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Facilitators attitude towards learning targets of a professional development course for upper secondary statistics

1. Professional development course

Changes in the national standards (KMK, 2012) and the new state curriculum implemented in North Rhine-Westphalia (NRW) made teaching statistics and the use of digital tools mandatory in the final examination (Abitur). Teaching adequately under this new circumstances seems to be a challenge for several upper secondary teachers. Therefore, the demand for professional development (PD) courses in statistics increased. This is accompanied with the need for appropriate qualified facilitators to implement such courses. To tackle both gaps at the same time a team of the German Center for Mathematics Teacher Education (Deutsches Zentrum für Lehrerbildung Mathematik; DZLM) in Paderborn cooperated with the regional government of Arnsberg. As a result, the DZLM team refined an existing PD course (Biehler, 2016) together with four facilitators of Arnsberg. The collaboration is inspired by the idea of *Content-Focused Coaching* (Staub, 2014) only that the principle was lifted from the classroom level to the teacher PD level. The facilitators were qualified to conduct the PD course on their own by collaborating in the design process, discussing fundamental ideas of the course (Burrill & Biehler, 2011) and bringing in suggestions for a new and enhanced course adaption. The four facilitators implemented the current version of the PD course consisting of five one day long modules. Between each day was a break of several weeks. During this break the participating teachers could try the presented ideas and materials or learn new content in self-learning modules. Teams of two conducted the course at two locations with overall 60 participants.

2. Theoretical background and research question

Based on the three-tetrahedron model for content-related PD research (3TM, Prediger, Leuders & Rösken-Winter 2018) there are several levels where research on teacher PD courses can be situated. Studies on PD courses often focus on the classroom level or content-specific learning pathways on the teacher PD level. Therefore, there are plenty of results regarding design principles (Barzel & Biehler, 2017), levels of effect and effectiveness of PD courses (Lipowsky & Rzejak, 2012). Models of teaching and learning were also examined in several studies (Lipowsky, 2006).

There are several authors claiming that facilitators take an essential role in a PD course and that their behavior has huge impact on the outcome, but there

are just few results regarding PD facilitators (Bell et al., 2010; Borko, Koellner & Jacobs 2014; Prediger et al., 2018). Therefore, a new study direction opens up with a focus on facilitators. Current studies in this field can be sorted under three aspects: 1. Research on knowledge and competences of facilitators (*Mathematical Knowledge for Professional Development (MKPD)* Borko et al., 2014; Beswick & Goose, 2018) 2. Research on implementation by facilitators (Even, 2008; Jacobs et al., 2017) 3. Research on qualification programs for facilitators (*Researching Mathematics Leader Learning (RMLL)* Leisseig et al. 2016)

The study presented here tries to add another aspect to this research direction by looking at facilitators attitude towards PD courses and the knowledge and competences development of the participants. This article focuses on the learning targets which the facilitators wanted to achieve and the presentation of initial results regarding their justifications. Therefore, the following research question is addressed:

> What kind of learning targets do the facilitators pursue regarding the knowledge and competences development of the participants and how do the facilitators justify their choice of goals?

3. Methodology

Semi structured interviews were conducted with facilitators directly after each implementation of a PD course day. The four facilitators were asked different questions regarding their attitude towards the PD course like their learning targets, their view on the participants, the effectiveness of PD courses, their adaptions and transfer processes. The interview recordings were transcripted and made anonymous for further examinations like qualitative content analysis.

The facilitators' learning targets and justifications were classified based on the TPACK – framework (Mishra and Koehler, 2006) on the classroom level and the *MKPD* – framework on the PD level. The emphasis of this article is on one facilitator called Mike and his target reasoning mostly done on the classroom level.

4. Results

Facilitator Mike is experienced in teaching at schools (16 years of service) and also in implementing PD courses (4 years for statistics and 13 years for other topics). He was present at three PD days. He differs between three types of learning targets in every interview.

He labels the first type content related competences (*inhaltsbezogene Kompetenzen*) and he sums up targets under this aspect which emphasize the

teaching of content knowledge (CK) to the participants. Mike does not mention much about the choice and justification of those target groups. Only that those goals and the teaching of CK are necessary in the PD due to a lack of knowledge on the part of the participants.

Mike pays more attention to the second kind of goals labeled process related competences (*prozessbezogene Kompetenzen*) by himself. In all three interviews he focuses on the sensitization of teachers towards special misconceptions and learning obstacles (pedagogical content knowledge, PCK) of a certain topic like mixing of probabilities during Bayesian reasoning. He justifies the importance of a sensitization by mentioning that it is a first step towards a change of teaching practice. Only if a teacher is aware of certain misconceptions, he will pay more attention to them in his lessons and possibly make him create learning environment fostering not only pure CK but also particularly addressing those misconceptions. On the long term this should increase the understanding of the students and their development in Mikes' opinion.

The last kind of learning targets Mike mentions every time can be summarized under enhancing participants' technology knowledge (TK). He focuses in his goals on the mastering of technical problems regarding the graphic calculator (GC) like knowing of correct commands or executing simulations with a GC. The pedagogical purpose of this innovative tool is disregarded. Mike explains that he mentions this kind of goals because the participants have deficiencies and concerns towards GC and that he recognizes no development in their skills.

5. Discussion

By looking at the learning targets you can see that the facilitator Mike has not only the PD course level and competence development of the participants in mind but also reconsiders the impact for lessons and pupils. The learning targets are important for him because he wants to change the way teachers behave towards statistics and also change their way of teaching statistics. The first step to achieve this is, in his opinion, to strengthen content related competences and also to sensitize teachers for misconceptions and learning obstacles. You have to be careful to generalize this finding for other facilitators or PD courses / topics. But this preliminary analysis is a first step towards the examination of facilitators' attitude and their reasoning of learning targets for PD courses in statistics.

It is planned to compare the learning targets of the four facilitators with each other and to identify patterns. Their learning targets will be put in relation to the goals of the participants and DZLM developer later on.

6. Literature

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