

Students' achievements in solving geometric problems using visual representations in a virtual learning environment

Amalija Žakelj

University of Primorska, Faculty of Education

`amalija.zakelj@pef.upr.si`

Andreja Klancar

University of Primorska, Faculty of Education

`andreja.klancar@pef.upr.si`

The process of visualization is considered to be indispensable in mathematics learning, specifically in mathematical problem solving.

The role of visual representations is becoming increasingly important in technology-based learning. Researchers have presented a variety of frameworks for the optimal use of visual representations in complex, multimedia environments over the last two decades.

For the purpose of the study presented in this paper, we designed a model of learning geometry in a virtual learning environment with the use of different learning resources, dynamic geometry programs and applets, which fosters visualisation and the exploration of geometric concepts through the manipulation of interactive virtual representations. The instructional design incorporates Bruner's (1966) three-stage learning model, where learning activities are designed following a concrete-visual-abstract sequencing of instruction, starting with the concrete and progressing through visual to abstract representations.

We present the results of an experimental study aimed at exploring (1) whether geometry learning in a virtual learning environment (rich in various teaching material and activities, including dynamics geometry activities, and instructions) is reflected in higher student achievements in solving geometric problems and (2) whether solving geometric problems with the aid of visual representations contributes to higher student achievements.

Key words: mathematical education, geometry, multiple representations, visualization, virtual learning environment