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Teaching transformation geometry with cabri geometry plus II

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Abstract

The overall aim of this study is to search whether teaching geometry with Cabri Geometry Plus II software have effects on 7th grade students' learning transformation geometry in mathematics. In this context, the researcher has used a pre-test and post-test research design with a control group. The research sample consisted of 135 students in total with random selection method. In the experimental group consisting of 66 students, teaching process by using Cabri Geometry Plus II software has been explained in a six-hour lesson period. In the control group consisting of 69 students, the transformation geometry has been also explained in a six-hour lesson period by making use of traditional teaching method. 20 questions of Mathematics Achievement Test have been asked to collect the research data. The data obtained from Mathematics Achievement Test has been analyzed through dependent and independent testing with SPSS Program. As a result of the data analysis it has been inferred that there have been improvements in the academic achievement of the students in the experimental and control groups, but the academic achievement of the students in the experimental group have been found to be higher when compared to the students in the control group. In other words it is concluded that between the students in the experimental and control groups have significantly different levels of achievement. According to this result, using dynamic geometry software Cabri program while teaching transformation geometry has been found to increase success levels of the students in the experimental group.

Keywords: Computer-Assisted Learning, Cabri Plus II Software, Transformation Geometry

1. Introduction

Following the demise of proof in school mathematics during the latter half of the 20th century, mathematics curricula in many countries now place increased importance on the need for students to justify and explain their reasoning. In the case of geometry, concern has been expressed, however, that dynamic geometry software (DGS), such as Cabri Geometry, may be contributing to a data-gathering approach to school geometry, with empirical evidence becoming a substitute for mathematical justification (Vincent, 2003).

DGS is an interface that affords direct manipulation of geometrical figures, particularly by *dragging* parts of them with the mouse (Laborde and Laborde, 1995). While such dragging deforms the resulting shape, some aspects remain the same. Hence the software allows a focus on the important geometrical idea of invariance. In addition, DGS usually includes the means for drawing loci, performing animations and working with coordinates thus permitting a wide range of geometrical activity (Jones, 2002). In contrast to the traditional representations of paper and pencil geometry, the visual output of DGS does not represent an instance of a geometry figure but a class of drawings; it can be dragged around the screen with its constructed properties or underlying geometric

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relationships preserved. Thus the system provides a kind of feedback that is not readily evident in paper and pencil constructions (Laborde and Laborde, 1995).

Additionally, drawn shapes can be dragged by the dynamic geometry software, Cabri software (Hoyles & Noss, 1994). The unique properties of Cabri software give us an opportunity to explore mathematics dynamically (Baki, 2001). Cabri software enables mathematical thoughts by allowing modification of mathematical objects on the screen. Many relations, properties, and generalizations that cannot be handled in traditional settings can be easily addressed in this way (Guven, 2007). This software provides students to predict, reason, think intuitively, engage, experiment, formulate and communicate individually with the teacher (Gurbuz, 2008).

Use of dynamic geometry software in instructional settings provides richer learning opportunities for the students, arouses their interests and increases their motivation by putting student at the center (Sahin & Yildirim, 1999). Cabri has strong capabilities for the design of learning activities that encourage learners to: take an investigative perspective, express their inter-individual and intra-individual learning differences, make self-corrections, formulate and verify conjectures and exploit the advantages from the negotiation of their knowledge with the knowledge of their classmates in cooperative settings (Straesser, 2001; Kordaki & Balomenou, 2006). In addition, authentic meaningful real life learning activities can be integrated within the context of Cabri, activities that can develop strong learner motivation.

There are many studies investigating the effect of using dynamic geometry software on students' success. Some of these studies concluded that dynamic geometry software positively contributes to students' achievement (Tutak & Birgin, 2008; Egelioglu, 2008; Kose, 2008; Aydogan, 2007). Contrary to these studies, Kurak (2009) and Johnson (2002) reported that there is no significant difference between the achievement of the students in the experimental and control groups. Therefore the overall aim of this study is to search whether teaching geometry with Cabri Geometry Plus II software have effects on 7th grade students' learning transformation geometry in mathematics.

2. Method

An experimental method was considered as appropriate to this study to investigate the effect of using of Cabri Geometry Plus II software on students' success compared with the traditional method.

2.1. Participants

The study consisted of 135 7th grade students in total with random selection method in Konya during 2010-2011 school years. The experimental and control groups consisted of 66 and 69 students respectively.

2.2. Data Collection Tools

The data were collected with Mathematics Achievement Test. Mathematics Achievement Test including 20 multiple choice questions was developed considering student gains in the new 7th grade mathematics curriculum and misconceptions reported in the literature for the subjects of transformation geometry. In order to calculate the reliability of the test, the test was implemented to 60 8th grade students. After the implementation, the Cronbach α-reliability coefficient of the test was found as 0.731 by using SPSS 17. Thus the Mathematics Achievement Test was applied to study group as pre-test and post-test.

2.3. Implementation Phase

This study was conducted on the subjects of transformation geometry. The study was completed within three weeks. At the beginning of the study, the pre-test was applied to study group. After the pre-test, in the experimental group, the transformation geometry was explained in a six-hour lesson period by using Cabri Geometry Plus II software. Within this period, the lessons were carried out with worksheets developed for subjects of transformation geometry by using Cabri Geometry Plus II software by the researcher in the computer lab. In the control group, the transformation geometry was also explained in a six-hour lesson period by making use of traditional teaching method. Finally the post-test was applied to study group.

2.4. Data Analysis

The data were obtained from Mathematics Achievement Test. In the evaluation of 20 multiple choice questions included Mathematics Achievement Test, “1” point was given for every correct answer and “0” point was also given every wrong answer. After this scoring, maximum total score obtained from the test was determined “20” point and minimum total score was also determined “0” point. The students’ total scores obtained from Mathematics Achievement Test were analyzed through independent and paired t-test by using SPSS 17.

3. Results

In this part, the data obtained from Mathematics Achievement Test were analyzed with independent and paired t-test by using SPSS 17 and the results were presented in tables. In order to determine whether a significant difference exists between the pre-test total scores of the students in the experimental and control groups, the total scores obtained from pre-test were analyzed by using independent t-test. The results were given in Table 1.

Table 1. Independent t-test results concerning pre-test total scores of the students

Groups	Test	N	Mean	Sd	df	t	p
Experimental	**Pre-test**	66	11.53	3.44	133	-0.119	0.905
Control	**Pre-test**	69	11.46	3.04			

As a result of independent t-test, no significant difference was found between the pre-test total scores of the students in the experimental and control groups ($p>0.01$). This result presented that the experimental and control groups were equivalent groups.

Paired t-test was used to determine whether a significant difference exists between pre-test and post-test total scores of the students in the experimental and control groups. The results were given Table 2 and Table 3.

Table 2. Paired t-test results concerning pre-test and pos-test total scores of the students in the experimental group

Groups	Test	N	Mean	Sd	df	t	p
Experimental	**Pre-test**	66	11.53	3.44	65	9.304	0.000
Experimental	**Post-test**	66	15.95	2.80			

A significant difference was found between pre-test and post-test total scores of the students in the experimental groups ($p<0.01$). According to this result, using Cabri Geometry Plus II software while teaching transformation geometry was found to increase success level of the students in the experimental group.

Table 3. Paired t-test results concerning pre-test and pos-test total scores of the students in the control group

Groups	Test	N	Mean	Sd	df	t	p
Control	**Pre-test**	69	11.46	3.04	68	-5.626	0.000
Control	**Post-test**	69	13.52	2.78			

A significant difference was found between pre-test and post-test total scores of the students in the control group ($p<0.01$). This result showed that making use of traditional teaching method while teaching transformation geometry was found to increase success level of the students in the control group.

So as to determine whether a significant difference exists between the post-test total scores of the students in the experimental and control groups, the total scores obtained from post-test were analyzed by using independent t-test. The results were given in Table 4.

Table 4. Independent t-test results concerning post-test total scores of the students

Groups	Test	N	Mean	Sd	df	t	p
Experimental	**Post-test**	66	15.95	2.80	133	-5.058	0.000
Control	**Post-test**	69	13.52	2.78			

A significant difference was found between the post-test total scores of the students in the experimental and control groups ($p<0.01$). As a result of the data analysis, it was inferred that there were improvements in the academic achievement of the students in the experimental and control groups, but the academic achievement of the students in the experimental group were found to be higher when compared to the students in the control group. In other words it was concluded that between students in the experimental and control groups had significantly different levels of achievement.

4. Conclusion and Recommendation

The aim of this study is to search whether teaching geometry with Cabri Geometry Plus II software have effects on 7th grade students' learning transformation geometry. In parallel with this purpose, using dynamic geometry software Cabri program while teaching transformation geometry has been found to increase success levels of the students in the experimental group. In other words Cabri Geometry Plus II software is detected to positively contribute to students' learning transformation geometry. Based on this result, it is recommended to use Cabri Geometry Plus II software for other subjects of geometry and investigate the effect of this software on students' success. So that teachers can quite easily use this software in the classroom, in-service training courses for them towards computer assisted instruction may be given by experts.

References

Aydogan, A. (2007). *The effect of dynamic geometry use together with openended explorations ın sixth grade students' performances ın polygons and similarity and congruency of polygons*, Unpublished Master Thesis, Institute of Education Sciences University of METU, Ankara.

Baki, A. (2001). Evaluation of mathematics education under the light of information technology. *Journal of National Education*, 149, 26-31.

Egelioglu, H. C. (2008). *Computer based education has an influence on success and epistemological belief in teaching of sublearning zones of transformation geometry and areas of quadrangle zones*. Unpublished Master Thesis, Institute of Education Sciences University of Marmara, İstanbul.

Gurbuz, R. (2008). A computer aided material for teaching probability topic. *Mehmet Akif Ersoy University Journal of Education*, 15, 41-52.

Guven, B. (2007).Using dynamic geometry software to convey real-world situations into the classroom: the experience of student mathematics teachers with a minimum network problem, *Teaching Mathematics and Its Applications* 27(1), 24-37.

Hoyles, C. & Noss, R. (1994). Dynamic geometry environment: What's the point? *The Mathematics Teacher*, 87(9), 716-717.

Johnson, C. D. (2002). *The effects of the Geometrer's Sketchpad on the Van Hiele Levels and academic of high school students*, Unpublished Doktoral Thesis, Wayne State University, Detroit.

Jones, K. (2002). Implications for the Classroom, *MicroMath*, 18, 18-20.

Kordaki, M. & Balomenou, A. (2006). Challenging students to view the concept of area in triangles in a broader context: exploiting the tools of Cabri II. *International Journal of Computers for Mathematical Learning*, 11(1), 99-135.

Kose Y. N. (2008). *Determining fifth grade primary school students' understanding of symmetry using dynamic geometry software Cabri geometry: an action research***,** Unpublished Doktoral Thesis, Institute of Education Sciences University of Osmangazi, Eskişehir.

Kurak Y. (2009). *The Effects Of Using Dynamic Geometry Software On Students' Understanding Levels Of Transformation Geometry And Their Academic Successes,* Unpublished Master Thesis, Institute of Sciences University of KATÜ, Trabzon.

Laborde, C. & Laborde, J. M. (1995). What about a learning environment where Euclidean concepts are manipulated with a mouse? In A. A. diSessa, C.Hoyles, & R. Noss (Eds.), *Computers and exploratory learning,* Berlin: Springer-Verlag. Pages

Straesser, R. (2001). Cabri-Geometre: does Dynamic Geometry Software (DGS) change geometry and its teaching and learning? I*nternational Journal of Computers for Mathematical Learning*, 6, 319-333.

Sahin, T. Y. & Yildirim, S. (1999). *Instructional technologies and material development.* Ankara: Anı Publications.

Tutak, T., & Birgin, O. (2008). The effects of computer assisted instruction on the students' achievement in geometry. *VIII. International Educational Technology Conference Proceedings*, 1062-1065.

Vincent, J. (2003).Year 8 students' reasoning in a Cabri environment. In L. Bragg, C. Campbell, G. Herbert, & J. Mousley (Eds.), *Mathematics education research: Innovation, networking, opportunity: Proceedings of the Twenty-Sixth Annual Conference of the Mathematics Education Research Group of Australasia*, 696-703.Sydney: MERGA

Yazlik, D. O. (2011). *Teaching Transformation Geometry with Cabri Geometry Plus II in Seventh Grade*, Unpublished Master Thesis, Institute of Education Sciences University of Selcuk, Konya.