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CONCEPT MAPPING IN CONSTRUCTION MATERIALS TECHNOLOGY

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Abstract. Civil Engineering Science is a multidisciplinary type of science that requires enhanced understanding, integrated application of engineering, scientific, and mathematical principles. In particular, materials science is an interdisciplinary subject, spanning the physics and chemistry of matter, engineering applications, industrial manufacturing processes and environmental considerations such as climatic changes on a local or wider scale.

In the interdisciplinary approach, the differentiation of instruction permits the engineering students alternatives and opportunities to prepare their culminating reports in a variety of ways including writing reports in according to pc-lab exercises, organizing debates (e.g. timber products or aluminum alloys for windows frames), designing PowerPoint presentations and concept maps. In the context of the module "Constriction Materials Technology" in the program BSc (Hons) Civil Engineering and Construction (MC) of Mediterranean College, accredited by the University of Derby (UK), the module lecturer Mr. Kabitis I. chose to assess the understanding of the basis of materials properties for design applications within the construction sector through concept maps designed by student groups.

The selection of construction materials for a specific civil engineering application requires methodical, thorough, and imaginative thinking. The main idea behind concept mapping, as a meta-learning strategy in the frame of constructivism based on the Ausubel-Novak-Gowin theory of meaningful learning, is that thinking or understanding of material properties can be assessed by asking a student group to construct a cognitive (or concept) map by relating concepts or terms (such as creep, concrete, modulus of elasticity of the aggregate), in a hierarchical knowledge structure. For example, the creep, as one of the main mechanical properties of the concrete, depends on the modulus of elasticity of the aggregate, which is a major component of the concrete. In this example, the assignment tutor can assess the hierarchy levels of this proposition (e.g. aggregate as component of the concrete, creep strains as mechanical property), the cross-links (e.g. between the concepts "creep strains" and "modulus of elasticity") and the linking words or phrases (e.g. "depends on") that student group used constructing the concept map.

Two concept maps, constructed by two student groups of University of Derby (UK) in their Construction Materials Technology module, are presented. Each group chose a specific material (concrete, timber) and prepared a poster using the free software CmapTools which offers the ability to create concept maps, to share them using Internet technologies and to work collaboratively. Each group prepared a concept map for public and professional viewing encompassing raw materials, manufacture processes, the effect of moisture, temperature and other factors on the mechanical properties of the material, sustainability credentials and the laboratory tests. Both of the concept maps have a lot of concepts, branchings, examples and crosslinks and reveal students' cognitive structure due to prior knowledge and current experiences provided by module learning events (e.g. slump test in the engineering lab of Mediterranean College). Students' group consisted of three students Katakouzinos P., Ntasis G. and Zgherea Cr. chose to construct a concept map with major concept "concrete" and students' group consisted of three students Palatsidi Efth., Vardalachos N. and Liveris-Tzelas T. chose to construct a concept map with major concept "timber.