

Gamification for Technology-Enhanced Education in the Mineral Value Chain: Mining Simulation Game for Teaching the Geometallurgy Concept

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The similarity between gaming and learning has led to a growing interest among educators in gamifying the learning process to make it more appealing and engaging. The incorporation of game elements in non-gaming situations to motivate learners is what gamification in education involves. In preparing young adults for future roles in the mineral industry, digital teaching and learning concepts, coupled with virtual technologies like gamification, can be useful in helping students grasp complex concepts. As part of the "Innovative and hybrid education in mining value chains - Nordic context" work package within the EIT Raw Materials project *Emeraldinho*, this study aims to improve student learning in the area of geometallurgy by developing an educational mining simulation game. The game allows the students to immerse themselves in decision-making aspects in the different stages of the mining value chain: exploration geology, mining, mineral processing, and mine rehabilitation. The game utilizes a three-dimensional synthetic exploration and geometallurgical database of an iron ore deposit. It is the student's task to find, mine, and process the ore in the best possible way given the engineering, financial, and environmental constraints in the game. The student is also provided all the information required to establish a mineralogy-based geometallurgical program that can be utilized to create predictive models necessary for successful mine planning. This hands-on approach enables students to comprehend concepts beyond theory and see how changes in one area can impact other sections of the mining value chain. The game's geometallurgical approach promotes a holistic and responsible mindset and encourages sustainable mining and beneficiation methods to minimize the mineral industry's environmental impact.