USE OF SELECT-AND-FILL-IN CONCEPT MAPS

Working toward my doctorate, I took a course in constructivist theory and practice. The use of concept maps, with roots firmly grounded in constructivist thought, held particular interest for me. A concept map is a graphical representation of the meaningful relationships between concepts within a domain of knowledge. It is most often hierarchical, reflecting a subordinate relationship between concepts in the domain. Concept maps are drawn in a tree-like structure with concepts having the broadest meanings occurring at the top and those with the most specific meaning at the bottom. In the representation, concepts are most often indicated by geometrical shapes labeled with words that identify the concept. These are commonly referred to as nodes and are connected with lines, known as links, that are labeled to identify the relationship between concepts. Most often, concept maps are used as assessment tools, requiring students to construct a map representing their understanding of the structure and relationships between ideas within a topic.

I had been teaching an online course in environmental studies and decided to use concept maps in the course. I had developed the course materials a semester earlier and looked forward to supplementing the existing assignments with concept-mapping activities. However, I found myself struggling with developing exercises requiring dynamic, interactive graphic organizers using the technology that was available to my students and me. I needed an alternative way to use concept maps without requiring that students construct them. I found inexpensive, commercial software, most notably *Inspiration®*, that allowed me to create maps and export them to a webpage as an image embedded in an HTML document. This tool easily facilitated the presentation of static concept maps into course materials. After reading some of the literature on concept mapping, I stumbled upon the idea of the Select-and-Fill-In, or SAFI, map. SAFI maps begin with a teacher-created master map. Then, while maintaining the structural integrity of the map, some or all of the concepts or link labels from the map are eliminated. Students are asked to fill in the missing concepts or links by choosing them from a provided list of terms. At this point, I decided to use SAFI maps in the course.

During instruction, SAFI maps provide a form of advance organizer, giving students a bare, skeletal structure onto which further knowledge will be constructed. To complete the SAFI map task, learners must consider and reconsider relationships between concepts as they test their own understanding against an expert, taking into account the nuances and subtleties of the relationships between concepts as they construct their own understanding. The structure of the map, for the student, reflects a viable, accepted representation of the structure and relationships between concepts within the topic or subject matter domain which they build and develop their own cognitive structure.

My first attempt at using SAFI maps was as a formative, review assignment. Using *Inspiration®*, I created a complete concept map on ecological succession, then eliminated certain links and concepts, labeling the missing nodes and links with numbers. Figuring out which items to eliminate took a substantial amount of time, as I determined which links or nodes could be missing without making the remaining structure and relationships incomplete or ambiguous. Below the incomplete map was a list of terms from which students could choose the term that best fit the missing item.

I was teaching two sections of my online course, so I used the opportunity to do some classroom research. One group completed the SAFI exercise, and the other did not. The "experimental" group was required to go to the course website where the SAFI map was posted. Students selected items from the provided list that would reflect the desired, accepted structure and meanings to the relationships contained in the map. Students then sent their responses to me in an e-mail. I provided feedback regarding their responses, asking them to resubmit their answers if they had missed more than two items. Of the students who completed the

SAFI task, all but one were 100% correct.

Upon completion of the SAFI task, all students, including those in the "control" group, were required to complete a quiz that contained an item requiring them to apply the succession knowledge contained in the SAFI map. The item read: *Describe, in a few short sentences, the succession of plants which occurs after a volcanic blast like that at Mt. Saint Helens in 1980. Is this a primary or secondary succession?* There was little difference in overall quiz scores between the two groups. However, students who completed the exercise were more likely to identify the succession as secondary correctly, one of the key concepts of the SAFI map.

Since this initial investigation, I have added an online tutorial that introduces students to concept maps and their components. I have also added additional SAFI maps to the course requirements. The maps carry formative and summative functions and, over the last two years, have become some of the most instructionally sound and innovative components of my online course. By providing students with an advance organizer—a SAFI map—instructors may elicit a more accurate understanding of concepts within a domain, resulting in higher student achievement.

The creation and use of SAFI maps in the online course was completed using technically simple procedures, eliminating the need for technical sophistication. In addition to the practical, ease-of-administration aspects of SAFI maps, many students actually enjoy completing the SAFI exercises. They indicate that maps are helpful as review in preparing for quizzes, explicitly clarifying relationships between concepts and demonstrating the scope of ideas and understanding I expect from a given lesson or unit. In addition, many students have observed that the SAFI maps help them think about their own learning, indicating that the SAFI maps may play a metacognitive, as well as the intended cognitive, role.

Although SAFI maps I have described here are used in an online environment, there is no reason that they could not be used, formatively or summatively, in the traditional classroom. They are simple to construct, are easy to administer, and can be graded quickly.

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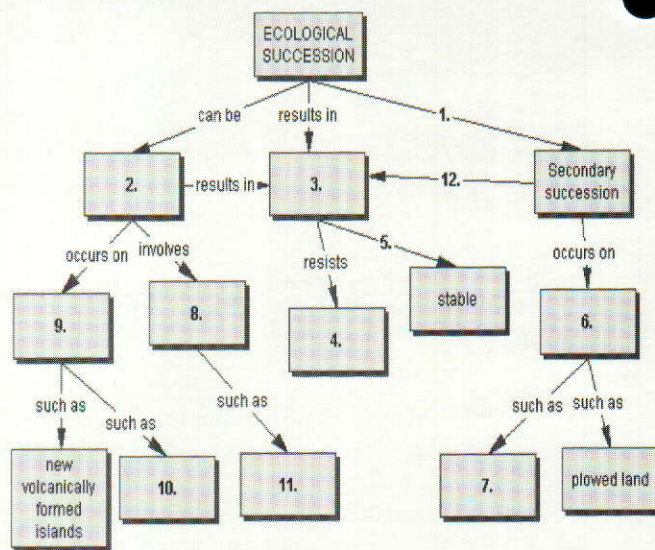
The preferred answers to the SAFI map, based on the manner in which the topic was presented in the course text, are: 1) L, 2) G, 3) J, 4) I, 5) C, 6) H, 7) D, 8) F, 9) A, 10) B, 11) E, and 12) K.