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ABSTRACT

Many educators recommend the "Geometric Supposer" as exemplary software. This study compared the achievement of one high school class that used the software and a similar class that did not. The treatment class used the software once every 2 weeks throughout the school year. The SRA Achievement Test was used as a pretest and the Houghton-Mifflin Modern Geometry Test was used as a posttest. Four separate (Analyses of Covariance) ANCOVAs were calculated to determine the effect of the treatment on total geometry achievement, lower level items, application items, and higher level items of the posttest. The treatment class scored significantly higher on all except the lower level items. Traditional teaching methods seemed to address lower level knowledge and comprehension. (YP)

# Does the Supposer Improve Problem Solving in Geometry?

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## Does the *Supposer* Improve Problem Solving in Geometry?

There are literally thousands of educational software programs available for various content areas and various levels. Most educators are very much in need of guidance in the selection of appropriate and effective software for classroom integration.

In general, use of the computer is highly recommended in mathematics. In the *Curriculum and Evaluation Standards for School Mathematics* (National Council of Teachers of Mathematics, 1989), use of the computer in the mathematics classroom is one of the highlighted goals. The *Geometric Supposers* are a series of computer programs recommended for use as a supplement in high school geometry courses. This software is described as a flexible tool to construct, label, and measure a variety of geometric figures. This software has been called exemplary and has been highly recommended to practitioners (Classroom Computer Learning, 1987; Dickey, 1988).

Even though the *Supposer* is commended by many within the mathematics education community, there is a lack of empirical data to support its effectiveness. The current study was undertaken to compare the achievement of one high school geometry class which integrated the *Supposer* and a similar class which did not use it.

### Method

Subjects of this study were two intact high school geometry classes at two parochial high schools. Each class contained 29 tenth grade students. The teachers of the two classes were identified by their principals as "very effective" teachers. Both had several years experience in teaching high school mathematics. Informal observations of the teachers indicated that, except for the Supposer activities, both used similar teaching methods. Both classes used the same textbook.

Because of a special grant, microcomputers were made available in the experimental class and Supposer software was obtained. Early in the school year, this class was taught to use the Supposer. Then approximately once every two weeks throughout the school year, a Supposer activity was assigned and completed using suggestions from the Supposer manual and adapted problems from the text. The suggested format was followed: Students worked in groups of two or three. Sufficient class time was allocated for the activities. Student groups were required to make conjectures about the given problem and then find examples or counterexamples which were used to write a report of their analysis. The control class utilized traditional teaching activities and had no exposure to the Supposer activities.

To measure initial differences in the students, total mathematics percentile scores from the SRA Achievement Series (Level H) were obtained from school records for each student. At the end of the school year, both classes took the Houghton-Mifflin Modern Geometry Test (Hanna, 1971). This is the final examination provided by the publisher of the textbook used by both classes. It consists of 48 multiple choice items. A total raw score was obtained for each student. Additionally, the 48 items were examined and classified according to Bloom's Taxonomy. In order to measure higher level thinking skills, three subtest raw scores were obtained: (1) Lower level: knowledge and comprehension, 6 items, (2) Application, 15 items, and (3) Higher Level: analysis, synthesis and evaluation, 27 items.

Analysis of Covariance was used to determine the effect of the treatment on post geometry achievement scores. To control for initial differences, the covariant was mathematics scores from the pretest, SRA Achievement Test. Four separate ANCOVA's were calculated to determine the effect on Total Geometry Achievement, Lower Level Items, Application Items, and Higher Level Items.

## Results and Conclusions

Results of the ANCOVA for total geometry achievement score, controlling for initial mathematical ability scores, revealed that the treatment group scored significantly higher on the total posttest ($F(1, 57) = 34.24$, $p < .01$). Similarly, the treatment group scored significantly higher on Application Questions ($F(1,57) = 22.35$, $p < .01$) and on Higher Level Questions ($F(1,57) = 33.64$, $p < .01$). There was no significant difference in the two groups' scores on the Lower Level Questions ($F(1,57) = 0.18$, $p > 0.01$).

The question which this study sought to answer was whether use of the Supposer resulted in higher geometry achievement. Data indicated that the answer was "yes". The group which received the Supposer treatment scored significantly higher on the final examination in geometry than the control group which did not receive the treatment. Further analysis indicated that the difference in posttest achievement was limited to application questions and higher order questions (analysis, synthesis, and evaluation). There was no difference on knowledge and comprehension questions. This result was expected. Traditional teaching methods seem to address lower level knowledge and comprehension, and use of the Supposer was expected to have a greater effect on students' problem solving skills. The nature of the Supposer activities required that the students experiment and analyze their data to reach conclusions which were then organized and presented. This is a problem solving process, and it is not surprising that the greatest differences were in higher level questions.

In summary, this study found evidence of a positive effect on geometry achievement from integrating Supposer activities into a high school "honors" geometry class. While further study is recommended, the results of this study support the position of the National Council of Teachers of Mathematics that microcomputers can and should be integrated into mathematics courses. The Supposer is a geometry tool that appears to increase the higher level thinking skills of students who use it as part of their geometry instruction. This suggests that use of this type of "tool" software should be a regular part of mathematics instruction.

# REFERENCES


Classroom Computer Learning. (1987). The 1987 Classroom Computer Learning software awards. *Classroom Computer Learning*, *7*(5), 18-25.

Dickey, E. (1988). The ten packages that should be in every high school mathematics software library. *Journal of Computers in Mathematics and Science Teaching*, *7*(3), 19-25.

Hanna, G. S. (1971). *Modern Geometry Test*, Boston: Houghton Mifflin.

National Council of Teachers of Mathematics, (1989). *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: NCTM.