Simulations in the Learning Cycle: A Case Study Involving "Exploring the Nardoo"

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Abstract: This study of involved students using simulation software in all phases of the learning cycle. Middle school students used a CD-based simulation program, Exploring the Nardoo, which first provided preinstructional and exploratory activities to elicit and challenge students' alternative conceptions. Having set the context for formal instruction, simulations then were used in the invention phase of the learning cycle to help students learn new concepts. The simulations were used again to apply newly learned concepts in different contexts in the expansion phase of the learning cycle. In this study, middle school science students were observed using the simulations as they engaged in learning cycle lessons on environmental systems. The students were tested for their understanding of the concepts before and after completing the learning cycle lessons. Interviews also were made of the students and their instructor.

This study involved students using simulation software in all phases of the learning cycle. Research on the use of simulations in science education has shown that the simulations can be used effectively in preinstructional (Hargrave & Kenton, 2000; Gokhale, 1996) and exploratory activities (De Jong & van Joolingen, 1998). Preinstructional and exploratory activities elicit and challenge students' alternative conceptions. Having set the context for formal instruction, simulations then can be used to learn new concepts in the invention phase of the learning cycle. With the specific guidance in simulations such as Exploring the Nardoo (Harper, n. d.; Harper & Hedberg, 1996), students perform better (Lee, 1999). Simulations can be used again to apply newly learned concepts in different contexts in the expansion phase of the learning cycle.

In this study, 16 upper elementary and 17 middle school science students were observed using the simulations as they engaged in learning cycle lessons on environmental systems. The students were tested for their understanding of the concepts before and after completing the learning cycle lesson. Interviews also were made of the students and their instructor. Data collected included videotape transcripts, teacher journal, student field logs, student concept maps, student and teacher interviews, and products of student activities.

The use of simulations in all phases of learning cycles was shown to be an effective strategy for learning. The teacher was better able to bridge student understanding between print materials and real-world experiences. Results of pre-instructional and post-instructional concept mapping showed a richer variety of concepts and increased linkages among those concepts. This case study thus provides an example of the effective use of simulations in learning cycle lessons for middle school students engaged in environmental studies.

References


