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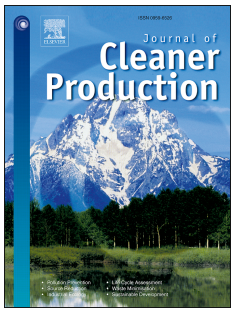

Improving engineering education for sustainable development using concept maps and multivariate data analysis

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ACCEPTED MANUSCRIPT

Improving Engineering Education for Sustainable Development using Concept Maps and Multivariate Data Analysis

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Abstract

In education for sustainable development (ESD), the inclusion and handling of a multitude of perspectives and the interconnectivity of different dimensions of the world are often targeted. Based on the assumption that concept maps can capture notions of this learning, concept maps generated by students were used to complement a large number of other empirical data from several years of a master level course module in engineering education with a specific focus on ESD. Multivariate data analysis (MVDA) was used to find correlations between the many different variables. Empirical data included data on the background of students, on their participation in different teaching and learning activities (TLAs), and on their performance in different types of assessment, including concept maps generated before and after the course.

According to the concept map results, the students seem to develop, in general, a more balanced and systemic view during the course. The use of MVDA was helpful in revealing both expected and unexpected co-variations. Results show that previous experiences (student background) is an important factor behind high performance and that TLAs in the course are providing complementary knowledge.

The main focus of this paper is on how the innovative approach of combining the use of concept maps and MVDA can provide useful understanding of possible correlations between student characteristics, their participation in TLAs and their performance in assessments in an ESD course. The use of concept maps was seen as useful in capturing important notions of ESD while the MVDA enabled quick analysis of the large data set.

[1] Morgan Fröling tragically died on November 14th 2017. He is greatly missed.

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