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► To cite this version:

Bartjan Vollmuller, Michiel Veldhuis, Mara Otten, Sonja Stuber, Madhuvanti Anantharajan, et al.. Developing functional thinking from teacher education to primary school: Students walk along the number line. Paul Drijvers; Csaba Csapodi; Hanna Palmér; Katalin Gosztonyi; Eszter Kónya. Thirteenth Congress of the European Society for Research in Mathematics Education (CERME13), Jul 2023, Budapest, Hungary. Alfréd Rényi Institute of Mathematics; ERME, Proceedings of the Thirteenth Congress of the European Society for Research in Mathematics Education (CERME13), TWG18 (20). hal-04421428

HAL Id: hal-04421428

<https://hal.science/hal-04421428>

Submitted on 27 Jan 2024

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Developing functional thinking from teacher education to primary school: Students walk along the number line

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Keywords: Teacher education, primary education, functional thinking, preservice teachers.

Introduction

Functional thinking is seen as a major constituent of algebraic thinking (Warren & Cooper, 2005) and described “as the process of building, describing, and reasoning with and about functions” (Pittalis et al., 2020, p. 632). Descriptions of relations between quantities is an important prerequisite for anyone to function in society. In the project *FunThink* (Erasmus+ Strategic Partnership) activities were developed to elicit students’ functional thinking, from primary school to upper secondary school. The development of these activities was grounded on design principles that emerged from an extensive literature research (cf. Wei et al., 2022): the use of embodiment, digital tools, inquiry, and situatedness. The development of these activities was inspired by existing activities, and on insights from interviewed educational experts (Frey et al., 2022b). A dissemination of teaching and learning material into practice could improve the conceptions of functional thinking (Frey et al., 2022a). Therefore, this poster focuses on the relationship between teacher education and the implementation of one prototypical activity by pre-service teachers in their practice schools in primary education.

Methods

The meeting at teacher education

This was a first introduction to functional thinking as a concept, *FunThink* as a project, and focused on one prototypical activity. First, preservice teachers responded to a set of three items on different aspects of functional thinking. Then, they participated in the activity, walking along the number line. Finally, there was a short classroom discussion on the approach in the activity, the way learning was facilitated, and guidance of the teacher in the activity. Then, the preservice teachers were asked whether they wanted to perform the activity in their own practice schools.

Prototypical activity: Walking along the number line

A teacher educator places a big number line (10 meters) on the floor and demonstrates an example of the activity with preservice teacher volunteers. Each pair of preservice teachers gets a card with a secret rule (an operation, e.g. “+2”) on it. The other pair of preservice teachers has to work out what the secret rule is by walking along and standing on the number line. They start with single operations and work towards more complicated and combined rules (such as “*3 – 2”).

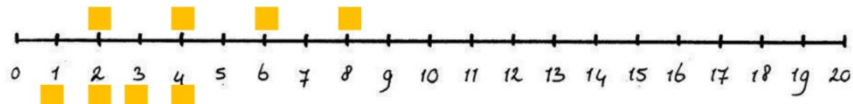


Figure 1: Example of the number line with the traces of students' positions indicated by sticky notes

The teacher educator introduces the activity by discovering a rule (e.g., “ $\times 2$ ”) himself, whilst the preservice teachers do know the rule. The teacher educator walks and stands on one side of the number line, the preservice teachers stand and walk on the opposite side, sticking sticky notes to the corresponding output number (see Figure 1). The teacher educator reasons out loud about what the secret rule could be. Following the introduction, two groups of preservice teachers take turns to work out new secret rules with different colored sticky notes per rule. In this activity, preservice teachers use their bodies to enact numerical relations, inquire the relation between numbers, and mathematically organize phenomena.

Results

On the poster (see Vollmuller et al., 2023), two cases of preservice teachers following the teacher education activities and performing the activity at their practice schools are described. These two cases show that preservice teachers mimic most of the elements visible in their teacher education, but they make slight adaptations based on their own beliefs and interpretations of the activity and student performance.

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