CONCEPT-MAPPING ACTIVITIES TO ASSESS STUDENTS' UNDERSTANDING OF NEW KNOWLEDGE

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Abstract. This study explores how constructivist teaching and Concept Mapping helped my students learning. A crucial aspect of my teaching work was observing my students during their work in order to understand how they construct their Concept Maps which showed me how they learn. During my lectures I introduced new concepts regarding my subject called Information and Knowledge Strategy. While learning the new elements of knowledge, the students were expected to perform searches on the internet. The browsing behavior differed from student to student. As a result of personalized filters the students' past interests determined what they found. So using the same keywords, they ended up on difference websites. I focused on the students' ability of finding and validating new knowledge on internet. Drawing Concept Maps students developed into more responsible self-directed learners. Every student was making different connections between topics, so their explanations of taxonomies reflected their own knowledge. I could observe how the main concepts of my subject were picked up by my students meanwhile they were drawing their own Maps. This activity was a highly challenging work both for my students as well as for me.

1   Background Knowledge

The content of our thoughts is altered by internet. As a teacher I will face new challenges in the 21st century which are shown by the most significant thinkers (www.thinkers50.com). I am trying to contextualize them and attempt to respond to them. What can the students do with the unlimited information at their fingertips? On the one hand we have too much information, namely information overload. On the other hand information under-load (Gates, 2006). The students and also the teachers increasingly overwhelmed by information, but we have no tools to validate them effectively. Solving the problem of the information underload is a challenge for the Knowledge Workers. According to Anderson (2006:125) on that market everything is measured by the reputation. A culture of idea-spreading is another challenge for Knowledge Workers. TED is a nonprofit organization devoted to Ideas Worth Spreading (www.ted.com). These considerations guide my choice of sources as well as content for my teaching material; resulting in not only using the newest significant ideas of high complexity but also enabling my students to pursue their own interest in relation to the class. In November 2003 when I participated in the 2nd IASTED International Conference in Scottsdale Arizona I meet John W. Coffey. The benefit of knowledge representation was well known to me, my presentation (Velencei, 2003) in Scottsdale was focused on our Expert System which is based on symbolic knowledge representation. I was highly impressed by Coffey's presentation. In no more than a year I started to use this tool in business coaching. As we described it in our paper (Baracskai, Dörfler, Velencei, 2008) Concept Maps and Expert Systems are both in the soft toolbar of knowledge modeling. In that paper we presented the ideas elaborated in the form of a Conceptual Model and we also mentioned few additional ideas as our plans for future research. We combined different kinds of Concept Maps and our Expert System in order to map organizational knowledge.

2   My Teaching Approach

This paper is not intended to present constructivist pedagogy only I note strongly how this approach can support my teaching work. Knowledge is constructed and not merely reproduced. This construction is personal and individualistic. (Dörfler, 2010) When students encounter new knowledge, they relate it to their previous knowledge. They are constantly doing something to the new knowledge and what they already know and in the process create of their own knowledge. According to the constructivist pedagogy knowledge cannot be imposed or transferred intact from the mind of the knower to the mind of another. Even if I teach very well, students may not learn unless they have constructed their own knowledge. By reflecting on students' experiences, they construct their own understanding of the world they live in. Information and Knowledge Strategy demonstrate an innovative, new subject in our University. The main concepts of this subject are accept the necessity of Knowledge and Information Sharing, describe the era of abundance, understand the Freeconomics, identify the Most Powerful Thinkers and contextualize the new elements of Knowledge.

2.1   Flow can be achieved

Concept Mapping activity does not exclusively imply the "draining" of students' knowledge, but organizing it and often enriching it. What is required for students to take organizing their knowledge as a thrill? Based on Csíkszentmihalyi's (1990) idea we (Baracskai, Velencei, 2002) showed the states of a Decision Making expert

during co-work. I discovered some similarity between knowledge elicitation of experts and students in a state of Flow.
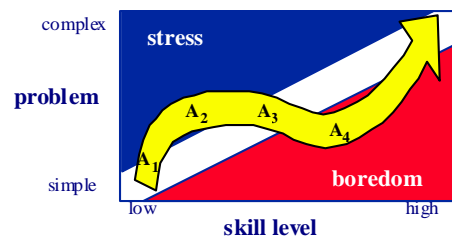
Figure 1. Boredom, Stress and Flow

Boredom and stress are two anti-thrills. To find state A_1 I showed some Concept Maps drawn by my previous classes' students. When the Concept Mapping activity began, it gave a thrill to my students. In higher education, traditional approaches to teaching are mainly based on a 'single right solution, but I have to mention objects can have even different meanings. Students can conveniently work out the elements of their knowledge if it does not bore them or give them stress. In state A_2 too much of knowledge is demanded, so they feel stressed. In state A_3 the preparedness of the students is better and they find pleasure in the work again. If the level of requirements does not rise, they can reach state A_4 where they get bored. Nobody can work in any of these anti-thrills for too long. Flow is a state of consciousness which could be achieved by my students with Concept Mapping. According to Csíkszentmihályi (1990) and my own experience I enumerate the main characteristics for enjoying the learning process, i.e. for achieving the state of Flow.

- Challenging task: If the task is too easy, students will get bored and eventually stop. If the task is too difficult, they will get frustrated and eventually stop. Either way, they lose.
- Working without intrigues: There is no single correct solution. Every Concept Map is based on students' previous knowledge so there could be more than one correct solution.
- Sense of achievement: While drawing their Concept Maps the students could recognize the results immediately. Observing their own Maps they could concentrate continuously.

Students could choose any themes of my subject, and could choose any approaches. Flow blossoms when students' skills are fully engaged. The challenge absorbs them so much that they lose themselves in their work, becoming so fully concentrated that they may feel "out of time." In this state, students seem to handle everything effortlessly, nimbly adapting to shifting demands. A state of Flow may be the ultimate motivator. "The original motivation for the creation and use of Concept Maps was to externalize and evaluate students' conceptual knowledge and misunderstanding in a knowledge domain." (Coffey, Carnot, 2003:18)

2.2   Working in Classroom

We use CmapTools for graphical depiction. It has high importance in teaching as the resources can be identified more effectively and in a shorter time. There is no best method to do this, but by observing some successful Content Maps, I could identify the main characteristics of a useful design. By redrawing their Maps, students are encouraged to understand the meaning of the new elements of knowledge better. I was really surprised at how many of them generated additional details. Subsequently the students shared their Concept Maps with two-three classmates. The main result of the discussion between them was identifying similarities and differences in their Maps and reconciling them. This provided opportunities to articulate their thoughts and learn from each other. To effectively enable my students, I was always challenging them to reach beyond their current ability level. The challenge for me was to find the balance between supporting and pushing them to act independently. While they were drawing I did not tell them exactly what and how to do, but I tried to refine their thinking through engagement and enhancing their own Concept Maps. Drawing Concept Maps made my students able of structuring knowledge and representing the process of their knowledge. For my students adding linking words onto their Concept Map was the most difficult task. They grouped and organized differently the new elements of knowledge. Highly personalized maps were drawn by each student. Figure 2 depicts an esthetically pleasing map in which one of the students focused on websites.
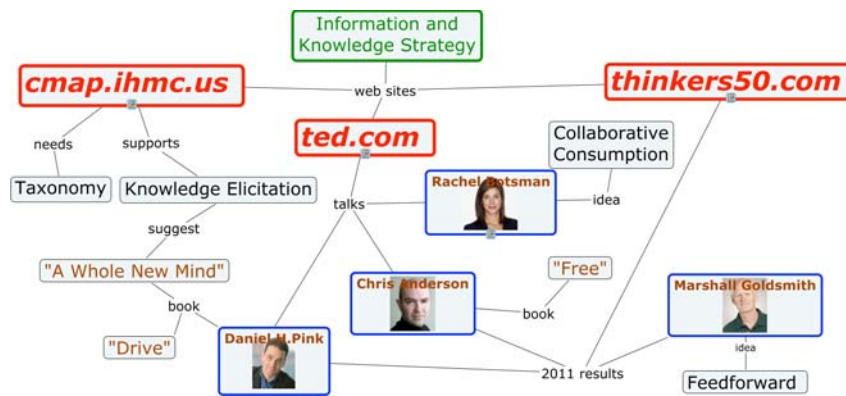
Figure 2. An esthetically pleasing concept map drawn by a student

Another Concept Map is included to illustrate how differently my students understood this subject. One of them reflected only on one main topic, called "era of abundance" shown in Figure 3.
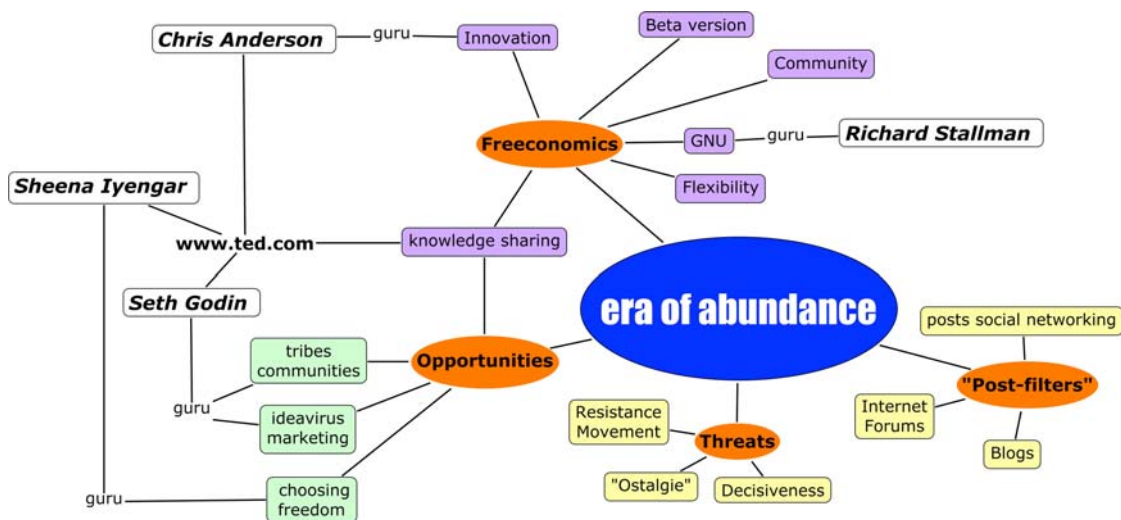

Figure 3. A concept map drawn by a student

Based on my experience (from this class as well as my previous teaching) I outline the necessary competencies for those teachers who plan to use Concept Mapping activities in their classrooms. The enumeration is not in order of importance. These are not findings emerging from what the students accomplished but findings emerging from reflecting on the process and retrospectively identifying what was necessary for enabling this accomplishment of the students.

- Paying attention: This is the ability to sense students' emotions. It is to focus on what is said and what they ask.
- Thinking in images: Students' images about the world are not created by "summing" separate pieces of knowledge and information. The teacher has to see the whole picture before the students start to draw.
- Emotional consciousness: Teachers need time to ascertain the faith and ideas of their students, and have to tolerate the possible unpunctuality.
- Sense of time: The activity of Concept Mapping has to take place within a given period. The given deadline, which is, for supporting students, approximately two-three hours, must not be significantly exceeded.
- Non-verbal communication: Delivering a message by gesticulation and expressions is a part of a teacher's work. Students are usually sensitive and various negative gesticulations block them, while positive ones stimulate their readiness for co-operation. "There is emotional credit not in what he says, but how he says it." (Goleman, 1998)

- Open mind: Teachers should be ready to accept new ideas before, during and after the activity of Concept Mapping and should be free of any prejudices, but not without a final judgment.
- Creating a good atmosphere: Drawing a Concept Map is a tiresome work. Breaks should be often taken when the emphasis comes on chatting. A sense of humor is useful as well. "We can also help someone in over viewing a problem by telling a good joke. Laughter stimulates for grand style thinking and perceiving connections we would have missed otherwise." (Goleman, 1998)

3   Conclusions

The goal of this paper is to present a teaching approach which helps assessing students' understanding of new knowledge. Concept Maps have great potential as assessment tool, but the design of a Concept Mapping activity can change what is measured/assessed/evaluated. I adopted my students' contextualization as my viewpoint, so the Concept Mapping activity clearly showed me how their understanding improved. I could quickly see gaps in their learning and adapt my lesson plans. The Concept Mapping activity promoted a friendly, cooperative climate. In spite of limited usefulness of the exam method, my students' results were excellent because they took the exam in a state of Flow. Paying attention and emotional consciousness, as teacher's features were the most important. In my classroom a culture of idea-spreading could be developed. Using Concept Mapping generated a highly interactive learning environment, where my students became able of obtaining and developing knowledge, willing of sharing and able of articulating that knowledge.

4   Acknowledgements

5   References

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