DEPARTMENT OF MINING ENGINEERING RESEARCH

Engineering education: An integrated problem-solving framework for discipline-specific professional development in mining engineering

This research is based on the premise that the purpose of engineering education, in general, is to deliver engineering practitioners who are intellectually capable of identifying, structuring and solving complex problems, and that solving engineering problems is systemic. The solutions to problems are viewed as objects, tools, processes and systems. The purpose of this article is, however, to specifically explore some of the aspects of the intangible world of mining engineering from a generic problem-solving perspective, which would also be applicable to any other engineering discipline. This is done by focusing on higher-order intellectual processes when processing information in the problem-structuring and problem-solving space. As such, this article builds on a previous study in which the intangible world of the mining engineer was identified as worth investing in. The article begins by briefly reviewing the complexity of the mining engineering problem-solving space and the background and role of a generic cognitive approach to problem solving in the mining engineering curriculum at the University of Pretoria (UP). Several dimensions of extended cognitive processing are then detailed, explaining why the early phases of problem solving are difficult to learn, and more difficult still to teach. An outline is given of the classification of types of mining engineering problems, and its determinant role in the dynamics of information processing. Conceiving, designing, implementing and operating (CDIO) as an overarching engineering methodology is discussed, together with the subsequent mapping of cognitive phases onto CDIO stages. Finally, the researchers pose an open research question that seems important to answer in order to identify the best pedagogical practices for improving problem-solving capabilities not only in mining engineering, but also in other engineering disciplines.

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