

Effect of Dynamic Geometry Environment on Immediate and Retention Level Achievements of Seventh Grade Students

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Abstract

Problem Statement: International studies, such as the repeat of *Trends in International Mathematics and Science Study* and *Programme for International Student Assessment*, have shown that the mathematics achievements of Turkish students are lower than the international average. Geometry is an area of particular weakness. The use of dynamic computer environments has been advocated as a means to improve student understanding and problem-solving skills in geometry. Although a number of research studies have utilized dynamic geometry software as a tool for investigating students' learning of geometrical concepts, most are case studies with very small samples of students. Therefore, there is a need for experimental studies about the effects of dynamic geometry environments on students' learning of various geometrical concepts.

Purpose of Study: The purpose of this study was to compare the effects of instruction utilizing a dynamic geometry environment (i.e., *Geometer's Sketchpad*) to traditional lecture-based instruction on seventh grade students' learning of line, angle, and polygon concepts.

Methods: A pre-test, post-test and delayed-post-test experimental-control group design was utilized. One of the two seventh grade classes in an elementary school was randomly assigned as the experimental group and the other as the control group. There were 15 girls and 16 boys in the experimental group and 17 girls and 15 boys in the control group with ages

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ranging from 12 to 14 years. A geometry achievement test covering seventh grade geometry topics was prepared to investigate students' achievement in geometry. The pre-test was given prior to the intervention and two post-tests after the intervention.

Findings and Results: After controlling for initial differences, comparison of pre-test and post-test scores indicated that the students in the experimental group significantly outperformed those instructed in the traditional environment. However, delayed post-test scores indicated that the achievement difference between the groups was not enduring. Furthermore, although female students retained their knowledge better than male students, no significant *treatment*gender* interaction was found.

Conclusions and Recommendations: This study has shown that, if used appropriately, dynamic geometry environments can serve as an important vehicle to improve student achievement in geometry and achieve a classroom culture where conjecturing, analysing, exploring, and reasoning are daily routines. However, long-term professional development activities focusing on how to use technology effectively in the classroom are needed to change what and how teachers are teaching in geometry.

Keywords: Technology integration, mathematics education, dynamic geometry environments, Geometer's Sketchpad, student achievement, elementary geometry education