Chapter 5

Improving Metacomprehension with the Situation-Model Approach

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ABSTRACT

Over the past fifteen years, research on improving students’ monitoring of their own understanding while learning from text (metacomprehension accuracy) has led to the development of a theoretical framework called the situation-model approach. This approach has been motivated by the role that the situation model plays in comprehension, as well as the roles that online monitoring and the use of experience-based cues play in effective self-regulated study and learning. This work has elucidated how giving students a clear understanding of what it means to comprehend expository science text may be critical for effective self-regulation of study.

FRAMING THE ISSUE

Poor metacomprehension accuracy (i.e., the inability to judge one’s own level of understanding from text) is a pervasive problem in the majority of college students (Baker, 1989; Pressley, 2002). Few students come to college equipped with the monitoring skills they need to engage in maximally effective self-regulated study behaviors that will in turn enable them to effectively comprehend and learn from expository texts (Ley & Young, 1998; Wandering, 1998; Zimmerman, 2002). Many empirical studies have demonstrated that college students are quite poor at gauging how well they have understood what they have just read (Dunlosky & Lipko, 2007; Dunlosky & Metcalfe, 2009; Maki, 1998; Otero & Campanario, 1990; Thiede, Griffin, Wiley & Redford, 2009). The generally poor metacomprehension skills seen in most
college students are unsurprising given the near total lack of attention given to developing these skills at any level of instruction in the United States. Yet, success in college depends to a considerable degree upon students’ ability to engage in strategic reading of informational or expository texts. Simpson and Nisbet (2000) reported that 85 percent of college learning requires careful reading. Text is the primary source of information and students are required to study texts on their own. Despite the fact that the purpose and demands of reading in college are different from those in high school (Orlando et al., 1989), this is rarely made explicit to students, nor are they taught how to deal with the change in expectations.

To the extent that students do receive instruction, one approach to improving the study skills required for college-level reading is to provide guidance in strategic reading (Baker & Brown, 1984; Paris & Jacobs, 1984; Paris & Winograd, 1990; Pearson & Dole, 1987; Pressley & Afflerbach, 1995) which generally involves providing students with the knowledge of strategies they may use in the face of comprehension failures, particularly when reading to learn from expository science texts. This approach is based on observations that less skilled students fail to use effective reading strategies, and are limited in their knowledge of available strategies (Alexander & Murphy, 1998; Pressley, Yoko, Van Meter, Van Etten, & Freeborn, 1997). Work from this tradition has shown that self-report inventories of study strategies and direct instruction on such strategies both predict text comprehension (Caverly, Nicholson, & Radcliffe, 2004; Moskhar & Reichard, 2002; Moore, Zubrisky, & Commander, 1997; Pintrich, Wolters, & Baxter, 2000; Pressley, 2002; Schraw & Dennison, 1994; Zimmerman, 2002). However, while instruction emphasizing strategy knowledge can add tools to a reader’s arsenal, strategy instruction alone is unlikely to maximize self-regulated learning (SRL) outcomes.

Instead, accurate monitoring of progress during ongoing learning episodes seems to be a critical ingredient for effective SRL (Flavell, 1979; Winne & Hadwin, 1998; Winne & Perry, 2000). Many models of effective SRL presume that accurate monitoring of ongoing learning is what allows for online regulation of cognitive processes during study (e.g., Griffin, Wiley & Salas, 2013; Metcalfe, 2009; Nelson & Narens, 1990; Thiede & Dunlosky, 1999; Thiede et al., 2009; Winne & Hadwin, 1998; Zimmerman, 2002). As such, accurate metacognitive monitoring is the gatekeeper for effective regulation of study (Winne & Perry, 2000), and correspondingly, comprehension monitoring accuracy has been demonstrated to relate positively to self-regulated learning outcomes from text (de Bruijn, Thiéde, Camp, & Redford, 2011; Griffin, Wiley, & Thiéde, 2013; Thiéde, Anderson, & Theriault, 2003; Thorus & McDaniel, 2007). The central premise that underlies the connection between monitoring and SRL is that a person does not accurately

Many years of research have demonstrated that calibration is quite low when it is not explicitly encouraged. "Self-calibration" or self-assessment are often used interchangeably in research on self-regulated learning (SRL). Of the 47 studies reviewed by Burns (1999), 39 had been conducted on university students, 8 had been conducted on college students, and 1 on secondary school students. The mean correlation coefficient between self-assessment and actual test scores was 0.27 for one group, and the correlation coefficient between self-assessment and actual test scores was 0.35 for another group. This suggests that self-assessment is not always an accurate predictor of actual performance. However, self-assessment can be improved through training and feedback. In general, self-assessment is more accurate when people have received feedback on their performance and have had opportunities to practice self-assessment.
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Pioneering studies by Maki and Berry (1984) and Glenberg and Epstein (1985) provided an early blueprint for the typical meta-comprehension paradigm that is used to measure students’ accuracy at monitoring of their own understanding to the present day. Participants are asked to study a set of passages, judge their comprehension for each, and then take a test of comprehension for each passage. In this paradigm, accuracy is operationalized as the intra-individual correlation between a person’s comprehension ratings and his or her test performances; thus, greater comprehension monitoring accuracy is indexed by stronger positive correlations between predictive judgments and actual test scores. A standard term for this index is relative metacomprehension accuracy (Maki, 1998). This basic paradigm provides a good model for the actual SRL that students need to engage in on a daily basis, as students routinely have to complete assignments for multiple classes simultaneously, and they need regulate how much effort to devote to each topic.

**MAKING THE CASE**

Many years of research using this basic metacomprehension paradigm has demonstrated that typical levels of *relative metacomprehension accuracy* are quite low. For instance, Glenberg, Sanocki, Epstein, and Morris (1987) concluded, “Data from our laboratory has almost uniformly demonstrated poor calibration” (p. 120). Likewise, Maki (1998) reported that the mean intra-individual correlation between comprehension ratings and test performance across twenty-five studies from her lab was only .27. An analysis by Dunlosky across his lab’s studies arrived at the same exact figure (Dunlosky & Lipko, 2007). Other reviews by Lin and Zabrucky (1998) and Weaver, Bryant, and Burns (1995) reached similar conclusions. In 2009, Thiede et al. completed a review of all published studies of relative metacomprehension accuracy that had been done in the previous thirty years, and also arrived at an average of $r = 0.27$ for the baseline conditions. Metacomprehension accuracy can be especially poor in less skilled, less able, or younger readers. An initial study in Griffin, et al. (2008) found that comprehension skill strongly predicted meta-comprehension accuracy, with poorer comprehenders showing an inability to discriminate texts they understood well from those they understood poorly. A second study in Griffin, Wiley, and Thiede (2008) showed that proficient college readers with lower working memory capacity (WMC) also had poorer
meta-comprehension accuracy. Thiede, Griffin, Wiley, and Anderson (2010; Experiment 1) found that at-risk college readers had lower average meta-comprehension accuracy than more proficient readers. Similarly, comprehension monitoring accuracy in younger readers (i.e., students in seventh and eighth grade) is so poor that sometimes it is observed to be negative (meaning that many younger students report understanding texts that they understood the least texts that they understood the most; de Bruin et al.; Redford, Thiede, Wiley, & Griffin, 2011; Thiede, Redford, Wiley, & Griffin, 2012).

A prevailing explanation for inaccurate monitoring is that students typically use invalid cues to predict their comprehension. For example, the at-risk readers in Thiede et al. (2010) were found to rely more heavily on cues that were not tied to their representation of the text (such as the length of texts, or personal interest in the topic) when making their judgments of learning. Koriyama’s (1997) influential cue-utilization framework asserts that learners infer their level of learning and gauge likely future performance based on two general types of cues: those tied to one’s subjective experiences during learning and those tied to a priori assumptions about the task, materials, topic, one’s abilities, or the presumed general effectiveness of the study strategies one has employed. Griffin, Joe, & Wiley (2009) mapped these cue types onto Flavell’s (1979) distinction between meta-experiences and meta-knowledge, noting that the latter represents a heuristic route to deriving judgments of understanding, while the former are the cues that must be monitored during a learning episode. These experience-based cues more directly reflect the level of learning that has actually occurred and the quality of the mental representation one has constructed. It is upon these cues that accurate monitoring and effective ongoing regulation both depend.

However, not all experience-based cues are equally valid indicators of comprehension. Some cues reflect only surface memory or episodic memory for text, while other cues better reflect one’s understanding of the concepts from the text, their relation to each other and to prior topic knowledge (Maki & Serra, 1992; Rawson, Dunlosky, & Thiede, 2000; Wiley, Griffin, & Thiede, 2003). Experience-based cues can be mapped onto the different levels of text-representation specified in the construction-integration model of text comprehension (Kintsch, 1998). In this model, text is concurrently represented at multiple levels including a lexical or surface level, a textbase level, and a situation model. The lexical level, containing the surface features of the text, is constructed as the words and phrases appearing in the text are encoded. The textbase level is constructed as segments of the surface text are parsed into propositions, and as links between text propositions are formed based on argument overlap. The construction of the situation model also involves linking propositions. However, the integration of propositions
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below involves connecting text information with the reader’s prior knowledge (McNamara, Kintsch, Songer, & Kintsch, 1996) and making causal connections or inferences (Graesser & Berter, 1998; Milb & Graesser, 1994; Trabasso & van den Broek, 1985; Wiley & Meyer, 2005; Wiley & Voss, 1996). It is a person’s situation-model that largely determines his or her performance on tests of comprehension (Kintsch, 1994; McNamara et al., 1996; Wiley, et al., 2005). Thus, it is experience-based cues related to the quality of one’s situation model that are the most valid basis for making judgments of comprehension. The situation-model approach to metacomprehension recognizes the central role of valid cue use for accurate monitoring (Griffin et al.

| Table 5.1 Relative Metacomprehension Accuracy by Instruction Condition across Studies |
|-------------------------------------|---------|---------|
| Instruction Condition and Data Source | Comparison | Instruction |
| Delayed Keyword                     | 0.28    | 0.70    |
| Thiede et al., 2003                 | 0.29    | 0.52    |
| Thiede et al., 2005, Exp 1          | 0.16    | 0.55    |
| Thiede et al., 2005, Exp 2          | 0.14    | 0.56    |
| Delayed Summary                     | 0.28    | 0.60    |
| Thiede and Anderson, 2003, Exp 1    | 0.28    | 0.61    |
| Thiede and Anderson, 2003, Exp 2    | 0.20    | 0.64    |
| Anderson and Thiede, 2006           | 0.21    | 0.63    |
| Thiede et al., 2010, Exp 1          | 0.30    | 0.67    |
| Concept Mapping while Reading       | 0.22    | 0.67    |
| Thiede et al., 2011, Exp 2          | 0.26    | 0.43    |
| Self-Explanation during Re-reading  | 0.24    | 0.61    |
| Griffin et al., 2009, Exp 2         | 0.15    | 0.43    |
| Self-Explanation from Diagrams      | 0.15    | 0.56    |
| Wiley et al., 2005                  | 0.15    | 0.34    |
| Delayed Keyword (7th grade)         | 0.15    | 0.27    |
| de Brun et al., 2011                | 0.24    | 0.43    |
| Comprehension-based Curriculum (7th grade) | 0.26    | 0.43    |
| Thiede et al., 2012, Exp 1          | 0.10    | 0.65    |
| Delayed Diagram Completion (9th grade) | 0.07    | 0.56    |
2009; Koriat, 1997; Rawson & Dunlosky, 2002) as well as the central role of the situation model in determining the validity of cues when engaged in learning from text (Kintsch, 1994; Rawson et al. 2000; Wiley et al. 2005). Work emanating from this approach has explored a number of conditions that may allow readers to use more valid cues when judging their own comprehension. As shown in table 5.1, there are now several studies that have been able to show a variety of contexts that can lead to sizable improvements in metacomprehension accuracy. These contexts can be classed into a few types (delayed generation tasks, generating explanations or concept maps while reading, and giving students a clear understanding of what it means to comprehend expository science text), and the benefits of each instructional approach are elaborated in the next section.

**Pedagogical Implications**

**Benefits from Delayed Generation Tasks.** Several studies have shown that activities that make the cues related to the situation model more accessible to students can improve their metacomprehension accuracy: Delayed Keyword Generation Tasks, Delayed Summarization Tasks, and engaging in explanation during reading. For example, in Thiede and Anderson (2003), accuracy was higher for students who wrote summaries of assigned readings after a delay, and then judged their performance, than for groups who either wrote a summary immediately after reading or wrote no summaries. Similarly, Thiede et al. (2003) showed that a delayed generation task, where students were asked to list keywords that captured the gist of assigned readings, also improved relative metacomprehension accuracy over a no-keyword-generation condition.

Why do delayed generation tasks improve relative metacomprehension accuracy? First, generating a summary or keywords may allow a reader to reflect on how successfully he or she is able to retrieve information during generation (cf. the modified feedback hypothesis described by Glenberg et al., 1987). Accordingly, a text may receive a high rating of comprehension if the person is able to retrieve a great deal of information about the text during generation; whereas, a text may receive a low rating of comprehension if the person struggles to retrieve information about the text. Second, the timing of the generation task is critical. Kintsch, Welsch, Schmalhofer, and Zimny (1990) showed that surface memory for text decays over time, whereas the situation model is robust to such decay. Thus, when writing a summary immediately after reading, a person may have easy access to their surface model (or episodic memory for the text) and can use this information to generate a summary. However, using this experience as a basis for a judgment of comprehension fails to improve accuracy because the performance on the immediate summary task is influenced by the levels of representation in the situation model. The findings by Kintsch (1994) and greater access to information by writing a summary improves accuracy and performance in the situation model. Thiede, explanation for different features of an approach, the delayed generation was a delay before readers have to make judgment. (M communicates Processing)

Delayed generation activities have explored students to engage in creating summaries of texts by self-explanations that represent an explanation. To test this, Gog, van Merriëns & Windels (2003, 2005) in improvement of students' comprehension. Benefits from the delayed generation activities and...
summary task and the later comprehension test are determined by different levels of representation. In contrast, when writing a summary after a delay, the findings by Kintsch et al. suggest that a person will likely have relatively greater access to the situation model of a text. Thus, using the experience of judging a summary after a delay as a basis of a judgment of comprehension improves accuracy because performance in both the delayed summary task and performance on the comprehension test are both based on the situation model. Thiede, Dunlosky, Griffin, and Wiley (2005) provided a test of this explanation for delayed generation effects by independently varying several different features of generation tasks. Consistent with the situation model approach, the critical feature for improving metacomprehension accuracy was a delay between reading and generation, because only this delay causes readers to have relatively greater access their situation models at the time of judgment. (Manipulation of other delays helped to rule out a Transfer Appropriate Processing explanation, as they did not improve accuracy.)

Delayed generation effects have been replicated several times across a number of studies (Anderson & Thiede, 2003; de Bruijn et al., 2011; Lauterman & Ackerman, 2014; Shih & Chen, 2013; Thiede & Anderson, 2003; Thiede et al., 2003, 2005, 2010, 2012). Delayed completion of diagrams can also result in improvements in metacomprehension accuracy (van Loon, de Bruijn, van Gog, van Merriënboer, & Dunlosky, 2014).

Benefits from Explanation Tasks. While keyword and summary generation activities may need to be done at a delay to improve accuracy, other studies have explored the benefits of explanation-based activities that students can engage in during or immediately after reading. For example, prompting students to engage in self-exploration is intended to encourage access to situation-model cues during monitoring more directly. Based on previous work showing how explanation can help promote comprehension processes (Chi, 2000; Davey & McBride, 1986; King, 1994; McNamara, 2004), attempting to self-explain during reading should generate metacomprehension such as a subjective sense of how hard it is to generate an explanation, or how coherent an explanation seems, and this should in turn improve relative accuracy. To test this, Griffin et al. (2008) randomly assigned participants to one of three groups. One group read texts and then self-explained the connections between parts of each text as they read them a second time. Another group read the texts twice and a third group just read the texts once. The group that had attempted to explain connections to themselves experienced significantly better metacomprehension than the other groups. Similar benefits were seen by Jaeger and Wiley (2014) when readers were instructed to self-explain from illustrated texts.

Similarily, studies have begun exploring the use concept maps as learning activities and artifacts that might help to improve the metacomprehension
accuracy of students with less advanced reading skills. Concept maps may help readers deal with the competing demands of reading and monitoring. Since the text is available during the activity, and the activity creates a visual representation of the situation model, concept mapping tasks may be especially appropriate for students who have limited processing resources (Stensvold & Wilson, 1990). Indeed, in a review of the literature, Nesbit and Adesope (2006) concluded that concept mapping tasks were the most effective activities for improving learning from text for younger, less skilled, or at-risk readers. In addition, constructing concept maps should help readers to have access to valid comprehension cues. Weinstein and Mayer (1986) suggested that instructing students to create concept maps of texts during reading helps them to identify the connections among concepts, which improves comprehension. From this perspective, concept mapping is similar to self-explanation, as both tasks should help readers to construct and pay attention to the underlying causal models of the subject matter. This can improve comprehension monitoring accuracy especially if readers are prompted to attend to causal connections when making their diagrams.

Thiede et al. (2010, Experiment 2) tested the effectiveness of a set of concept mapping activities using a within-subjects design where baseline relative metacomprehension accuracy was obtained by running participants through the standard paradigm. That is, students read a series of texts, judged their comprehension of each text, and then completed a comprehension test for each text. Participants, who were college students enrolled in a remedial reading course, then received extensive concept mapping instruction that included lessons on how to construct causal concept maps from short scientific texts. Then, the students completed the standard metacomprehension paradigm again, but this time they constructed concept maps while reading the texts. This improved both comprehension and relative metacomprehension accuracy. However, in another study with seventh graders, simply prompting students to generate concept maps did not lead to improvements in metacomprehension accuracy (Redford et al. 2011). Improvements were only found when readers were shown a good example concept map and were given explicit instruction in how to create and use concept maps for answering comprehension questions.

Benefits from Understanding What It Means to Comprehend a Text. Another set of studies has explored contexts that may help readers to select the most valid cues for comprehension monitoring from among those that are available, for example by giving students the expectancy that their comprehension will be assessed with inference tests rather than memory tests. This work takes as its starting point the premise that students need to understand what it means to “comprehend” an expository text in order to be able to monitor their own comprehension (Wiley, Griffin, & Thiede, 2008). Without specific instruction, reading should evaluate their levels of comprehension, in the goal of trying saying.

Reading passively, memory, may be classes. Reading in class, and in terms, details, of course, and certainly important if tests require scientific process to prompt students. Readers understand how situations they will be encoded across same behaviors. Instead, readers are tasked.

There is a body of research to help in improve this. Wiley & Pellegrino. There are now a number of tests that ask comprehension as well. In Educational Psychology, students were probed comprehension, an expected, and effective in this field. This comprehensibility procedures in several improved monitoring students with (“memory of specific make connection”) comprehension as emerged even within reading (but still...
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Reading passively, or trying to store the exact ideas from a text into memory, may be the way students may generally approach reading for their classes. Reading with a goal of memorization is of course better than reading passively, and it can be an effective strategy if future tests ask for specific items, details, or ideas directly stated by the text. Further, this behavior is certainly important for some subject matter and learning contexts. However, if tests require students to gain conceptual understanding, for example of scientific processes and phenomena from expository text, then it is important to prompt students to override the "passive reading" or "reading for memory" settings. Readers need to appreciate that their goal for reading is to try to understand how or why a phenomenon or process occurs, and that the questions they will be asked will depend on making connections and causal inferences across sentences, so that they can engage in monitoring of the correct behavior. Instilling this learning goal may be particularly important when readers are tasked with understanding expository science texts.

There is a body of work that has shown how practice test questions can help to improve comprehension, especially when students are encouraged to engage in active processing of the text to answer the questions (c.f. Hinze, Wiley, & Pellegrino, 2013; Jensen, McDaniel, Woodard, & Kummer, 2014). There are now a couple of studies that test the idea that instilling appropriate reading goals and test expectations may be critical for accurate metacomprehension as well. One study used graduate students enrolled in a program in Educational Psychology (Thiede, Wiley, & Griffin, 2011). In this study, students were provided with an explicit statement about the nature of comprehension, an explicit statement about the nature of the final test items they should expect, and example inference test items. The manipulation was highly effective in this population. A second series of studies has further tested for this comprehension expectancy effect in first-year freshmen, varying the procedures in several ways to better understand the mechanisms underlying improved monitoring (Wiley, Griffin, & Thiede, 2008). Surprisingly, providing students with just a simple description about what they would be tested on ("memory of specific details for each text" vs. "comprehension and ability to make connections across different parts of the text") greatly impacted metacomprehension accuracy. It was also theoretically interesting that the effect emerged even when the test expectancy instruction was not given until after reading (but still before making monitoring judgments). This finding supports
a cue-selection explanation rather than one that assumes expectancies may have their effects on monitoring by impacting text processing during reading of the texts, and therefore the benefits could have been attributed purely to improved cue access. Finally, when a self-explanation instruction was combined with comprehension expectancy instruction, the benefits to monitoring accuracy were additive, which supports the theoretical distinction between the two mechanisms (access and selection) as both being necessary for valid cue utilization and effective monitoring.

These instructional conditions have also been applied in a classroom context (Griffin, Wiley, & Thiede, 2013; Wiley, Griffin, Jaeger, Jarosz, Cushen, & Thiede, in press). College students enrolled in an introductory research methods course in Psychology were randomly assigned to receive the combined comprehension test expectancy and self-explanation instructional condition that was found to be effective in laboratory studies versus a no-instruction condition. Not only did students who received the combined test expectancy/self-explanation instruction have higher metacomprehension accuracy, they were also more likely to restudy the texts in a strategic manner (rather than just reread texts in order, or fail to reread texts altogether), and their restudy behavior was more effective in producing learning gains as evidenced by their quiz scores.

Benefits from Long-term Curricular Experiences. It has been argued that one main reason why students may experience poor metacomprehension accuracy is because they need a better understanding of what their goals should be when comprehending expository texts in different content areas. However, if prior instruction has already provided readers with this knowledge, then they should be in a better position to engage in accurate comprehension monitoring. Two recent lines of work suggest that differences in curricula can impact metacomprehension skills.

A cross-cultural study found that Chinese students have better metacomprehension accuracy than American students (Commander, Zhao, Li, Zabrucky, & Agler, 2014). The authors attributed these differences in accuracy to differences in instruction, and noted the lack of metacomprehension training in the United States, and the need to place more emphasis on the training of metacognitive skills (Hall, 2005; Nokes, 2010; Pintrich, 2002). Further, they note that content-area teachers often relegate teaching skills of comprehension and metacomprehension as being a part of “reading instruction” not content instruction (Hall, 2005), and therefore, “not their job.” As a result, students in the United States are seldom taught how to learn a subject but, rather, are taught the content of the subject and generally left to figure out how to learn by themselves. This neglect continues at the college level, even as the quantity and complexity of information increases. On the other hand, the authors argue that supporting reading competence is a significant part instruction through China, and that it is improving comprehension and metacomprehension.

In another study (Griffin, 2012) found that literacy education for comprehension tests were better than those found in students. Moreover, superior performance on texts to restudy, and potential explanation tests, and a better use of students to use more comprehension, and then

A SUMMARY

Based on the research, several suggestions for engaging in comprehension use valid cues to judge their goals for reading must be accessible. A complex text is available, so that they expect, so that they are available. Further, the activities and tests, reading from text.

In addition to these resource limitations, it is important to keep in mind, the cues of metacomprehension with limited attentional cues while they are also to rely on heuristic cues (Griffin et al., 2009). It be directly addressed in their skill, low WMC) to be particularly malleable, preventing this constraint. In
a cue-selection explanation rather than one that assumes expectancies may have their effects on monitoring by impacting text processing during reading of the texts, and therefore the benefits could have been attributed purely to improved cue access. Finally, when a self-explanation instruction was combined with comprehension expectancy instruction, the benefits to monitoring accuracy were additive, which supports the theoretical distinction between the two mechanisms (access and selection) as both being necessary for valid cue utilization and effective monitoring.

These instructional conditions have also been applied in a classroom context (Griffin, Wiley, & Thiede, 2013; Wiley, Griffin, Jaeger, Jaeger, Cushen, & Thiede, in press). College students enrolled in an introductory research methods course in Psychology were randomly assigned to receive the combined comprehension test expectancy and self-explanation instructional condition that was found to be effective in laboratory studies versus a no-instruction condition. Not only did students who received the combined test expectancy/self-explanation instruction have higher metacomprehension accuracy, they were also more likely to re-read the texts in a strategic manner (rather than just reread texts in order, or fail to reread texts altogether), and their re-reading behavior was more effective in producing learning gains as evidenced by their quiz scores.

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In another study within the United States, Thiede, Redford, Wiley, and Griffin (2012) found that seventh- and eighth-grade students whose early literacy education focused on deep understanding and experience with inference texts were better able to access and select valid cues for judging comprehension, which supported dramatically better metacomprehension accuracy than was found in students coming from a more typical schooling experience. Moreover, superior monitoring accuracy led to better decisions about which texts to reread, and produced significantly better overall comprehension. A potential explanation for this result is that prior experiences with inference texts, and a better understanding of what comprehension entails, allowed students to use more valid judgment cues when monitoring their own comprehension, and therefore more success at self-regulated study.

A SUMMARY OF IMPLICATIONS FOR INSTRUCTION

Based on the research reviewed above, the situation model approach makes several suggestions for instruction. In addition to encouraging readers to engage in comprehension monitoring, it is also important to help student to use valid cues to judge their own level of comprehension. One way of helping students is to have them participate in activities that make valid cues more accessible. A complementary approach is to be clear with students about what their goals for reading should be, and what kinds of test items they might expect, so that they may select the correct cues from among those that are available. Further, the more experience they have with comprehension-based activities and tests, the better they may become at judging their understanding from text.

In addition to these general recommendations, it seems likely that cognitive resource limitations of less skilled readers or younger readers will be important to keep in mind. Based on the finding that WMC was a strong predictor of metacomprehension accuracy, Griffin et al. (2008) suggested that students with limited attentional resources may be less able to attend to metacognitive cues while they are also processing a text. Resource limitations force students to rely on heuristic cues rather than the more valid experience-based cues (Griffin et al., 2009). Thus, it is likely that resource limitations will need to be directly addressed for some populations of at-risk students (low reading skill, low WMC) to achieve accurate monitoring. Although WMC is not similarly malleable, learning activities can be designed to directly circumvent this constraint, indeed, forcing all students to read each text twice, and
self-explain only on the second reading, allowed even low-WMC students to show benefits from a self-explanation instruction (Griffin et al., 2008). Generating concept maps or completing diagrams may be other useful approaches that can help to support less skilled populations.

It also seems likely that many students may need explicit instruction in comprehension so they can better appreciate what it means to construct an understanding from expository text in specific disciplines. It has been argued that discipline-specific considerations for reading are rarely made explicit to students (Yore, Craig, & Maguire, 1998). Reading instruction in early grades is generally confined to the understanding of narrative texts, even though students are expected to eventually read for understanding from expository texts. This mismatch between basic literacy instruction using narratives, and the demands of college-level reading, may be particularly acute for at-risk students (Hall, 2004; Spence, Yore, & Williams, 1999). Thus, more exposure to expository science texts, and more explicit instruction on what it means to build understanding from expository science texts, may be essential for accurate goal setting and regulation of study behaviors. As demonstrated by the Thiede et al. (2012) study, students who have long-term exposure to a reading curriculum that emphasizes deep levels of comprehension throughout early schooling show more advanced comprehension-monitoring skills than students who acquire basic reading skills from a more typical curriculum.

Providing more general knowledge about the genre of expository science texts, along with examples of comprehension test items, and articulating how these relate to what it means to comprehend expository text, should increase the likelihood that all students develop a portable set of metacognitive knowledge, skills, and goals to help them monitor their learning more accurately in contexts where there is no researcher or instructor there forcing them to perform particular tasks that happen to lead to more accurate judgements.

Over the past fifteen years, research on metacomprehension accuracy has led to the development of a theoretical framework called the situation-model approach. This approach has been motivated by the role that the situation-model plays in comprehension, as well as the role that online monitoring and the use of experience-based cues play in effective self-regulated study and learning. This work has led to the discovery of several contexts and conditions that have produced sizable improvements in comprehension monitoring accuracy. Further, this work has elucidated constraints that cognitive resources may impose on effective monitoring, and demonstrated how having an understanding of what it means to comprehend expository science text may be critical for engaging in effective self-regulation of study. The more general message of this work is that students may need explicit instruction and support in “what comprehension means” before they can attain the sophisticated understanding and monitoring skills that are now being emphasized as part of the notion, research on how we they need to effectively construc make, content areas will becom experts, and other stakeholders.

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A final synopsis of the three main points for practitioners is (1) Be sure to (ide)graph what students are expected to know (i.e., what will be on the test and how it will be tested). This is especially important if the goal of the unit is for students to achieve real comprehension of concepts, and not just memorization of facts or definitions. (2) Be persistent in testing deeper comprehension and emphasizing deeper comprehension as a reading goal. As seen in the cross-cultural study (Commander, Zhao, Li, Zabrucky, & Agler, 2014) and the Thiede et al. (2012) middle school study, there is reason to believe that students with long-term exposure to curricula that stress deeper comprehension develop better comprehension-monitoring skills. (3) Emphasize comprehension and metacomprehension building activities when teaching reading. There are a number of possible activities (explanation, question-asking, concept mapping), and although they have not all been fully investigated yet, having students do things to work toward comprehension (connecting ideas across the parts of texts—and connecting new info with prior knowledge) seems to support both better comprehension and metacomprehension outcomes.

REFERENCES


**FURTHER READINGS**

