A scheme to support preservice physics teacher in analysing curriculum materials

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Abstract. Though curriculum materials (CMs) are an important source for teachers' when designing classroom instruction, the dissemination of innovative CMs has limited influence on teacher practice. A common explanation for this phenomenon is that teacher interpret CMs different than developers. Thus, some teacher educators argue that preservice teachers need to learn how to interpret CMs in order to make meaningful instructional decisions and subsequently design meaningful classroom instruction. We iteratively developed a research-based scheme to support preservice physics teachers in analysing innovative CMs. In a presentation, we will present the scheme, its research-driven development and discuss its potential for teacher education.

Introduction & Theoretical Background

Curriculum materials are well established in schools and important sources for teachers' curricular decisions [1,10]. Thus, many efforts from universities and national reforms were taken to influence classroom instruction by providing teachers innovative CMs [1,2,4]. However, the implementation of these CMs is strongly shaped by the teachers, e.g. their knowledge, beliefs or personal goals, and how they interpret these materials [10]. Especially in maths education, the idea emerged that teachers are more like designers of classroom instruction than just transmitter of CMs [5,10]. Brown [5] introduces the concept of design capacity as the ability to mobilize CMs for designing classroom instruction—an ability that should be trained [7,11].

Therefore, in teacher education, several approaches were taken to support preservice teachers in mobilizing CMs [e.g. 3,6]. This mobilization can be conceptualized by three interpretative activities "reading", "evaluating" and "adapting" CMs [12]. For the first two activities, Ben-Peretz et al. [3] suggest to provide pre-service teachers a scheme for analysis that "may aid teachers to identify and clarify general characteristics that were deliberately introduced into CMs by their developers." [3, p. 53] However, there is no such scheme for physics education.

Therefore, we developed such a scheme for analysis as part of a design-based research approach: the representation of essential features (REF). In this presentation, we introduce the REF as a scheme for analysis and provide insights into the research-based development of the REF.

Research-based Development of the Scheme

The REF was developed in several steps. First, we tried to identify which pedagogical decisions developers of physics curricula make, when designing the CMs. For example, developers need to decide what the content key ideas are, in which order they develop, which to omit, or which representations to use. For this, we analysed different CMs and clustered such decisions in categories, such as key ideas, order of key ideas or representations. Secondly, we conducted expert interviews with five curriculum developers from university [8] and thirdly, we iteratively refined and implemented the categories as analysis scheme in several activities of a seminar in physics teacher education on bachelor level [9]. We conducted short guided interviews within some of the activities, collected learning products and problem-centred interviews after the activities in two consecutive years.

Findings & Conclusion

After using the REF, most of the preservice teachers seem to perceive the REF as a useful tool, especially for the beginning of their teaching career or for choosing CMs. The REF provides them different perspectives on CMs and they feel supported in what to look at and how to structure the analysis. Without the REF, they seem to rely more on their gut feeling and personal preferences. Nevertheless, the first impression of the REF was overwhelming for many students because of the 16 categories and the analysis with the REF is very time-consuming. Interestingly, the time-consuming nature of the analysis with the REF is also seen positively by some preservice teachers, because they have the impression that they learn a lot during the analysis.

In summary, the REF seems to have a potential for providing preservice physics teachers a scheme of analysis that can be used in teacher education. The REF can support them in interpretative activities, such as read and evaluate CMs, as integral part of their design capacity. In the oral presentation, we present and discuss the development of the REF as well as research-based ideas to implement the REF in teacher education.

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