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Developing thinking skills through green chemistry texts in a web-based learning environment

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1 Abstract

The ability to compare and engage in argumentation in real-world situations is an essential competence in a modern world. This design-based research (DBR) study investigates the possibility of fostering the development of representation, comparison and argumentation skills in high-school students. This was done using web-based texts and assignments in the context of green chemistry, without any classroom support by teachers. The final version of the intervention was comprised of five texts on green chemistry accompanied by guides for comparison and argumentation skills. Assignments were designed to reflect various levels of each skill and various levels of scaffolding. The results demonstrate a significant improvement in the students' medium level of comparing and arguing. Results indicate that online learning materials in their final form can foster medium level comparison and argumentation skills in a relatively short time frame. However, developing higher level ('advanced') comparison skill requires more intensive support.

This DBR study yielded important practical design implications in relation to hypermedia-hypertext learning environments. Challenges involved in digital learning environments, as they are implemented nowadays in Israeli high schools, are presented. The notion that treats 21st century students as 'digital natives' was found to be questionable. Many students expressed ambiguity towards the digital learning platform. One of the major obstacles involved reading texts on screens, which I believe overlies a broader issue of reading comprehension. I believe this study is the first to deal with the skill of comparison in the field of science education. As such it contributes to the construction of a theoretical framework of the skill of comparison.