

SUPPORT FOR AND RESISTANCE TO A CONCEPT MAPPING ASSIGNMENT IN A PHARMACY COMMUNICATIONS COURSE

Lilian H. Hill, Virginia Commonwealth University, United States

Email: lhhill@vcu.edu, <http://www.pubinfo.vcu.edu/pharmacy/Faculty/FacDetail.asp?ID=54>

Abstract. A concept mapping assignment was developed for pharmacy students that emphasizes meaningful learning and discourages rote memorization of communications course material with the intention to improve student retention of pharmacy communications information. Students in small groups work to create a concept map that demonstrates their understanding of major concepts taught in the course and their interrelationships. Support for this work came from faculty in other disciplines and institutions, but resistance to the assignment came from students, faculty peers, and administrators. Student perceptions of the assignment were sought and are reported here. Incorporating a concept map assignment into an existing course requires a significant investment for instructors. The reward for faculty is that students learn to understand abstract material and grapple with conceptual meanings so that they are challenged to move beyond rote memorization to meaningful learning. However, given the resistance, a wise faculty member choosing to use concept mapping as an assignment would also educate his/her peers and administration about the value of visual learning.

1 Introduction

Encouraging students to achieve long-term integration of knowledge is a challenge to all faculty teaching in higher education. Many students have learned to rely on rote memorization in their early college years to obtain the 'right' answers. This method may have been successful for completing prerequisite courses, but in a healthcare profession such as pharmacy knowledge must be retained for application in complex practice settings in which ill-defined problems are frequently encountered. Professionals must therefore achieve a sophisticated understanding of the conceptual tools within their discipline. Novak comments that students can be tenacious in their preference for rote memorization because of previous success with the method and because memorization requires a smaller investment of mental energy than learning to fully understand course material (Novak, 2003). Over-reliance on rote memorization is counter-productive to retention of meaningful knowledge, and knowledge gained this way requires intense effort to maintain and constant reinforcement (Donald, 2002; Novak, 1998; Trepagnier, 2002).

Instructors are able to influence student choices of how to learn with their decisions regarding how material is presented in class, the creation of exercises that engage students with course material, and how student learning is assessed. As a graphic knowledge representation tool, a concept map enables students to diagram their understanding of key ideas in a topic area and to demonstrate their conceptions of the relationships among them (Novak, 1998; 1984). Students are often able to articulate key concepts within course material, but they may be unclear about the relationships among them and their relative importance (Trepagnier, 2002). A concept map assignment can help students listen for meaning in class, assist students in taking more effective notes, and promote conceptual learning.

The *Communications in Pharmacy Practice* course at the VCU School of Pharmacy is a two-credit course that is currently offered in the first semester of the Doctor of Pharmacy program. The content 1) addresses communication skills employed in pharmacy practice with an emphasis on patient counseling and education, 2) explores communicating with diverse populations including geriatric, mentally ill, and disabled patients, and 3) provides instruction about low health literacy and cultural competence. A concept mapping assignment was introduced because the pre-existing course structure did not appear to encourage students to engage with the material and students were not retaining information they need to successfully engage in the culminating experiential program and in practice after graduation.

Introducing a concept mapping assignment is not without its difficulties, however, and it was met with resistance from several quarters: the students, other faculty, and administration. Students were resistant because concept mapping requires students to engage with course material in meaningful ways, and this requires substantive effort. Faculty peers were dubious because they were unfamiliar with the concept mapping process, and suspicious that the assignment might consume excessive time that students might have invested in studying for other courses. Administrators were the recipients of student complaints, and were also unfamiliar with the value of concept mapping.

2 The Assignment

Concept mapping was selected as an active learning process that involves students in meaningful learning because the process engages complex cognitive structures within the brain. Meaningful learning refers to the process of acquisition of new information by an individual and its interrelationship with relevant knowledge mental structures (Novak, 2003; Trepagnier, 2002; Novak, 1998). The learning tends to be long lasting because the new knowledge is related to and integrated within a person's existing knowledge structure (Novak, 1998). Cognitive learning theory indicates that the brain learns most effectively by relating new experiences and knowledge to prior knowledge, and that meaningful learning requires deliberate effort to link new knowledge with higher-order, more inclusive concepts in a person's cognitive structure (Trepagnier, 2002; Heit, 1997; Roth & Roychoudhury, 1993; Novak, 1984).

Past research indicates that conceptual mapping has clearly demonstrated its value in helping students learn in the natural sciences. Trepagnier (2002) argues that requiring students to create concept maps is especially useful in teaching abstract, conceptual topics in which there may be multiple ways to interpret the interesting and abstract relationships between concepts. In an interdisciplinary study of intellectual development of postgraduate students, Donald (2002) found that the sciences tend to teach more concepts within a single course than the social sciences, but that the meanings of these concepts tend to be explicit and specific. In the social sciences, as much as 90 percent of subject matter may be abstract. Learning about pharmacy communications requires students to engage with abstract notions of the social, psychological and behavioral aspects of pharmacy care.

An introductory class session of the course was devoted to explaining the process of concept mapping and the purposes of the assignment. A detailed presentation explained the structure of concept maps and their relevance to education and then provided opportunities for questions. Students were engaged in an exercise in which they practiced creating a simple concept map of their existing knowledge of pharmacy communications at the outset of the course. Students also received handouts that 1) explained the assignment and concept mapping, 2) included a concept map that demonstrated the general structure, 3) provided an example of a relevant concept map, and 4) specified scoring criteria used for grading. Students were also shown the final products of students who completed the course in past years, although they were not allowed to retain these.

Students were required to include three concepts, 1) the pharmacist, 2) the patient, and 3) pharmaceutical care, and to make pharmacy communications the focus of their map. They were encouraged to incorporate material from other courses, but had to demonstrate the connection of the material to pharmacy communications. Students submitted first and second drafts during the semester, and a final draft was due on the last day of class. Each draft was graded, but the grade value of the first and second drafts was kept low so that the experience involved minimal risk as students developed greater skill in working with the concept mapping technique. Given that students had to work on the assignment throughout the semester, the final draft of the concept map was weighted so that together the three drafts of the assignment represented 25 percent of the final grade. The students are also graded on their participation in small group conference activities, and complete two midterms and a final exam. Students received feedback on their work so that they could make improvements and correct their understanding of the course material and assignment prior to submitting the next draft. The quality of most of the groups' concept maps was excellent, and it was immediately obvious which groups had invested significant time, effort, and creativity in completing their finished maps. See Figure 1 for a sample of one group's concept map.

Roth and Roychoudhury (1993) suggest that concept mapping can serve to facilitate collaborative and cooperative learning. In this course, students worked in self-selected groups of three to five to create a mutually acceptable concept map and a narrative that explained the decisions made in its organization. The map individual students created of their existing knowledge of the role that communications skills play in pharmacy practice provided them with the material with which to begin their group conversations and helped students document their existing knowledge for the narrative. In order to create a mutually acceptable group product, students needed to cooperate and negotiate meaning within their group discussions. The need to negotiate meaning in a group setting also helps students prepare to work as a member of a healthcare team.

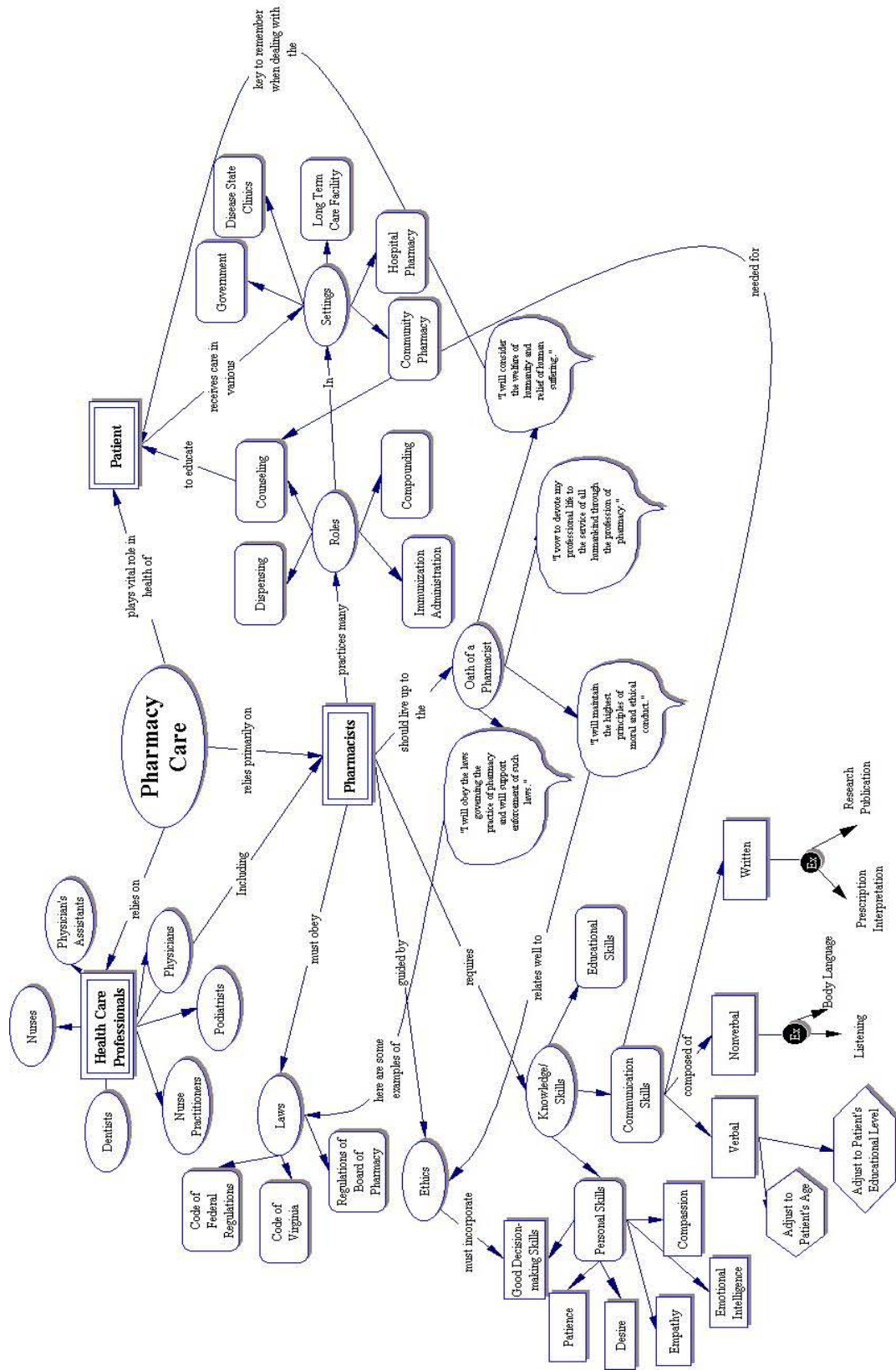


Figure 1: Sample of Student Concept Map

3 Assessment of Student Learning

The emphasis in grading both the concept maps and the narrative should be on the meaning group members have made from the subject material in the course and its interrelationships and avoid simple counting of the number of elements included. Once students suspect that numerical scoring prevails, they are tempted to crowd their maps with as many concepts and linking words as possible, and to create multiple cross-links whether they have validity or not. An evaluation rubric developed by Trepagnier (2002) examines the original thinking used in developing links between concepts and their accuracy, the theoretical accuracy demonstrated by directional arrows within the maps, and the accuracy and creativity displayed in writing the narrative. Maps that are rated as excellent have accurate and insightful links on the concept maps and indicate independent thinking. By contrast, maps that need improvement or are unsatisfactory include inaccurate links and misconceptions in both the map and narrative.

3.1 Students' Perceptions of the Assignment

Information regarding students' perceptions of the class and the assignment was collected during the semester. Approximately 6 weeks into the course, students were asked to fill out an informal formative evaluation form containing several sentence stems they were to complete. Student comments and their frequency are reported in Table 1. Students could make comments in each category. It should be noted that in every category except "The concept map . . ." students were commenting on the course as a whole, and not just the concept mapping assignment. This explains why there are only a few comments about the concept map assignment in some categories.

Students reported that while valuable, the process of concept mapping was challenging. They had to learn how to organize a concept map and link concepts together. Other comments related to uncertainty with the process and the feeling that it felt more like brainstorming than an orderly progression. Some students appeared to have enjoyed the assignment and they commented that they found it useful in organizing their ideas, retaining information, and relating the communications course material to other courses in the curriculum. One student liked the process so well that she used it to study for a difficult exam. Several students responded that the concept maps were challenging and provided them with some difficulty, yet at the same time some also responded that they found it a useful exercise that helped them better understand the role of communications and the pharmacist in providing pharmacy care. In several instances, a single individual commented that the exercise was both challenging and that it was helpful in learning. A few students commented that they appreciated gaining experience with a new learning tool that they could use to study for other courses.

Just past the midpoint of the course, a second exercise solicited responses to specific questions about student experiences of the concept mapping process. Both positive and negative comments were received. Students responded that "*Creating a concept map helped me organize my notes for studying,*" "*Is a good way to show and learn how different aspects of pharmacy are interrelated,*" "*Taught me a great deal about the pharmacy profession,*" "*Is helpful in connecting ideas related to pharmacy and remembering them,*" "*Is a fun project,*" but at the same time several students remarked that the assignment "*Was challenging.*"

Comments from both exercises are similar to those reported by Trepagnier who used concept mapping to teach sociology.² She also reports receiving a mixture of positive and negative comments. Student responses indicated that both *dis-equilibrium* and *equilibrium* occurred during the concept mapping process. Dis-equilibrium signifies that students experience uncertainty and search for information to clarify their understanding while equilibrium refers to regaining comfort with material by achieving understanding and the restructuring of mental schema held about the subject. Trepagnier indicates that most students felt that the exercise helped them learn the concepts taught in the course. She concludes that concept mapping requires students to engage in constructivist learning processes to comprehend whole-part relationships in order to create a comprehensive, interrelated picture of the material taught in a course.

Novak concludes that the sophisticated concept maps produced by university students represent, "an enormous amount of knowledge. . . . The construction of the map requires considerable creativity in organizing the structure of the map, selecting important, relevant concepts to add to the map and searching out salient cross-links, indicating relationships between concepts in different sections of the map. Needless to say, the map becomes an important learning experience for my students as well as a unique evaluation experience"¹ (p. 192). Novak notes that scoring criteria must also be specific and clearly related to the objectives of the assignment.

The Concept Map . . .			
▪ Was a helpful tool in exploring communications and pharmaceutical care and in understanding the role of the pharmacist in patient care.		8	
▪ Is challenging.		8	
▪ Is a good experience. I enjoy coming up with new concepts and figuring how it relates to others.		7	
▪ Is a new assignment for me. It really makes you sit down and put everything together.		6	
▪ It organized my ideas from reading and lectures.		5	
▪ Helped me learn and remember better the concepts presented in class.		5	
▪ Is a fun way to link our ideas and show what we know and what we learned.		4	
▪ Helps to clarify knowledge about the practice and the profession of pharmacy.		4	
▪ Is a good and applicable concept that can be applied to other classes used as a study aid.		4	
▪ Was a good, innovative way to learn about communications.		3	
▪ Does not help me understand the relationships we discuss.		3	
▪ Finding time to work on it is the hardest part.		2	
▪ Was somewhat difficult for me to understand and create.		2	
▪ Helped me to see the broad idea. Is a good way to organize ideas.		2	
▪ Takes a lot of time and coordination.		2	
▪ Is helpful in connecting ideas that we related to pharmacy and remembering them.		2	
▪ Is a great opportunity to work in groups and learn pharmacy practices from my peers.		2	
▪ Helps to put info from different classes together.		2	
▪ Seemed like an easy idea at first, but was harder when it actually came time to do it.		2	
▪ Is confusing, but it helps to learn more about the different aspects of health care.		2	
▪ Was a valuable learning tool and more difficult than I had anticipated.		1	
▪ Importance/value remains to be seen.		1	
▪ Proved to be an interesting way to explain something and to teach and learn other concepts.		1	
▪ Was my favorite section of the course!		1	
I learned the most when . . .		I was surprised by . . .	
▪ I was researching the concept map.	1	▪ How helpful concept mapping is as a learning tool.	1
▪ Using the concept mapping.	1	▪ How easy it was to use the concept mapping software.	1
▪ We connected all the lines in the concept map and made the final product.	1	▪ My ability to come up with concepts for the map.	1
▪ Putting all the thoughts together in the narrative for concept map.	1	▪ How easy it is to become carried away with the concept map	1
I will remember this material because . . .		Things became clear to me because . . .	
▪ I used the concept map to give the information structure and how it fits into the scheme of things.	1	▪ I looked to my concept map for organization	2
▪ The concept map has helped me to relate to the concepts better in class and conference has helped to reinforce it.	1	▪ I used a concept map as a tool to learn important information.	1
▪ I related it to concept mapping and was able to organize the material.	1	▪ By using concept map skills, I could organize things better.	1
		▪ I studied from the concept map.	1
I had the most difficulty with . . .			
▪ The concept map		1	
▪ Knowing how to organize the concept map with linking words.		0	
▪ Getting started on the concept map, but once we organized our ideas it became easier.		8	
▪ Finding linking words for the concept map.		6	
▪ Writing the narrative for the concept map.		3	
▪ Formulating ideas for the concept map.		2	
▪ Simplifying and linking concepts together in map. It felt more like brainstorming		1	
▪ Breaking down the concept map topics.		1	
▪ I am not a visual or artistically-oriented person, so this is very difficult.		1	

Table 1: Frequency of Student Responses to Formative Evaluation Questions

4 Sources of Support

I first learned about concept mapping for visual learning through a colleague at another university. I had expressed my frustration to her after the first year of teaching the pharmacy communications course that students seemed to believe the material taught in this course is less important and relevant than concurrently scheduled basic science courses such as anatomy and physiology. I was concerned that the students relied heavily on rote memorization as their primary learning and study method. My colleague has used concept mapping in both her teaching and research, and had the privilege of studying with J. D. Novak of Cornell University. She suggested that I use concept mapping in my course, shared resources with me, and we have continued to dialogue about the concept mapping process and share ideas and teaching strategies.

I found other faculty colleagues at my university who use concept mapping to teach in other disciplines. We shared ideas and resources. Eventually two of us were invited to make a presentation regarding concept mapping for the university's Center for Teaching Excellence. Through presenting my concept mapping work at the national pharmacy education conference, I have found other faculty in pharmacy education using the process in their teaching and curricular planning. We have discussed the issues in concept mapping and learned from each other.

5 Resistance to the Assignment

Resistance to the concept mapping assignment came from several sources and seemed to center around three issues: the assignment's unfamiliarity and related doubts about its value, the required time investment, and resistance to change. I had not anticipated that it would be necessary to promote the assignment to administration and my peers.

5.1 Student Resistance

For most students, learning to create a concept map is an unfamiliar process. Some students will have experience with mind mapping and other brainstorming techniques and must be taught to differentiate what is unique to a concept map, namely the creation of linking words to indicate relationships between concepts, development of a clear hierarchy to differentiate general concepts from specific ones, and the use of cross-links to demonstrate logical connections between different sections of the map. Expectations for students must be clear and specific and a credible rationale for why they are required to undertake this assignment must be provided.

Some students indicated that they did not believe they were visual learners and that the assignment did not suit their learning style. Other students felt that they did not find the concept mapping process natural or comfortable, and one person indicated that he would be glad to never do this again. In a class of more than 100 students, different learning styles will always be present and a variety of techniques are used within the course to accommodate students' learning needs. The educational literature related to learning styles indicates that while many styles can be accommodated within a course, people must also *learn to learn* in different ways regardless of whether they are immediately comfortable. Some students may be uncomfortable with the concept map assignment because of its unfamiliarity and the experience of mental dis-equilibrium this assignment and all learning have the potential to create. Novak (1998) comments that while students may recognize the value of concept maps as learning and evaluation tools, they also recognize that creating a worthwhile map takes significant time and effort. After years of schooling that emphasizes rote memorization of information, instructors should not be surprised that students find being asked to take responsibility for constructing their own meanings to be challenging (Novak, 1998; Sternberg, 1998).

Another source of student resistance was the requirement to work in small groups. This is commonly encountered by faculty who assign group work, and appears to be based on the time commitment required to meet with other students outside of class. It may also indicate students' lack of trust in their classmates. For the second year of this assignment, peer- and self-assessments were designed. The self-assessment turned out to be the most useful because it required students to document the time spent working individually and group meetings. Large time discrepancies within a small group were used as a potential indicator of the need for instructor intervention. The group assignment format was practical for the instructor in a large class, and by the

end of the semester several students indicated that they realized that the assignment was a good experience in preparing to become a member of a healthcare team.

5.2 Faculty Resistance

Other faculty were dubious about the value of concept mapping, but their resistance was mainly concerned with the time this homework assignment required of students. The school's Curriculum Committee advises that for each class hour, students should invest three hours in homework. In fact, this assignment did not exceed that mandate, and in many cases students invested less time. There was sufficient time left over for other course homework, and the assignment did not impinge on the time required for other courses scheduled in the same semester.

5.3 Administrative Resistance

Initially, the school's executive associate dean was excited by the students' concept maps and was very supportive of the assignment. The school's technology committee approved a request to install Inspiration software in the workstations of the student computer lab. The software request stated that, "my intention in creating the concept map assignment was to alleviate my concern that students were leaving the course with disparate ideas that were disconnected from pharmacy practice and other courses in the curriculum." Inspiring students to achieve long-term integration of knowledge is essential in a knowledge-driven profession, and pharmacy accreditation standards state that "the organized program of study should provide students with a core of knowledge, skills, abilities, attitudes, and values necessary to the provision of pharmaceutical care."

I had not anticipated that there would be administrative opposition to using concept mapping in this class, but should have realized that some assertive students will direct their complaints directly to the associate dean of students, and if they aren't satisfied with the response address their complaints to the dean. Rather than be supportive of innovative teaching, the resistance culminated in a directive to discontinue use the assignment just as the Inspiration software was being installed. In explanation, I was told the assignment was "too difficult for first-year students." This is rather puzzling considering that concept mapping has been used with elementary children.

6 Discussion and Conclusions

Incorporating a concept map assignment into an existing course requires the instructor to invest significant thought, time, and effort. It is necessary to review the course learning objectives and think about how the assignment will help students achieve them. Instructors need to develop clear expectations for students and explanations for the assignment as well as a credible rationale for why they will be required to engage in this unfamiliar process. Grading concept maps also requires a large time investment particularly when several grading points are spaced across the semester. The reward for the instructor are that concept mapping can help students to understand abstract material within a course, integrate learning from related courses, and engage students in grappling with conceptual material so that they are challenged to move beyond rote memorization to meaningful learning. Instructors can dialogue with students about course topics in a novel way and gain appreciation for the depth of student learning. Students can benefit by gaining experience with a new learning tool and in the way this assignment is structured, students also gain experience with teamwork and collaborate as they work to create a mutually acceptable final product within an imposed deadline.

Despite all these positive benefits, a faculty member's good intentions and investment of time and effort can be misconstrued and devalued. No other part of the faculty role consumes so much intellectual energy as teaching, and yet faculty creativity is infrequently documented and shared (Bernstein, 2002). Faculty members usually have a great deal of latitude in selecting teaching methods and assignments. However, this was not the case in this instance, academic freedom notwithstanding. It was clear that I might have been more successful if I had invested more effort in promoting visual learning to my peers and administrators.

7 Acknowledgements.

Travel to this conference is funded in part by a *2004 Inspired Teacher Scholarship for Visual Learning* provided by Inspiration Software, Inc.

8 References

- Bernstein, D. (2002). Representing the Intellectual Work in Teaching Through Peer-Reviewed Course Portfolios. In S. Davis & W. Buskit (Eds.), *The Teaching of Psychology: Essays in honor of Wilbert J. McKeachie and Charles L. Brewer* (pp. 215-229). Mahway, NJ: Lawrence Erlbaum & Associates.
- Donald, J. G. (2002). *Learning to Think: Interdisciplinary Perspectives*. San Francisco: Jossey-Bass Publishers.
- Heit, E. (1997). Knowledge and Concept Learning. In: K. Lambert & D. Shanks (Eds.), *Knowledge, Concepts and Categories* (pp. 7-41). Cambridge, MA: MIT Press.
- Novak, J. D. (2003). The promise of new ideas and new technology for improving teaching and learning. *Cell Biology Education*, 2, 122-132.
- Novak, J. D. (1998). *Learning, Creating and Using Knowledge: Concept Maps as Facilitative Tools in Schools and Corporations*. Mahwah, NJ: Lawrence Erlbaum & Associates.
- Novak J. D., & Gowin, D. B. (1984). *Learning How to Learn*. Cambridge, UK: Cambridge University Press.
- Roth, W., & Roychoudhury, A. (1993). The concept map as a tool for the collaborative construction of knowledge: A microanalysis of high school physics students. *Journal of Research in Science Teaching*, 30(5), 503-534.
- Sternberg, R. J. (1998). Metacognition, abilities and developing expertise: What makes an expert student? *Instructional Science*, 26, 127-140.
- Trepagnier, B. (2002). Mapping sociological concepts. *Teaching Sociology*, 30(1), 108-119.