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HYDROGEOLOGY STUDENTS' CONCEPTIONS OF SCALE REGARDING GROUNDWATER

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The science education community has only recently engaged in examining the teaching and learning of groundwater concepts and principles. Results from initial studies in the U.S. indicate that alternative conceptions relative to those held by the scientific community flourish regardless of geography, socio-economic status, race, gender, age, and level of education. The majority of these conceptions involve inappropriate mental models that impose surface-oriented hydrologic structures and processes on subsurface environments. We conducted a study to determine the role of scale in the development of such alternative conceptions.

The study population consisted of a purposeful sample of 23 undergraduate and graduate students enrolled in an introductory hydrogeology course at a small university located in a major coastal city in the southeastern United States. Participants completed three instruments regarding issues of structure, scale, and perceived importance of groundwater before and after course completion. The mixed-methods approach employed in this study incorporated simple descriptive statistics of multiple-choice item responses and qualitative analysis of drawings and open-ended responses. All qualitative data were coded and categorical aggregation was used to identify themes. We triangulated the data by comparing all three sources and making assertions based on congruency.

Results indicate that inappropriate conceptions of groundwater are common even after successful completion of an introductory hydrogeology courses. Although some of these students still possessed naïve understandings, most made appropriate use of terms such as porosity and permeability. The application of appropriate scale to these terms, however, is another issue as we identified student ideas of typical pore size on the order of kilometers. Implications include consideration of spatial reasoning in deciding how more abstract geologic concepts like groundwater are taught. More specifically, teachers need to address groundwater concepts for different levels of spatial abilities, involving the progression from concrete forms of instruction (e.g. physical models) to the use of strategies that employ more abstract representations (e.g. employing abstract 3-D models to mapping of subsurface systems).

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