

MATHEMATICAL PUZZLES IN EDUCATION

JERZY POGONOWSKI

Department of Logic and Cognitive Science

Adam Mickiewicz University in Poznań

pogon@amu.edu.pl

I shall discuss in this talk my teaching experiences in mathematical problem solving during my university course on *Mathematical puzzles*. The audience consisted mainly of students of cognitive science. Problems taken into account embraced first of all mathematical puzzles with surprising solutions, unexpected from the point of view of everyday experience. Such puzzles are instructive, as far as a critical attitude towards problem analysis is concerned. The puzzles were divided into thematic groups, including such topics as: the Infinite, numbers and magnitudes, movement and change, shape and space, orderings, patterns and structures, algorithms and computation, probability, and logic. Many of them were connected with paradoxes, that is results which seem counterintuitive but are nevertheless true, which can be shown by resolving the paradox in question. It seems, judging from the discussions with students and from the content of their essays that puzzle solving – including brain-storming and group discussion on the way to solutions – proved a very effective way for achieving improvement in students' mathematical skills.

I proposed to consider the process of teaching mathematics in the *context of transmission* of mathematical knowledge, skills and abilities (see for instance Pogonowski 2016, 2018a, 2018b and chapter 8 of Pogonowski 2019). This context differs from the contexts of discovery and of justification traditionally investigated in the methodology of sciences. Major role in the context of transmission is played by *intuitive explanations*. They help us to achieve better understanding of mathematical notions and ideas. In a sense, they transcend mathematics itself. Intuitive explanations may be related to language, physical models, perception, everyday experience, and so on. I shall discuss examples of such explanations in my talk.

Pogonowski, J. 2016. Kontekst przekazu w matematyce [The context of transmission in mathematics]. *Annales Universitatis Paedagogicae Cracoviensis. Studia ad Didacticam Mathematicae Pertinentia* 8, 119–137.

Pogonowski, J. 2018a. Paradox resolution as a didactic tool. In Błaszczuk, P., Pieronkiewicz, B., editors, *Mathematical Transgressions 2015*, 324–339, Universitas, Kraków.

Pogonowski, J. 2018b. Intuitive explanations of mathematical ideas. *Annales Universitatis Paedagogicae Cracoviensis. Studia ad Didacticam Mathematicae Pertinentia* 10, 123–137.

Pogonowski, J. 2019. *Extremal axioms. Logical, mathematical and cognitive aspects*. Wydawnictwo Nauk Społecznych i Humanistycznych UAM, Poznań.