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# Developing personas to support professional practices of mathematics teacher educators

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## Introduction

Modern pedagogies place increasing emphasis on individualized learning to address student diversity. This is also required by new educational policies. Providing future teachers with relevant knowledge and fostering the development of their competencies to implement individualized learning settings is a challenge for mathematics teacher educators (MTEs). In this work, we suggest personas as a way to support MTEs in conveying the diversity of characteristics, needs, and conditions of mathematics learners. Personas are concise data-driven descriptions of fictional representatives of learners who share similar characteristics and needs. In our recent work, we have identified the potential of personas to facilitate student-centered teaching and learning of mathematics. We have collected data on students' goals, needs, challenges, joys, fears, and strategies, and have developed personas of students in Austrian academic upper secondary schools to provide teachers with a resource to facilitate individualized learning. In this project, we expand upon that work towards teacher education courses suggesting personas as a new resource for MTEs to facilitate rendering the development of mathematical pedagogies more student-centered and promoting individualized teaching and learning opportunities. We aim at answering the following questions with regard to mathematics teacher education: (a) Which student characteristics should be portrayed by personas to promote decisions on designing individualized teaching and learning settings? (b) What are the scenarios for applying personas?

## Theoretical and methodological framework

In Austria, teachers are required to align their teaching to the diversity of students by educational policy documents. In practice, however, teachers tend to consider highly specific and stereotypical student characteristics to decide how to address diversity in lesson design (Larina & Markina, 2019). To reduce subjectivity and bias in design contexts, Cooper (1999) claims that it is beneficial to have one specific person in mind and tune the design to their goals and needs. He suggests to use personas as a portray of the target group and as a communication tool for designers when discussing design ideas and drafts.

Personas are “hypothetical archetypes of actual users [...] defined by their goals” with fictional names, fictitious personal details, and a portrait (Cooper, 1999). Originally, they were used in user experience research to present characteristics, goals, skills, and interests of homogenous user groups. While Cooper (1999) introduced personas for product optimization processes with the goal to promote sales, the goal in the context of education is to enhance design processes for more efficient teaching and learning.

There has not been comprehensive research on applying persona development techniques to teacher training contexts although the use of personas has the potential to facilitate preparing teachers to implement individualization in their classrooms.

In recent research, we collected data from mathematics teachers in Austrian academic upper secondary schools about the characteristics and needs of their students and created student personas based on these data. These personas have been utilized in teacher training courses to design materials for teaching mathematics. We plan to refine the personas by conducting a quantitative questionnaire study among school students. Including the teachers' expert views and using standardized questionnaires for surveying students should help minimize subjectivity and bias. To identify potential applications of personas for MTEs, we review current approaches of MTEs to foster individualized mathematics teaching. We then propose applications of personas for MTEs based on the findings of this review.

## **Results and discussion**

Recent literature on individualized teaching and learning states that for successful learning the demands on the students have to match their individual learning conditions (attitude, interests, level of knowledge, misconceptions, skills, self-concept) to avoid a decrease in cognitive activity; therefore, decisions on the demand level of students and on appropriate teaching and learning methods have to be made (Prediger & Aufschnaiter, 2017). As a consequence, when developing personas for use in mathematics teacher education, the learning condition of students should be portrayed.

Personas of such kind can be a valuable resource for MTEs to train how to implement individualized learning in classrooms by promoting well-founded decisions for designing individualized materials and settings for teaching and learning mathematics. In particular, personas can serve as a basis for discussions about design approaches proposed by participants of mathematics teacher education courses. Thereby, personas meet Gueudet et al.'s (2012) demand for resources for MTEs to foster collaborative work. They facilitate including the students in discussions and have the potential to establish individualization as a premise for designing learning settings while reducing the bias stemming from stereotypical beliefs of the discussants.

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