Modifying Mental Models of Studying

June Wai (id113-ey@violet.berkeley.edu)
Charles Woodson (woodson@soe.berkeley.edu)
Cognition and Development
University of California
Berkeley, CA 94720-1670 USA

Abstract

When persons intentionally act to learn, they use a mental model of studying to choose among their repertoire of study acts on the basis of beliefs about the effectiveness of these acts. One important educational objective is to develop that mental model to be more in agreement with our scientific knowledge about studying. In this experiment, subjects were asked to recommend study actions for fictitious students described in computer-presented scenarios. Feedback for one group was designed to reflect our scientific knowledge about learning, and for the other it was randomly determined. Student's repertoire of study acts expanded in both groups, and the acts selected in the scientific-feedback group became more congruent with scientific knowledge about studying.

Introduction

Studying involves intentional actions for the purpose of learning. Woodson (1997) has proposed a model of studying that includes a repertoire of steps and a set of beliefs about the effects of these steps held by each student.

One of the major findings from research on science education is that students often develop misconceptions about the phenomena of physics (Pfundt & Duit, 1991 provide a bibliography), and these misconceptions often are major impediments to solving physics problems and understanding physics (Ploetzner, 1995). The student who uses a mental model of studying that is more congruent with our scientific understanding of learning is likely to make choices that lead to more learning.

Students have been found to apply the knowledge gathered from studying examples to solve later problems and develop problem solving skills to solve later problems (Chi, Bassok, Lewis, Reimann, & Glaser, 1989).

The purpose of this study was to test a procedure for modifying the mental model students have of studying by presenting them with a large collection of examples and feedback about the effects of actions within those examples.

Method

Subjects and design Fifty undergraduate students were randomly assigned to a scientific-knowledge feedback condition and a random-feedback condition.

Materials. Scenarios representing typical study situations students face were presented by computer.

Choices. Following each scenario, students were asked to advise the scenario students from a list of 150 study acts, categorized in 24 categories, and three global categories (Woodson, 1997).

Feedback. Feedback was given about what the scenario students did (the same for both groups) and the resulting learning in terms of a test score from zero to 100. For the scientific group the amount of learning reported was based upon estimates from the scientific basis for study skills. For the random group, feedback was randomly selected.

Results and Discussion

Subjects in the scientific-feedback group (mean 11.3 to mean 22.4, $t=3.12$, $p<.05$) and random-feedback group (mean 10.6 to mean 20.4, $t=2.77$, $p<.05$) both increased in the number of acts they used in their recommendations. The average "scientific" ranking for the acts recommended by the scientific-feedback group improved from 7.2 to 5.3 ($t=2.2$, $p<.05$), while that for the random-feedback group did not improve over the training period (7.0 to 6.3, $p > .05$).

The mental model students used appears to have been relatively easily modified to include a larger repertoire of acts and the choice of acts was modified by information about the impact of actions fictitious student took in the examples.

References

Ploetzner, R. (1995). How misconceptions affect formal physics problem solving: model-based predictions and empirical observations. *Proceedings of the Seventeenth Annual Conference of the Cognitive Science Society* (pp. 248-252). Hillsdale, NJ: Lawrence Erlbaum Associates.

Pfundt, H., & Duit, R. (1991). Bibliography: Students' alternative frameworks and science education (3rd ed.). Kiel, Germany: Institute for Science Education.

Chi, M. T. H., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989). Self-explanations: How students study and use examples in learning to solve problems. *Cognitive Science*, 13, 145-182.

Woodson, C. (1997) Expert's and Non-Expert's Mental Models of Studying. submitted for publication