

Promoting favourable beliefs of prospective math teachers concerning the nature of mathematics by using Interactive Mathematical Maps

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INTRODUCTION AND RESEARCH QUESTION

The poster contains information about a study conducted in a recent course among prospective Swedish mathematics teachers at Karlstad University evaluating “Interactive Mathematical Map(s)” developed at the University of Passau, Germany. In this study, we analyse *to what extent does the use of the digital tool Interactive Mathematical Map(s)*¹ *promote students’ favourable beliefs concerning the nature of mathematics*, as described in Felbrich et al. (2008). Such beliefs “are a crucial part of the professional competence of mathematics teachers” (ibid, p. 763). The interactive three-dimensional mathematical map is intended to “offer the student an optimal solution for establishing successful learning processes” (Brandl, 2009, p. 106) by integrating the historical origin of mathematical concepts as well as interdependencies between them. The design-based research and development process of the digital didactical tool Interactive Mathematical Map(s) is described in detail in Przybilla et al. (2022) and Datzmann et al. (2020).

THEORETICAL FRAMEWORK

The study is based on Felbrich’s understanding of the belief structure as a one-dimensional space containing four principal orientations: “the *formalism*-related”, “the *scheme*-related”, “the *process*-related”, and “the *application*-related” orientations (cf. Felbrich, 2008, p. 764). Two “mutually exclusive and antagonistic” (ibid.) alignment poles can be distinguished: a *dynamic* one, represented by *process* and *application* and a *static* one, defined by *formalism* and *scheme*. This means, a “person favours either a dynamic or a static view on mathematics” (ibid.). While the static perspective gives a non-accurate picture of mathematics, which is *unfavourable* for teachers and learners (cf. ibid.), the dynamic view on mathematics emphasizes the subject as an *emerging science* containing and allowing for failures. The latter is considered as *favourable beliefs* related to the nature of mathematics (cf. ibid.). By analysing students’ feedback to working with the Maps, we try to understand if favourable beliefs are promoted.

METHODOLOGY AND RESULTS

In the study, the digital tool Interactive Mathematical Map(s) was used in a Geometry course for Swedish mathematics teacher education. In total, 44 students (in-service and

¹ The tool is freely available at the web address <https://math-map.fim.uni-passau.de/> under the tab Interactive Map.

prospective teachers) participated in the study. For each of the components of the map a short explanatory video was created. The participants tested the functionalities of the map and produced own texts as application of the mathematical-historical content in the mathematical map during work assignments². The assignments concluded with a technical and content evaluation of the individual components of the map.

As result of qualitative content analysis the students' answers contain clear indications that the map seems to open up for viewing mathematics as an *emerging science*. The considerations about the usefulness of the map included reflections upon the relations to the structure of mathematics and students' opportunities to learn. *Dynamic* understanding of mathematics can be seen in, for instance, students' reasoning about the struggle when mathematicians develop mathematical concepts. This was expressed in, for example, terms of how the historically authentic development of mathematics gives students a deeper knowledge of mathematics and its nature. Most students show a *process*-related and *application*-related orientation in relation to their future role as teachers when using the map. The tool is also seen as a way to motivate their future students to see the relevance of mathematics. Overall, students' reflections suggest that the use of the digital tool Interactive Mathematical Map(s) promotes *favourable beliefs* related to the nature of mathematics.

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² The weekly assignments are freely available at the web address https://docs.google.com/document/d/e/2PACX-1vTq_w6A2MqresPr5PQLGujDt3NIS6i7aiL7ShsmaR841TtI-hrsyTM2zLY6UEhbULBumIx0zEtTOz6V/pub