

# NATURE OF MATHEMATICS, META-SCIENTIFIC REFLECTION AND SCIENTIFIC PROPAEDEUTICS

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In the German secondary school (“Gymnasium”), students shall become acquainted with the fundamentals of scientific ways of working, they shall develop a scientific attitude and be able to think about the nature and the limits of scientific findings. This first contact with scientific ways of working and thinking is called scientific propaedeutics (“Wissenschaftspropädeutik”). One aim of this first contact is that students are better prepared for studying at university. Since scientific propaedeutics is primarily a concept of general education and has been rarely discussed in mathematics education yet, we adapt this concept to the subject mathematics. Theoretical approaches to conceptualize scientific propaedeutics propose a model consisting of three hierarchical levels: (1) meta-scientific knowledge, (2) methodological awareness and (3) meta-scientific reflection (Müsche, 2009). To specify this model to mathematics, we used the concepts “nature of science”, discussed in science education, and domain-specific “beliefs” (Törner, 2002), well-known in mathematics education. In this presentation, we focus on the third dimension of this model.

The presented study aims to describe the concept meta-scientific reflection on mathematics and to investigate how this concept is related to prevalent concepts of mathematics education such as nature of mathematics and epistemological beliefs. Accordingly, the research questions are:

- What is meta-scientific reflection on mathematics as one aspect of science propaedeutics?
- How meta-scientific reflection on mathematics can be assessed?

To answer the first question, we consider the specific character of mathematics with its deductive structure, built on definitions, theorems and proofs. The third level of scientific propaedeutics, namely meta-scientific reflection on Mathematics as an academic discipline, includes thinking and discussing about the certainty of mathematical knowledge and about the specific characteristics of mathematics in comparison to other scientific disciplines. Students who achieve the third level of scientific propaedeutics are able to recall and apply knowledge about mathematics, to systemize academic disciplines in categories and categorize specific scientific disciplines (e.g. mathematics as a formal science) into the wide field of disciplines. One interesting question in this regard is whether students refer to mathematics as a natural science (like physics) or not and how they justify their decision.

To answer the second question, we developed a questionnaire and conducted a pilot study, implementing in an online survey, with pre-service teacher students. Since the survey is currently in progress, we cannot present any results yet. We expect that more than 50 students will participate in the survey. In the presentation, first results will be discussed in detail.

## References

- Müsche, H. (2009). Wissenschaftspropädeutik aus psychologischer Perspektive – Zur Dimensionierung und Konkretisierung eines bildungstheoretischen Konzeptes. *TriOS*, 4(2), 61-109.
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