How Does Adaptive Scaffolding Facilitate High School Students' Ability to Regulate Their Learning with Hypermedia?

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Introduction

Can high school students gain a deep conceptual understanding of conceptually challenging topics such as the circulatory system by using hypermedia environments? Recent cognitive research has shown that providing students with flexible access and a high degree of student control in non-linear, random access hypermedia environments rarely leads to deep conceptual understanding of complex systems (e.g., Azevedo, Cromley, & Seibert, in press). Learning in a hypermedia environment requires a learner to regulate his or her learning; that is, to make decisions about what to learn, how to learn it, how much time to spend on it, how to access other instructional materials, and to determine whether he or she understands the material. Specifically, students need to analyze the learning situation, set meaningful learning goals, determine which strategies to use, assess whether the strategies are effective in meeting the learning goal, evaluate their emerging understanding of the topic, and determine whether the learning strategy is effective for a given learning goal. They need to monitor their understanding and modify their plans, goals, strategies, and effort in relation to contextual conditions (e.g., cognitive, motivational, and task conditions). Further, depending on the learning task, they need to reflect on the learning episode.

Recent research has used several scaffolding methods to support students' learning of conceptually challenging topics. In this study, we extend our previous research (e.g., Azevedo, Guthrie, & Seibert, in press) by examining the role of different scaffolding methods in facilitating students' shift to more sophisticated mental models as indicated by both performance and process data. High-school students (N = 53) were randomly assigned to one of three scaffolding conditions (adaptive scaffolding [AS], fixed scaffolding [FS], and no scaffolding [NS]) and were trained to use a hypermedia environment to learn about the circulatory system. Pretest, posttest, and verbal protocol data were collected. Findings revealed that the AS condition facilitated the shift in students' mental models significantly more than did the other comparison conditions. Students in the AS condition regulated their learning by activating prior knowledge, monitoring their emerging understanding by using several strategies (e.g., monitoring progress towards goals), using several effective strategies (e.g., hypothesizing), and engaging in adaptive help-seeking. Learners in the FS and NS conditions were less effective at regulating their learning and exhibited great variability in self-regulation of their learning during the knowledge construction activity. Please refer to Azevedo, Cromley, and Seibert (in press) for a complete description of the scaffolding conditions, procedure, methodological approach, scoring of the mental models, and coding of students' SRL data. We discuss how the findings can be used to inform the design of MetaCognitive tools (Azevedo, 2002)—hypermedia environments designed to foster students' self-regulated learning (SRL) of challenging conceptual science topics.

References

Azevedo, R. (2002). Beyond intelligent tutoring systems: Computers as MetaCognitive tools to enhance learning? *Instructional Science, 30*(1), 31-45.

Azevedo, R., Cromley, J.G., & Seibert, D. (in press). Does adaptive scaffolding facilitate students' ability to regulate their learning with hypermedia, *Contemporary Educational Psychology*.

Azevedo, R., Guthrie, J.T., & Seibert, D. (in press). The role of self-regulated learning in fostering students' conceptual understanding of complex systems with hypermedia, *Journal of Educational Computing Research*.

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