An Ideal van Hiele Web-based Model for Computer Programming Learning and Teaching to Promote Collaborative Learning

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Abstract

Computer programming teaching is often based upon the traditional lecture format. However, this methodology may not be the best way to help many students actively understand underlying concepts. This paper formulates an alternatively pedagogical approach that emphasizes constructive and problem-solving process in computer programming teaching. The proposed modified van Hiele Model has focused on the conceptual knowledge of thinking levels in programming and on the role of instruction in raising levels of critical thinking for a web-based implementation. Collectively, collaborative learning tools include: discussion boards, e-mail, internet assignment units, tutorial units, quick-run units, and expert templates, which are all integrated into the environment to increase student satisfaction and achievement by stimulating student motivation and encouraging the perception of problem solving and programming as a learning project.

Keywords: Computer programming teaching, van Hiele Model, Problem solving, computer science teaching

1. Introduction

Adopted by Soviet educators for use in their geometry curriculum, the van Hiele model has stimulated considerable research, and in recent years, interest has risen in the United States (NCTM, 1989) as more and more researchers have attempted to adapt the van Hiele model to the learning in other mathematical areas. For instance, it was applied to economics and chemistry in Holland (Crowley, 1987).

The van Hiele theory is partially based on the notion that student growth in geometry takes place in terms of identifiable levels of understanding and that the instruction in geometry is most successful when directed toward the student's level. Hence, the hierarchical structure of the van Hiele levels has been verified by Fuys, Geddes, Lovett, and Tischler (1988) and Usiskin (1982).