

The characterization of systems thinking skills in the context of earth systems among high school earth science students

Tamar Basis

Advisor: Nir Orion

The current study deals with the characterization of systems thinking in the context of earth systems among high school students who major in earth science. The theoretical base of this study is the hierarchical model that developed by Ben-Zvi Assaraf and Orion.

The research combined qualitative and quantitative methods and the collected data included pre/post-instructional questionnaires of system thinking skills and student-generated artifacts. The teachers' perspectives served as secondary data sources.

The population included 74 high school students from a single prestigious high school, divided into three cohorts during the '05-'07 academic years..

The findings indicated that most of the students began with poor systems thinking skills, indicating that low instructional emphasis was given to these skills prior to this study. Following instruction of an earth science curriculum, these skills developed significantly in many, but not all students, due to the following factors: the initial cognitive ability of the students, the curriculum that builds off the outdoor learning experiences, knowledge integration activities, the teachers' mediation and guidance, the teachers' emotional support of the students, the students' level of involvement, and the students' perception of the learning process. Students develop systems thinking skills only when all these factors are synergistic.

This study supports Ben-Zvi Assaraf and Orion's hierarchical model of the systems thinking skills, but suggests moving the "hidden system dimension" lower in the hierarchy, because of the enhanced ability of these earth science students to identify a system's hidden dimensions.