

Accompanying “in-service teaching” internships of prospective mathematics teachers – a model for encouraging exchange between theory and practice using the triple coaching approach

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Abstract: Developing professional expertise of prospective teachers not only in terms of theoretical knowledge but also in terms of competencies of designing challenging and cognitively activating learning opportunities in the mathematics classroom is certainly one of the key aims of internship phases in pre-service mathematics teacher training. As mathematics-related theoretical contents of teacher training and practice-related learning opportunities of school internships are not always linked in an optimal way, this paper aims at discussing a model of an intensive internship phase combined with a triple coaching approach partly integrated in a course accompanying the internship phase.

1. Introduction

School internships of prospective mathematics teachers do not always accomplish their goals: Short or one-day-per-week forms of internships tend not to give a realistic workplace experience to the prospective teachers. Moreover, in these forms of internships, it is hardly possible to establish strong links between realistic workplace practices in classrooms and mathematics education theories provided in university courses. There is the risk that students may see these contents as purely theoretical and develop patterns of instructional practice almost without taking advantage of academic contents that could support their professional growth.

At Ludwigsburg University of Education, for several semesters, a so-called semester with practical focus has been created, emphasising practice (four days a week for more than three months) and linking it with academic teaching (one day per week at the university). This form of intensified internship offers the possibility to accompany the professional growth of prospective teachers in a potentially crucial phase, and to support the development of classroom routines that conform with research results of mathematics education. Accordingly, from the point of view of mathematics education, the question of how to design learning opportunities at the university for accompanying the teachers' professional growth is crucial for the quality of this form of “in-service teaching” internship phase.

Consequently, this paper presents a model for encouraging exchange between theory and instructional practice in the accompanying university course. The model uses the triple coaching approach, integrating reflections and feedback of researchers, expert teachers, and peers. The focus contents of tasks/materials, visualisation, and classroom interaction are addressed.

2. Theoretical background

The theoretical background for research on supporting professional growth of prospective teachers is associated with the notion of professional knowledge of mathematics teachers. Professional knowledge and epistemological as well as instruction-related beliefs of mathematics teachers encompass a range of sub-components, which can be structured according to three criteria. Firstly, such components may be located more on the side of “knowledge” or more on the side of beliefs or prescriptive convictions. However, as clear distinctions are often impossible (e.g. Pajares, 1992), we assert a spectrum between knowledge and convictions/beliefs within the notion of professional knowledge. Secondly, following the approach of Shulman (1986), domains of professional knowledge may be distinguished, such as pedagogical knowledge, content matter knowledge or pedagogical content knowledge. Thirdly, professional knowledge can be global, content domain specific, related to a particular content or specific for a particular instructional situation (cf. Törner, 2002; Kuntze & Reiss, 2005). Figure 1 sums up these distinctions, even though we emphasise that the distinctions are less strict than the schematic overview in the figure may suggest.

Even though the relationship between components of professional knowledge and instructional practice is still not completely understood (Tillema, 2000), there are empirical findings suggesting that variables in the domain of professional knowledge play crucial roles for the development of instructional practice (e.g. Putnam & Borko, 1997; Lipowsky, 2004).

Model for components of professional knowledge

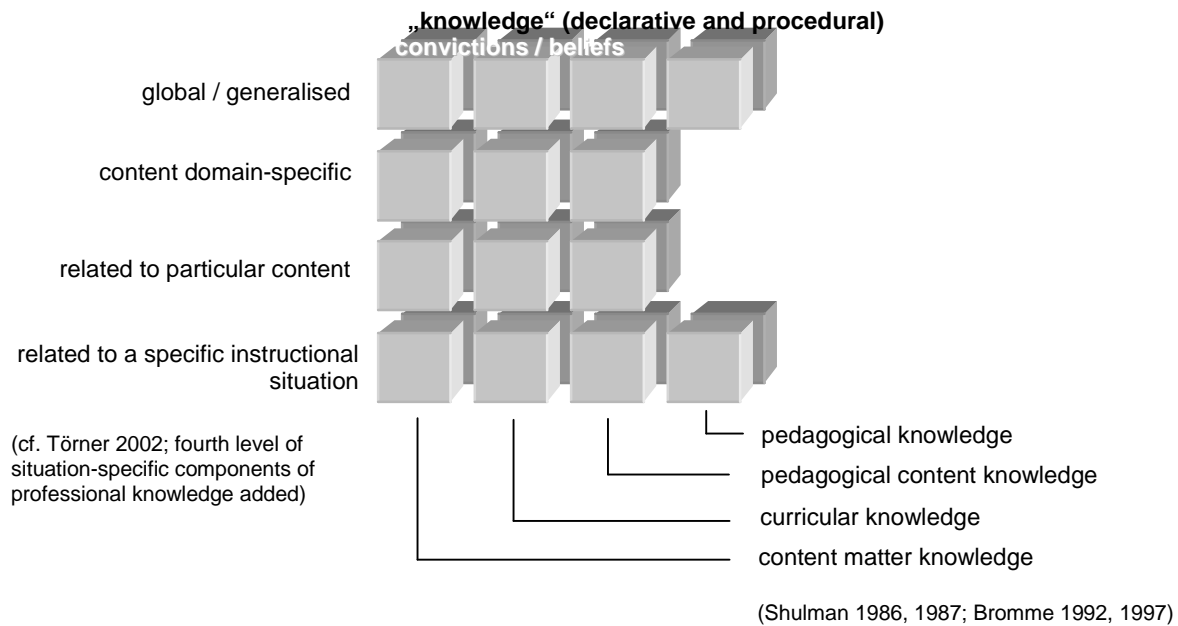


Fig. 1: Model for components of professional knowledge (Kuntze & Zöttl, 2008)

As far as the training for prospective teachers in internship phases is concerned, questions associated with the interplay of instructional practice and professional knowledge are in the centre of interest, because the rather theoretical input of university courses focuses on the development of professional knowledge, which should be linked to instructional practice in internship phases. However, there are inhibiting factors which seem to make it difficult for prospective teachers to establish solid connections between the theoretical input of university courses and practice-related experiences. For example, academic mathematics instruction contents may lack of connections with other theoretical and practice-related knowledge, the contents of university courses may be perceived as unspecific for particular lessons or instructional situations by the prospective teachers and the instructional practice in the internship phases may lack a realistic character as far as circumstances of the teaching profession are concerned.

Consequently, goals for improving school internship phases should focus on the aspects of interconnecting levels of globality in the model of Figure 1, corresponding to theory and content domains on the one hand and to classroom practice in instructional situations on the other. A possibility of facilitating the development of such connections consists in coaching support of the prospective teachers (see section 4 below).

We expect that a focus on strengthening practice-relevant connections in professional knowledge can improve the outcome of internship phases in terms of the prospective teachers' professional growth. As empirical evidence on the effectiveness of intensive internship phases is rare (cf. e.g. Lipowsky, 2004), we will focus on findings concerning the effectiveness of in-service teacher training in the next section, as the integration of instructional practice in the teacher training is a key issue of accompanying internships as well.

3. Effectiveness of teacher training

Teacher training accompanying internship phases should include a focus on the instructional practice

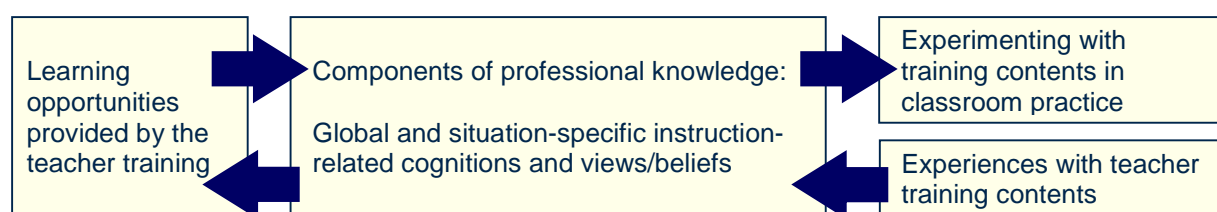


Fig. 2: Model for the implementation cycle of in-service teacher training (cf. Kuntze, 2006)

of the participants, like it is also the case for in-service teacher training (cf. Lipowsky, 2004). Consequently, the design of teacher training accompanying internship phases can profit from empirical findings concerning in-service teacher training. For example, the relationship between learning opportunities provided by the training and instructional practice can be described in a model for the implementation cycle of in-service teacher training (Kuntze, 2006), in which professional knowledge as described above plays a mediating role. The impact of in-service teacher training can be observed empirically on different levels (Lipowsky, 2004; Wade, 1985): The level of impacts reported by the participating teachers themselves, the level of developments in the professional knowledge of the participating teachers, the level of changes in the teachers' classroom practice and the level of competency developments of the students in the teachers' classrooms. According to the overview study by Lipowsky (2004), in-service teachers training programs are effective when they (cf. Garet et al., 2001; Barnett & Sather, 1992; Richardson, 1996; Wade, 1985):

- cover a longer period of time and combine phases of theoretical input, reflection, training and implementation
- support cooperative work in professional communities or teacher teams and enable self-regulated, structured and goal-oriented work
- address convictions and cognitive components of professional knowledge of the teachers and when they have strong connections to mathematics education contents
- are linked to instructional practice, and in particular when they include elements of coaching.

Video-based teacher training can respond to these characteristics: for example, video technology enables participants view instructional situations repeatedly, which can enhance reflection on instruction (Sherin, 2004; Seago, 2004). For this reason, videotaped instructional situations often play a role in coaching projects, too (Sherin & Han, 2003). Lipowsky (2004) identified instruction-related reflection by the participants as a prerequisite of the success of teacher training in the domain of developing professional knowledge. For the case of video-based training, the role of encouraging reflection processes is emphasised e.g. by the findings of Beck, King and Marshall (2002).

4. Coaching

As already reported above, support of teachers by elements of coaching can not only encourage teachers to reflect on instructional quality and on their classroom practice, but it provides teachers with a structured and focused help when they aim at improving and developing their classroom practice (Staub, 2001). The role of the coach can vary: The coach can be an expert, representing the position of research on instructional quality; the coach can be an experienced teacher giving feedback according to the framework of cognitive apprenticeship; the coach can even be a peer sharing the perspective of the learner being coached.

Coaching has shown to be successful when the coaching focused on the professional context and when the coach supported the process rather than taking the role of a problem solver (Joyce & Showers, 1982; Collins et al., 1989; Rauen, 1999).

5. Model of the “in-service teaching” internship and the accompanying course

Against the background of the considerations and empirical findings presented above, we conclude that coaching support can be an effective way of fostering the development of practice-related professional knowledge of prospective teachers, which also conforms with essential training goals of pre-service mathematics education.

Consequently, in a current project, we will integrate coaching components in an accompanying course of an intensive internship phase. This course will take place in the framework of a pilot “in-service teaching” internship programme of Ludwigsburg University of Education. In this pilot programme, prospective teachers spend four days a week during one semester teaching at a school and the fifth day at the University of Education for accompanying courses.

In our project, the development of an accompanying training and its evaluation will be in the focus. The model we use in our project is based on a triple coaching approach, integrating reflections and feedback of researchers, expert practitioners/teachers, and peers. Moreover, the triple coaching approach concerns the three areas of use of materials, representations and tasks, planning of

instruction, and interactions/discourse in the classroom.

Consequently, in the accompanying university course, the focus content areas of tasks/materials, representation/visualisation, and classroom interaction are addressed. The contents and framework of learning opportunities provided by the accompanying course follow the matrix-like structure shown in Figure 3. The cells of this table can be used to give an overview on the different learning domains and coaching activities of the course accompanying the internship.

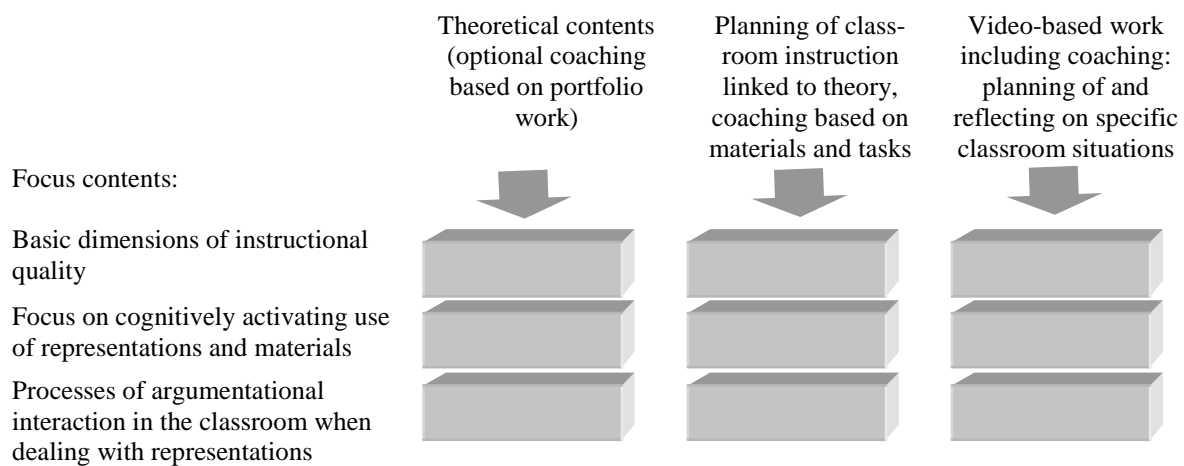


Fig. 3: Structure of learning opportunities in the accompanying university course

6. Evaluation research: Research questions and design of the study

In order to find out about professionalisation processes associated with the internship, the project includes an evaluation research component. The research questions concentrate on the observation of possible developments in the professional knowledge of the participants and on their (self-reported) views on the internship phase.

In the theoretical background section, empirical results concerning in-service teacher training have been asserted to be at least partly valid for the situation of the accompanying course of the intensive internship phase, as prior empirical research in this domain is still relatively rare. This raises interesting additional research questions about the applicability or generalisability of the results cited above. As the internship phase is situated in a relatively early phase of the professionalisation process of the prospective teachers, they might lack of prior instruction-related experiences when being confronted with the learning opportunities of the course. However, an opposite effect might also occur: As there might not yet be very stable classroom routines of the prospective teachers, the internship phase might succeed in the goal of supporting the teachers to build up practice-related professional knowledge and routines coherent with research about instructional quality.

7. Conclusions

On the base of the model for professional knowledge in the theoretical background section and empirical research about the effectiveness of in-service teacher training, elements of coaching are considered as an important support for the professional growth of prospective teachers in the intensive internship semester. Complementary forms of coaching and complementary mathematics education contents are integrated in an accompanying course that aims at establishing strong links between theoretical academic teacher training contents and the instructional practice of the intensive internship phase. These elements have the potential of enhancing professionalisation processes – which sets interesting perspectives for the evaluation research of the project and beyond, e.g. concerning research into impacts of school internships on the professional growth of mathematics teachers at a more general level.

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