

Concept Mapping: Developing Metacognitive Awareness in a Postsecondary Reading and Writing Classroom

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ABSTRACT

Metacognition provides the opportunity for students to become more active and strategic readers; therefore, developing metacognitive awareness is necessary with all students, regardless of age or developmental level. This article describes a reading assessment used in a college-level, paired developmental reading and writing course that utilized electronic concept mapping in order to provide students with a metacognitive reading strategy to enhance reading comprehension. Students were encouraged to use concept mapping to illustrate connections between and among texts and to also extend those connections using images and other electronic resources such as webpages and videos. This assessment provided the opportunity for students to increase their comprehension of texts while enhancing the connection between reading and writing. In addition to learning a new strategy and technology tool, students appreciated how this assessment made the connection between reading and writing more explicit. This assessment, and the use of concept maps generally, invites students to create their own meaning and experience the process of learning first-hand. This article discusses one way instructors can improve college students' metacognitive awareness, positioning them for greater academic success.

Successful readers of all ages and developmental levels connect preexisting knowledge to new ideas found in texts. Activating this prior knowledge allows for a deeper understanding of the new text and has the potential to aid in comprehension (Moje, Dillon, & O'Brien, 2000). Research has demonstrated that students who struggle with reading often do so because they struggle with conceptualizing new ideas and forming connections between previously acquired knowledge and new or unfamiliar texts or information (Ambe, 2007; Eilers & Pinkley, 2006). Difficulty with conceptualizing new

ideas can hinder the way a student takes control of his/her learning; therefore, strategies need to be put in place that encourage students to look for deeper meaning and allow for individual experiences to play a part in meaning-making.

Researchers have also shown that certain metacognitive reading strategies help students develop these methods for improving comprehension and understanding (Fisher & Ivey, 2006; McKeown & Gentilucci, 2007; Wade & Reynolds, 1989). Metacognition is often defined as "thinking about thinking" or, as Flavell (1978, p. 8) suggested, "knowledge that takes as its object or regulates any aspect of

cognitive behavior.” Even though metacognitive reading strategies are taught throughout the elementary and secondary school years, not all students are successful in gaining the requisite skills needed for “thinking about thinking.” This situation often leads to students who later enter college underprepared for the demands—particularly the reading demands (Simpson & Nist, 2000)—of college courses as well as the reading expectations of their professors. In short, students who are not sufficiently metacognitively aware are likely to struggle throughout their academic journey.

The three premises most commonly associated with metacognitive reading strategies include the idea that (1) students must take control of their learning (Baker & Brown, 1984), (2) that they remain active during the learning process (Brozo & Simpson, 1995), and (3) that they understand the individual goals connected to each academic task (Bandura, 1986). For people who have never struggled with reading, or learning in general, these may not seem like difficult tasks. However, for many underprepared students, metacognitive awareness is not part of their repertoire for learning and so it needs to be developed so they can be successful in the college classroom.

Concept Mapping

Monitoring comprehension and taking control of the thinking process while reading are key features of becoming metacognitively aware; therefore, it is important that students are exposed to strategies that promote both of these processes. When students successfully monitor their thinking, they are able to detect errors, make connections between the current text, other texts, and their experiences, as well as recognize when their reading comprehension breaks down (Wilhelm, 2001). Strategies that help students take control of their learning are those that help the student judge what is happening and decide whether the current strategy is useful or if they need to abandon it and choose another (Sperling, Howard, Staley, & DuBois, 2004; Holschuh & Aultman, 2009). *Concept mapping* is a strategy that gives students

that control as well as help in the monitoring of their understanding. *Concept maps*, visual or graphic organizers, can be used to help students at all ages and developmental levels “form mental constructs or schemata of how texts are organized” (Guastello, Beasley, & Sinatra, 2000, p. 357) and allow students the opportunity to connect ideas across different texts. These processes all aid readers in becoming more metacognitively aware and are thus vital for academic success.

Students benefit from having a variety of available strategies that can be used at different times throughout their academic career. Many students are labeled as developmental not because they are incapable of doing college-level work but because they are unaware of how to use the strategies that they have been taught. Holschuh and Aultman (2009) suggested that strategies that have metacognitive, cognitive, and affective components often appeal to developmental students and so have the potential to be utilized more on their own. Baker and Brown (1984) stressed that metacognitive reading strategies must include self-regulatory mechanisms such as “*checking* the outcome of any attempt to solve the problem, *planning* one’s next move, *monitoring* the effectiveness of any attempted action, and *testing, revising, and evaluating* one’s strategies for learning” (p. 353, italics in original). As this article will demonstrate, concept mapping clearly offers students practice with each of these important components of learning.

Research has shown the positive effects concept mapping has on student success (see Hay, 2007); however, much of this research has been conducted in science classrooms and is more common with elementary and/or high school students (Brown, 2003; Carnine & Carnine, 2004; Guastello et al., 2000; Güvenç & Açıkgöz, 2007; Kose, 2007; Snead & Young, 2003). A missing piece in the extant research is the inclusion of concept mapping with postsecondary students, particularly those in developmental courses, and the use of these organizational strategies within reading and writing courses in particular.

Levy (2001) specifically mentioned the use

of concept maps with developmental and non-developmental English students, with an emphasis on using concept maps as a way for students to “chart their own way through the text” (p. 193). In this study, Levy argued that, when reading, it is necessary for students to be familiar with different writing styles and choices in order to successfully navigate through them and be able to gain an understanding of the content. She proposed that graphic organizers can be used by students to help understand authorial intent and rhetorical choices an author makes, which in turn makes the text more meaningful and more comprehensible. Levy asserted that two key features needed to be kept in mind when working with concept maps—the text and the goal. Mapping a novel or a short story is a much different task than mapping the concepts in a psychology textbook chapter. Goal setting within this metacognitive reading strategy helps students successfully monitor the learning that is taking place.

Other studies that focused on the inclusion of concept maps reported positive findings in regard to the use of the strategy within the confines of the particular study and specific research questions (e.g., Anderson-Inman, & Zeitz, 1993; Chiou, 2008; Güvenç & Açıkgöz, 2007; Nesbit & Adesope, 2006). For example, Güvenç and Açıkgöz (2007) examined individual and cooperative concept mapping and found that allowing students to work cooperatively in creating concept maps was more effective than when the maps were completed individually. Even though this study was completed with fifth grade students, it is important to think about the positive effects of allowing students to work with others, especially when learning a new strategy. Collaboration between students adds in a new degree of scaffolding since students may be receiving support from a peer and the transfer of knowledge is no longer only between the instructor and student.

The type of instruction used by the teacher is also viewed as important with an emphasis on the idea that direct instruction, modeling, and practice are imperative for the successful use of concept mapping. For instance,

Santhanam, Leach and Dawson (1998) and Chiou (2008) discussed the importance of introducing and teaching students how to create concept maps. Oftentimes, educators assume that students are familiar with a certain strategy and fail to fully explain what they want and expect. This is frequently the case with metacognitive reading strategies. Without modeling, scaffolding, and guided instructional practice, concept mapping can easily become merely another strategy that students are taught but fail to utilize on their own. Chiou’s focus on instruction not only led to favorable learning achievements for the advanced accounting classes that utilized concept maps, but also had a positive impact on how the students later viewed the strategy. Chiou reported that nearly all students believed the concept mapping strategy was helpful and expressed that it could be transferred to other subject areas, courses, and content. When students can evaluate the success of a particular strategy and determine its impact on learning, they are showing positive signs of becoming more metacognitively aware. In this study, students recognized the benefits of concept mapping, and by providing an authentic experience for students, as Chiou did, it allowed for the concept map process to become both versatile and transferable.

One interesting finding is the idea that concept mapping is a strategy that is especially beneficial for low-achieving students. For example, in their meta-analysis of concept and knowledge maps, Nesbit and Adesope (2006) showed evidence of this finding and explained that “students with low verbal ability can more easily understand and construct concept maps than they can decipher and write scholarly texts” (p. 420). However, like any other strategy, concept mapping must be explicitly taught. One study found that without explicit instruction, only high-ability students exhibited improved performance measures (Caverly, Orlando & Mullen, 2000). Caverly, Orlando and Mullen’s finding highlights the importance of providing direct instruction on concept mapping for students in college-level developmental courses and also calls for a

wider range of texts—beyond content specific textbooks—to be used. Since the research also suggests that lower achieving students are often unaware of their own cognitive processes, the need for specific strategies that target metacognitive awareness is a critical factor as well.

Concept Mapping in the Developmental Reading and Writing Classroom

Building upon the idea of utilizing concept maps with struggling college learners, I created a culminating reading assessment in a paired developmental reading and writing course that made use of electronic concept mapping software, specifically, the Institute for Human and Machine Cognition (IHMC) CmapTools program (Cañas, Hill, Carff, Suri, Lott, Eskridge, T., et al., 2004; <http://cmap.ihmc.us>). The purpose of this assessment was twofold: (1) to provide students with a new and effective tool for increasing comprehension, and (2) to establish a clearer connection between and among texts and the additional assignments for the course. This CmapTools (Cañas et al., 2004) program was chosen because it was available to all students through the university, the software was previously downloaded on campus computers, and a number of colleagues on campus offered training and support. According to IHMC, the CmapTools software “empowers users to construct, navigate, share and criticize knowledge models represented as concept maps” (<http://cmap.ihmc.us/>). In addition, since current college students are fully immersed in the use of technology (e.g. Jones et al., 2009), the use of electronic software was intended to increase students’ motivation and desire to complete the work.

Typically, students in the paired developmental reading and writing course I was teaching read a number of texts, using a variety of genres that connected to a common theme. In the writing portion of the course, students produced three formal papers and a reflection essay that were all required for the final portfolio. In the reading portion of the

class, students read, analyzed, and discussed the required readings, completed extensive strategy development, and produced three formal summaries. One revised summary was included in the final portfolio. Desirous to see more of a reading “presence” in the final portfolio, a copy of the final concept map, as well as a reflection, was included and required of all students.

The actual concept map assessment I assigned in this course asked students to:

- Create a concept map based on the theme of the course
- Include at least 30 concepts or facts organized into categories and subcategories
- Include at least 10 images used to illustrate the concepts
- Include at least 10 hyperlinks attached to items on the map
- Include linking words or phrases to specify the relationship between different concepts
- Include at least 5 cross-links which showcase the relationship or links between concepts in different categories or subcategories
- Present the final concept map to their classmates during the last class session
- Write a response paper about using concept maps and the CmapTools (Cañas et al., 2004) software

Students were introduced to the assessment and the CmapTools (Cañas et al., 2004) software at the beginning of the term. Three work days were planned where the class met in a computer lab and the entire class session (75 minutes) was used for working on the assessment. This structure gave students the opportunity to become more familiar with the software and with the overall assessment. It also allowed for whole class discussion and demonstration of using the software. Prior to these working days, students were introduced to concept mapping and had the opportunity to create additional concept maps throughout the quarter.

Discussion

As explained earlier, students were able to create an online concept map that displayed their learning throughout the quarter. In addition, they were encouraged to make connections between and among the texts they had read, as well as

connections to the outside world through the use of images and hyperlinks. Figures 1 (this page) and 2 (next page) show examples of concept maps that students created during the first term this project was assigned. The icons listed at the bottom of some concepts (see Figure 3, page 41) show that an image or a hyperlink is connected to

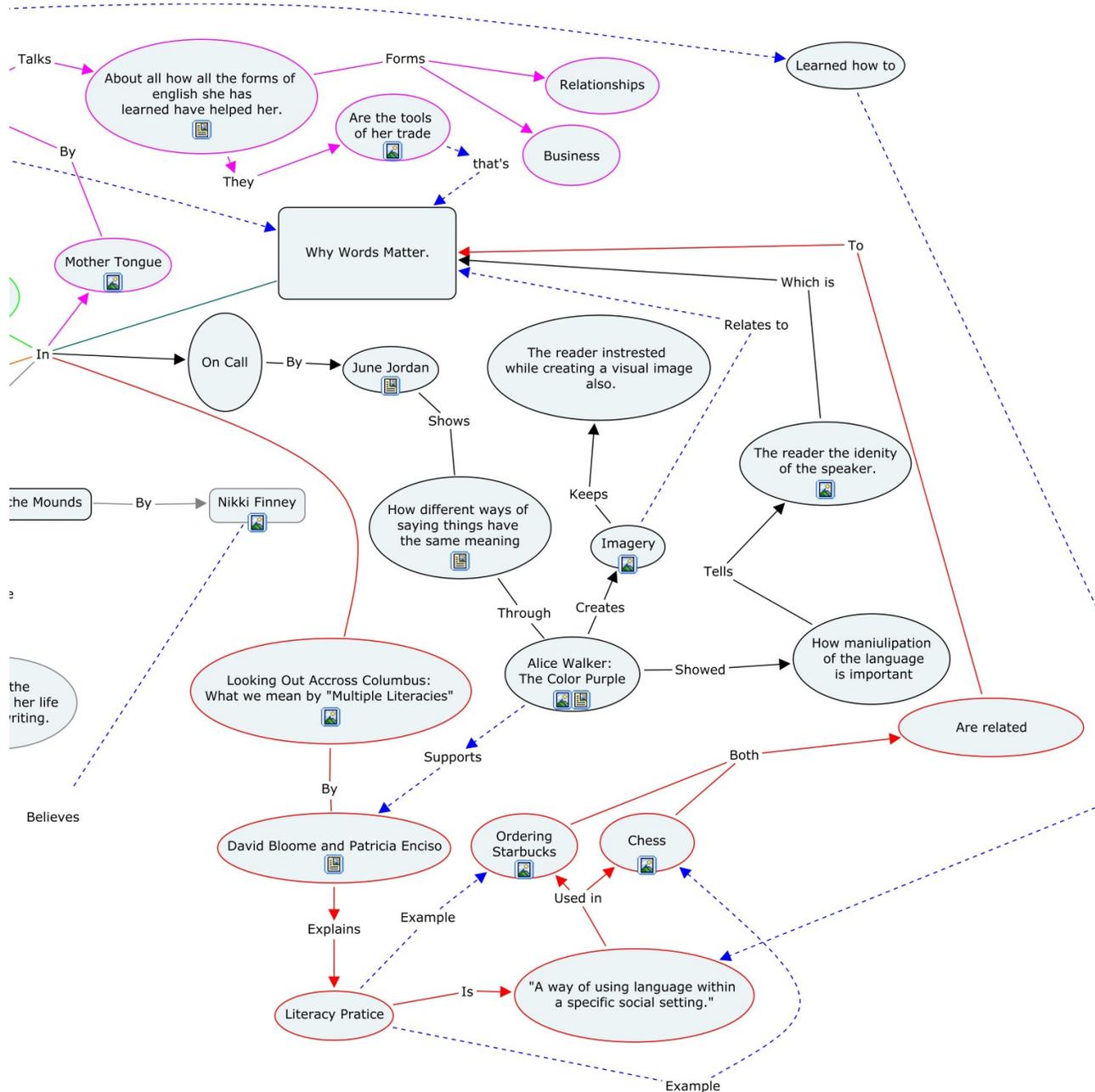


Figure 1

Student example (cropped from larger map) illustrating concepts and connections made between and among texts within the course theme *Why Words Matter*. Student shows how the theme was discussed within six of the required texts, in addition to identifying connections between additional texts (e.g., *The Color Purple*). Further, the student explains how various concepts are connected to each other and to the theme through the effective use of cross-links.

that particular concept. For some concepts, students attached images that helped visualize a certain aspect of the text, e.g., a picture of the author or a photograph of the location where the story was set. Hyperlinks most often included webpages that offered additional information about a particular topic, author, or text. They were also used to link the concept to a copy of the student's paper from the writing portion of the class or to a summary that was completed in the reading portion of the class. Throughout the term, students were encouraged to think about how they were making connections with the texts and this metacognitive thinking then played out in their concept map.

For the most part, this reading assessment was a success. As with any online software or

tool, issues with the CmapTool (Cañas et al., 2004) software surfaced periodically during the academic term. For example, when working on the assessment outside of class students often had trouble logging on to the software. In addition, work was lost when the software unexpectedly shut down and/or students did not save their work correctly. In their reflection papers, however, students often admitted that the issues they had with the software were mostly due to trying to rush through the assessment, not utilizing the resources available, or not spending enough time learning how to use it successfully. By the end of the term, all students made progress. Student comments such as "After becoming familiar with the basics of CMapTools, I

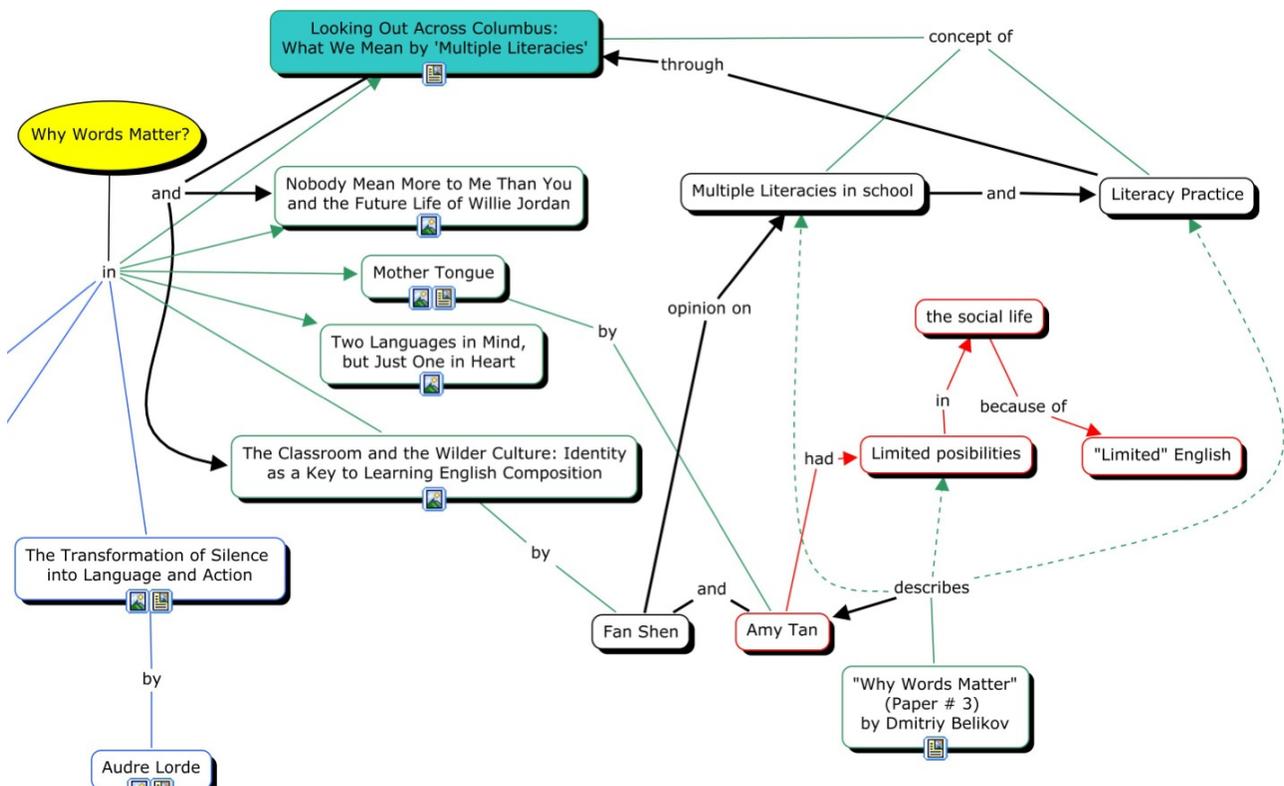


Figure 2

Student example (cropped from larger map) illustrating concepts and connections made between and among texts within the course theme *Why Words Matter*. Student began by demonstrating the connections eight of the required texts had to the course theme. In addition, this student made connections between the course theme, required readings, and paper assignments. Utilizing cross-links shows the connections between concepts in different sections of the concept map.

found this project to be fun,” “Once I learned how to use all the cool tools in the map it became really fun,” and “The assignment wasn’t as scary as I thought it was after I got in the groove of things” were frequent remarks recorded in their reflection papers. Interestingly enough, dealing with finicky software also produced new opportunities for collaboration between students. One student specifically mentioned how he thought the assessment was “hard at the start but it eventually got easier as I worked with classmates to learn more about the program and how it worked.”

Academically, concept mapping exceeded my expectation that it could help students make clear connections between and among texts and the additional assignments for the paired reading and writing course. For example, students noted that this reading assessment ultimately helped them with the formal papers they were drafting in the writing portion of the class. One student explained that “this project was beneficial to me because it helped organize my ideas. While this project was taking place, we were writing papers for the writing half of this course. The mapping of my ideas along the way, helped to shape the result of my papers.” Another student added that “this assignment helped me with the understanding of the texts and it helped me to put direct

quotes in my papers as well as compare it with what the prompt was asking me to do with the text.” And still another student commented that “concept mapping helped me to visualize connections between [the] three papers that I did during this quarter.” These student remarks suggest that this assessment ultimately helped bridge the two halves of the paired reading and writing course more completely and also helped students see the connections between the reading and writing assignments in the course, something that had been a struggle for them in the past.

In addition to assisting students plan for and write their papers, the concept map also acted as a support system in the reading course. Students recalled that creating the concept map aided in their understanding and comprehension of the texts. Student comments such as “This project helped me appreciate multiple points of view and the author’s main ideas from different texts” and “Since I am a visual learner, it really helped me sum up everything I’d read about this quarter” helped situate the need for more activities that encourage students to make connections between and among texts. Students also noted that the use of concept maps enabled them to “understand what the theme of quarter was” and acted as a “good review of what I learned this quarter.” One student was surprised when her end result made her “realize how much [she] learned over the course of several weeks” and that she was able to apply what she “had learned in a hands-on, fun-filled way.” This positive feedback demonstrates that concept mapping can and should have a place within a postsecondary developmental reading and writing courses.

Conclusion and Recommendations

As Novak (2010) suggested, “as an instructional tool, concept maps encourage students to explicitly organize and make public their (current vision of) knowledge” (p. x). This concept map assessment supported students in a developmental reading and

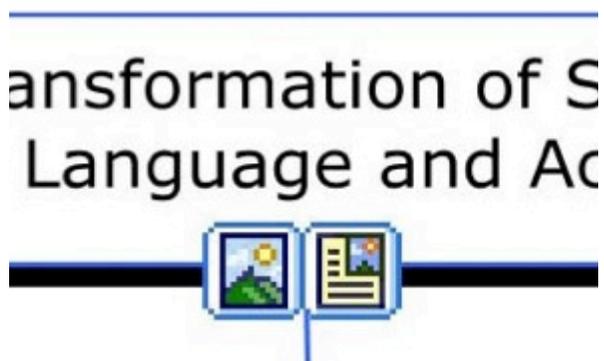


Figure 3
Different icons indicating that a student has included an attached image (icon on left) and hyperlink (icon on right).

writing course as they made sense of and organized information through a series of reading and writing assignments. Being able to show their understanding of a text in a visual display enabled students to “track learning, to find gaps in knowledge, and to work on closing those gaps” (Novak, 2010, p. x), all of which are important and necessary skills for academic success.

Concept maps clearly have both the cognitive and metacognitive components that appeal to developmental students; however, they also offer an affective dimension that contributes to student learning as well (see Holschuh & Aultman, 2009). The concept map assessment, as I have described it, allowed students to have complete control over the texts they used, the connections they made, and the way they represented the information. This sense of control, according to Nist and Holschuh (2000), can improve student motivation and increase their desire to learn. Student reflections clearly indicated that the use of concept maps increased their ability to make sense of the texts they were engaging and form stronger reading and writing connections. Further, students created their own meaning and witnessed the process of learning first-hand.

The Internet provides a number of electronic resources for the creation of concept maps. As previously mentioned, the IHMC CmapTools (Cañas et al., 2004) software was used since it was available to the current students and was a reputable platform. However, there are other resources that could be used instead and, perhaps, would be better suited for this assessment. Software programs such as Inspiration Software® and iMindMap (ThinkBuzan, 2010) offer a variety of methods for creating concept maps, but they can be costly. Bubbl (bubbl.us), Popplet (popplet.com), and Prezi (prezi.com) are free web-based tools that are easy to use and offer a number of tutorials as well as support pages. Allowing students the freedom to choose which tool they use could add a nice variety to the type of concepts maps that are created within one course. This would also expose students to more than one resource and emphasize the importance of making decisions based on the desired outcome. Regardless of the platform used, the benefits of concept maps are numerous, suggesting the key role they can play in building college students’ metacognitive awareness and thus positioning them for academic success. **JCLL**

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