

Prof. RNDr. Ján Čižmár, PhD.
Department of Algebra, Geometry
and Didactics of Mathematics
Faculty of Mathematics, Physics
and Informatics of Comenius University
Mlynská dolina
842 48 Bratislava
e-mail: jan.cizmar@fmph.uniba.sk

Report of the PhD. thesis

“Embodiment and a-didactical situation in the teaching-learning of the perpendicular straight-line concept”

submitted by Giannamaria Manno

The work “Embodiment and a-didactical situation in the teaching-learning of the perpendicular straight-line concept” submitted by Miss Giannamaria Manno as a thesis for to get PhD. degree in Didactics of Mathematics at the Faculty of Mathematics, Physics and Informatics of Comenius University is concerned with some important branches of three contemporary domains:

- the theory of didactical situations in didactics of mathematics
- the embodiment theory as an epistemological and methodological component of the investigation and explanation
- the neurophysiological base of the learning process and development of some psychic and cognitive functions.

The central problem the author considers is a mathematical-didactical one of developing perpendicularity concept in a wide complexity based on a vast knowledge of all relevant results in numerous mathematical, didactical, philosophical and medical investigations. She is fully acquainted with the up-to-date state of the research in these fields and supplies a wide-ranging survey of recent discoveries, methods and tools. This all is reported in details in the thesis and incorporated in an adequate scale into appropriate parts of the work.

The thesis consists of five chapters from which the first two ones bear a preparatory character. They treat a general theoretical framework of the proper theme namely the first one

describes lengthily the theory of didactical situations with all necessary concepts and details of their relations and the second one is devoted to a careful classification of relations between mathematical and natural language, particularly in a form of the everyday students' language. In this chapter conceptions of several authors are confronted, partially controversial, without the estimation about advantages or disadvantages of those standpoints. In several sections of this chapter the author refers to many questions at the mathematical terminology considered as a specific part of the mathematical language.

The core of the thesis presents chapter III where a general problem situation is sketched, three research hypotheses are formulated and both a realization and a multilateral evaluation of an experiment are presented. The first hypothesis refers to the confusion of terms *vertical* and *perpendicular*. (It must be noted that this confusion is typical only in some European languages in which the denomination of both concepts comes from Latin. And perhaps the confusion or distinction depends strongly on the age of pupils.) The second hypothesis formulates conditions of overcoming previous epistemological obstacle. The third one deals with the problem of another conceptualization of the perpendicularity notion replacing it by the concept of minimal distance. The hypotheses are formulated correctly despite the fact that the relations between variables are not expressed in all cases explicitly. It should be underlined that in a realization of experiments a greater stress is put rather on the conceptualization and contextualization of main concepts than on a positive instruction and teaching process. This intention also corresponds with the choice of realization means at which the devolution and a-didactical situations are preferred to frontal instruction in the classroom. The recent methods and tools of French didactical school are also used in the preparation and evaluation of tests and experiments as well as other generally well-tried means of both qualitative and quantitative analysis which closes this chapter.

The extensive chapter IV entitled *The embodiment theory* presents a goal-directed attempt to show some fundamental concepts and conceptions of mathematics and didactics of mathematics in the light of embodiment theory which represents by itself a sophisticated synthesis of many science branches, mainly of cognitive sciences and neurosciences. Some glances could be rather inspirational, some beliefs and links seem hitherto open. But forthcoming investigation in the direction of application in didactics of mathematics can enrich this domain considerably.

A similar valuation can be said on the chapter V investigating neurophysiological base of several psychic functions and some perception phenomena such as perception of gravity, vertical and horizontal position, distance etc. A knowledge of new discoveries closely connected with cognitive processes can be of great importance for the progress in didactics.

Conclusion: The work “Embodiment and a-didactical situation in the teaching-learning of the perpendicular concept” submitted as PhD. thesis by Giannamaria Manno has achieved the declared research goals. It has shown a great ability of the author to formulate originally a research problem in didactics of mathematics, in a highly creative way to analyze this problem in a complex scientific context, to choose suitable methods, means and tools for to solve it and to work in an inventive way in all stages of the solving process. The work brings new valuable scientific results and confirms clearly the capability of the author in the field of science research. I recommend to accept the thesis for the defense in the science field Didactics of Mathematics at the Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava.

I propose to award to

Miss Giannamaria Manno

after a successfully defense of the thesis the scientific-academic degree

philosophiae doctor (PhD).

Bratislava 25th November, 2005

Prof. RNDr. Ján Čižmár, PhD.