

Empowering Control Behaviors of students in Constructing Geometrical Proof

Hosein Ghaffari, Amir H. Asghari

Shahid Beheshti University

Geometry has a longstanding reputation as a building block for teaching deductive reasoning. Nevertheless, previous researches show that teachers are faced with many challenges in this direction. The main important ones are helping students to understand the structure of a geometric proof, to construct such a proof, and to write it properly.

During the last century, many attempts have been made to help students to understand, to construct, and to write geometric proofs. Probably, the most famous attempt was introducing two-column proofs (Herbst, 2002). It is now commonly believed that failed since it had strong focus on form rather than content. However, seeing proof constructing as a problem-solving task, two-column proofs can be regarded as a tool to enhance students' behavior at the control level (In Schoenfeld's sense, 1985). This is also the aim of the present study, though with a different tool.

The present study used a revised version of "Reasoning Control Matrix for the Proving Process" (Dimakos et al, 2007). It was a written form with 7 different sections that should be filled by students while solving a geometric problem. Different sections of this tool, asks students to write down their hypothesis, figures, partial proofs, auxiliary elements, scaffoldings and overall thinking process. Unlike two-column proofs, this is designed to encourage students to adopt a backward strategy and somehow plan the chain of reasoning needed before writing the complete proof.

The tool was administrated to a class of thirty-four second grade high school students and it was used time and again throughout the school year in their geometry class. Students' written responses to a range of theorems were collected and analyzed as problem solving protocols.

The results show an improvement in students' understanding of different aspects of the problems, notably, the distinction between hypothesis and conclusion, the role of figures and auxiliary elements, and the ways they are all related to each other.

References

- Dimakos,G., Nikoloudakis,E., Ferentions,S., &Choustoulakis,E. (2007). Developing a proof-writing tool for novice lyceum geometry students. *The Teaching of Mathematics*.X, 2, 87-106.
- Herbst, P. (2002). Establishing a custom of proving in American school geometry: Evolution of the two-column proof in the early twentieth century. *Educational Studies in Mathematics*, 49, 283 -312.
- Schoenfeld, A. H. (1985). *Mathematical problem solving*. New York: Academic Press.