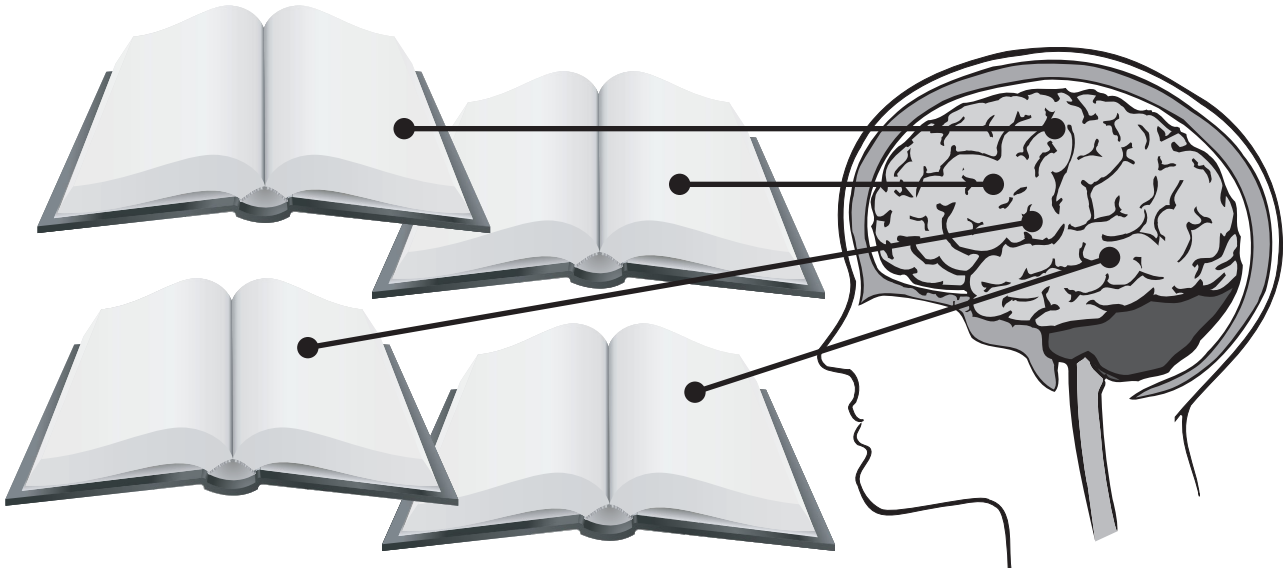

The Cognitive Psychology of Multiple Text Comprehension: What Can Educators Garner from the Literature?

BY TRACY LINDERHOLM

Abstract
The purpose of this brief literature review is to introduce journal readers to the cognitive psychology of multiple text comprehension. Relatively little is known about how advanced readers effectively synthesize and comprehend ideas when, for example, they must read multiple sources to prepare for a college exam. Both cognitive-psychological theory and empirical work that has been done on this topic is summarized. From this nascent literature base, recommendations are made to educators of secondary and post-secondary students regarding how to facilitate the integration and comprehension of information across multiple texts.

Reading and synthesizing ideas across texts is an essential skill for secondary and post-secondary academic success and for success in the workplace. For example, college-level students are often asked to do literature reviews of relevant empirical work prior to proposing a research project or they must study multiple sources to prepare for exams; individuals in the workplace frequently prepare reports that streamline larger sets of information in order to reach a conclusion. Mentally synthesizing text ideas from a variety of sources and then communicating this synthesis in writing is a skill that is not taught explicitly often or is perhaps extremely challenging to teach. It would certainly inform pedagogy if more were known about the underlying cognitive-psychological processes involved in performing such a task. From a theoretical perspective, there are limited accounts of the process of multiple text comprehension. From an empirical perspective, most of the research on how students process text information has been done on single texts and not on the process of synthesizing ideas from multiple texts. The purpose of this paper is to briefly review both the theoretical and empirical work that has been done on the cognitive psychology of the multiple text comprehension process and to make recommendations to educators about what can be garnered from this sparse literature base.

The most comprehensive theoretical framework to describe the product of reading multiple texts, that is, the consolidated representation of text information in long-term memory, offered to date is *the theory of documents representation* (Braten, Britt, Stromso, & Rouet, 2011; Perfetti, Rouet, & Britt, 1999). The model is compatible with a well-established theoretical account of the cognitive psychology of comprehension, the Construction-Integration model (Kintsch, 1998) that views the process of reading as being an iterative process where several layers of mental models are created. In *the theory of documents representation*, it is posited that readers create a documents model that contains both an *intertext model* and a *situations model*. The intertext model keeps the source, the validity of each source, and the basic contents of each source preserved, whereas the situations model is an integrated mental model of common themes, events or ideas across sources. Ostensibly, the documents model is the ideal mental model created after reading

multiple texts because it allows the reader to track sources and integrate common themes across texts. One can imagine that good, synthesized writing of what is learned from multiple sources cannot happen without a properly formed documents model.

Recently, Rouet and Britt (2011) have offered an updated "task model", the MD-TRACE model, that details the decisions readers must make to successfully meet their goals for reading multiple sources. Some of the decisions involve how to interpret the task at hand, how each text/source meets the instructions of the task, how relevant the text is for reaching the goal of the task, and then determining how to update the documents model as texts are read. Some interesting points that arise out of the description of this task model is what an explicit problem-solving process this type of reading is. This is interesting given debates of the past about the degree to which reading is an automatic versus a strategic, problem-solving process (see Kintsch, 1998), and multiple text comprehension almost necessarily involves both reading and writing as the majority of readers will, at the very least, produce notes as they read through each of their sources (also see Wiley & Voss, 1999) as a way to handle the complexity of the problem of synthesizing multiple sources. Another interesting point made, that would have a strong impact on pedagogy, is the clear need there is for readers to constantly monitor their comprehension, to assess how well they are meeting the overall goals of the assignment, and to evaluate how well each text is meeting their needs when reading multiple texts. Related to this, Rouet and Britt (2011) point out that accurate self-regulation and monitoring of comprehension is difficult prior to late adolescence, for developmental reasons, and that even college-level students are notoriously poor at monitoring how well they understand even single text information (e.g., Linderholm, Wang, Therriault, Zhao, & Jakiel, 2011; Linderholm & Wilde, 2010; Thiede, Anderson, & Therriault, 2003), and certainly how well readers are able to monitor their comprehension in light of the task instructions will be constrained by the cognitive resources (e.g., prior knowledge, working-memory capacity, general reading skills, etc.) of the individual reader. To summarize, the MD-TRACE model (Rouet & Britt, 2011) brings to light several characteristics of reading multiple texts that should inform instructional practice.

Leaving theory behind for a moment, what empirical evidence do we have about the cognitive psychology of comprehending multiple texts? Multiple text comprehension has been a topic of research for less than two decades, which is a fairly short life span for such a complex topic. Nonetheless, several themes emerge from this literature. One research theme has been focused on the cognitive benefits of multiple text comprehension. Researchers have found that readers write much more sophisticated summaries of text material, involving greater synthesis, when reading multiple sources (Gil, Braten, Vidal-Abarca, & Stromso, 2010; Wiley & Voss, 1996, 1999). It is proposed that reading multiple sources forces a more advanced reasoning and integration process that moves the reader away from verbatim recall (e.g., Britt & Aglinskas, 2002; Wiley & Voss, 1996, 1999). Others claim that reading multiple texts may also be a more motivating and engaging task, which could facilitate more advanced cognitive processing of text information than reading a singular source (Guthrie & Cox, 2001).

Another theme within this literature base is the difficulty readers generally have in forming a well-integrated documents model. It appears that advanced readers need specific task instructions, for example, to develop an argument or to summarize text information, when reading multiple texts in order to demonstrate solid recall and comprehension of common text themes (e.g., Britt & Aglinskas, 2002; Britt & Sommer, 2004; Gil et al., 2010; Wiley & Voss, 1999; Wolfe & Goldman, 2005). It is likely the case that particular instructions help to focus readers' limited cognitive resources on a particular goal, making the task more manageable. Likewise, Wiley and Voss (1999) claim that instructions that require the reader to take on a particular point-of-view presented in texts may give readers the chance to personalize the material or to elaborate on text information, which allows readers to make the text information meaningful and more memorable to them.

Yet another strand of research focuses on the philosophical orientation that readers have about the nature of learning and/or the purpose for reading and how that influences their ability to form a documents model. Specifically, several researchers have investigated the role of personal epistemology, that is, one's theory about the purpose for reading and how it is best accomplished, on multiple text comprehension (e.g., Gil et al., 2010; Stromso, Braten, & Samuelstuen, 2008). Whether or not a reader believes that knowledge is a static entity where there is an expert source to be relied upon wholesale can affect one's ability to synthesize and evaluate the credibility of multiple sources and created a unified documents model (see Braten, Gil, & Stromso, 2011), and a reader's epistemological stance oftentimes interacts with the specific task instructions. Specifically, in some cases naïve theorists, those who view knowledge as static, respond better to integrating multiple sources when they are given instructions to summarize whereas sophisticated theorists, those who view knowledge as dynamic, tend to perform better when asked to make an argument for or against one side of a controversial issue (for a review, see Braten et al., 2011).

Unfortunately, the literature is still sparse on what happens *during* the act of reading for readers to develop a documents model. My colleagues and I have performed a few studies on the cognitive processing strategies that readers use during reading to comprehend multiple texts (Linderholm, Therriault, & Kwon, in press; Linderholm, Kwon & Therriault, in progress). In our first study, a correlational study (see Linderholm et al., in press), we asked readers to "think aloud" about their understanding of text ideas as they read three expository texts on the topic of electrical circuits. Their comments during reading were then categorized by two researchers, who reached an acceptable level of agreement, into several cognitive processing strategies. The strategies were then correlated with performance on a reading comprehension test covering common text themes and specific content. The strongest correlation between the cognitive processing strategies readers engaged in during reading and performance was the use of a self-explanation strategy. That is, readers who attempted to explain to themselves the ideas presented in the text and/or attempted to explain ideas based on their background knowledge had greater comprehension performance of the three science texts they read and showed at least some evidence of synthesizing ideas more readily across texts than readers who used other, more superficial memorization strategies.

In two follow up experiments (Study 2: Linderholm et al., in press; Linderholm et al., in progress) my collaborators and I provided pre-reading instructions to readers to self-explain, varying in degree of explicitness, as they read three expository texts on electrical circuits and we did so based on previous research that showed how important specific instructions are for successful multiple text comprehension (e.g., Britt & Aglinskas, 2002; Britt & Sommer, 2004; Gil et al., 2010; Wiley & Voss, 1999; Wolfe & Goldman, 2005). Compared to control conditions where readers were simply instructed to comprehend the texts well, readers who were instructed to self-explain during reading had superior reading comprehension performance and/or more comprehensive written essays. So it appears that specific pre-reading instructions regarding how to process text information is important (see Wiley & Voss, 1999) but also asking readers to use a key cognitive processing strategy during the act of reading facilitates comprehension. The fact that self-explanation is a beneficial strategy for comprehending expository texts is not a new finding for single text comprehension (e.g., Ainsworth & Loizou, 2003; Ainsworth & Burcham, 2007; Ozuru, Briner, Best, & McNamara, 2010) but our studies are the first to highlight the importance of self-explaining when synthesizing ideas across multiple texts. Further research is needed to examine how to best teach the self-explanation strategy to readers (e.g., Linderholm, Wang, & Therriault, in progress).

Given the importance and ubiquitous nature of the task of synthesizing multiple sources in both academic and work life, what can educators of secondary and post-secondary students garner from the literature at this point in time? In the sections below, several suggestions are made based on both theory and research.

1. Multiple text processing and synthesis should be practiced in the classroom context as it advances higher order thinking about complex topics (see Wiley & Voss, 1996; 1999) such as the seriousness or veracity of global warming or controversial historical events. And there is evidence that multiple text comprehension is a teachable skill (Britt & Angliskas, 2002) and that students who practice this particular skill become more adept at it (Rouet, Favart, Britt, & Perfetti, 1997).
2. It is clear from the literature that readers need explicit pre-reading instructions to guide their reading in order to be successful at this task (e.g., Linderholm et al., in press; Wiley & Voss, 1999). However, there are complex interactions that exist between type of instructions and the individual characteristics of readers (for a complete review, see Braten et al., 2011). One fairly safe recommendation is that pre-reading instructions to take a stance or build an argument may be best reserved for students who have a solid base of prior knowledge about the topic whereas pre-reading instructions to summarize may be more successfully employed by students who have limited topic knowledge (Braten et al., 2011).
3. Encourage readers to use self-explanation during multiple text comprehension. This is a strategy that is helpful for personal elaboration of text material, which facilitates a deeper understanding of text information (e.g., Linderholm et al., in press; Linderholm et al., in progress; Wiley & Voss, 1999). Having a deeper understanding of each source allows the reader to better see themes across texts and to better evaluate the relevance of each text to meet their reading goals. Actively self-explaining during reading may also serve to enhance monitoring of text comprehension, which, again, is notoriously poor even in advanced readers (e.g., Linderholm et al., 2011).
4. Educators, at some point, must evaluate how well the complex task of multiple text processing has been executed. Use writing as a tool to determine whether or not synthesis has taken place (see Rouet & Britt, 2011) and/or create test questions that require a synthesis of ideas from each text in a series (e.g., Linderholm et al., 2012).
5. Explicitly encourage in both reading and writing exercises that the purpose of reading multiple texts is to create a synthesized understanding of the ideas, points, or counter points. Be explicit when

assigning such a task that readers/writers are not to develop a serial understanding of the points of each text and/or report on each source in an isolated manner. Explicit instruction should help to counteract naïve theories of how to learn from texts. Some readers have naïve theories of what "good reading" entails (see Gil et al., 2010) and may be tempted to recall verbatim the contents of each individual text source without evaluating themes or integrating ideas across texts.

Some future research directions that may better inform our instructional practices include developing a valid method for assessing the quality of documents models that readers form. Currently, many researchers use comprehension questions that force text integration and/or writing tasks that urge readers to synthesize ideas and this is currently the best option. What we do not always know from this method is for certain whether or not the synthesis was a result from reading the specific texts in the task at hand or did the reader draw from previous experiences/knowledge in some way. Another future research direction is that we need to make a clearer connection between the pre-reading instructions, cognitive processes employed during reading as a function of reader characteristics such as skill, and the documents model representations that advanced readers develop. As noted by Braten et al. (2011), the interactions between pre-reading instructions and reader characteristics are often so complex and vary from situation to situation that it is difficult to make concrete recommendations to educators. If further empirical work could simply some of these complex relationships, clearer pedagogical recommendations could be made. Regardless of the relative lack of empirical and theoretical work on this topic, educators are urged to use multiple text processing assignments with their students to build on their reading (and writing) skills to, at the very least, prepare them for the tasks that they will most certainly face in college courses and in the workplace.

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