# 8

# SIX QUESTIONS REGARDING STRATEGY USE WHEN LEARNING FROM MULTIPLE TEXTS

*Alexandra List*
*THE PENNSYLVANIA STATE UNIVERSITY, USA*

Multiple text use, whereby students access and consider information introduced across multiple documents to understand a particular topic, has been described as a complex, challenging, effortful, goal-directed, and contextualized process (Goldman & Scardamalia, 2013; List & Alexander, 2018b; Rouet & Britt, 2011; Rouet, Britt, & Durik, 2017). These characterizations, in and of themselves, point to the central role of strategic processing in students' learning from multiple texts. In this chapter addressing strategic processing in multiple text use, I have three goals. I first overview prior work on strategic processing and introduce a central framework that may be used to conceptualize strategy use when students learn from multiple texts. Second, I suggest future directions in strategy research. I do this by asking six questions. In particular, I make the case in the first section of this chapter that much prior work has focused on *what* strategies students may engage when learning from multiple texts. In the second part of this chapter, I further suggest that the *where*, *when*, *who*, *why*, and *how* of strategy use ought to be considered as well. In the final section of this chapter, I extend the strategy framework introduced in the first to consider how strategies may be applied when students learn from multiple, multimedia documents, presenting a plurality of textual and non-textual information (e.g., diagrams, tables, videos) side by side.

## WHAT STRATEGIES DO STUDENTS USE WHEN LEARNING FROM MULTIPLE TEXTS?

Research on strategy use has been an integral part of the multiple text use literature since its inception. Indeed, in one of the first studies to examine multiple text use, Wineburg (1991) compared the strategy use of expert historians and Advanced Placement history students presented with multiple historical documents. Wineburg (1991) found historians' multiple text use to be characterized by the use of three heuristics absent among

the document use of Advanced Placement history students. In particular, historians engaged in (a) sourcing, (b) contextualization, and (c) corroboration, whereas high school students did not (see also De La Paz & Nokes, this volume). Sourcing included looking at a document's meta information (e.g., author, publisher) to determine document origin and trustworthiness. Contextualization reflected the application of prior knowledge to situate documents within a historical context. Finally, corroboration reflected the comparison of information across texts, one to another. Since Wineburg's (1991) study, these strategies, and sourcing in particular, have received considerable attention in the literature (Braasch, Rouet, Vibert, & Britt, 2012; Britt & Aglinskas, 2002; De La Paz et al., 2014; De La Paz & Nokes, this volume; Nokes, Dole, & Hacker, 2007; Rouet, Favart, Britt, & Perfetti. 1997) and have been targeted for intervention, to varying extents (Brante & Strømsø, 2018; Nokes et al., 2007; Reisman, 2012).

Likewise, as the literature on multiple text use has progressed, investigations of strategy use have expanded to consider strategies associated with (a) elaboration to support text comprehension (e.g., Wolfe & Goldman, 2005), (b) information accumulation and linking across multiple texts (e.g., Bråten & Strømsø, 2011), (c) notetaking (e.g., Kobayashi, 2009a, 2009b), (d) cross-textual navigation (List & Alexander, 2017b), (e) metacognitive monitoring (Stadtler & Bromme, 2007, 2008), and more (see Afflerbach, Hurt, & Cho, this volume). To systematize this strategic breadth, two frameworks have been introduced (Cho, Afflerbach, & Han, 2018; List & Alexander, 2018b). In the first section of this chapter, I integrate these two frameworks to classify strategies according to two dimensions: their functions (Cho et al., 2018) and referents (List & Alexander, 2018b) when learning from multiple texts. In this case, *functions* reflect the particular aims of strategy deployment, while *referents* capture their targets or foci.

### *Strategy Functions When Learning from Multiple Texts*

A key framework describing strategic processing during multiple text use defines strategies as conscious and controllable efforts to achieve some cognitive purpose and multiple text use as a constructive, meaning-making process (Afflerbach & Cho, 2008; Cho et al., 2018, p. 135). This reflects definitions of strategy use found in earlier work on single text comprehension. This work defines strategy use as intentional and purposeful on the part of the learner (Paris, Lipson, & Wixson, 1983) and strategic processing for comprehension as active and constructive in nature (Baker & Brown, 1984). When engaging in meaning-making based on multiple texts, then, Cho et al. (2018) suggested that students engage in processes falling into one of three general, strategy clusters reflecting: (a) constructive-integrative processing, (b) critical-analytic processing, and (c) metacognitive-reflective processing. *Constructive-integrative* processing, which includes the search for and identification of information in texts, reflects learners' efforts to construct a singular, coherent, cognitive representation of multiple texts, including both content and document information from across texts (Britt, Perfetti, Sandak, & Rouet, 1999; Cho et al., 2018, p. 140; Perfetti, Rouet, & Britt, 1999). *Critical-analytic* processing reflects students' efforts to determine the value, quality, or veracity of texts or text-based information, with such determinations rendered based on sourcing (i.e., consideration of document information) and source evaluation.

Finally, *metacognitive-reflective* processing is focused on the deployment and control of strategies falling into the previous two strategy clusters and includes the reciprocal processes of comprehension monitoring, self-regulation, and metacognition (Cho et al., 2018, p. 143). Across these strategy clusters, Cho et al. (2018) emphasized the interactive nature of strategy use, with the engagement of some strategies (e.g., metacognitive monitoring) eliciting the engagement of others (e.g., information search).

In describing strategic processing as serving "diverse functions and purposes," Cho et al. (2018, p. 144) adopted a *functional* view of strategic engagement. That is, they classified strategies according to their aims or purpose. The three general, strategic aims that may be served during multiple text use are presented in each row of Table 8.1.

### *Strategy Referents When Learning from Multiple Texts*

The second strategy framework I consider in this chapter comes from the *Integrated Framework of Multiple Texts* (IF-MT; List & Alexander, 2018b). The IF-MT conceptualizes multiple text use as a three-stage process, including preparation, execution, and production. In the execution stage, List and Alexander (2018b) classified the strategies that students engage during multiple text use as behavioral, cognitive, or metacognitive in nature. They defined behavioral strategies, including information search, selection, and navigation, as intentional actions performed during the course of engaging with multiple texts. Cognitive strategies, then, are defined as the mental processes that students use when trying to learn from multiple texts. These are further distinguished as intra-textual or inter-textual in nature. *Intra-textual* processes refer to those strategies that are deployed in reference to only a single text; whereas, inter-textual processes refer to strategies that require the simultaneous consideration of more than one text at a time. Finally, metacognitive strategies are regulatory processes engaged based on students' monitoring of their comprehension, epistemic standards, and task satisfaction. As such, our view of metacognitive strategy use is embedded in Schraw and Moshman's (1995) framework, which suggests that metacognition includes both (a) *metacognitive knowledge* (i.e., knowledge of cognition, such as strategy knowledge) and the (b) *regulation of cognition* (i.e., planning, monitoring, and evaluation). In this chapter, due to my focus specifically on strategy use during task completion, I am particularly concerned with students' metacognitive monitoring (i.e., reflection and evaluation of their cognition during task completion) and any regulation (i.e., deliberate efforts to control cognition or affect during task completion) that may result.

The framework suggested by List and Alexander (2018b) may be said to adopt a *directed* view of strategy use. In other words, they classified the strategies that students engage according to the referents at which they are directed or the content they address (i.e., a single text, multiple texts, or learners' knowledge and beliefs). The possible targets or referents for strategy use are reflected in each column of Table 8.1.

### *Comprehensive Strategy Framework*

By overlapping the strategy functions and referents described by Cho et al. (2018) and List and Alexander (2018b), I introduce the *Comprehensive Strategy Framework* (CSF), presented in Table 8.1. Each row of the CSF (Table 8.1) identifies one of three

**Table 8.1** Sample Strategies Corresponding to the Functions and Referents Identified in the Comprehensive Strategy Framework

| | | **Strategy Referents** *See List and Alexander (2018b)* | | | |
|---|---|---|---|---|---|
| | | **Intra-textual** *Referent is information in a single text* | **Inter-textual** *Co-referents are more than one text* | **Personal** *Co-referents are a text and learners' prior knowledge or beliefs* | **Inter-modal** *Co-referents are a text and another source including non-textual content (e.g., diagram, table, video)* |
| **Strategy Functions** *See Cho et al. (2018)* | **Constructive-integrative processing** *Strategies focused on meaning-making within and across texts* | Summarizing content in one text (Anmarkrud et al., 2013)<br>Paraphrasing or restating the content of one text to aid understanding (Wolfe & Golfman, 2004) | Elaborating information in one text by connecting ideas across texts (Anmarkrud et al., 2013) | Elaborating information in one text by connecting it with prior knowledge (Anmarkrud et al., 2013)<br>Introduction of personal associations to text content, in a way that does not support comprehension (Wolfe & Goldman, 2004) | |
| | **Critical-analytic processing** *Strategies focused on determining source and information quality, credibility, and veracity* | Sourcing (Wineburg, 1991) or using document information from one text to predict or interpret text content (Anmarkrud et al., 2013)<br>Positive or negative judgments of some aspect(s) of a text (Wolfe & Goldman, 2004) | Corroboration (Wineburg, 1991) or the comparison of trustworthiness across texts<br>Comparing author benevolence and authority across texts to decide whom to believe (Stadtler & Bromme, 2014) | Contextualization (Wineburg, 1991) or the application of prior knowledge to interpret text content or to aid in text evaluation | |
| | **Metacognitive-reflective processing** *Strategies focused on monitoring and regulating comprehension* | Monitoring the comprehension of a single text (Anmarkrud et al., 2013; Stadtler & Bromme, 2007)<br>Determinations of comprehension success/failure, in reference to a single text (Wolfe & Goldman, 2004) | Trying to solve a comprehension problem in one text by searching for information in other texts (Anmarkrud et al., 2013) | Using information in prior knowledge to address a problem with text comprehension<br>Awareness and monitoring of the biasing role of prior beliefs on reading (Maier & Richter, 2014) | |

general strategy functions, as specified by Cho et al. (2018). These functions include (a) constructive-integrative processing, (b) critical-analytic processing, and (c) metacognitive-reflective processing. Each column of the CSF corresponds to a strategy referent, as identified by List and Alexander (2018b). Referents include a single text, multiple texts, or learners themselves, including their prior knowledge and beliefs. Jointly, the rows and columns of the CSF introduce the idea that any strategy that students engage during multiple text use may be decomposed according to its function and referent, and that any strategic function that students carry out (e.g., identifying important information) may be executed in reference to a single text, to multiple text, or to students' own knowledge and beliefs. In the sections that follow, I present examples of various strategic functions carried out across the variety of referents possible during students' learning from multiple texts.

**Constructive-Integrative Processing.** As conceptualized by Cho et al. (2018), constructive-integrative processing involves students' attempts to make meaning from multiple texts and includes strategies such as searching for and locating information, identifying and learning important ideas, and building new knowledge. Adopting List and Alexander's (2018b) directional view of strategy use, the primary distinction in constructive-integrative processing may be whether students are trying to make sense of information presented only within a single text, occurring across multiple texts, or arising from students' prior knowledge.

This difference in foci as the referents for processing is highlighted in Wolfe and Goldman (2005) think-aloud study of adolescents reading conflicting texts about the fall of the Roman Empire. Specifically, Wolfe and Goldman coded students' think-aloud utterances both for the type of processing evidenced (i.e., referred to as a think-aloud event) and for the information source(s) targeted, with four information sources examined (i.e., information from the same text; information from a previous text; prior knowledge; and information from a previous think-aloud comment). In total, 58% of students' utterances reflected elaborations, or attempts to make meaning from information in texts. These included strategies aimed at developing: (a) causal (25.24%) or comparative (8.61%) (i.e., connections that enriched the meaning of texts) self-explanations, (b) surface associations (45% ) (i.e., prior knowledge-based connections that did not contribute to textual understanding); (c) predictions (2%) (i.e., expectations), and (d) surface-text connections (12%) (i.e., superficial connections based on semantic overlap). These various elaborative functions were able to be carried out in reference to a single text, to multiple texts, or to students' prior knowledge. Specifically, 49% of elaborations referred to students' prior knowledge, 16% of elaborations focused on a single text, while 18% of elaborations were focused on a previously read text. As such, only a minority of the elaborative utterances that students produced referred to multiple texts. Moreover, few identified causal, comparative relations of any kind, making the intersection of these, or the number of utterances identifying relations across multiple texts, all the more limited.

Wolfe and Goldman (2005) further found that the nature of the connections that students formed differed by referent. In particular, when elaborations referred to a single text, 75% of the connections formed were causal in nature, while 15% were comparative. As a contrast, when elaborations were developed across texts, 46% were causal, while 40% were comparative. In part, this reflects an increase in comparative

relations formed when students reason about multiple texts. This differential pattern in think-aloud utterances points to the need to examine not only the function of students' strategic engagement (i.e., formation of causal or comparative connections) but also its referent (e.g., a single text or multiple texts).

Anmarkrud, Bråten, and Strømsø (2014) adopted a similar approach to coding undergraduate students' think-aloud utterances reported during multiple text use. Specifically, in addition to coding for the strategy clusters specified by Afflerbach and Cho (2008), they coded for linking strategies, capturing students' consideration of more than one text at a time, rather than a single text. All told, Anmarkrud et al. (2014) found 31.29% of students' strategic processing involved cross-textual linking. When considering more than one text at a time, they found 47.1% of strategies to be aimed at learning important information, 16.7% of strategies to be aimed at monitoring, and 36.3% of strategies to be focused on evaluation (i.e., critical analytic processing). In this case, the majority of strategies executed across multiple texts focused on connecting ideas across texts to improve comprehension. In examining the nature of cross-textual linking, they further found the majority of such linking to be backward, rather than forward, directed, drawing connections to previously read texts. Moreover, they found linking to identify conflicts between texts, rather than points of concurrence or corroboration. Both different types of strategies (i.e., identifying and learning important information strategies vis-à-vis evaluation strategies) and linking strategies, in particular, were found to have distinct associations with multiple text task performance. In keeping with the differential strategy use, both in function and in referent, documented by Wolfe and Goldman (2005) and Anmarkrud et al., 2014), Table 8.1 includes descriptions of the constructive-integrative strategies that may be engaged in reference to a single text, to multiple texts, or to learners' prior knowledge and beliefs.

**Integrative Processing Across Multiple Texts.** As strategies that may be used to construct meaning from a single text have been much more extensively examined in prior work (Afflerbach & Cho, 2008; McNamara, 2004; McNamara & Magliano, 2009), here I provide a more detailed discussion of how students may make meaning across multiple texts or engage in cross-textual integration. Cho et al. (2018) and List and Alexander (2018b) recognized that multiple text integration involves the connecting and cognitive representation of texts that are both consistent with and in conflict with one another. For texts that are consistent, providing corroborative (e.g., redundant) or complementary information, the cross-textual strategies engaged may be described as synthesis. These are strategies focused on additively connecting texts and organizing such connections. To make sense of texts that are conflicting, reconciliation-focused strategies are required. Reconciliation is the umbrella term applied to the processes involved in the representation of discordant texts as in conflict with one another, and associated efforts to understand and possibly resolve such conflicts. The joining and organization of the mental representations that arise through synthesis and reconciliation results in integration, or students' holistic conceptualization of multiple texts (Britt et al., 1999; Goldman, Lawless, & Manning, 2013; Perfetti et al., 1999).

List and colleagues (List, 2019; List & Alexander, 2018b) specified four steps involved in both students' synthesis and reconciliation of multiple texts. Specifically, students connect multiple complementary and conflicting texts through: (a) identification,

(b) separate representation, (c) simultaneous relation, and (d) relational elaboration. *Identification* involves students' initial search for possible corroborative or related information across texts or attendance to potential conflict. *Separate representation* involves students' separate mapping or elaboration of related information within each text. *Simultaneous relation* involves students conceptually linking information from separate texts via a single statement, typically using a relational modifier (i.e., a linking term such as and, but, or therefore). Finally, *relational elaboration* involves students classifying the type of cross-textual connections formed, and elaborating these to various extents. This may include students generally specifying that texts agree or conflict with one another or determining a more specific point of comparison across texts (e.g., texts disagree with one another in their estimate of projected causalities as a result of overpopulation).

When texts are classified as being in conflict with one another, Stadtler and Bromme (2014) outlined at least three strategies that students may use to not only represent conflicting information but also to resolve conflicts as well. These included (a) ignoring the conflict, by dismissing one of the texts that conflicts, (b) inferring an (often incorrect) resolution to the conflict based on prior knowledge or other information in texts, or (c) deliberately choosing a side of a conflict to defer to by evaluating and comparing either author (i.e., whom to believe?) or information (i.e., what to believe?) quality. Of course, when students are presented with conflicting information from similarly expert or trustworthy sources, they are left unable to easily determine whom to believe. In such instances, other strategies, including relying on their prior attitudes, making plausibility judgments based on world knowledge, or searching for additional information, may be required (Hepfer, List, & Du, 2019; Lombardi, Seyranian, & Sinatra, 2014). Nevertheless, the comparison and evaluation of discrepant sources remains a key mechanism that students can use to resolve conflicts when these are identified across texts (Braasch et al., 2012). The processes used to evaluate texts' sources (e.g., author) and content were termed critical analytic strategies by Cho et al. (2018).

**Critical-Analytic Strategies.** Cho et al. (2018) described critical analytic strategies as focused on the evaluation of information and its source(s). The leading evaluation strategy examined within the context of multiple text use has been *sourcing*. As Stadtler and Bromme (2014) explained, sourcing is key because when trying to understand a complex and unfamiliar topic by reading multiple texts, students often do not have the requisite knowledge, resources, and skills necessary to directly evaluate the knowledge claims introduced (i.e., to decide what is true). Rather, students are left to make second-order sourcing judgments or assumptions about information quality based on source characteristics, including author benevolence (i.e., intention to provide accurate and quality information) and expertise (i.e., authoritativeness). Making such judgments is, nevertheless, a complex process. Brante and Strømsø (2018), in a review of sourcing interventions, found sourcing to include students' (a) attendance to and identification of document information, including author, publisher, date of publication, (b) recall of document information (i.e., its storage in memory or in an external representation, like students' notes), (c) use of document information to predict and interpret content in texts, and (d) evaluation of source credibility.

Beyond sourcing, the other strategies identified by Wineburg (1991) may also serve evaluative functions, albeit less frequently considered in prior work. Rouet et al. (1997)

examined the sourcing, corroboration, and contextualization of graduate students classified as either experts or novices in the domain of history. Sourcing included specific references to study documents reflected in students' essays, but was not found to differ across expert and novice graduate students in the domain of history. Corroboration, or comparing information across texts, was classified in one of four ways. Specifically, students developed (a) *argument models* (i.e., recognizing different texts as forwarding conflicting interpretations), (b) *positive connections* (i.e., grouping similar texts), (c) *negative connections* (i.e., identifying conflicting texts), and (d) *general references* (i.e., identifying a group of consistent sources) across texts. Corroboration was limited, with less than one corroborative instance occurring in students' essays, but uniformly so across expert and novice graduate students. Finally, students' engagement in contextualization was classified according to the type of knowledge implicated. Specifically, students made (a) *problem context statements*, drawing on topic-specific prior knowledge; (b) *historical context statements*, using prior knowledge at the domain level; and (c) *general context statements*, reflecting the contribution of general, world knowledge to multiple text evaluation. It was in the engagement in contextualization that expert-novice differences emerged, with expert students including more contextual information overall and more historical contextual statements in their essays, in particular. Elsewhere, the use of sourcing, corroboration, and contextualization by high school history students has been found to be quite limited, with the engagement of the latter two strategies found to be especially rare (Nokes et al., 2007; Stahl, Hynd, Britton, McNish, & Bosquet, 1996).

Nevertheless, all three of these critical-analytic strategies are presented in the second row of Table 8.1. As demonstrated in Table 8.1, critical-analytic strategies may be intra-textually, inter-textually, or personally directed. For instance, students engaging in sourcing may consider the document information in one text (i.e., an intra-textually directed strategy) or can compare author credentials across texts (i.e., an inter-textually directed strategy). Likewise, students may apply prior knowledge to contextualize a particular text (i.e., a personally directed strategy) or may use information in one text to contextualize or situate another (i.e., an inter-textually directed strategy). An exception to this may be the corroborative strategy for text evaluation, which necessarily requires the simultaneous consideration of more than one text and is therefore a strategy that is inter-textual in nature. At the same time, even this strategy may be engaged to compare information in a text with students' prior knowledge, thereby evaluating its content. The intra-textual, inter-textual, and personal-directedness of various critical-analytic strategies is reflected in Table 8.1.

**Metacognitive-Reflective Strategies.** The final strategy cluster defined by Cho et al. (2018) is termed metacognitive-reflective and includes students' regulation of their own sense-making of multiple texts and monitoring, or self-assessments of comprehension. Although Cho et al. (2018) identified metacognitive-reflective strategy use as necessary for the deployment of the constructive-integrative and critical-analytic strategies necessary for learning from multiple texts, this strategy cluster has, nevertheless, received the least attention in the literature on learning from multiple texts. Wolfe and Goldman (2005) found evidence of metacognitive monitoring among students' think-aloud utterances. These were coded as either reports of comprehension success or comprehension problems; however, each of these

accounted for only 3% of all reported think-aloud utterances. Likewise, Anmarkrud, Bråten, and Strømsø (2014) found strategies belonging to the metacognitive-reflective cluster to be the least commonly reported (16.56%), as compared to constructive-integrative (34.36%) and critical-analytic strategies (49.08%). As demonstrated in Table 8.1, these strategies can nevertheless be executed in reference to a single text (e.g., *detecting a comprehension problem with a particular text*), to multiple texts (e.g., *trying to solve a detected comprehension problem … by searching for clarifying information in other available texts*, Anmarkrud et al., 2014, p. 70), or to students' prior knowledge (e.g., if students are conscious of knowledge revision or belief change; Richter & Maier, 2017).

Other work has sought to explicitly elicit metacognition and comprehension monitoring, in particular, during the course of students' learning from multiple texts. For instance, Stadtler and Bromme (2007, 2008) developed *met.a.ware* as a platform to prompt students' metacognitive monitoring and source evaluation. To spur monitoring, students were asked to rate: *how well do you comprehend the information*, *how much do you know about the topic right now*, and *how much information do you still need on the topic*, after accessing each text. At post-test, students assigned to the monitoring condition were found to have higher factual knowledge as compared to a control group.

Maier and Richter (2014) examined an expanded set of three metacognitive monitoring strategies that students could use when learning from multiple texts. The first involved students monitoring the *biasing influence* of their prior beliefs on their processing of multiple texts. The second involved students identifying inconsistencies across texts, violating standards for internal coherence among information sources (i.e., *internal consistency standard*). Finally, the third standard involved students evaluating information in texts relative to their prior knowledge (i.e., *external consistency standard*). Although not specifically examining the differential effects of these various metacognitive monitoring strategies, instruction on these various strategies and the provision of feedback were found to result in improved situation model construction, corresponding to a more accurate cognitive representation of information presented across texts, and improved text recall. Noteworthy for the development of the CSF is that Maier and Richter (2014) specify monitoring strategies that use both multiple texts and learners' prior knowledge and beliefs as strategy referents. Indeed, as was the case with evaluative strategy use, metacognitive monitoring and regulatory strategies may be deployed in reference to a single text, to multiple texts, or to learners' prior knowledge and beliefs.

### *Overview*

Thus far, we have explicated the strategy clusters identified by Cho et al. (2018) by demonstrating how these may be applied in the service of students' understanding, evaluating, and monitoring their comprehension of single texts or multiple texts or the development of their knowledge. Among the strategies classified in the CSF are processes identified through (a) think-aloud reports (Anmarkrud et al., 2014; Wolfe & Goldman, 2005); (b) students' endorsement of strategy inventories (e.g., *Multiple Text Strategy Inventory* [MTSI], Bråten and Strømsø, 2011); (c) the comparison of

the strategic performance of better and poorer learners (Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012; Wiley et al., 2009); and (d) the elicitation of certain strategies during processing (Maier & Richter, 2014; Stadtler & Bromme, 2007). Nevertheless, underlying these diverse methods for capturing strategy use is a central focus on *what strategies* students engage during multiple text use. That is to say, across these various approaches to capturing and studying strategy use, there has been the underlying assumption that the use of certain strategies over others results in particular benefits for multiple text comprehension and integration. Although this has often been found to be the case (e.g., Bråten, Anmarkrud, Brandmo, & Strømsø, 2014), such findings are hardly universal. For instance, while Bråten and Strømsø (2011) found the information accumulation dimension of the MTSI to be negatively associated with multiple text task performance, List, Du, Wang, and Lee (2019) found students' reports of strategies aimed at both information accumulation and cross-textual elaboration to be positively associated with multiple text integration. Hagen, Braasch, and Bråten (2014) found students' connection formation in their written notes to be associated with multiple text comprehension when asked to write an argument, but not a summary; while Kobayashi (2009a) found students' note-taking, or external strategy use, to have no effect on performance, regardless of task assignment. Wiley et al. (2009) found some justifications for source reliability to differ across students deemed more or less successful at multiple text task completion (e.g., attending to explanation quality), while others did not (e.g., considering cross-textual corroboration). At the same time, Stadtler and Bromme (2007) did not find students assigned to a prompted source evaluation intervention condition to differ in their comprehension of multiple texts, relative to a control group, although some benefits for source recall were identified.

Of course, these mixed findings can be explained in a number of ways, stemming from the variety of methods used to capture students' multiple text use across studies, including differences in the task assignment, texts provided, and outcome measures used. Nevertheless, in this chapter, I argue that these mixed results stem, in part, from limitations in the ways that strategy use has been examined. In particular, I suggest that prior work has focused almost exclusively on *what* strategies students employ during multiple text use, failing to fully capture the dynamic and contextualized nature of strategy use during learning from multiple texts. In the second section of this chapter, I call on researchers leading the next phase of strategy research to move beyond questions addressing *what* strategies students use to conceptualize strategy use in a multidimensional fashion, one that more explicitly considers the where, when, whom, why, and how of strategy use, in addition to the what. I do this by reviewing work already addressing each of these focal questions, in turn.

## WHERE ARE STRATEGIES DIRECTED DURING MULTIPLE TEXT USE?

In addition to considering what strategies students deploy during multiple text use, there is a need to consider where, or toward what referent, such strategies are directed. The need to consider the where or referent of students' strategy use is, in part, suggested by the CSF, which explicitly asks that strategy functions be understood as intra-textual,

inter-textual, or personally directed in nature. Nevertheless, these represent only general referents, with many more specific referents needing to be considered to understand what features students attend to when strategically using multiple texts.

Two primary referents have been considered in prior work. The first has been students' attendance to document information or source features during text use. For instance, Gerjets, Kammerer, and Werner (2011) used eye-tracking and think-aloud data to examine learners' attendance to specific areas of search results produced on a search engine results page. They found that instructing students to engage in source evaluation increased attendance to document information (e.g., publisher) and user ratings in search results, as compared to a control condition. Examining students' attendance to sources in texts, Braasch et al. (2012) focused on students' gaze patterns and think-aloud utterances in reference either to source information (e.g., an art critic) or to text content. They found that the presentation of conflicting information across texts stimulated attendance to source information but not to content, as compared to the introduction of consistent information.

Examining texts more holistically, Kammerer and Gerjets (2012) considered differences in students' selection of objective (i.e., fact based), subjective (i.e., opinion based), or commercial (i.e., promotional) websites during Internet searches. Likewise, Wiley et al. (2009) found that students learning disproportionately much or little from a multiple text task were distinguishable according to their time allocation, navigation, rereading, and rankings of reliable vis-à-vis unreliable websites.

In addition to directing strategies at source information, some studies have distinguished students' strategy use when directed toward relevant vis-à-vis irrelevant information, with relevance defined as pertinence to task assignment (Cerdán & Vidal-Abarca, 2008; Rouet, Ros, Goumi, Macedo-Rouet, & Dinet, 2011). For instance, Anmarkrud et al. (2013) found students to be able to both distinguish more relevant from less relevant information presented across texts and to more frequently use cross-textual linking strategies when processing relevant vis-à-vis irrelevant information. Collectively these findings point to the need to consider *where*, or at what specific texts or text components, students direct their strategic efforts during multiple text use (e.g., rereading reliable versus unreliable websites; Wiley et al., 2009).

Nevertheless, considerably more work is needed to understand the *where* aspect of strategy use. This includes further examining whether targeting a given strategy referent is specifically associated with task performance, both on its own and in interaction with a particular strategy function engaged (e.g., Braasch et al., 2012; Wiley et al., 2009), and considering an expanded set of strategy referents as potential targets during multiple text use. These referents can include the central arguments forwarded in texts, the evidence provided, and other content-related factors (e.g., List et al., 2019).

Expanding beyond students' learning from documents that are only textual in nature, examining *where* strategies are directed may be particularly important when understanding students' learning from multiple, multimedia documents, or documents including textual information alongside non-textual content, like diagrams, tables, or videos (List & Alexander, 2018a).

Within the context of learning from multimedia documents, students' iterative attendance to textual and non-textual features in textbooks (e.g., diagrams) has been associated with improved learning (Mason, Pluchino, & Tornatora, 2015; Mason,

Pluchino, Tornatora, & Ariasi, 2013; Schwonke, Berthold, & Renkl, 2009). For instance, Cromley, Snyder-Hogan, and Luciw-Dubas (2010) found that while many students skip over diagrams in science textbooks entirely (22%) or attend to a relatively limited set of diagram features (34% of the features possible), those students who do study diagrams, alongside textual content, demonstrate a greater number of inferences and high-level strategies engaged during processing as well as improved task performance. More recent studies examining students' learning from various textual and non-textual sources have found students to engage different strategies in response to different types of documents. For instance, Van Meter and Cameron (2018) found students to take fewer notes on political cartoons than on historical documents, presented during a multiple text task, with the character of notes differing as well (i.e., more affective notes taken in response to political cartoons). All told, these findings point to the need to examine a variety of referents and their elicitation of strategy use during students' learning from multiple, multimedia documents.

## WHEN ARE STRATEGIES DEPLOYED DURING MULTIPLE TEXT USE?

While prior work has provisionally considered where students direct strategies during multiple text use, *when* during text use strategies may be deployed has received considerably more limited attention in the literature. Nevertheless, some studies indicate that when during text use students deploy particular strategies matters for their efficacy. For instance, Wineburg (1991), in describing experts' use of the sourcing strategy, specifically notes that experts looked to document information *first*, prior to reading, with sourcing serving as the interpretive lens for the textual information to follow. Emphasizing sourcing prior to reading a text seems in line with research identifying the activation of prior knowledge as a central strategy to support reading comprehension, more generally (Alvermann & Hynd, 1989; Spires & Donley, 1998; Wetzels, Kester, & Van Merrienboer, 2011). In addition to certain strategies needing to be activated prior to multiple text use, other strategies may be more effective when deployed during or after engagement with multiple texts. For instance, across two experiments, Britt and Sommer (2004) examined the effectiveness of intervening tasks on students' integration of multiple texts. They found that composing brief summaries after reading a first text (Experiment 1) improved its integration with a second text, as did answering questions related to text macro-structure (i.e., questions about why events occurred), rather than micro-structure (i.e., questions asking where and when events occurred; Experiment 2).

Within the context of learning from multiple, multimedia documents, Lee and List (2019) compared students' strategic processing when learning information that was presented either as two texts or as two videos. An interesting finding to emerge from this work is that, in addition to some similar and some different strategies engaged during reading vis-à-vis video viewing, video viewing resulted in strategic front-loading in ways that reading did not. That is to say, when viewing videos students engaged disproportionately more strategies during the first quintile of viewing, with strategic engagement during reading found to be more proportionally distributed in nature. While Lee and List attribute these distributional differences in strategy use to the linear

nature of videos, rendering non-sequential navigation difficult, these findings point to the need to consider the when of strategy deployment both when students read texts and when they seek to process other media, including videos. A further consideration in determining the when of strategy use may be not only the point of strategy initiation but also its duration.

## WHO BENEFITS FROM STRATEGY USE DURING MULTIPLE TEXT USE?

A wide variety of individual difference factors have been examined within the context of learning from multiple texts. These include cognitive factors, like epistemic beliefs and need for cognition (e.g., Bråten, Strømsø, & Samuelstuen, 2008; Ferguson & Bråten, 2013), as well as affective factors, like interest and attitudes (e.g., Bråten & Strømsø, 2006; McCrudden & McTigue, 2018), and, more recently, psychophysiological factors like heart rate variability (Mason, Scrimin, Zaccoletti, Tornatora, & Goetz, 2018; see Brante & Strømsø, 2018 for a review; List & Alexander, 2017a, 2018b for a central framework).

In one research tradition, individual differences on various learner characteristics have been associated with the differential ability to take advantage of the various affordances or features of multiple text environments. For instance, Gil, Bråten, Vidal-Abarca, and Strømsø (2010), while not examining strategy use per se, did find that students with high prior knowledge were able to take advantage of a task assignment asking them to compose an argument, rather than a summary, while students low in prior knowledge were not able to do so. Le Bigot and Rouet (2007) similarly distinguished the performance of students comparatively low and high in prior knowledge, assigned to write either arguments or summaries within hypertext environments that varied according to their format of text presentation (i.e., by topic or by author and topic). Results included that students high in prior knowledge performed better on comprehension questions than their low knowledge counterparts and that argument tasks resulted in students composing more sophisticated written responses than did summary tasks. However, interactions among prior knowledge and hypertext affordances were limited.

A second research approach has examined how individual difference factors may function more directly in interaction with students' strategy use during learning from multiple texts. For instance, Bråten, Strømsø, Brandmo, and Anmarkrud (2014) found prior knowledge, epistemic beliefs, and need for cognition to be associated with students' deeper level strategy use (i.e., engagement in cross-textual elaboration), resulting in improved multiple text comprehension. List, Stephens, and Alexander (2019) found the relation between situational interest and students' multiple text task performance to be mediated by the time that students devoted to text access, considered to be a proxy for persistence and the more effortful processing of multiple texts. Beyond these investigations, few studies have examined how strategies might interact with individual difference factors to result in variations in performance. In particular, there has been limited consideration of the extent to which different strategies may be beneficial for learners differing in prior knowledge, multiple text use skills, or motivation.

Within the context of multimedia learning, a wider range of individual difference factors may need to be considered (Moreno, 2002). These include verbal and

visuospatial working memory (Gyselinck, Jamet, & Dubois, 2008; Schüler, Scheiter, & van Genuchten, 2011 for a review), visuospatial reasoning (Hegarty & Waller, 2005; Höffler, 2010; Wu & Shah, 2004), and multimedia/graphic comprehension knowledge and skills (Canham & Hegarty, 2010; Cromley et al., 2013; delMas, Garfield, & Ooms, 2005). Indeed, these individual difference factors in conjunction with affordances in multimedia learning environments have been found to result in differences in performance. For instance, Brucker, Scheiter, and Gerjets (2014) examined how students with high versus low visuospatial reasoning learned from graphics that varied in realism (i.e., realistic versus schematic) and dynamism (i.e., dynamic versus static). Learners with high visuospatial abilities were found to perform better when presented with realistic visualizations, while learners low in visuospatial ability were found to benefit from more schematic graphics. Cook, Wiebe, and Carter (2008) compared the diagrammatic reasoning of students low and high in prior knowledge, learning about diffusion and osmosis. While low knowledge students tended to focus on the surface features of diagrams (e.g., noticing differences in color and shape), high knowledge students were better able to interpret these features, forming inferences based on prior knowledge. Moreover, when asked how diagrams can be improved, students low in prior knowledge expressed a desire for more labeling and verbal explanation, while students high in prior knowledge were satisfied with the more parsimonious diagrams provided. These findings suggested that differences in prior knowledge result not only in attentional differences during processing but in strategic differences as well, with prior knowledge supporting greater inferencing during diagrammatic learning. These results further echo findings from expert-novice studies which have found novice learners to treat diagrams more discretely, grouping them based on surface features, while experts reason more holistically and, crucially, are able to reason across multiple diagrams to develop understanding (Chi, Feltovich, & Glaser, 1981; Kozma, 2003). The next step within this body of work, then, is to further consider how learners' individual differences alongside design features in various multimedia environments might jointly result in differences in strategic processing and ultimately, in improvements in task performance.

## WHY DO STUDENTS DEPLOY STRATEGIES DURING MULTIPLE TEXT USE?

The identification of metacognitive-regulatory strategies in Cho et al.'s (2018) strategy framework is, in part, an effort to consider *why* particular strategies may be engaged by learners. In particular, Cho et al. (2018) conceptualized strategy use as the result of learners' metacognitive monitoring and regulation. In the broader literature on multiple text use, two general categories of mechanisms to elicit strategy use have been identified. These are initiating mechanisms that are *internal* (e.g., resulting from metacognitive monitoring) or *external* to the learner, prompted by extrinsic features in the task environment. Indeed, these strategic triggering mechanisms may be said to operate throughout multiple text use, including prior to, during, and following task completion.

Prior to a multiple text task being initiated, students' intentions for strategy use may be elicited by the task assignment (i.e., an external factor, Hagen et al., 2014;

Marton & Säljö, 1976; McCrudden & Schraw, 2007) as well as by students' interpretations of task demands and their cognitive representation via a task model (List, Du, Wang, & Lee, 2019; Rouet & Britt, 2011). Indeed, among the most robust findings in the field of multiple text use is the role that task assignment plays in students' learning from texts (McCrudden & Schraw, 2007; Wiley & Voss, 1999). Nevertheless, most commonly the strategy-driven link between task assignment and actual performance has only been implied rather than directly investigated. This is largely the case for studies determining the facilitative role of argument tasks for multiple text integration, as compared to other multiple text tasks (Bråten & Strømsø, 2011), with Wiley and Voss (1999) attributing this to a difference between argument tasks prompting students to engage in *knowledge-transforming* vis-a-vis *knowledge-telling*.

Informing this literature is a study by Cerdán and Vidal-Abarca (2008) that directly examined students' processing when responding to two different types of tasks, requiring either intra-textual or inter-textual integration. Among differences in processing identified, Cerdán and Vidal-Abarca found that writing an essay to demonstrate global understanding (i.e., an inter-textual task) resulted in students reading relevant information more slowly than irrelevant information. This reflected more strategic processing and stood in contrast to students in the intra-textual task condition, who read both relevant and irrelevant information at the same rate. Moreover, students in the inter-textual task condition engaged in more integrative processing (i.e., defined as the consecutive reading of separate relevant paragraphs in text, one after the other) than students belonging to the intra-textual task condition, and produced more think-aloud utterances when processing relevant segments of text. These processing variables, particularly those related to integration, were later found to be associated with performance on a transfer task, corresponding to deep-level learning, even though no differences in superficial learning emerged, as assessed via performance on a statement verification task. Within the context of learning from multimedia documents, Schwonke et al. (2009) found many students to be ignorant regarding the functions and purpose of multiple representations. They, therefore, found that simply instructing students as to the functions of representations in multimedia environments served to improve learning, particularly for students with low prior knowledge.

Beyond task instructions, during the course of multiple text use, strategy use may be initiated both by students' metacognitive monitoring (Cho et al., 2018) and by features of the task environment, including the texts themselves and their presentation. Introducing a framework of conflict-driven validation, Richter and Maier (2017) argued that students constantly monitor text consistency both with their prior beliefs and in relation to other texts, throughout the course of processing, with the detection of conflict considered to potentially spur elaborative strategy use. Such monitoring may be considered to be an internal, learner factor triggering strategy use and can be contrasted with more external mechanisms examined in prior work. These include the arrangement of search results either as a list or as an ontologically organized, graphical overview resulting in differences in text selection (Kammerer & Gerjets, 2012; Salmerón, Gil, Bråten, & Strømsø, 2010) and the presentation of conflicting, rather than consistent, information across texts spurring attendance to document information (Braasch et al., 2012; Kammerer, Kalbfell, & Gerjets, 2016; Stang Lund, Bråten, Brante, & Strømsø, 2017). More intensively prompting students' strategic processing

has been work that explicitly designed multiple text interfaces to cue sourcing, source evaluation, or metacognition (Britt & Aglinskas, 2002; Stadtler & Bromme, 2007, 2008).

Within the context of learning from multimedia representations, Renkl and Scheiter (2017) reviewed the material-oriented (e.g., dynamic versus static representations; realistic versus schematic pictures) and learner-oriented (e.g., inference training) factors that may be used to trigger strategic processing and to improve students' learning from visual displays. One external trigger used by Seufert (2003) to stimulate text and visual integration was to provide students with directive help by explicitly identifying relevant points of connection across representations. Seufert (2003) found such directive help to be particularly useful for students with moderate prior knowledge, while have a slight deleterious effect for low knowledge learners. Such mixed results point to the need to further determine not only whether external triggers do, indeed, elicit certain types of processing but also to ascertain whether externally eliciting certain strategies results in the same benefits for learning as does such strategic processing when it is internally triggered. This latter point is demonstrated by Gerjets, Kammerer, and Werner's (2011) examination of spontaneous versus cued source evaluation during web search. Specifically, while Gerjets et al. (2011) did find that explicitly instructing students to evaluate texts increased the number of evaluation-related think-aloud utterances students reported, the instructed evaluation condition did not result in students' improved justifications for choice of diet (i.e., the topic of the task).

Following task completion, feedback (i.e., an external factor, Llorens, Cerdán, & Vidal-Abarca, 2014; Maier & Richter, 2014; Moreno, 2004) as well as students' self-assessments of task performance (i.e., an internal factor, List & Alexander, 2015; Rouet & Britt, 2011, Wang & List, 2019) can be mechanisms that prompt learners' revisiting of multiple texts and strategy re-engagement. Although these post-task aspects of strategy use have received perhaps the least attention in the literature, these do constitute strategy triggers likely to occur in real-world task contexts. More generally, given the research reviewed up to this point in the chapter, the pertinent question with regard to strategy triggers ought not be what these are, but rather which triggers may be beneficial for whom (i.e., which learners) and when during task completion. In other words, within the context of learning from multiple texts and multiple, multimedia representations it remains essential to ask under what conditions strategies ought to be externally triggered vis-à-vis under what conditions internal, metacognitive triggering is sufficient.

## HOW CAN WE DETERMINE THE EFFECTIVENESS OF STRATEGY USE DURING MULTIPLE TEXT TASK COMPLETION?

The final question we are left to grapple with when considering students' strategic engagement with multiple texts is how we can determine whether strategy use is effective. To date, strategy effectiveness has been determined according to whether strategy use increases particular multiple text outcomes or not. Although this constitutes an intuitive approach to evaluating strategy effectiveness, the reality of strategy use is that strategies, even when appropriately engaged, are oftentimes not successful, requiring students to adjust their strategic approaches throughout the course of task

completion (Winne & Hadwin, 2008). Currently there have been few, if any, studies to specifically examine this type of dynamic strategy use, wherein students deploy, adapt, and discontinue using strategies, recursively, to accomplish task goals. At the same time, emergent work in the field of self-regulation suggests that microanalytic techniques that specifically ask students why they engage certain strategies may be a promising avenue for gaining more insight into the metacognitive and regulatory decisions underlying students' processing (Callan & Cleary, 2018; Cleary, Callan, Schunk, & Greene, 2018).

Another route to considering the effectiveness of strategy use is to consider the effectiveness with which strategies are engaged. That is to say, just because students deploy a particular strategy does not mean that they do so successfully. As demonstrated by Wolfe and Goldman, (2005), for example, engaging prior knowledge, while effective for some students (Anmarkrud et al., 2014), can lead to irrelevant associations made by students, detracting from learning. Likewise, Kühl, Scheiter, Gerjets, and Gemballa (2011) found students to report more positive monitoring (i.e., reporting successful comprehension) when studying dynamic, rather than static, visuals. At the same time, Kühl et al. (2011) attribute such positive monitoring to an illusion of understanding, rather than to comprehension benefits per se. Beyond these examinations, limited attention has been paid to the effectiveness with which students may deploy particular strategies during task completion. However, such an approach to determining strategy effectiveness can be said to align with efforts to examine students' strategy use in reference to expert processing (e.g., historians, Rouet et al., 1997; Wineburg, 1991; chemists, Kozma, 2003).

A final path to determining strategy effectiveness is tied to theoretical understandings of learning from multiple texts (Rouet & Britt, 2011). Theories of learning from multiple texts specify that much of task completion is guided by students' personal representations of how a task ought to be carried out (i.e., students' task models, Rouet & Britt, 2011). A means of determining strategy effectiveness, then, would be to evaluate strategies relative to the goal(s) and sub-goals that students set for task completion. Nevertheless, the quality, rather than quantity, of students' strategy use remains a fundamentally unexplored area of students' learning from multiple texts.

Thus far, in this section, I have posed a series of questions that may be essential to understanding learners' strategy use when learning from multiple texts. These questions can add additional nuance and interpretive power to understanding students' strategic processing. In the final section of this chapter I briefly discuss how the CSF and the five strategy-directed questions that follow can be used to understand students' processing when learning not only from multiple texts but from multiple, multimedia documents as well, or documents containing textual information alongside non-textual content (e.g., diagrams, tables, videos).

## CONCLUSION

In this chapter I ask six questions that I consider to be foundational to understanding students' strategy use in a multidimensional fashion and as it manifests in real or authentic contexts for learning. In such real contexts, strategy use is (a) oriented toward the materials available, or in response to the *where* question, purposefully

focused on a variety of stimuli; (b) in response to the *when* question, engaged throughout the course of task completion, (c) to answer the *who* question, variably beneficial to different learners, (d) in response to the *why* question, metacognitively motivated, and (e) to answer the *how* question, recursive and differentially effective. Recognizing this reality necessarily suggests that investigations focused only on the *what* of strategy use, or just which strategies are deployed, to the exclusion of where these strategies are directed, when they are used during processing, who uses these strategies and why, and how effective these are, is insufficient. As such, investigating answers to these various questions is both essential to understanding strategy use and the imperative of future work in this field.

## ACKNOWLEDGMENTS

I would like to sincerely thank Jonna Kulikowich for her invaluable feedback on the ideas in this chapter on drives from Pennsylvania to Maryland.

## REFERENCES

Afflerbach, P., Hurt, M., & Cho, B.-Y. (this volume). Reading comprehension strategy instruction. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), *Handbook of strategies and strategic processing: Conceptualization, measurement, and analysis*. New York: Routledge.

Afflerbach, P. A., & Cho, B. Y. (2008). Identifying and describing constructively responsive comprehension strategies in new and traditional forms of reading. In S. Israel & G. Duffy (Eds.), *Handbook of reading comprehension research* (pp. 69–90). Mahwah, NJ: Erlbaum.

Alvermann, D. E., & Hynd, C. R. (1989). Effects of prior knowledge activation modes and text structure on nonscience majors' comprehension of physics. *The Journal of Educational Research*, *83*(2), 97–102.

Anmarkrud, Ø., Bråten, I., & Strømsø, H. I. (2014). Multiple-documents literacy: Strategic processing, source awareness, and argumentation when reading multiple conflicting documents. *Learning and Individual Differences*, *30*, 64–76.

Anmarkrud, Ø., McCrudden, M. T., Bråten, I., & Strømsø, H. I. (2013). Task-oriented reading of multiple documents: Online comprehension processes and offline products. *Instructional Science*, *41*(5), 873–894.

Baker, L., & Brown, A. L. (1984). Metacognitive skills and reading. In D. Pearson, M. Kamil, R. Barr, & P. Mosenthal (Eds.), *Handbook of reading research* (pp. 353–394). New York: Longman.

Braasch, J. L., Rouet, J. F., Vibert, N., & Britt, M. A. (2012). Readers' use of source information in text comprehension. *Memory & Cognition*, *40*(3), 450–465.

Brante, E. W., & Strømsø, H. I. (2018). Sourcing in text comprehension: A review of interventions targeting sourcing skills. *Educational Psychology Review*, *30*(3), 773–799.

Bråten, I., Anmarkrud, Ø., Brandmo, C., & Strømsø, H. I. (2014). Developing and testing a model of direct and indirect relationships between individual differences, processing, and multiple-text comprehension. *Learning and Instruction*, *30*, 9–24.

Bråten, I., & Strømsø, H. I. (2006). Epistemological beliefs, interest, and gender as predictors of Internet-based learning activities. *Computers in Human Behavior*, *22*(6), 1027–1042.

Bråten, I., & Strømsø, H. I. (2011). Measuring strategic processing when students read multiple texts. *Metacognition and Learning*, *6*(2), 111–130.

Bråten, I., Strømsø, H. I., & Samuelstuen, M. S. (2008). Are sophisticated students always better? The role of topic-specific personal epistemology in the understanding of multiple expository texts. *Contemporary Educational Psychology*, *33*(4), 814–840.

Britt, M. A., & Aglinskas, C. (2002). Improving students' ability to identify and use source information. *Cognition and Instruction*, *20*(4), 485–522.

Britt, M. A., Perfetti, C. A., Sandak, R., & Rouet, J.-F. (1999). Content Integration and source separation in learning from multiple texts. In S. R. Goldman, A. C. Graesser, & P. van Den Broek (Eds.), *Narrative comprehension, causality, and coherence: Essays in honor of Tom Trabasso* (pp. 209–233). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Britt, M. A., & Sommer, J. (2004). Facilitating textual integration with macro-structure focusing tasks. *Reading Psychology*, *25*(4), 313–339.

Brucker, B., Scheiter, K., & Gerjets, P. (2014). Learning with dynamic and static visualizations: Realistic details only benefit learners with high visuospatial abilities. *Computers in Human Behavior*, *36*, 330–339.

Cairo, A. (2015). Graphics lies, misleading visuals. In Bihanic, D. (Eds.), *New challenges for data design* (pp. 103–116). London: Springer.

Callan, G. L., & Cleary, T. J. (2018). Multidimensional assessment of self-regulated learning with middle school math students. *School Psychology Quarterly*, *33*(1), 103–111.

Canham, M., & Hegarty, M. (2010). Effects of knowledge and display design on comprehension of complex graphics. *Learning and Instruction*, *20*(2), 155–166.

Cerdán, R., & Vidal-Abarca, E. (2008). The effects of tasks on integrating information from multiple documents. *Journal of Educational Psychology*, *100*(1), 209–222.

Chi, M. T., Feltovich, P. J., & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science*, *5*(2), 121–152.

Cho, B. Y., Afflerbach, P., & Han, H. (2018). Strategic processing in accessing, Comprehending, and using multiple sources online. In J. L. G. Braasch, I. Bråten, & M. T. McCrudden (Eds.), *Handbook of multiple source use* (pp. 133–150). New York: Routledge.

Cleary, T. J., Callan, G. L., Schunk, D. H., & Greene, J. A. (2018). Assessing self-regulated learning using microanalytic methods. In D.H. Schunk & B. Zimmerman (Eds.), *Handbook of self-regulation of learning and performance* (pp. 338–351). New York: Routledge.

Cook, M., Wiebe, E. N., & Carter, G. (2008). The influence of prior knowledge on viewing and interpreting graphics with macroscopic and molecular representations. *Science Education*, *92*(5), 848–867.

Cromley, J. G., Bergey, B. W., Fitzhugh, S., Newcombe, N., Wills, T. W., Shipley, T. F., & Tanaka, J. C. (2013). Effects of three diagram instruction methods on transfer of diagram comprehension skills: The critical role of inference while learning. *Learning and Instruction*, *26*, 45–58.

Cromley, J. G., Snyder-Hogan, L. E., & Luciw-Dubas, U. A. (2010). Cognitive activities in complex science text and diagrams. *Contemporary Educational Psychology*, *35*(1), 59–74.

De La Paz, S., Felton, M., Monte-Sano, C., Croninger, R., Jackson, C., Deogracias, J. S., & Hoffman, B. P. (2014). Developing historical reading and writing with adolescent readers: Effects on student learning. *Theory & Research in Social Education*, *42*(2), 228–274.

De La Paz, S., & Nokes, J. (this volume). Strategic processing in history and historical strategy instruction. In D. L. Dinsmore, L. K. Fryer, & M. M. Parkinson (Eds.), *Handbook of strategies and strategic processing: Conceptualization, measurement, and analysis*. New York: Routledge.

delMas, R., Garfield, J., & Ooms, A. (2005). Using assessment items to study students' difficulty in reading and interpreting graphical representations of distributions. In K. Makar (Ed.), *Reasoning about distribution: A collection of current research studies*. Proceedings of the Fourth International Research Forum on Statistical Reasoning, Thinking and Literacy. Brisbane, Australia: University of Queensland.

Ferguson, L. E., & Bråten, I. (2013). Student profiles of knowledge and epistemic beliefs: Changes and relations to multiple-text comprehension. *Learning and Instruction*, *25*, 49–61.

Gerjets, P., Kammerer, Y., & Werner, B. (2011). Measuring spontaneous and instructed evaluation processes during Web search: Integrating concurrent thinking-aloud protocols and eye-tracking data. *Learning and Instruction*, *21*(2), 220–231.

Gil, L., Bråten, I., Vidal-Abarca, E., & Strømsø, H. I. (2010). Summary versus argument tasks when working with multiple documents: Which is better for whom?. *Contemporary Educational Psychology*, *35*(3), 157–173.

Goldman, S. R., Braasch, J. L., Wiley, J., Graesser, A. C., & Brodowinska, K. (2012). Comprehending and learning from Internet sources: Processing patterns of better and poorer learners. *Reading Research Quarterly*, *47*(4), 356–381.

Goldman, S. R., Lawless, K., & Manning, F. (2013). Research and development of multiple source comprehension assessment. In M. A. Britt, S. R. Goldman, & J.-F. Rouet (Eds.), *Reading: From words to multiple texts* (pp. 180–199). New York, NY: Routledge/Taylor & Francis Group.

Goldman, S. R., & Scardamalia, M. (2013). Managing, understanding, applying, and creating knowledge in the information age: Next-generation challenges and opportunities. *Cognition and Instruction*, *31*(2), 255–269.

Gyselinck, V., Jamet, E., & Dubois, V. (2008). The role of working memory components in multimedia comprehension. *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition*, *22*(3), 353–374.

Hagen, Å. M., Braasch, J. L., & Bråten, I. (2014). Relationships between spontaneous note-taking, self-reported strategies and comprehension when reading multiple texts in different task conditions. *Journal of Research in Reading*, *37*(1), 141–157.

Hegarty, M., & Waller, D. A. (2005). Individual differences in spatial abilities. In P. Shah & A. Miyake (Eds.), *The cambridge handbook of visuospatial thinking* (pp. 121–169). New York: Cambridge University Press.

Hepfer, M., List, A., & Du, H. (2019). Developing a measure of conflict recognition, conflict-related reasoning, and resolution (C3R): Establishing the reliability and validity of the C3R. *Manuscript submitted for publication*.

Höffler, T. N. (2010). Spatial ability: Its influence on learning with visualizations—a meta-analytic review. *Educational Psychology Review*, *22*(3), 245–269.

Kammerer, Y., & Gerjets, P. (2012). Effects of search interface and Internet-specific epistemic beliefs on source evaluations during Web search for medical information: An eye-tracking study. *Behaviour & Information Technology*, *31*(1), 83–97.

Kammerer, Y., Kalbfell, E., & Gerjets, P. (2016). Is this information source commercially biased? How contradictions between web pages stimulate the consideration of source information. *Discourse Processes*, *53*(5–6), 430–456.

Kobayashi, K. (2009a). Comprehension of relations among controversial texts: Effects of external strategy use. *Instructional Science*, *37*(4), 311–324.

Kobayashi, K. (2009b). The influence of topic knowledge, external strategy use, and college experience on students' comprehension of controversial texts. *Learning and Individual Differences*, *19*(1), 130–134.

Kozma, R. (2003). The material features of multiple representations and their cognitive and social affordances for science understanding. *Learning and Instruction*, *13*(2), 205–226.

Kühl, T., Scheiter, K., Gerjets, P., & Gemballa, S. (2011). Can differences in learning strategies explain the benefits of learning from static and dynamic visualizations?. *Computers & Education*, *56*(1), 176–187.

Le Bigot, L., & Rouet, J. F. (2007). The impact of presentation format, task assignment, and prior knowledge on students' comprehension of multiple online documents. *Journal of Literacy Research*, *39*(4), 445–470.

Lee, H. Y., & List, A. (2019). Processing of texts and videos: A strategy-focused analysis. *Journal of Computer Assisted Learning*, *35*(2), 268–282.

List, A., & Alexander, P. A. (2015). Examining response confidence in multiple text tasks. *Metacognition and Learning*, *10*(3), 407–436.

List, A., & Alexander, P. A. (2017a). Cognitive affective engagement model of multiple source use. *Educational Psychologist*, *52*(3), 182–199.

List, A., & Alexander, P. A. (2017b). Text navigation in multiple source use. *Computers in Human Behavior*, *75*, 364–375.

List, A., & Alexander, P. A. (2018a). Postscript: In pursuit of integration. *Learning and instruction, 57, 82–85*.

List, A., & Alexander, P. A. (2018b). Cold and warm perspectives on the Cognitive Affective Engagement Model of Multiple Source Use. In J. L. G. Braasch, I. Bråten, & M. T. McCrudden (Eds.), *Handbook of multiple source use* (pp. 46–66). New York: Routledge.

List, A., & Alexander, P. A. (2019). Toward an integrated framework of multiple text use. In *Educational Psychologist*, *54*(1), 20–39.

List, A., Du, H., & Lee, H. Y. (2019). How do students integrate multiple texts?: An investigation of top-down processing. *Manuscript submitted for publication*.

List, A., Du, H., Wang, Y., & Lee, H. Y. (2019). Toward a typology of integration: examining the documents model framework. *Contemporary Educational Psychology*, *58*, 228–242.

List, A., Stephens, L. A., & Alexander, P. A. (2019). Examining interest throughout multiple text use. *Reading and Writing*, *32*(2), 307–333.

Llorens, A. C., Cerdán, R., & Vidal-Abarca, E. (2014). Adaptive formative feedback to improve strategic search decisions in task-oriented reading. *Journal of Computer Assisted Learning*, *30*(3), 233–251.

Lombardi, D., Seyranian, V., & Sinatra, G. M. (2014). Source effects and plausibility judgments when reading about climate change. *Discourse Processes*, *51*(1–2), 75–92.

Maier, J., & Richter, T. (2014). Fostering multiple text comprehension: How metacognitive strategies and motivation moderate the text-belief consistency effect. *Metacognition and Learning*, *9*(1), 51–74.

Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I—Outcome and process. *British Journal of Educational Psychology*, *46*(1), 4–11.

Mason, L., Pluchino, P., & Tornatora, M. C. (2015). Eye-movement modeling of integrative reading of an illustrated text: Effects on processing and learning. *Contemporary Educational Psychology*, *41*, 172–187.

Mason, L., Pluchino, P., Tornatora, M. C., & Ariasi, N. (2013). An eye-tracking study of learning from science text with concrete and abstract illustrations. *The Journal of Experimental Education*, *81*(3), 356–384.

Mason, L., Scrimin, S., Zaccoletti, S., Tornatora, M. C., & Goetz, T. (2018). Webpage reading: Psychophysiological correlates of emotional arousal and regulation predict multiple-text comprehension. *Computers in Human Behavior*, *87*, 317–326.

Mayer, R. E. (2009). *Multimedia learning*. New York: Cambridge University Press.

McCrudden, M. T., & McTigue, E. M. (2018). Implementing integration in an explanatory sequential mixed methods study of belief bias about climate change with high school students. *Journal of Mixed Methods Research*, *13*(3), 381–400.

McCrudden, M. T., & Schraw, G. (2007). Relevance and goal-focusing in text processing. *Educational Psychology review*, *19*(2), 113–139.

McNamara, D. S. (2004). SERT: Self-explanation reading training. *Discourse Processes*, *38*(1), 1–30.

McNamara, D. S., & Magliano, J. (2009). Toward a comprehensive model of comprehension. *Psychology of Learning and Motivation*, *51*, 297–384.

Moreno, R. (2002). Who learns best with multiple representations? Cognitive theory predictions on individual differences in multimedia learning. In *EdMedia: World Conference on Educational Media and Technology* (pp. 1380–1385). Association for the Advancement of Computing in Education (AACE).

Moreno, R. (2004). Decreasing cognitive load for novice students: Effects of explanatory versus corrective feedback in discovery-based multimedia. *Instructional Science*, *32*(1–2), 99–113.

Nokes, J. D., Dole, J. A., & Hacker, D. J. (2007). Teaching high school students to use heuristics while reading historical texts. *Journal of Educational Psychology*, *99*(3), 492–505.

Paris, S. G., Lipson, M. Y., & Wixson, K. K. (1983). Becoming a strategic reader. *Contemporary Educational Psychology*, *8*(3), 293–316.

Perfetti, C. A., Rouet, J.-F., & Britt, M. A. (1999). Toward a theory of documents representation. In H. van Oostendorp & S. R. Goldman (Eds.), *The construction of mental representations during reading* (pp. 99–122). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Reisman, A. (2012). Reading like a historian: A document-based history curriculum intervention in urban high schools. *Cognition and Instruction*, *30*(1), 86–112.

Renkl, A., & Scheiter, K. (2017). Studying visual displays: How to instructionally support learning. *Educational Psychology Review*, *29*(3), 599–621.

Richter, T., & Maier, J. (2017). Comprehension of multiple documents with conflicting information: A two-step model of validation. *Educational Psychologist*, *52*(3), 148–166.

Rouet, J., & Britt, M. A. (2011). Relevance processes in multiple document comprehension. In M. T. McCrudden, J. P. Magliano, & G. Schraw (Eds.), *Text relevance and learning from text* (pp. 19–52). Charlotte, NC: Information Age.

Rouet, J. F., Britt, M. A., & Durik, A. M. (2017). RESOLV: Readers' representation of reading contexts and tasks. *Educational Psychologist*, *52*(3), 200–215.

Rouet, J. F., Favart, M., Britt, M. A., & Perfetti, C. A. (1997). Studying and using multiple documents in history: Effects of discipline expertise. *Cognition and instruction*, *15*(1), 85–106.

Rouet, J. F., Ros, C., Goumi, A., Macedo-Rouet, M., & Dinet, J. (2011). The influence of surface and deep cues on primary and secondary school students' assessment of relevance in Web menus. *Learning and Instruction*, *21*(2), 205–219.

Salmerón, L., Gil, L., Bråten, I., & Strømsø, H. (2010). Comprehension effects of signaling relationships between documents in search engines. *Computers in Human Behavior*, *26*(3), 419–426.

Schüler, A., Scheiter, K., & van Genuchten, E. (2011). The role of working memory in multimedia instruction: Is working memory working during learning from text and pictures?. *Educational Psychology Review*, *23*(3), 389–411.

Schwonke, R., Berthold, K., & Renkl, A. (2009). How multiple external representations are used and how they can be made more useful. *Applied Cognitive Psychology*, *23*(9), 1227–1243.

Seufert, T. (2003). Supporting coherence formation in learning from multiple representations. *Learning and Instruction*, *13*(2), 227–237.

Schraw, G., & Moshman, D. (1995). Metacognitive theories. *Educational Psychology review*, *7*(4), 351–371.

Spires, H. A., & Donley, J. (1998). Prior knowledge activation: Inducing engagement with informational texts. *Journal of Educational Psychology*, *90*(2), 249–260.

Stadtler, M., & Bromme, R. (2007). Dealing with multiple documents on the WWW: The role of metacognition in the formation of documents models. *International Journal of Computer-Supported Collaborative Learning*, *2*(2–3), 191–210.

Stadtler, M., & Bromme, R. (2008). Effects of the metacognitive computer-tool met. a. ware on the web search of laypersons. *Computers in Human Behavior*, *24*(3), 716–737.

Stadtler, M., & Bromme, R. (2014). The content-source integration model: A taxonomic description of how readers comprehend conflicting scientific information. In D. N. Rapp & J. L. G. Braasch (Eds.), *Processing inaccurate information: Theoretical and applied perspectives from cognitive science and the educational sciences* (pp. 379–402). Cambridge, MA: MIT Press.

Stahl, S. A., Hynd, C. R., Britton, B. K., McNish, M. M., & Bosquet, D. (1996). What happens when students read multiple source documents in history?. *Reading Research Quarterly*, *31*(4), 430–456.

Stang Lund, E., Bråten, I., Brante, E. W., & Strømsø, H. I. (2017). Memory for textual conflicts predicts sourcing when adolescents read multiple expository texts. *Reading Psychology*, *38*(4), 417–437.

Van Meter, P. N., & Cameron, C. (2018). The effects of presentation format on multiple document notetaking. *Learning and instruction*, *57*, 47–56.

Wang, Y., & List, A. (2019). Calibration in multiple text use. *Metacognition and Learning*, 1–36.

Wetzels, S. A., Kester, L., & Van Merrienboer, J. J. (2011). Adapting prior knowledge activation: Mobilisation, perspective taking, and learners' prior knowledge. *Computers in Human Behavior*, *27*(1), 16–21.

Wiley, J., Goldman, S. R., Graesser, A. C., Sanchez, C. A., Ash, I. K., & Hemmerich, J. A. (2009). Source evaluation, comprehension, and learning in Internet science inquiry tasks. *American Educational Research Journal*, *46*(4), 1060–1106.

Wiley, J., & Voss, J. F. (1999). Constructing arguments from multiple sources: Tasks that promote understanding and not just memory for text. *Journal of Educational Psychology*, *91*(2), 301–311.

Wineburg, S. S. (1991). Historical problem solving: A study of the cognitive processes used in the evaluation of documentary and pictorial evidence. *Journal of Educational Psychology*, *83*(1), 73–87.

Winne, P. H., & Hadwin, A. F. (2008). The weave of motivation and self-regulated learning. In D.L. Schunk & B. Zimmerman (Eds.), *Motivation and self-regulated learning: Theory, research, and applications* (Vol. *2*, pp. 297–314). New York: Lawrence Erlbaum Associates.

Wolfe, M. B., & Goldman, S. R. (2005). Relations between adolescents' text processing and reasoning. *Cognition and Instruction*, *23*(4), 467–502.

Wu, H. K., & Shah, P. (2004). Exploring visuospatial thinking in chemistry learning. *Science Education*, *88*(3), 465–492.