately I think it's – that it should be banned" (TAP). Abbey had an existing position; she said, "I already know my personal opinion of this, so, I'm just going to go with this and use the information to back up my personal opinion" (TAP). Mark stated that he needed to clarify his position by learning more, "I'm obviously not for it, but I'm not sure, to the extent" (Mark, TAP). The most predominant search strategy for learning more about the topic was to use a search engine such as Google or Bing, and to search using content keywords. The keywords used early in the search process, when students were trying to get an overview of the topic, were typically quite broad, for example, "cosmetic testing on animals" (Ishaan).

As they researched and read sources, all but one student who created mediating documents evaluated the sources. There were differences in the degree to which they did so, however. Recall that the figures in Table 3 do not represent raw counts; however, one can see a wide range in terms of the percentage of segments in which evaluation occurred. Mark was particularly focused on source credibility; he selected sources based on: neutrality, balanced perspective, citations by and to other sources, relevance, authorship (positively evaluating sources written by associations, as opposed to blogs), content, geography (preferring sources with content relevant to Canada), and inclusion of science. He rejected sources based on irrelevance, bias, age, and mode (cartoons and pictures). After his initial browsing, Mark actually chose his "main sources" (Mark, interview). He printed the sources in hard copy and included links to them in a reference page in a Word document. He selected these on the basis of the criteria noted above. Other students noted fewer criteria than Mark, but were nonetheless attuned to credibility. Notably, students sometimes used sources in their own reading which they would not cite. Four of the five students who created mediating documents (all except Abbey) used Wikipedia but noted that they would not cite it.

Once students who created mediating documents had gotten a sense of the topic in general, they began to set more focused rhetorical goals and these goals drove their search goals and operations, and also drove the way they interpreted content. At this stage, students who used the mediating-documents strategy also began taking notes or writing an outline (more on this below). Their research goals included: finding information to support their claim (e.g., "get some major points that I can use", Mark, TAP), understanding counter-arguments in order to refute them (e.g., "If I can find pros,

then it's easier to find, like a way to argue against it", Kieley, TAP; see Video 1 and Video 2), and clarifying previously-read information (e.g., "just want to make sure I get it right", Mark, TAP). At this point, they searched using content keywords, in order to locate information relevant to a particular line of reasoning (paragraph) in their paper. For example, while writing a paragraph about the harm done to animals, Sarah searched "conditions of animals during cosmetic testing". Mark referred predominately to the "main sources" that he printed.

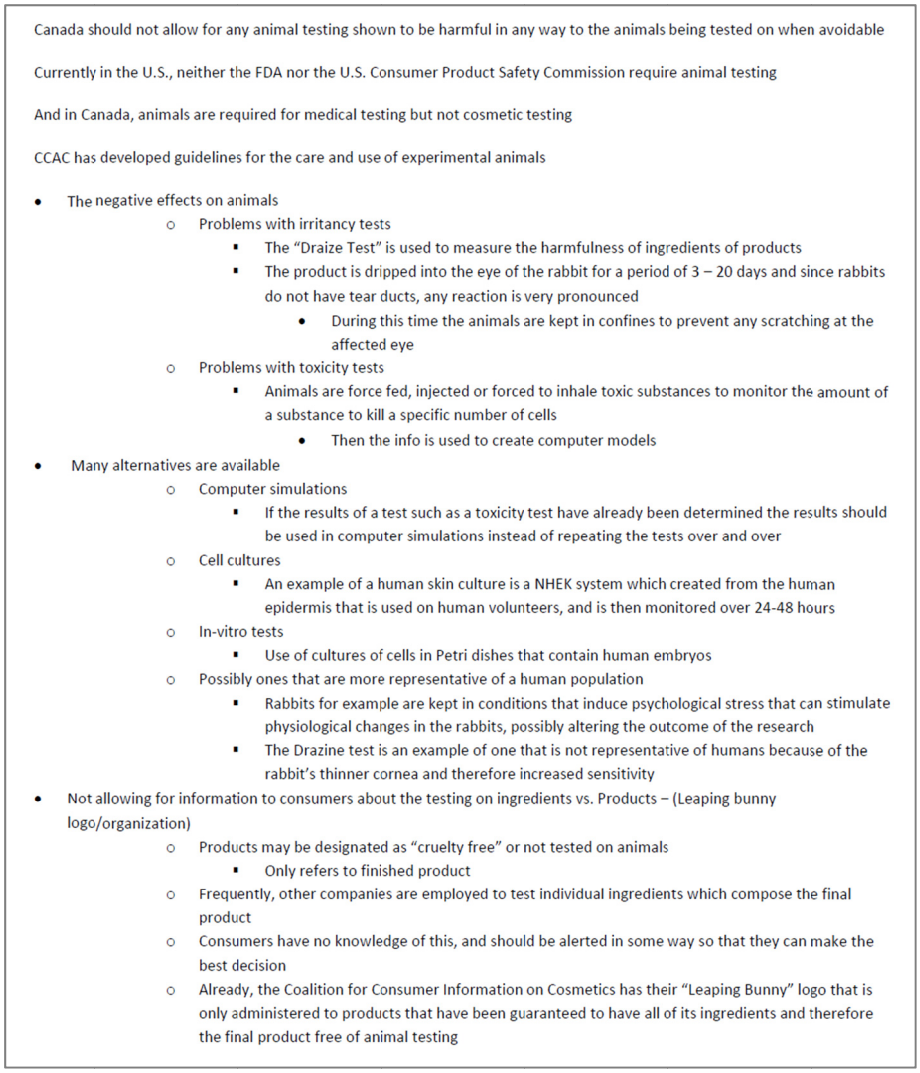
One of the students who used the mediating-documents strategy – Kieley - used search engines such as Google or Bing to search using a combination of content and rhetorical keywords [one of these searches is depicted in Video 1]. Content keywords were those that related to the topic of animal testing; rhetorical keywords were those that related to argumentation. Recall Kieley's statement that she wanted to search for arguments (pro- animal testing) counter to her own (anti- animal testing) claim, in order to refute them. In addition to the content-rhetoric search depicted in Video 1, Kieley also searched "reasons for animal testing" and determined that human safety is a reason given for testing. She then clicked an internal link "alternatives" on the Canadian Federation of Humane Societies site, in order to identify alternatives to animal testing that maintain human safety. In her interview, she explained that she wrote her paragraphs around "perceived notions of why we can't [stop animal testing]" and "why those aren't necessarily true". Note that these types of content-rhetoric searches were far less frequent than content searches. Students who created mediating documents also searched for sites in a variety of other ways. For example, they searched by clicking on internal or external links or by going to a site with which they were already familiar (e.g., www.knowmore.org (Kieley)).

While reading the sources returned from these searches, students who created mediating documents considered what they were reading in terms of their to-be-written texts. In some cases, these students simply borrowed information from sources that supported their arguments. For example, when reading about alternatives to animal testing Joy thought: "Those [alternatives] are good arguments for the theory that animal testing's not necessary" (TAP). At other times, students synthesized and transformed information. Joy read a Department of Justice site that outlined laws on animal cruelty. She thought: "Under cruelty to animals, causing unnecessary suffering, I guess you could argue it's unnecessary suffering if there's alternatives to cosmetic testing, which would mean that anyone who did so was guilty under the law." Several students inferred from the fact that Europe has banned animal testing that Canada could also do so.

Creating mediating planning documents. The mediating documents created by these participants were created at the same time as they researched. That is, they moved recursively between reading sources and writing their notes. The centrality of the mediating documents to these participants' strategy is made clear, in part, by the high number of segments in which mediating documents were created (e.g., Mark

worked on his outline in approximately 1/3 of his 5-minute segments). Participants who created mediating documents also commented on why they did so. Joy said, "these [notes] are good for me just to remember important points" (Joy, TAP). Mark said, "it's just really easy for me to turn it [the outline] into sentences [the text] from here" (Mark, TAP). The mediating documents created by each individual were unique.

Mark created an electronic outline (Figure 1), which was hierarchically structured and contained almost all of the content that later appeared in his text.



Canada should not allow for any animal testing shown to be harmful in any way to the animals being tested on when avoidable

Currently in the U.S., neither the FDA nor the U.S. Consumer Product Safety Commission require animal testing

And in Canada, animals are required for medical testing but not cosmetic testing

CCAC has developed guidelines for the care and use of experimental animals

- The negative effects on animals
  - Problems with irritancy tests
    - The "Draize Test" is used to measure the harmfulness of ingredients of products
    - The product is dripped into the eye of the rabbit for a period of 3 – 20 days and since rabbits do not have tear ducts, any reaction is very pronounced
      - During this time the animals are kept in confines to prevent any scratching at the affected eye
  - Problems with toxicity tests
    - Animals are force fed, injected or forced to inhale toxic substances to monitor the amount of a substance to kill a specific number of cells
      - Then the info is used to create computer models
- Many alternatives are available
  - Computer simulations
    - If the results of a test such as a toxicity test have already been determined the results should be used in computer simulations instead of repeating the tests over and over
  - Cell cultures
    - An example of a human skin culture is a NHEK system which created from the human epidermis that is used on human volunteers, and is then monitored over 24-48 hours
  - In-vitro tests
    - Use of cultures of cells in Petri dishes that contain human embryos
  - Possibly ones that are more representative of a human population
    - Rabbits for example are kept in conditions that induce psychological stress that can stimulate physiological changes in the rabbits, possibly altering the outcome of the research
    - The Drazine test is an example of one that is not representative of humans because of the rabbit's thinner cornea and therefore increased sensitivity
- Not allowing for information to consumers about the testing on ingredients vs. Products – (Leaping bunny logo/organization)
  - Products may be designated as "cruelty free" or not tested on animals
    - Only refers to finished product
  - Frequently, other companies are employed to test individual ingredients which compose the final product
  - Consumers have no knowledge of this, and should be alerted in some way so that they can make the best decision
  - Already, the Coalition for Consumer Information on Cosmetics has their "Leaping Bunny" logo that is only administered to products that have been guaranteed to have all of its ingredients and therefore the final product free of animal testing

Figure 1. Mark's outline.

He began this outline after having read several Internet sources and after having selected and printed his main sources. He began by writing a thesis, reasons supporting his thesis, and some supporting points. He then alternated between reading his main sources and adding information to his outline. Note that the structure of the outline is precisely that of the final written text. Mark ultimately printed his outline.

Ishaan created a set of electronic notes while searching for and reading sources. This document became more structured over the researching process. Ishaan revised the electronic document by cutting, pasting, and using bullets, to transform it from source-based notes to an outline for the text. He then continued researching, reading sources, and adding content to the document.

Kieley created a set of hard-copy research notes as she searched for and read Internet sources. That is, she read sources and took notes based on those sources. She then wrote a second document. This document appeared to help her organize; as she began, she asked herself, "what arguments can I use?" (TAP). The document signaled more structure than did her first set of notes, but was not nearly as clearly structured as Mark's or Ishaan's mediating documents.

Joy and Abbey each created a set of research notes as they read sources; Joy's were in hard copy and Abbey's were electronic. See Figure 2 for Joy's. Note that some of what appears in Joy's notes ('main argument', '1', 'economy argument') was added late, once the notes were otherwise complete. Each of them then created a separate outline, which indicated the structure of the to-be-written text, but little additional content; the content was in the notes. The outlines also contained process ('sum up points') and rhetorical ('hook reader in') goals. See Joy's outline in Figure 2. Abbey's outline was colour coded to indicate essay structure. There were several points noted in the outline. Those that would be discussed in the first paragraph were red; those that would be discussed in the second paragraph were blue, and so on.

To recap, every student who used the mediating-documents strategy had a mediating document with selected content from the sources, and every student had a mediating document with rhetorically (genre) structured outline for the text. Sometimes these both happened in the same document (Mark, Ishaan), and in some cases these happened in two different documents (Kieley, Joy, Abbey). For all students who used the mediating-documents strategy, most of the content and structure for their texts came from these mediating documents. That is, these documents helped them to keep track of source content in order that they could incorporate it into their papers and helped them to structure the content in their new papers.

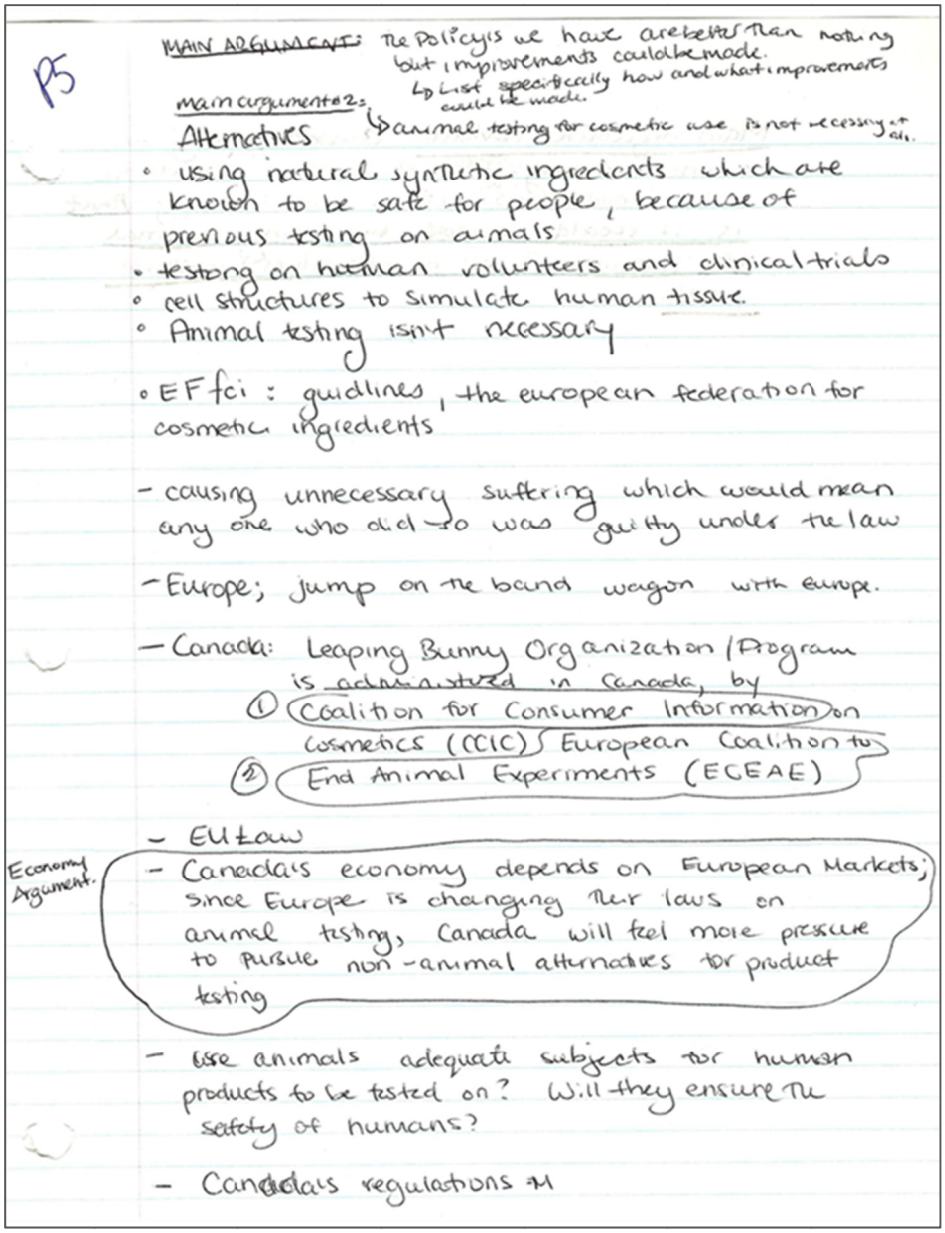
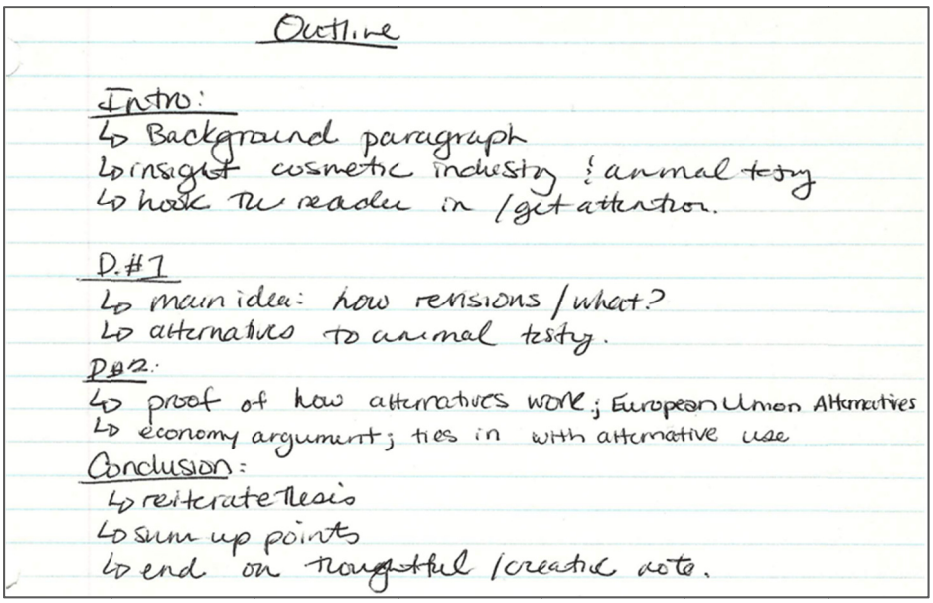


Figure 2a: Joy's notes.


Outline

Intro:
↳ Background paragraph
↳ insight cosmetic industry & animal testy
↳ hook the reader in / get attention.

D.#1
↳ main idea: how revisions / what?
↳ alternatives to animal testy.

D#2:
↳ proof of how alternatives work; European Union Alternatives
↳ economy argument; ties in with alternative use

Conclusion:
↳ reiterate thesis
↳ sum up points
↳ end on thoughtful / creative note.

Figure 2 b: Joy's notes

Drafting. Students who used the mediating-documents strategy waited until they had a comprehensive set of mediating documents, and only then focused on drafting: "I think for this paper, I probably have enough about everything that I can put something together" (Mark, TAP). In their interviews, all students who used the mediating-documents strategy indicated that their goal was to write a persuasive piece, "what the outline [prompt] said, trying to get some sort of persuasive argument about like what Canada should do in terms of animal testing" (Mark, interview). All of the students who created mediating documents drafted their final texts electronically. One student - Joy - wrote an initial draft in hard copy which she later re-wrote electronically. Students who used the mediating-documents strategy drafted the major sections of their paper in the order in which they appear in the final draft (e.g., they drafted paragraph 1 before paragraph 2). However, they also sometimes wrote smaller pieces of text out of the order in which it appears in the final text. For example, while re-reading their texts, students who created mediating documents would sometimes add a sentence into an existing paragraph.

Students who used the mediating-documents strategy drew the content and structure for their texts from their mediating planning documents; that is, the content and structure appeared first in mediating document(s) and then in the final text. Sometimes, students who used the mediating-documents strategy would re-read an already-read source to confirm information that was about to be included in the text; for example, Mark said that he was going "back to one of the sources that I had . . . something about organ damage . . . just want to make sure I get it right (TAP)".

Occasionally, these students would also conduct new research; this was done to confirm information or generate content. Primarily though, these students relied on their mediating planning documents to generate their texts.

As they wrote, all of the students who created mediating documents used word-processing functions to support their writing. In one sense, all electronic drafting could be considered to have been supported by word-processing functions such as typing and deleting text. This code was reserved for additional tools, such as bolding, colouring, or underlining text; using bullets; or using the automatic spelling and grammar checker. Students differed in which tools they used, how frequently they used them, and for what purpose. The automatic spelling and grammar checker was used by all students who created mediating documents. A few students used colour, bolding, or underlining, to indicate sections of text to which they wanted to return and edit. Joy used sub-headings in the first draft of her text, to indicate sections of the text. She deleted these for the final draft. The in-progress and final versions of Joy's essay are presented in Figure 3. Note that students made similar use of word processing functions during their outlining (e.g., Abbey used colour to indicate paragraphs; Ishaan bolded points in his outline which he had not yet included in his text). Students (e.g., Ishaan) also used Internet sites (www.dictionary.com and www.thesaurus.com) to confirm the meaning of words or to look up alternatives to words.

Revising. All students who created mediating documents revised their texts in order to improve them; revision involved changing text. Students who used the mediating-documents strategy made minor edits which corrected spelling and grammar as they initially drafted sentences. They sometimes detected and made corrections themselves; they sometimes relied on the spelling and grammar checker in Word. These students appeared to make these changes almost automatically; the changes made during drafting happened quickly and were rarely addressed in the think-aloud protocols. Students who used the mediating-documents strategy also devoted a period at the end of their process to revision. During this time, the students re-read their texts and made corrections (e.g., "I'm going to start from the beginning and look over more for a bit of grammar," Mark, TAP). Many of the students who created mediating documents made comments about wanting to review their essay for "mistakes" (Kieley, TAP).

In addition to minor edits, all students who created mediating documents made mid-level revisions to their texts that affected local meaning. For example, Abbey wrote: "If other leading countries can completely change their policy on cosmetic, testing on animals, why can't Canada, a country which." She indicated that she didn't want that sentence and was going to change it. She deleted it and wrote: "There are so many other options when it comes to cosmetic testing and there are so many countries that know this and take advantage of it." These mid-level revisions occurred less frequently than minor edits. Mid-level revisions occurred during drafting – students stopped drafting to revise for a few moments – or during a period devoted to revising.

Body Paragraph 1:

Topic Sentence: The policy, which governs the testing of animals for cosmetic purposes in Canada, should be revised on the rational that there are available and effective alternatives.

Context: any experiments or testing which results in death, pain or malformations to the animal should be banned. Testing on animals should only be permitted on the condition that any ingredients being tested has been proven to be harmless to that animal, which is measurable by previous testing. Cosmetic manufacturers in Europe have banned all use of animals for testing purposes, and instead rely on using natural synthetic ingredients derived from human cell tissues, which have been proven to be safe for people.

Proof: using animals for the testing of cosmetics is not necessary, as to argue that something is necessary is to also argue that these are absolutely no other options or alternatives. Not only are there other options available, there are available options, which have been proven to be both effective and adequate substitutions.

The policy, which governs the testing of animals for cosmetic purposes in Canada, should be revised on the rational that there are available and effective alternatives. Any experiments or testing which result in death, pain or malformations to the animal should be banned. Testing on animals should only be permitted on the condition that any ingredients being tested have proven previously to be harmless. Cosmetic manufacturers in Europe have banned all use of animals for testing purposes and instead rely on using natural synthetic ingredients derived from human cell tissues. This alternative is just one of the many safe and effective methods that can be used as a substitute for animal experimentation (CFHS). Using animals for the testing of cosmetics is not necessary, as to argue that something is necessary is to also argue that these are no other options or alternatives. Not only are there other options available, there are options available that have proven to be both effective and adequate substitutes.

Figure 3: Joy's in-progress (above) and final (below) essay.

High-level revisions that affected the global structure or meaning of the text occurred infrequently among students who used the mediating-documents strategy (Joy wrote a first draft in hard copy and then we-wrote it electronically, but high-level revisions were not made during the re-writing). Note that two participants did not make any high-level revisions at all; these were the two students with the most detailed outlines prior to writing (Mark, Ishaan). Kieley did make a high-level revision during a final period devoted to revision. She thought, "I need to make this [first body paragraph] more about human safety." While she left much of the content unchanged, Kieley made revisions that shifted the emphasis of the paragraph.

3.3 Strategy of Writing Directly from the Source Documents

Brief description. The other four students - Sarah, Kristen, Aisha, and Rebecca - used a global strategy in which they created no or minimal mediating documents and instead wrote directly from the source documents; that is, they wrote while they were reading. Mid- and high-level revisions were also embedded during the cycle. This process was easily discernible from the series of codes; for these participants, researching, drafting, and revising codes were used throughout the process and mediating documents were used very little, if at all. The interviews triangulated the recorded data, in that participants clearly described the process. Rebecca said:

> I wanted to first know what Canada's, current policy is... And then I looked up different viewpoints... so I could kind of get a grasp of what I wanted to argue. And then, I looked for different arguments... and I looked for proof for those. *I kind of wrote as I went. When I found different information, I'd write it.* And then, I edited after it was all finished (interview).

Note that although Rebecca characterizes her editing as occurring at the end of the process, she actually made lower-level revisions throughout the process, and made her mid- and high-level revisions approximately half-way through the process.

Sarah also clearly described this process and expressed some regret at her choice not to use mediating documents:

> *I tried to look up information as I was doing [writing] it.* Now that I think about it, I think it would have been easier if I looked it all up first and then kind of had it all out in front of me and then used that instead of doing back and forth... If you have already have your information, you already kind of know what you want to say (interview).

She was the only student who wrote directly from sources who expressed this sentiment. Please note that she did actually spend some time creating a mediating document, but this happened very late in the process; it did not precede writing (more on this below).

Initial researching. The four students who used the strategy of writing directly from sources began their researching with initial broad searching. Like students who created mediating documents, their goals included understanding more about animal testing ("get a basic understanding", Kristen, TAP), forming an opinion on the topic (e.g., "I'm kind of debating in my head right now whether I think, testing should be banned in Canada",Aisha, TAP), and supporting an existing position (e.g., "My opinion on it would be that I don't agree that animals should be tested on – cosmetics – so that's the viewpoint that I'm going to look into",Sarah, TAP).

As with students who created mediating documents, many of the initial searches conducted by students who wrote directly from sources were based on content keyword searches (e.g., "Canada's policy on cosmetic testing"). Three of the four

students who wrote directly from sources did searches early in the process that combined content and rhetorical terms. For example, Kristen sought to understand the reasons for animal testing so she searched "reasons for animal testing" and "why animal cosmetic testing should be legal". As another example, while still trying to form her opinion, Aisha searched "alternatives for animal testing". In one instance, a student's content-rhetoric search actually resulted in a change in her claim. Rebecca had originally decided on an anti-testing claim. She was having trouble finding information however, so she decided to argue in favour of testing instead. She began to search "why animal testing should be (used)" but Google suggested "banned" rather than "used." She continued with the suggested search, found information, and wrote the original anti-testing argument that she intended. All four of the students who wrote directly from sources consulted Wikipedia during their early researching. Many made comments like, Wikipedia "isn't good for actually sourcing in essays, but it's good for a basic outline." (Rebecca, TAP).

One student had a unique goal for two of her searches; rather than trying to generate content for her essay, as was the purpose of most of participants' searches, Aisha searched in order to generate knowledge of the rhetorical structure used in the persuasive genre. Aisha noted that she had not written a persuasive essay in a long time and needed to learn more about the structure. She searched on Google, "persuasive essay sample essay" and later, "persuasive essay structure". She retrieved an annotated sample essay and then copied the annotations to a word document, to use as a template for her own text (this was coded as an outline). See Figure 4 for a screen shot.

No or minimal mediating planning documents. Students who used the strategy of writing directly from sources created no, or minimal, mediating documents; when mediating documents were created, they were not used to record content for later drafting. Kristen created no mediating documents at all. Rebecca began to, but quickly abandoned the notes and did not consult them again. Sarah wrote a hard-copy document very late in her writing process (i.e., it did not serve as an outline; an outline would precede writing); she said, "I'm just going to write down the points that I do have, right now, so I know" (TAP). The document indicated the reasons supporting her thesis, and some content related to each. Aisha created a rhetorical outline – like a genre template – based on the argument template she found online (see Figure 4). She is included under the second process though, as the outline was somewhat generic and contained little content specific to the topic at hand. She primarily generated content as she wrote, as participants who used the strategy of writing directly from sources did.

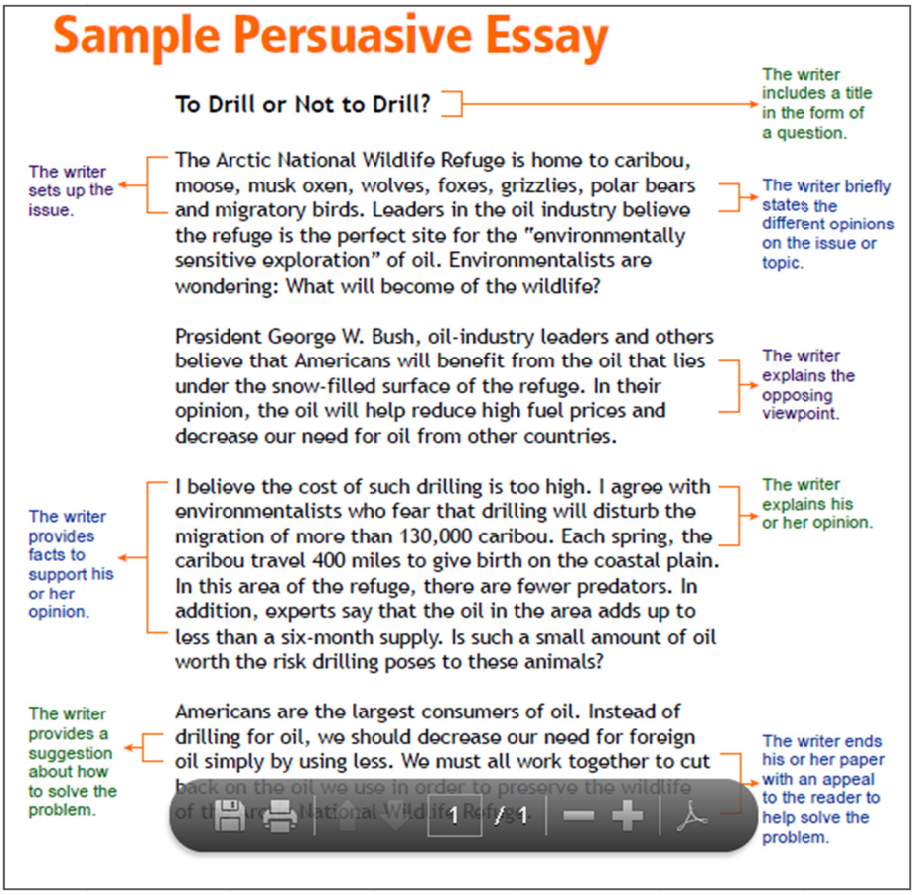


Figure 5: Annotated sample essay used by Aisha (Time for Kids, 2004). Aisha's outline below.

Interleaved Drafting and Researching. Students who used the strategy of writing directly from sources spent some time at the beginning of their writing process focused on research (as described above). However, they began drafting relatively early in the process. The drafting goals of participants who wrote directly from sources were consistent with the persuasive genre. For example, Rebecca wanted to "prove why, instead of just saying it's [cosmetic testing's] bad" (interview). All students who wrote directly from sources planned a macrostructure consistent with the persuasive genre; they wanted to have an introduction, two or three paragraphs with a supporting reason and evidence in each, and a conclusion.

As an example of early drafting, Sarah began drafting less than five minutes after beginning her work. She stated, "So I guess my first sentence would be, what animal testing is." As she read and viewed sources in the first few minutes, she determined her main arguments. For example, as she viewed a picture of a rabbit following an eye irritancy test, she read the caption and said, "Oh. And she will be killed afterwards. I think that's one of the points I'm going to have—the dangers these animals are in." The construction of her main arguments happened in under five minutes. She cycled between naming an argument aloud as she read / viewed a source and writing the line of argument into her introduction paragraph. In this way, her introduction served as a plan for the macro-structure of her text. Later in the process, when she could not find information about one of the reasons supporting her thesis, she chose not to use that reason and generated a new reason, based on information available in sources. In her interview, she indicated that she chose reasons based on those for which there was a lot of information.

As another example of beginning drafting, Rebecca spent about 20 minutes doing initial research. She then stated that she was going to start writing "'cause it's a good way to get thoughts down. 'Cause right now, I feel very overwhelmed by all of the information" (TAP). Rebecca drafted several introductory sentences, alternating between reading and writing. Rebecca planned that she wanted to form some basic arguments. She read a source and planned the argument: "Okay, so a basic argument is that it's inhumane, obviously." She wrote, "cosmetic testing on animals is extremely inhumane" as the topic sentence of a new paragraph. She said, "Hopefully I can get something that says, just short, what happens during testing on animals or how many animals die, or something like that, that I can use there" [see Video 3]. She then continued searching for and reading sources.

As they continued drafting, students who used the strategy of writing directly from sources continued to interleave researching and drafting. Students differed, within and between themselves, in the frequency with which they alternated between reading and writing. Students who wrote directly from sources could switch between source text and to-be-written text after each sentence or they could read for a prolonged period of time and then write for a prolonged period of time.

As students who wrote directly from sources researched, they critically evaluated the sources returned. For example, when Rebecca clicked on Health Canada's site she

said, "'K', this is obviously a credible site, 'cause it's our government one. I always try to stick to sites like this, 'cause you don't want to be sourcing sites that are made by some person in their basement" (TAP). These students also selected content in accordance with their rhetorical goals. For example, Sarah was writing an anti-testing essay and she was focusing on the conditions in which animals are kept. Sarah said, "she [the source author] actually says that the some of the conditions are pretty good. So, that's not really what I'm trying to prove." (TAP). Sarah did not use the information from the site in her own text.

In terms of what drove the relationship between drafting and researching for students who wrote directly from sources, students' rhetorical goals led them to formulate sub-goals to retrieve information, which they then integrated into text. At a macro level, students who wrote directly from sources tended to focus on one paragraph of their text at a time; note that each paragraph represented a reason supporting a thesis. They drafted the introductory topic sentence that noted a reason, and then conducted searches to generate content for that paragraph. Students who wrote directly from sources evaluated the credibility and relevance of entire sources, as discussed above, and they also evaluated and selected smaller sections of content according to what was needed for their texts. For example, Kristen had written the beginning of a topic sentence, "New technology…". She then searched "animal testing alternatives cosmetics" to find information about new alternatives to animal testing and included information about alternatives to testing in the paragraph.

Students who wrote directly from sources also often added information to their texts out of the order in which it appeared in their final texts. For example, Sarah was working on a second body paragraph about harm to animals but read something in a source about alternatives, which was the topic of the first body paragraph. She returned to drafting the first body paragraph, and incorporated the new information there. This also occurred with students who created mediating documents, but less frequently.

At a micro level – the writing within each paragraph also drove the searching of students who wrote directly from the source documents. For example, after drafting much of a paragraph on animal harm in cosmetic testing, Kristen said, "I think it would be better if I had a product that was tested on animals and, um, showed to not be harmful, and then, or maybe, one that was harmful to animals and then it wasn't even harmful to humans (TAP)". She then searched "products that harm animals." She did not find the information she wanted, so she wrote that animal testing is fundamentally wrong, regardless of potential benefits for humans.

Aisha's research and drafting provides a very clear example of how the genre drove searching. Recall that she was the student who searched in order to find rhetorical information and then used an annotated sample essay to develop a template for her own essay. Aisha used this template to guide her researching and drafting. She would read a section of the template and search according to that section. For example, she read the line that said "State different opinions", said: "State different opinions. Yeah I need to do that more," and then searched using content and rhetorical search terms

"debate animal testing cosmetics." [see video 4]. Students who wrote directly from sources sometimes decided that they needed a particular *type* of content in order to meet their rhetorical goals. For example, Kristen wanted to include a quote on animal testing, so she searched using a combination of content and type-of-content keywords, "cosmetic testing on animals quotes".

Students who wrote directly from sources did not simply re-iterate what they read in their texts. They also transformed source content. For example, while reading a site on www.buzzle.com, Kristen read the total number of animals used in cosmetics testing as well as the percentage of animals thought to experience pain. She thought: "It doesn't sound very good to say, to say in an argument, that's fighting against the use of animals in cosmetics, to say that 6% suffer (TAP)". She searched for an online calculator and multiplied the percentage of animals thought to suffer by the total number of animals used. She thus determined the *number* of animals that would be hurt, rather than the percentage. She used the number, rather than the percentage, when she discussed the harm to animals in her text.

Revising. Students who used the strategy of writing directly from sources made surface level edits as they initially drafted the text. The goals of such edits were usually not stated; presumably, students wanted to write with good spelling, grammar, and so on.

Mid-level revisions were made periodically throughout drafting by students who wrote directly from sources. Rebecca provides an example of a mid-level revision: "I don't want to sound like, I'm not sure what I'm talking about, so I want to take out '*can be considered* torture' [emphasis added] and put, '*is* torture [emphasis added]' because if that's what I'm arguing, I should make that clear (TAP)". Sometimes, the goals for mid-level revisions were implicit. Rebecca changed wording that sounded "weird"; this suggests a goal related to the tone of the paper.

Students who wrote directly from sources also made global level revisions. Sometimes, these revisions occurred at the end of the writing process. Aisha wanted to have an argument that was resistant to criticism, so she reread her text from the opposing perspective and made appropriate changes. However, high-level revisions were also embedded within the process. For example, during writing, Rebecca deleted a large section of text that she thought was irrelevant to her claim and Aisha combined two paragraphs into one, to keep related material together.

3.4 Ethical Issues in Animal Testing

Although not the focus of this paper, it is important to note that students in this project really grappled with the ethical issues involved with the testing of cosmetics products on animals. For example, Kieley thought, "I guess this relates to the bigger question, which is, do animals have the same rights as humans?" (Kieley, TAP). More implicitly, much of the students' thinking and writing dealt with ethical issues. Based on what they read in sources, participants weighed arguments in terms of the rights of animals versus the rights of humans (Aisha) and/or the value of their lives and safety (Abbey, Kieley).

Again based on what they read in sources, participants (e.g., Aisha) sometimes also considered issues such as the fact that many people eat meat, wear leather, and so on. This type of reasoning was also present in students' essays. For example, Sarah wrote: "Many believe animals receive the same rights to life as humans and deserve to be treated with respect". Such ethical decision making is likely a function of the topic and also of the genre; students had to choose and support a position on a complex and controversial topic.

4. Discussion

4.1 Summary of Results

This study contributes to the literature by illustrating the overall and sub-ordinate strategies that high-achieving students use to research and write from the Internet. To summarize the results, participants engaged in four major activities during their writing: researching, creating mediating planning documents, drafting, and revising. Five participants used a global strategy of creating mediating documents to plan their texts; they researched, then cycled between researching and creating mediating planning documents, then drafted, and then revised. Four participants used a global strategy of writing directly from sources; these participants researched briefly, generated a macrostructure, and then cycled between researching, drafting, and revising. All participants used a variety of sub-strategies to support their writing process.

Students' Overall Strategies for Writing from the Internet

Students' global strategies were both similar to and different from those used in print-based writing from sources. The global strategy used by five of the nine participants was to create mediating planning documents. The strategy of creating mediating documents is well documented in print-based writing (e.g., Spivey, 1997). It appears to also be well used in writing from online sources (Head & Eisenberg, 2010; Li, 2012; Zheng, 2013). Indeed, this is the strategy that is usually taught to students for writing source-based research papers. It may be even more important to create mediating documents when working online. Researchers (Kellogg, 1988, 1990) and participants have both noted that creating mediating documents assists with memory; and research has shown that there is additional working memory load inherent in working from the Internet (Olive et al., 2008).

Although the strategy of creating mediating documents, itself, is similar to what is seen in print-based writing from sources, there were some important differences in the creation of the electronic documents. Most notably, the electronic outlines were easily malleable. Participants added text out of the order in which it appeared in the final outline. For example, participants could add content generated late in the researching phase to the beginning out of outline. Participants also revised the structures of their outlines, either by rearranging jot notes to be more like an outline, or revising the order

or hierarchical structure of an existing outline. Participants also used word-processing functions when creating their outlines, such as bullets, colour coding, bolding, and so on. These functions can also be done in print, but like the text itself, in an electronic format, they are malleable and easily changed or reversed. Some participants did create their mediating documents in hard copy, either by drafting in hard copy originally or by printing the electronic version. Finally, recall that some participants created two separate mediating documents (one with content and one with structure). More research would be needed to determine whether this occurs as a function of the electronic environment or whether it was more of an individual writing habit.

The second global strategy, used by four of the nine participants, was to write directly from the source documents. This strategy was also documented by Li (2012) and Zheng (2013) although it was not described in detail. This is a strategy that has not been observed or documented, to our knowledge, with print-based writing from sources by strong writers. Together, these findings suggest that the strategy of writing directly from sources may be one that arises in an electronic environment. One possible explanation for this is the fact that text can be easily inserted or edited in electronic texts. Note that the use of this strategy was far more prevalent in this study than in Zheng's (2013). This difference may well be due to the relatively small number of participants in both studies. Far more participants would need to be included in a study, in order to determine the typical proportion of students who might write directly from sources. The process used by participants very likely also depends on the contexts, activities, and demographics of the students.

Students' Use of Sub-Strategies and Creation of a Task Environment

In addition to the global strategies discussed above, students used a variety of sub-strategies. Although many were similar to those used and documented in print-based writing from sources (e.g., outlining, Risemberg, 1996) or in researching without having to write (e.g., keyword searching, Kuiper et al., 2008), writing from the Internet also resulted in new sub-strategies, not seen in either writing without the Internet or using the Internet without having to write. That is, the research and writing media affected writing (cf. Hayes, 2012; Leijten et al., 2014).

We argue that these strategies were those that maximized the affordances of the Internet, the electronic writing medium, and internal cognition, and minimized their constraints; this represents a continuation and expansion of the ideas put forward in the Hayes models of writing (Hayes & Flower, 1980; Hayes, 1996, 2012; Leijten et al., 2014). The high-achieving student writers in this study did not simply use strategies to function within a *given* task environment. Rather, they *constructed* a task environment, which made these strategies possible. This point was implicit in the Hayes and Flower (1980) model, where the task environment included elements such as jot notes, outlines, and drafts, which the writer constructed. Similarly, our participants created an environment comprised of websites, jot notes, outlines, and drafts (cf., Attfield et al.,

2009; O'Hara et al., 2002). The writers then actively used elements of the task environment to generate ideas and language. This construction probably requires the writer to have some understanding of both cognition and media affordances. For example, Joy showed an awareness of how the representations that she created supported her cognitive writing processes when she made comments such as, "I want to start getting this typed up... 'cause that helps me organize"; or, "I usually like to break it [the text] up... 'cause then I can go back and see if it all makes sense". The following sections consider how students maximized affordances and minimized constraints during researching, creating mediating planning documents, drafting, and revising.

Researching. During researching, students capitalized on the amount of information available online; they used the online information to generate claims (e.g., animal testing should be banned in Canada), generate the macro-structure of their texts (e.g., three reasons supporting the claim), and generate the micro-structure of their texts (e.g., proof supporting the reasons). Students capitalized on the availability of a wide variety of types of sources available on the Internet, including government sites, blogs, advocacy sources, and so on; these represented a variety of perspectives, authors, and geographic regions. For example, students were particularly interested in and affected by the fact that Europe has recently banned cosmetics testing on animals.

Students who used the strategy of writing directly from sources were able to establish a fluent dialectic between drafting sentences and searching for additional necessary information; this also relied on the amount of information available online, as students could generate reasons and trust that they would be able to find more information as they wrote. In print-based writing from sources, writers are restricted in that they often have access to a fairly limited pool of resources. This has especially been the case in writing-from-sources research (e.g., Kirkpatrick & Klein, 2009; Risemberg, 1996; Spivey, 1997). It thus makes sense to base arguments on material the writer knows is available. Put another way, in print-based writing from sources, it is prudent to construct the macrostructure based on microstructure content the writer knows is available. In writing from Internet-based sources, students appeared to be able to generate the macrostructure based on a few ideas in sources, and trust that they could generate additional supporting details at a later stage.

With respect to generating content and structure for text, metaphorically, the Internet comprised an external long term memory. The most obvious example supporting this notion is that one student was able to retrieve genre knowledge from the Internet, something that would usually be conceived of as residing in LTM. Both LTM and the Internet comprise very large stores of information; at any given moment, most of this is outside of conscious awareness; it can be retrieved in milliseconds; and this information that is retrieved can then be incorporated into a probe to retrieve further related information. Conversely, both the Internet and LTM differ from many of the

textual sources available to students, which may offer more limited content, and may be more laborious to search.

Most notably, the Internet appears to support direct rhetorically-driven searching; this is possible in electronic searching using a probe that includes a content term and a rhetorical term (e.g., "animal testing cons"). This strategy was also used by students in Zheng (2013). These searches returned content that was already framed rhetorically and could easily be used as a reason to support the student's claim. In addition to being able to search the Internet to locate content that supported their claims, participants could use the content-rhetoric search potential of the Internet to support their refuting of counterarguments. For example, recall that Kieley had an anti-testing position, but searched "reasons for animal testing" in order to understand arguments in favour of testing and then refute them. She wrote a section of her text noting that human safety is a reason given in favour of animal testing, but the fact that alternatives exist negates that reason. The addressing of counterarguments is a feature of more sophisticated argumentation, used by older and more expert writers (Crammond, 1998). The amount of information available on the Internet, combined with search engines' (e.g., Bing, Microsoft Corporation, 2012; Google, Google Inc., 2009) ability to search using terms that combine content with rhetoric, appeared to facilitate this approach.

The Internet also presents challenges as a research tool. Students may have prevented themselves from becoming overwhelmed by the amount of information online by conducting targeted searches that were highly relevant to their to-be-written text. Students helped to offset the unreliability of some Internet information by being critical of sources and the information they contained.

One notable problem with the Internet is that it allowed participants to 'cherry pick' information that supported an existing claim. Some students did not feel the need to read or integrate information from various perspectives, as they might with fewer, assigned resources.

Creating mediating planning documents. Much of the discussion about how students used electronic documents (e.g., revising them, using word-processing functions, printing them) occurred above. What is important to note here, in the context of an argument about students' creation of a task environment, is that writers may have created mediating documents in an attempt to maximize the affordances of the electronic environment and minimize its constraints. Creating mediating documents maximizes electronic affordances in that the outlines can be easily manipulated and can be easily turned into full text. Mediating documents minimize the constraints associated with writing from the Internet, as they help writers to gather and organize a manageable amount of information in one or two documents, prior to writing (cf. Attfield et al., 2009), thus reducing the cognitive load associated with multiple screens (Olive et al., 2008) and the feeling of being overwhelmed by too much information (Head & Eisenberg, 2010; Jankowska, 2004).

Drafting. Students in the current study integrated source information well; this is likely because such high-achieving students were included. Source synthesis is an important element of good writing, but often proves difficult for students (Britt & Rouet, 2012; Kirkpatrick & Klein, 2009; Segev-Miller, 2004; 2007; Spivey, 1997). Students also summarized, paraphrased, and quoted sources (cf. Zheng, 2013). Most often, participants read sources with an eye to content's rhetorical potential. At other times, participants constructed their own arguments by synthesizing information from different sources. That is, they selected content that fulfilled the rhetorical goals of proving their point and persuading their audience, by having supporting reasons.

Note that participants did not just select existing content. Rather, they sometimes transformed source content into the type of microstructure content that would support their reasons and thus their claims (i.e., to meet rhetorical goals). For example, recall the way in which Kristen transformed a statistic on animal testing from a percentage to a number.

An important constraint of electronic documents is that when viewed on a laptop screen, two or more cannot be fully displayed at the same time, forcing users to switch between them. Alternating between displays, compared to accessing simultaneous displays, imposes additional cognitive load and affects writing (Olive et al., 2008). This may partially explain why writers either printed documents or created some documents in hard copy and then used electronic documents for drafts and final copies (Attfield et al., 2009).

Revising. The main affordance of electronic texts is the ease with which they can be revised; every writer except Joy exploited this malleability by using the same electronic document both to draft the text, and to revise the final copy. Several used features such as colouring or bolding text, to mark sections of text to which they wanted to return and edit. Students' use of these functions may have been similar, in some ways, to the way that the professional writer used the comments function and text placeholders to remind himself of sections to which he wanted to add material (Leijten et al., 2014). In terms of lower-level edits, writers relied on automatic spelling and grammar checkers, and Internet-based language supports, such as dictionaries and thesauri. In terms of mid- and high-level revisions, writers relied on functions such as copying and pasting to move sections of text, significantly altering the structure of their essays.

4.2 Limitations and Future Research

The biggest challenge in conducting this research was designing a method of analysis that would allow us to address both students' global strategies and the strategies that occurred very briefly and sometimes infrequently, but that were important (e.g., content-rhetoric searches). We are satisfied that we were able to strike a good balance, but some information was necessarily lost. For example, raw frequency counts of strategy use are not available and measures of source content transformation were not taken.

Another potential limitation is the use of think-aloud protocols. The use of think-aloud protocols assumes that they accurately reflects participants' thoughts (Ericsson & Simon, 1993); this assumption is difficult to prove. However, if a participant's reported thoughts lead logically to their solutions (in this case, actions), there should be no reason to assume the reports are false ((Ericsson & Simon, 1993). Also, it is possible that the act of speaking aloud might change cognition (Smagorinsky, 1998). Ericsson and Simon (1993) cite numerous studies which have examined this question, and come to the conclusion that if participants have to *explain or describe* their thoughts, it might impact the process, but if they are simply asked to *think aloud*, then the process should function as it ordinarily does. One reviewer noted that the instructions given in this study differ somewhat from the instructions suggested by Ericsson and Simon (1993). For a discussion of these issues, see Ericsson and Simon (1993) and Smagorinsky (1998).

A related issue is whether the fact that participants knew their recording would be watched and analyzed affected their performance. As one reviewer of this manuscript noted, it is possible that high-achieving participants such as these would have been particularly interested in demonstrating their intellectual strengths. Although this may indeed have been the case, as the purpose of this project was to identify effective strategies for academic researching and writing from the Internet, any 'boost' provided by such knowledge does not invalidate results (as it would if the purpose was to identify typical strategies, for example).

Future research could address a number of issues. First, an in-depth analysis of the texts created by participants in this project is underway. Such analysis will address precisely how students borrowed or transformed information from sources, and how students added their own content in their texts (cf. Jamieson & Howard, 2013; Wiley & Voss, 1996). In this analysis, relationships between text transformation, text quality, and researching and writing strategies will be addressed. Second, it would be interesting to conduct a similar project with more students, in order to determine whether the strategies discussed here form a comprehensive list or whether other strategies might emerge with more participants. Including more participants would also allow researchers to determine the proportions of students who use each of the global strategies and would also allow for a comparison of the effectiveness of the different strategies (e.g., in terms of product quality). Third, future research could also examine the strategies used by different populations of students (e.g., younger, older, students with learning disabilities, etc.). Comparing skilled and less skilled writers would provide evidence of the effectiveness of specific strategies. It might also place limits on the applicability of various strategies. For example, although participants in both this and Zheng's (2013) study were strong writers and were successful with the strategy of writing directly from sources, this strategy might have limited usefulness for less skilled writers. Fourth, future research could examine the strategies used by students writing for different purposes (e.g., blogs) and in different genres (e.g., comparison). As one reviewer noted, there are many questions to be addressed, such as whether students

have successful strategies for one genre (e.g., one that is common or familiar) but would struggle to transfer those strategies or adopt new strategies for a different genre.

5. Conclusion

The purpose of this paper was to examine the global and local strategies of high-achieving Grade 12 students as they researched on the Internet and then wrote a persuasive essay based on what they read. Results showed that participants used one of two global strategies: creating mediating planning documents or writing directly from source documents. They used a variety of sub-ordinate strategies, some of which were similar to those used in print-based writing from sources and some of which were new and a function of the Internet environment. We argue that students used these strategies in order to maximize the affordances and minimize the constraints of the Internet and electronic environment. This study is an initial step in building our understanding of students' researching and writing from the Internet. Further research is needed to expand our understanding; such research could include different ages and types of participants and writing in different genres.

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Appendix A

Wikipedia
http://en.wikipedia.org/wiki/Testing_cosmetics_on_animals

The European Federation for Cosmetic Ingredients
http://www.effci.org/index.php?id=12

Canadian Federation of Humane Socities
http://cfhs.ca/research/cosmetic_testing

Animal Alliance letter to Jean Chretian
http://www.animalalliance.ca/article.phtml?article=cpt&dir=urgentalert&title=Urgent+Alert+Archive%3A+Call+for+Cruelty+Free+Cosmetics+in+Canada

Leaping Bunny. org
http://www.leapingbunny.org/press6.php

Picture of rabbit following eye irritancy test
http://images.google.ca/imgres?imgurl=http://www.askuswhy.com/images/product/p8_big.jpg&imgrefurl=http://board.ogame.org/index.php%3Fpage%3DThread%26threadID%3D477637&usg=__0Eue3vidQLIDEuvdo_EiETABsqY=&h=283&w=344&sz=37&hl=en&start=3&sig2=Sl4DqiI2SF4VXrkERbTySw&tbnid=XwhD2DJIHCMzuM:&tbnh=99&tbnw=120&prev=/images%3Fq%3Dcosmetic%2Btesting%2Bon%2Banimals%26gbv%3D2%26hl%3Den&ei=A5jGSsCkGpO6lAeFw7ySAw

Blow up of same picture (eye irritancy)
http://www.askuswhy.com/images/product/p8_big.jpg

Cartoon
http://www.cartoonstock.com/lowres/amc0726l.jpg

National Academies Press

http://images.google.ca/imgres?imgurl=http://books.nap.edu/books/0309088941/xhtml/images/p20000b1fcg21001.jpg&imgrefurl=http://books.nap.edu/openbook.php%3Frecord_id%3D10733%26page%3D21&usg=__pAdrw0RpMp_QwTtRWXlPtnGcUWA=&h=275&w=272&sz=49&hl=en&start=17&sig2=desnvAdofEBRuzUIS_sPUQ&tbnid=fHtrCiHeLNAbfM:&tbnh=114&tbnw=113&prev=/images%3Fq%3Dcosmetic%2Btesting%2Bon%2Banimals%26gbv%3D2%26hl%3Den%26sa%3DG&ei=mpnGStiBEZTblAeyprGSAw

For the Greener Good (blog)
http://images.google.ca/imgres?imgurl=http://upload.wikimedia.org/wikipedia/en/6/6d/AnimaltestingMonkeyCovance2.jpg&imgrefurl=http://forthegreenergood.blogspot.com/2007/11/your-cosmetics-are-torturing-animals.html&usg=__1Y_Ccldf8lgjuUoq-vk0Oe2vV7c=&h=454&w=348&sz=52&hl=en&start=16&sig2=XfnwXS6qNhFUPydqw3Z0tw&tbnid=qtusvl9riTPRPM:&tbnh=128&tbnw=98&prev=/images%3Fq%3Dcosmetic%2Btesting%2Bon%2Banimals%26gbv%3D2%26hl%3Den%26sa%3DG&ei=mpnGStiBEZTblAeyprGSAw

Mail Online
http://images.google.ca/imgres?imgurl=http://img.dailymail.co.uk/i/pix/2007/07_02/girlskin2507_228x372.jpg&imgrefurl=http://www.dailymail.co.uk/news/article-470857/Human-skin-testing-cosmetics-grown-lab.html&usg=__ck42WqTazsIAnZU5OReYk2my20g=&h=372&w=228&sz=18&hl=en&start=18&sig2=LlWMJcLLnYSbprJqO5g-RA&tbnid=OUEpTafoFzyh2M:&tbnh=122&tbnw=75&prev=/images%3Fq%3Dcosmetic%2Btesting%2Bon%2Banimals%26gbv%3D2%26hl%3Den%26sa%3DG&ei=mpnGStiBEZTblAeyprGSAw

New York Fashion
http://nymag.com/daily/fashion/2009/03/12/

Sodahead
http://www.sodahead.com/entertainment/are-you-against-animal-testing/question-150633/?link=ibaf

Animal Voice: A Short History of Animal Testing
http://images.google.ca/imgres?imgurl=http://3.bp.blogspot.com/_JsdnzvIBL9E/RtAuRYSPbWI/AAAAAAAAAIc/B1XdBpxNrfE/s400/evil%2Bpeople.jpg&imgrefurl=http://theanimalvoice.blogspot.com/2007/08/short-history-of-animal-tests.html&usg=__tKla0vUvlPQxvVZ-7fl3eREmKxo=&h=320&w=400&sz=31&hl=en&start=21&sig2=Do4Bizs9XBOjONXj9lv4Fg&tbnid=by9xZPNoyRwlPM:&tbnh=99&tbnw=124&prev=/images%3Fq%3Dcosmetic%2Btesting%2Bon%2Banimals%26gbv%3D2%26ndsp%3D18%26hl%3Den%26sa%3DN%26start%3D18&ei=JZzGSuqbEJHnlAfkyYmSAw

The Beauty Brains

http://images.google.ca/imgres?imgurl=http://thebeautybrains.com/wp-content/uploads/2009/01/catwithlipstick-300x289.jpg&imgrefurl=http://thebeautybrains.com/2009/01/19/scientists-speak-about-cosmetic-animal-testing/&usg=__qeH5HIT6GX7TnFfwx4wvZlFVRx4=&h=289&w=300&sz=25&hl=en&start=28&sig2=gYw8RUENguGUDBmF9OQ8NQ&tbnid=FhYdFYEKi34AdM:&tbnh=112&tbnw=116&prev=/images%3Fq%3Dcosmetic%2Btesting%2Bon%2Banimals%26gbv%3D2%26ndsp%3D18%26hl%3Den%26sa%3DN%26start%3D18&ei=JZzGSuqbEJHnlAfkyYmSAw

Health Canada: Cosmetics FAQs
http://www.hc-sc.gc.ca/cps-spc/person/cosmet/faq-eng.php

Health Canada: Framework for International Cooperation on Alternative Test Methods (ICATM)
http://www.hc-sc.gc.ca/cps-spc/person/cosmet/info-ind-prof/iccr_test-eng.php

Image of baby rabbit
http://www.google.ca/imgres?imgurl=http://www.tranism.com/weblog/images/grass%2520rabbit.jpg&imgrefurl=http://www.tranism.com/weblog/2008/02/robots-replacin.html&h=300&w=400&sz=80&tbnid=ihBqGUDmfEDdrM:&tbnh=93&tbnw=124&prev=/images%3Fq%3Drabbits&hl=en&usg=__mMqAVS24ndQnx_oRc9Tr1Vz5ris=&ei=053GStfbCIGrlAfByKmSAw&sa=X&oi=image_result&resnum=1&ct=image

Wikipedia
http://en.wikipedia.org/wiki/Rabbit

House Rabbit Society
http://www.rabbit.org/

Google image results
http://images.google.ca/images?hl=en&source=hp&q=rabbits&um=1&ie=UTF-8&ei=053GStfbCIGrlAfByKmSAw&sa=X&oi=image_result_group&ct=title&resnum=1

Ontario Rabbit Education Organization
http://www.ontariorabbits.org/

Appendix B

1. What was your goal in this writing? What were you trying to achieve?
2. Can you tell me how you completed the assignment? For example, what did you do before you began writing your essay? And what about during? And what about after?
3. Did you have an overall strategy (could sub in "approach" or "plan") for writing your essay that you could tell me about?
4. How did you decide which information to include? How did you make connections between ideas in different sources? How did you decide how to structure or organize your essay?
5. How did you decide when you were finished? Did you plan how to use your time? Can you explain that?
6. Have you ever had any instruction on writing from the Internet? If so, what were you taught and by whom?
7. How would your approach change, if it would, if you were researching this topic for personal interest as opposed to a school task?
8. Was there any difference between what you did here and what you normally do when researching and writing?
9. How did you decide your position on the topic?
10. Did you have any emotional reaction to the topic?
11. Is there anything else you would like to tell me that relates to this activity?