

**AC 2009-2534: STUDENTS' LEARNING SATISFACTION AND PROGRESS
TOWARD A NANOMETER COURSE, EMPLOYING A CONCEPT MAPPING
LEARNING WEB PLATFORM**

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Students' Learning Satisfaction and Progress toward Nanometer Course Employing Concept Mapping Learning Web Platform

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ABSTRACT

The purpose of this study was to explore students' learning satisfaction when applying concept mapping with computer assisted teaching tools and to reveal students' learning progress in Nanometer course. The research method adopted in depth interviews. A total of six participants from the Nanometer course at National Kaohsiung University of Applied Sciences in Taiwan participated in interviews lasting 30 to 60 minutes. The research results revealed that students satisfied with the concept mapping instruction in the Nanometer course. The concept mapping instruction did effectively improve students' comprehension and retention memories as well as inspire students' learning interests and enthusiasm for Nanometer technology. Additionally, students also agreed that concept mapping instruction is an applicable approach to be applied into other professional fields or self-applications besides the science-related subjects. Finally, results even further indicated the deficiencies and suggestions proposed from students for concept mapping instruction.

Key-words □ Concept mapping instruction, Nanometer course, learning satisfaction, learning progress

INTRODUCTION

Concept Mapping has received considerable attention in education fields during the past decade, which has been under discussion about approval and recognition as a useful teaching and learning approach. In a bunch of previous researches, most researchers indicated that concept mapping successfully and effectively reinforced students' conceptual integrated knowledge (Chang, 2007; Chiu, 2004; Freeman, 2004; Marchand, D'Ivernois, Assal, Slama & Hivon, 2002). Moreover, concept mapping has been demonstrated to be a successful learning tool towards science related subjects since it includes the visual learning and computer assisted tools, such as power point, animations, video, audio, web pages, e-books, blogs, and digital courses to stimulate students' learning preferences and learning performances (Alpert & Grueneberg, 2000; Barker, 2005; Guastello, Beasley & Sinatra, 2000; Kinchin, 2006; Kinchin, 2000; Laigh, 2004; Zele, 2004). As a result, the benefits of concept mapping instruction have been always taken as an important core by a number of scholars mentioned above from many different viewpoints.

Concept Mapping and Meaningful learning

As for the meaningful learning, Kinchin (2006) addressed that concept mapping was explicitly embedded within a constructivist approach of instruction with the aim to facilitate meaningful learning. The issue has been undertaken to show that students had better memory skills and better comprehension when making use of concept mapping as the chosen instruction (Kinchin & Hay, 2000). Some other researchers even pointed out that using animation to present ideas and notions would facilitate students' learning processes in better and effective way (Guastello, Beasley & Sinatra, 2000; Kinchin, 2000). Similarly, Lee and Nelson (2005) indicated that visual learning did help students to clarify their thinking and organize the new knowledge to elaborate and complete the presentation of knowledge. Teachers and students are supposed to have active interactions during the concept mapping instruction (Kinchin, 2003). Therefore, being different from the traditional teaching technique, concept mapping not only inspired students' learning interests, but also created an efficient learning environment for meaningful learning.

The Concept Mapping Development in Taiwan

In terms of the development of concept mapping in Taiwan's education community, a researcher Qiu (1989) used to mention that the concept mapping instruction has become a mainstream in Taiwan's education; more and more teachers therefore started applying it into their curriculum. However, looking from another side, the teaching tools utilized primarily in Taiwan's classroom activities still mainly focus on work sheets, conceptual graph poster displays, and text-based tools (Lee, 1997; Li & Wang, 2004). Therefore, the research towards the use of computer assisted teaching tool is always needed in Taiwan's community in order to help students better comprehend complicated concepts and extend the memory, especially for the high technology-based subject, such as Nanometer Technology.

PURPOSE OF THE STUDY

In this research, the researcher attempted to use concept mapping with computer assisted teaching tools as the main teaching approach to assist university technology students in learning Nanometer-related course to see how much progress the students achieved. In addition, based on this research, the study focused on designing a well-functioning concept mapping learning web platform to investigate students' meaningful learning satisfaction.

METHODOLOGY

Applying the same techniques and main questions for each in depth interview, this research was collected on 6 students, seniors from National Kaohsiung University of Applied Science, residing in Taiwan. The main purpose of the in depth interview was to understand the working processes of students' learning and satisfaction towards Nanometer. All of the informants took a pre-Nanometer course test to check their prior knowledge and the post-Nanometer course test to evaluate their learning achievements and measure their satisfaction. The interviews were held before and after taking the test. The research tool

adopted semi-structured interview outline, which included concept mapping teaching, teaching methods, concept mapping teaching descriptions, and concept mapping teaching barriers. Finally, the interview data concerning students' learning processes and satisfaction, before and after receiving concept mapping instruction, was analyzed based on the Ground Theory.

RESULTS

The collected data of this qualitative research was basically categorized by nine assertions as shown in Table 1; each issue fully explains the progress of students' learning and further explore the differences/consistencies between pre-test and post-test of receiving concept mapping instruction. In terms of the coding below, the coding B1002, A1002, "B" refers to the pre-test interview and "A" refers to the post-test interview. "1" refers to the first student and "002" refers to the second text in the transcript.

TABLE 1: Results of in depth interviews

Issue	Pre-test Interview	Post-test Interview	Progress
1. How students think of concept mapping teaching core?	<i>"It is my first time to hear about concept mapping."</i> (B6099)	<i>"Concept mapping is a hierarchical structure and it links to each concept meaningfully. I think it extends many aspects and it really helps students to learn."</i> (#B6099)	Students' cognition toward concept mapping teaching core transformed from ambiguous to clear
2. What learning satisfaction students possess for concept mapping teaching method?	<i>"The teacher uses a computer to display power point as the auxiliary teaching tool, then, the teacher links power point and graphs to the lecture."</i> (B1094) <i>"The teacher said he will use Flash in the future chapters, but he hasn't used it yet."</i> (B4016)	<i>".....This teaching method impresses me and it is organized. Some concepts are explicit and they are not easy to forget."</i> (A1048) <i>"...The diagram showed us three ways, one was contact, and the other one is un-contact. They are shown by the picture files and the teacher used Flash to help us better understand."</i> (#A6059)	Concept mapping, a different teaching method from the traditional instruction, which left student with a positive satisfaction toward the course teaching material
3. How concept mapping improve students' memory process and comprehension?	<i>"...We can memorize through pictures and discover how to apply concepts and it will be easier to answer the teacher's questions."</i> (B2038) <i>"The pictures help us to comprehend Nanometer. We can associate with Nanometer theory in thinking and deducing. It helps us to memorize the teacher's lectures."</i> (B3159)	<i>"Concept mapping utilized interesting materials and factual cases to make a description of Nanometer. It is easier for students to remember the concepts...."</i> (A5031) <i>"...The pictures help us to visualize and comprehend the contents. I had heard something about Nanometer, but I have never seen it. I now recognized it immediately when I see the pictures."</i> (A3138)	Concept mapping effectively improved students' memory processes and comprehension during the learning process in a more practical way
4.	<i>"I read the books that the teacher</i>	<i>"We tended to have more initiative to figure</i>	Concept mapping

How concept mapping relates to students' learning effects and willingness?	<i>recommended only if I was interested in the subject.</i> [B2188] <i>"I find the answers on my own, and surf the internet to find the pictures, then, I sort them. I think when students learn the subjects on their own, and they pay more attention."</i> [B 6222]	<i>out the stuff on our own. Concept mapping is interesting and it inspires my interest in Nanometer. I also searched for some books to read."</i> (#A6027) <i>".....Nanometer combined with concept mapping is interesting and makes me want to learn more about Nanometer."</i> [A1321]	increased the learning effects that inspire students' willingness to learn for the subject
5. How student absorb the knowledge with concept mapping teaching?	<i>"Concept mapping teaching facilities, such as, computers and projectors, accelerate teaching. It is unnecessary to hold a book and copy it from the blackboard."</i> [A1022]	<i>"When I am tired I feel sleepy. It gets worse if I only watch power point without taking notes. Sometimes, the teacher just keeps displaying and talking."</i> [A3261] <i>"...If the teacher uses traditional teaching methods, at least the teacher can ask students questions and students might try to respond."</i> [A4166]	Concept mapping raised teaching efficiency and activate teaching content, however, students were incapable to absorb
6. How interaction goes among students and the teacher during concept mapping instruction?	<i>"I think the interaction between the teacher and students is more like the teacher asks questions and the students answer. Or students search for information that they are interested in, and then, they share it or talk to the teacher after the class."</i> [B5069]	<i>"Interactive teaching should be fun, but there is no interaction..... The interaction only happens when the teacher forces us to interact."</i> [A3038] <i>"Everyone doesn't know much about Nanometer, and much of the knowledge is related to high-technology. So I think it is quite difficult for students to ask questions or discuss."</i> [A5023]	With concept mapping teaching, students had less interaction with teacher during the learning procedure
7. How students agree to utilize the concept mapping instruction?	<i>"Concept mapping should be popularized because it is more active than traditional instruction. I personally encourage teachers to utilize it."</i> [B1137] <i>"But concept mapping has to use multiple types of materials. The teacher needs to do the extra preparation work."</i> [B6056]	<i>"I prefer that the teacher use concept mapping instruction if it is a technically abstract subject."</i> [A6253] <i>"Of course we hope the teacher utilizes concept mapping instruction methods, but it's up to the teacher."</i> (#A5085)	Students had the consistent satisfaction to agree the utilization of concept mapping instruction and applications
8. How students evaluate concept mapping instruction?	<i>"It is systematic teaching and it's also a good way to introduce a new subject to students."</i> [B5096] <i>"I give it a high evaluation because I think it has more benefits than shortcoming. I grade it an 80."</i> [B6183]	<i>"Concept mapping has abundant teaching material, especially the animation. So, concept mapping should be able to be applied to the all subjects."</i> [A5323] <i>"I grade concept mapping 80 because it utilizes power point and animation to activate the content. It deserves a high-middle level evaluation."</i> [A6285]	Students consistently have high identification for the value of concept mapping instruction
9. Is concept mapping instruction	<i>"Concept mapping can be extended to areas like Mechanics, or other abstract subjects. It also can be applied to Operating Theories...."</i> (#A1138)	<i>"It made my project more interesting than collecting and reading information and drawing the map by myself."</i> [A2172] <i>"My English isn't good, so I can apply it to</i>	Student agree the concept mapping is an effective approach to be

capable to be
extended to
other fields?

"Maybe it can be applied to Engineering Mathematics, or some formulas and deductions....or to LCD Manufacturing Procedures, 3D Drafting, Hydromechanics and Heat Power." [1] B4090 [2]

memorized vocabulary because each picture is a story and it will enhance my memory skills. [3] B6028 [4]

extended to other
professional fields
or self-applications

DISCUSSION AND CONCLUSION

To sum up the results, the researcher found out concept mapping with computer animation technology had received satisfaction from students' responses. In other words, students were able to easily catch up to the subject matters and the concepts of Nanometer technology through concept mapping instruction. This shows that concept mapping effectively assisted the students' Nanometer technology cognition procedures. In addition, the results also show that most of the students agreed that concept mapping combined with flash animation broke the traditional teaching barriers to inspire students' learning interests and enthusiasm for learning Nanotechnology. From the students' Meta-cognition aspects, concept mapping was a powerful learning strategy to stimulate students for searching deeper into the subjects since the animation displays were more dynamic and interesting for them. Moreover, students even agree to design the concept mapping diagram on their own and extend the construct to other professional fields. It fully explains that the concept mapping combined with computer auxiliary is a practical instruction tool to be applied in any other subjects besides science-based fields.

On the other hand, the results also point out some deficiencies of concept mapping, such as the less frequent interaction between students and the teacher, the difficulty of course content absorption for students, and the necessary to prepare more efficient and active course material for teachers. Furthermore, the physical learning environment is another important factor within students' learning process through concept mapping instruction. Consequently, with positive feedbacks and negative shortages, students still agree concept mapping instruction did improve their learning performance, thinking abilities, and problem solving abilities as well. Students were willing to continue applying concept mapping approach into other subjects even though the beginning works were sort of hard for them.

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