DEVELOPING PRIMARY SCHOOL STUDENTS' SPATIAL ABILITIES THROUGH TRANSFORMATIONAL GEOMETRY: A COMPARISON OF THE EFFECTS OF TWO INTERACTIVE DYNAMIC SOFTWARE

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For a number of years, a critical issue in the field of mathematics education has been the role of spatial abilities (SA) in geometrical understanding, and the importance of finding effective ways for their development. Due to the obvious connection between SA and transformational geometry, a number of researchers have claimed that work with the latter can have a positive impact to the former (Clements & Battista, 1992). Although there have been many research attempts to provide evidence for this position, the relationship is still unclear. One possible reason for this may be that most of these studies consider SA as a unitary construct. This study draws on a theoretical framework from the field of psychology which discriminates three SA sub-components: Spatial Orientation, Spatial Visualization and Spatial Relations (Lohman, 1988). Moreover, since the evolution of multimedia technologies, a number of studies concentrated on the prospective of dynamic geometry software (DGS) training SA. However, there have been some considerations regarding the potential of some DGS in the development of student's spatial and cognitive abilities. Hence, the aim of this paper is to compare the potential of two similar transformational geometry instructions, one with the use of a discrete dynamic DGS and one with a continuous DGS (Moreno-Armella, Hegedus, & Kaput, 2008), to develop primary school students' SA. Two groups of approximately 40 sixth-grade students (total of 79) received a twelve-session instructional program on transformational geometry concepts, with the same activities, but each with a different type of software – a discrete motion software or a continuous motion software. Students' SA were measured before and after the instructional program. The results suggest that the group which used the discrete dynamic software program had a significant increase in the Spatial Visualization factor, whereas the continuous dynamic instruction group had a significant increase in the Spatial Visualization and Spatial Relations factors, as well as in their overall Spatial Abilities. Comparisons between the two groups' post-test means suggest that the continuous dynamic instruction group significantly outperformed the discrete dynamic instruction group in their mean performance in Spatial Relations and overall Spatial Abilities. This suggests that instruction of transformational geometry concepts with a continuous DGS may have more potential for developing primary school students SA.

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