LEARNING SCIENCE FROM DIGITAL TEXT WITH CONCEPT MAP DESIGN AND INTERNET IN HIGHER EDUCATION

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Abstract. During last decade digital books and also Internet are widely used in higher education. New technical devices like mobile computers and tablets have increased the potential of future learning materials which have a flexible format system and include dynamic media and links. Internet also offers plenty of learning materials in all kinds of formats and structures, like Wikipedia that students widely use for course–related research. It is often suggested that digital learning materials can be more flexible and attractive because of the dynamic features. But these dynamic features can also provide problems for students. Students easily "get lost" and are not able to read for understanding. However, previous studies have shown that students can gain a deeper understanding of the connections between the science concepts and principles when the concept maps are used in the digital learning materials. Based on the original idea of Novak and Gowin (1984) concept maps represent meaningful relationships among concepts and serve as a way to organize knowledge in an integrated manner. Concept maps can be seen as "a schematic summary" of ideas. According to Puntmabekar et al. (2007) there seems to be great potential to apply concept maps on digital text design because guidelines for designing effective hypertext are abstract and based mainly on common sense.

The purpose of this pilot study was to investigate how university students learn science topic, photosynthesis, by using digital text with concept map design or Internet. The hierarchical concept map was used as design principle of the digital text representing the main concepts connected to photosynthesis. The participants were 16 first year university students who had educational science as major subject. The study was realized with pre-and post-test design. The tests consisted of 13 statements, covering both facts and problem solving questions. The study had two phases with crossover design. First, participants were randomly assigned to either Internet or digital text environment. After immediate post-test the treatment was counterbalanced. The empirical phase lasted 70 minutes.

The results indicate that the digital text with concept map design supported more effectively science learning among higher education students than Internet. The order of the learning materials provided had an essential role. The student group which started with digital text material with the concept map design improved their learning more than the group which had first the Internet. Both groups learnt significantly better with digital concept map text design than with Internet. Furthermore, students better answered the statements requiring problem solving than the fact oriented questions in the concept map digital text treatment.

Finally, it can be suggested that digital text material using hierarchical concept map design can perhaps scaffold students in constructing relevant conceptual understanding better than open Internet sources in higher education. Therefore, concept maps may play an important role in developing future digital learning materials for enhancing learning also in higher education. Further randomized experimental studies assessing the impact of digital learning materials on student performance are needed.

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