

THE COMPUTER AS MEDIATOR IN THE DEVELOPMENT OF MATHEMATICAL CONCEPTS

Charlotte Krog Andersen
IMFUFA, Roskilde University, Denmark

To motivate my ideas, I present an episode from observations of mathematics university students using a computer software package consisting of pre-programmed Maple procedures. These procedures may be used to create dynamical and interactive illustrations of central spatial concepts of differential geometry. In the episode, the students explore geodesics on an ellipsoid. They manipulate the parameters and create an ellipsoid with a curve running from the north “pole” to the south crossing itself on the equator and making a small circle at each pole. Subsequently, the students come up with a preliminary description of the curve as *Ribbon on an Easter egg* in order to formulate and anchor their experiences with this ellipsoid.

With the aim of investigating the role of such preliminary descriptions for mathematical concepts formation theoretically, I draw on Vygotsky’s work on the development of scientific and spontaneous (everyday) concepts. A similar distinction proves valuable also in relation to university mathematics. Scientific concepts (here mathematical) are according to Vygotsky initially introduced through their verbal definitions but based on a relatively mature development of spontaneous concepts formed in an out-of-school context. This emphasises the importance of everyday concepts as they mediate meaning to the mathematical ones. However, in an educational context students form semi-spontaneous concepts originating in intuitive reactions and empirical experiences as evidenced by the episode. These are valued by their illustrative and sense making potential in relation to the mathematical concepts, and I shall call them preliminary intuitive mathematical concepts.

In conclusion, I suggest that the use of computer software may play a mediating role in the acquisition of mathematical concepts. This is so at least if the software is rich in interactive, dynamic visualisations that enable the students to form preliminary intuitive mathematical concepts.

References:

Vygotsky, L. S. (1986). *Thought and Language* (ed. Kozulin, A.). USA: The MIT Press.