CHAPTER 3

MATHEMATICS TEACHER PROFESSIONAL DEVELOPMENT

A German Perspective

OVERVIEW

So far, professional development has been discussed from an international perspective. Since chapter 4 is concerned with presenting a specific initiative for professional development, the particular context of mathematics teacher education in Germany will be outlined in this chapter. The last comprehensive overview goes back to the work by Andrea Peter in 1996 who reflected the specific national situation against the Australian one. Much progress in the field can be stated from that time on, particularly, a shift from viewing in-service education as being rather isolated to being part of continuing professional development has emerged. What is elaborated on in the following are the current educational debate in Germany in general and aspects of mathematics teacher in-service education and training in particular.

Finally, the developments in the context of two specific professional development programs are reflected and discussed against the theoretical positions as supplied in chapters one and two. Thereby, the focus will be firstly on describing that initiatives, and secondly on working out the significance of both for the general discussion on professional development. Finally, the last subsection presents a short summary and some implications.

EDUCATIONAL DEBATE

During the last years, in the context of mathematical literacy as proclaimed by the OECD (2003), TIMSS and PISA have led to an intensive discussion in Germany about the concept of learners' competency, thereby opening the question of its equivalent for teachers (Baumert et al., 2001; Prenzel et al., 2004). In the aftermath of Germany's poor performance in TIMSS and PISA, a flurry of debates and discussions concentrated on students' mathematical knowledge and skills, i.e., competencies. Consequently, educational standards in mathematics and other subjects were launched by the Standing Conference of the Ministers of Education and Cultural Affairs of the Laender in the Federal Republic of Germany[1] (Kultusministerkonferenz, abbr.: KMK) in 2003.

New demands on school mathematics emerged, particularly on the teacher level (cf. Blum, Drueke-Noe, Hartung & Koeller, 2006). In this context of improvement and change, the professional knowledge of mathematics teachers in Germany has been researched in depth and from different perspectives (Baumert & Kunter, 2006;

Brunner et al., 2006, Blum et al., 2006). Particularly, in the COACTIV[2] study associated to PISA 2003, the aim was to investigate the professional competence of teachers, cognitively activating instruction, and the corresponding development of students' mathematical literacy.

Moreover, other studies have been concerned with improving school quality, like for instance BIQUA[3], and with identifying conditions, a school needs to have in place to enhance their students' learning. Especially, the SINUS project that is presented later has aimed at supporting teachers' professional development in the context of school improvement efforts while the TEDS-M[4] study analyzes knowledge and beliefs systems of prospective teachers. The TEDS-M related preparatory study MT21 (Mathematics Teaching in the 21st Century) yielded first national results (Bloemeke, Kaiser & Lehmann, 2008). With respect to these findings, Kaiser et al. (2007) conclude that "future teachers' knowledge and beliefs depend heavily on how they are trained. They gain knowledge in those fields emphasized in teacher education and their beliefs change in accordance with the curriculum taught at their institutions" (p. 3120).

So far, it can be considered basic progress that in the last ten years, the discussion of competency models, as happened in the aforementioned studies but in particular in the context of COACTIV (c.f. Baumert & Kunter, 2006), has produced a substantial theoretical background on both the student and the teacher level. Even though it may seem obvious that teaching to enhance students' competence demands special teacher qualities, the question of how sheer teacher knowledge sparks its counterpart in students still remains mostly open. In this respect, the efforts of Tenorth (2006) to moderate in the current German debate on teachers' professional development are particularly noteworthy.

While the emphasis has been on competency models, Tenorth (2006) tries to draw more attention to teaching practice and its associated essential routines. He points out that it is not sufficient to just focus on knowledge and derived competencies but also necessary to consider professional schemes, which represent the practical organization of teaching for a live in-class performance. The provocative subtitle of his paper *Theory stalled but practice succeeds* does not herald an argument against knowledge (which must, if anything, be stronger in practice than in theory!), but one against abstractly theorizing about knowledge.

Nevertheless, in Germany, to sum up, the developments built the basis for a theory of professional knowledge, which further led to a model of competence, characterized by a dynamic interplay of professional knowledge, beliefs, motivational orientations and self-regulative skills (Brunner et al., 2006). Surely, there is much value in the considerations, in particular as they have influenced the discussion on the aims of in-service education while broadening the view to the notion of a competent teacher as, for instance, reflected in the standards.

However, with respect to the current situation, the following statement by Jerome Bruner (1996) is rather relevant:

> These debates have been so focused on performance and standards that they have mostly overlooked the means by which teachers and pupils alike go about their business in real-life classrooms - how teachers teach and pupils learn.

The work of the COACTIV group on professional knowledge is close to the one of Ball and colleagues (cf. chapter one), but maybe not all relevant teacher competencies are covered in the model. One can ask, for example, whether these categories catch the difference between a seasoned teacher and his novice colleague when the latter, lacking established routines, enlivens his classroom actions by improvisation (cf. Roesken, Hoechsmann & Toerner, 2008). Maybe, a shift in paradigm from theorizing rather proficiency than competence, as Schoenfeld called for at his talk at the 2008 AERA's annual meeting in New York, would be the more appropriate approach.

However, teachers in Germany are under growing pressure to perform, that is, experienced teachers need to modify their practice to adapt to decisive changes in the German educational system. Besides implementing educational standards, the reduction of time at school (high school diploma after 12 years), central exams in grade 10 and a central exam at the end of high school put increasing demands on German mathematics teachers and constitute a non-habitual output orientation for the single school.

IN-SERVICE EDUCATION AND TRAINING IN GERMANY

In Germany, responsibility for educational affairs lies with the Departments of Education in each of the 16 Federal States (Laender). Specific institutions under their purview provide in-service education, thereby the aims are to assert and update the qualification obtained by pre-service education. In the final report (Terhart, 2000) of the commission constituted by the Standing Conference of the Ministers of Education and Cultural Affairs of the Laender (KMK), a threefold differentiation regarding teacher in-service training is provided, and will be outlined in the following.

In-service training is characterized as being (1) supply or demand oriented, provided (2) externally or school intern, and addressing (3) subject matter or pedagogical content themes (cf. Terhart, 2000).

Supply or Demand Oriented In-service Training

As Terhart (2000) points out, in-service training courses can be distinguished between being primarily supply or demand oriented. Thereby, a clear domination of externally provided supply oriented courses, addressing single teachers, is stated. This trend presents the traditional way of providing help for practicing teachers, as it is subject of the departments of education to take care of and support teachers' lifelong learning.

Demand oriented courses more precisely address teachers' needs and are mostly provided by external institutes, which adjust their offer with regard to this market. That is, the courses are already designed but teachers can ask for pursuing their specific demands. As will be shown in the next chapter, *courses on demand* constitute a decisive parameter of the initiative *Mathematics Done Differently*.

Regarding these two conceptions of supply and demand oriented in-service training, Terhart (2000) points out that the former takes the risk of not meeting teachers' needs and therefore might have just a limited, if any effect. The latter conception deals with different problems. If in-service training is just offered according

to a specific demand, it might happen that teachers do not notice either a need for professional development, or that they obtain difficulties to sufficiently formulate their demand.

Finally, Terhart (2000) emphasizes that the conceptions should not be viewed as being contrary or alternative to each other but both as being present on the market and bringing supply and demand together.

Externally or School Intern In-service Training

An important differentiation, so Terhart (2000), is to distinguish between externally and locally provided in-service training. Externally organized training courses are clearly not job-embedded and rather distant from the everyday life in school, which at some point might even be a relief for teachers. These events are mostly participated by single teachers, which is the reason why the transfer is largely questionable since no support by colleagues is given and, to the contrary, teachers might be confronted with their reluctance when trying to implement new issues and ideas.

The transfer problem can be minimized by addressing all subject teachers of one school and providing school intern in-service training. But Terhart (2000) also recalls considering that this form might be an additional strain for teachers. Finally, he stresses that the two conceptions of in-service training both serve to enhance school development and foster professional profiling of the single school.

Subject Matter or Pedagogical Content Themes Provided by In-service Training

In the last categorization, in-service training courses are categorized regarding the content they address, whether the relevance is on subject matter or pedagogical content knowledge. Subject matter knowledge oriented courses contribute to updating or enhancing teachers' specific knowledge, and to offering possibilities to conceive new trends and developments within the subject discipline. Pedagogical content related courses more directly aim at teachers' actions in the classroom, taking into account students' cognitive and motivational orientations.

Another thread of courses, so Terhart (2000), is formed by those emphasizing general pedagogical topics on a rather meta-level, going beyond merely subject related problems, in order to supply teachers with a systematic pedagogical support.

All three conceptions of teacher in-service training do have different aims, weaknesses and strengths. What the commission stresses, and that is a very interesting point, is that any course design should take into account the possibilities and scopes of all the different conceptions rather than generally favoring one at the expense of the other. Therefore, Terhart (2000, pp. 133–135) gives an overview on some principles worked out by the commission instead of assessing the different in-service training approaches:

> In-service education that is institutionalized is only part of a life-long learning process and is therefore considered as giving an impetus to initiate or substantiate teacher learning.

Intensifying teacher in-service education should not result in cancellation of lessons. That is, teachers are thought to bear the responsibility to pursue their professional development when they do not have classes.

One major goal is to overcome the conception of professional development being a short-term event and an individual endeavor in order to enforce a designated transfer. Intensive research is needed to systematically design, investigate and evaluate in-service programs.

Stronger than hitherto, in-service training should aim at teachers' actions in the classroom. What is mostly lacking is to train new teaching approaches in practical situations. As a major goal, the effect of training courses should reach not only the classroom but also the learning of students. Alas, the actual work in the classroom still mostly contributes to individualism than professionalism.

Voluntariness is a crucial point as well. Firstly, teachers are legally bound to pursue their professional development. Secondly, it is important no to view in-service education as being a solely individual choice but an essential part of staff development within the single school.

Concerning locally or externally in-service training, it should be considered that teachers do not necessarily need to be specialized in the same qualification. The interplay of different competencies contributes more effectively to successful progress. All teachers of the department are asked to develop together a plan what competencies are needed, and how they could be acquired.

The suggestions made by the commission are permeating the field and, to be sure, contribute to an innovative view on professional development. However, what can be stressed so far, regarding the second aspect of making teachers accountable for professional development even in their free time while maintaining the *axiom* that no lesson should be cancelled, calls for a more appropriate and supportive attitude on the part of the administration.

Nevertheless, the situation in Germany is still dominated by short-term training and single-session workshops rather than program settings, mostly centrally organized rather than locally. But alternative forms have taken place, not at least the SINUS project, which will be elaborated on in the next section, has significantly contributed to change towards more innovative approaches.

Developments are different within the Federal States. The Department of Education in North Rhine-Westphalia[5], for instance, provides an innovative conception of in-service education, mostly in line with the suggestions made by research. That is, school development is regarded as key in the development of the educational system, the single school is consequently assigned an autonomous role, and in-service education viewed as being embedded in the life and work of the school. Further, federal money serves as a budget for in-service training and is delivered directly to schools. Primarily, a social market view is anticipated, and schools are accordingly considered as entering the market as consumers. Another crucial variable is quality management, relating to this, evaluation is seen as a necessary and indispensable

obligation. The situation is rather interesting for the project that is outlined in chapter four, for one long-term goal is establishing the initiative within the educational system.

How to contribute to teacher professionalism is currently a highly discussed topic in Germany. Rather alarming, the national educational report (Autorengruppe Bildungsberichterstattung, 2008) worked out on behalf of the Standing Conference of the Ministers of Education and Cultural Affairs of the Laender and the Federal Ministry of Education and Research indicated that about 76.000 students left school in 2006 without any qualification. Remarkably, the expenses for education meanwhile decreased from 6.9% to 6.2% of the gross domestic product (GDP).

More recent, during an educational conference in one of the Laender, different politicians again stressed that the focuses of any reform endeavor should be on more responsibility of a single school. What is particularly favored is to give autonomy to schools regarding staff issues, for instance, the engagement of personnel. With respect to in-service education, it was advocated to establish a system of credit points for participating in-service courses, which should also partly being offered at the university. The latter aspect takes into account that knowledge in the subject domains changes and develops at any time.

Quite recently, in an interview, Koeller (2008) who at that time was working at the Institut for Educational Progress[6] (Institut zur Qualitaetsentwicklung im Bildungswesen, IQB), also stressed not only the importance of the single school, but first and last the single subject department. All subject teachers from one discipline should meet on regularly basis to work altogether on further developing their teaching. Support could be given by external experts in order to coach teachers and help them reflecting on their practice (cf. Zedler, Fischler, Kirchner & Schroeder, 2004). Koeller (2008) assigns a decisive function to school inspectors and their role of helping schools in their particular development and considers it a reachable goal to institutionalize these together with experts for professional development, independently from school administration.

TWO SPECIFIC PROFESSIONAL DEVELOPMENT PROGRAMS

Since the TIMSS study diagnosed a significant weakness of students' mathematical understanding, the initiatives SINUS[7] (Increasing Efficiency in Mathematics and Science Education) in Germany and IMST[8] (Innovations in Mathematics, Science and Technology Teaching) in Austria have been launched. While the former program initially aimed at improving the efficiency of mathematics and science teaching in lower secondary school (BLK, 1997), the latter addressed upper secondary school and additionally provided impulses for the whole educational system (Krainer, 1999).

The different conceptions are due to different assumed reasons for students' poor performance. In Germany, the failure was explained by taking a rather local focus, i.e., in terms of lessons and schools. In Austria, the criticism addressed primarily the entire educational system. Correspondingly, the programs provided different issues for improvement, which will be outlined in the next sections. The initiatives will then also be discussed regarding their contribution to teacher professional development in Germany.

SINUS – a German Intervention

The national initiative SINUS was first composed to last from 1998 to 2003. As reaction to the still poor performance of German students at PISA, it was extended two times (2003–2005 and 2005–2007) while additionally aiming at upper secondary school. Thus, the successful program has been expanded in stages, which led to the labeling of SINUS-Transfer. Although the actual project finished in August 2007, successful ideas and approaches have been pursued further in the networks built in the participating Laender or have already been implemented into new projects (Prenzel, 2007); an immediate continuation has only been realized in one of the Laender.

In the course of the project, the organization shifted from being centrally (IPN Kiel[9]) to being decentrally arranged, in responsibility of the participating Federal States. An extension of the project to primary school namely SINUS-Transfer Grundschule started in 2004 and lasted until 2009.

The initial SINUS project was composed to aim at lower secondary level in different school types. Besides mathematics, other subjects namely biology, chemistry and physics were in the focus as well. At first, the project started by involving 180 schools, six schools each were grouped together to so-called sets. Networking between schools organized in these sets was particularly stressed, and each set was looked after by a coordinator, that is, a teacher who took on a specific role. The networking included contacts to universities and specific institutions responsible for in-service education.

More and more school sets were established, at the beginning of the school year 2003/04 the first expansion was launched in 13 of the Laender and reached 700 participating schools while the second expansion in 2005 attained 1800 schools. The idea of transfer encompasses discussing methods, concepts and materials, ultimately aiming at a large-scale dissemination. Thereby, the cooperation of schools, which were already involved in the program, so-called reference schools, and newly participating ones in a common set was especially valued (Baptist, 2007; Baptist & Raab, 2007).

Primarily teachers were considered as key in the process of quality enhancement and management. Across the whole country, professional development was fostered in terms of a bottom-up approach while drawing on available teacher qualification and experiences. Correspondingly, quality management was regarded to start on a school level by means of assigning an autonomous role to the single school. However, regarding content, eleven modules to probe and explore in the classroom were made available and proposed for schools and sets. Problematic topics of teaching mathematics were addressed, and hints for an appropriate treatment were given. But, despite of the supplied material, schools were at the same time asked to take into consideration their local and regional particularities. The modular concept was based on providing basic information, but the topics were moreover understood to be developed individually according to the school staffs' needs. Thus, teachers have been actively involved and assigned responsibility for the concrete implementation of the suggested themes.

The modules covered the following topics: developing a task culture, working in a scientific manner, learning from mistakes, securing basic knowledge, cumulative learning, experiencing subject boundaries and interdisciplinary approaches, promoting boys and girls, promoting student cooperation, autonomous learning, assessing progress, and assurance. Every module was outlined on the project homepage in the Internet; further material for information and practical use in lessons was made available on the project server.

On a regional basis, the coordinators supported the school sets. On a central basis, additional help was offered by the project organization. The central principle drew on the collegial work of teachers within a school department and a network of neighboring schools. Hence, SINUS was primarily build around teacher collegiality and reflection. Baptist (2007) describes the philosophy of the project as follows:

> We had succeeded in integrating the teachers in the development of ideas and materials and therefore they have accepted changes in teaching. Mathematics turned out to be an experimental science - at first an unfamiliar point of view for most of our teachers. (p. 16)

The initiative has been guided by the idea that school improvement only takes place from inside by small steps rather than instantaneous by outside forces and therefore is perfectly in line with many suggestions made in the context of professional development. One crucial point is to foster the responsibility of the single school, and to acknowledge that innovations cannot be initiated top-down. Interestingly, the initiative IMST in the neighboring country Austria started rather at the same time and for the same reasons, but addressed some different issues, as will be shown in the next section.

IMST – an Austrian Intervention

In Austria, IMST was launched in 1998 and first composed as an analyzing project in order to explicate Austrian students' weak performance at TIMSS and to work out advices for appropriate actions. Initially, the program addressed upper secondary schools and from 2004 on it was expanded to other school forms as well (Krainer, 2008a). The findings of the initial project led to the developmental project IMST^2 (2000–2004) that was piloted for one year and then extended to three years. IMST^2 was organized around four priority programs, especially emphasizing mathematics in the school profile, which are: basic education, school development, teaching and learning processes, and research in practice. Additionally, a gender program was offered. Krainer (2005b) outlines the central objectives of the program as follows:

1) to initiate, promote and showcase innovations in the teaching of mathematics as well as of science and technology, to carry out a scientific analysis and to disseminate such innovations, with the emphasis on generating good practice concepts and to professionalise teachers;

2) to take part in setting up a support system for the further development of school practice in the fields of mathematics as well as science and

> technology, in particular by encouraging practice-oriented, scientifically grounded subject didactics. (p. 9)

In the school year 2000/01, 34 schools and institutions participated in the program by choice while the number increased to 62 in the school year 2003/04. A great demand led to a doubling of participating schools; thereby no interested school was rejected. IMST3 lasted from 2004 to 2006, addressing the entire secondary level of schooling. From its very conception, so Krainer (2008a), IMST3 presents a sustainable support system that primarily aims at spreading and broadening the IMST initiatives and establishing them in the educational system. Thus, primarily in the focus of IMST3 was implementing the second point of the objectives presented above. Thereby the following key measures, contributing to three different levels of the educational system, are guiding the process (Krainer, 2005b, pp. 10–12):

At the local level (schools):

(M1) Upgrading the role of the local subject coordinators

At the regional level (federal states):

(M2) Upgrading the role of regional subject coordinators

(M3) Setting up regional centres for subject didactics and school development

(M4) Setting up new or upgrading existing regional networks

At the national level (Austrian educational system):

(M5) Setting up national subject didactic centres

(M6) Setting up the MNI Fund

(M7) Operative steering of IMST3

The seven key measures are thought to support high quality teaching in mathematics. Remarkably, different levels are explicitly mentioned, and underline the systemic approach of the Austrian project. The theoretical conception of IMST draws on constructivism and unsurprisingly systemic theory while the methodological foundation is in action research. The main procedural intervention is to enhance reflection and networking.

Significance of the Interventions for the Professional Development Discussion

Both programs present successful initiatives to enhance school quality in their countries. However, there are commonalities and differences in the programs regarding the underlying philosophies, their systemic effect, and the relationship between research and practice, which led to rather different conceptions. Remarkably, the initiatives are mostly in line with regard to content, that is, the addressed topics and themes. Especially, they share providing possibilities to conceive a different culture of teaching and learning in the mathematics classroom, fostering autonomous and self-initiated work while emphasizing on reflection and collaboration among teachers.

The differences are obvious when discussing the grade of autonomy. In this regard, Krainer (2007) points out, that SINUS provides a more explicit idea what a good task or good teaching is; the corresponding view is theoretically and empirically founded. IMST^2 also brings in research expertise but is more reserved to purport such statements. As already mentioned in the introduction of this work, Krainer's (2005) attitude in this regard is, that in order to answer the question what good teaching is, teachers have to work for themselves at all times. He further stresses that the intention of SINUS is more on implementing modules already worked out by researchers. However, SINUS does not simply offer ready concepts for teaching nor provides any recipes but draws on concrete problems of the participating teachers and actively involves them (Baptist & Raab, 2007; Prenzel, 2000).

In contrast, participants of IMST^2 do collect their starting points and innovations by themselves and obtain support if necessary. Within a priority program offered by IMST^2, single projects are thus conducted mostly autonomously. As Krainer (2007) emphasizes, all developments base on individually identified issues and proposed aspects to enhance mathematics teaching and learning. Only marginal orientation is thereby given by research; although, announcing the specific priority programs at least provides a frame and conceptual orientation. To sum up, the bottom-up approach of the Austrian program is arguably more consequent.

The aforementioned aspects do not only touch the grade of autonomy but also the relationship between research and practice. For that reason, it makes sense to discuss the programs against the theoretical background provided by Cochran-Smith and Lytle (1999), see chapter one. Both projects contain a knowledge-*of*-practice conceptualization even though different nuances can be stated. IMST^2 can definitely be assigned to this category while SINUS is located rather at the borderline to the knowledge-*for*-practice category. Nevertheless, SINUS emphasizes sustained mentoring and effective guidance by externals while input and practice phases alternate. Remarkably, although mostly initial knowledge is provided by research, the philosophy does not persist in this rather strict conception but develops with the project and its participants.

IMST^2 is based on action research, that is, the emphasis is on systematic self-reflection of teachers while being involved in collaborative work. The collegial work contributes to discussions on both practical and theoretical issues. With respect to the relationship between the involved parties of research and practice, the one of IMST^2 seems to be more equitable while providing additionally input for the people engaged in research. In this regard, Krainer (2007) points out that one characteristic of the learning system is that it involves teacher educators and teachers as taking both the status of experts and learners.

In contrast, SINUS does more strongly involve expertise by research in the beginning and then focuses on teacher learning. Likewise, Ostermeier, Carstensen, Prenzel & Geiser (2004) stress that "the BLK-program SINUS is based on an implementation approach, where teachers further develop their teaching while working problem oriented and based on modules. The implementation thereby decisively depends on the locally available conditions[10]" (p. 220). The success of SINUS, and that is what the programs definitely share, can be attributed to reflection and

networking as well. However, IMST^2 is the more complex initiative since the approach has been very open and flexible to the interests and wishes of the involved teachers.

While the focus in Germany was primarily on making a difference in the classroom and on fostering networking between schools, in Austria the emphasis was additionally on a general discussion about basic education, moreover aiming at strengthening the subject didactics. In order to overcome a fragmented educational system in Austria, in the initial IMST report the advice was given to acknowledge and establish conceiving the educational system as a learning system (Krainer, 2007). Accordingly, as pointed out in the preceding paragraph, IMST^2 aims at improvements at the university level by fostering collaborations between teacher educators and teachers, which contribute to the growth of the former, too. Krainer (2005a) draws the following conclusion:

> Since SINUS is primarily composed as an *intervention in the school system* steered by research, IMST is stronger understood as an *intervention of teammates in the common educational system*[11]. (p. 7)

Regarding the systemic approach, IMST^2 addresses the local, regional and national level, while offering concrete measures for development. SINUS acted mainly on the local level, i.e., in schools but also on the regional level as the program was widely noticed and supported by the Departments of Education of the respective Federal State.

However, although maybe not initially contributing to a systemic approach, SINUS has influenced the educational system as well. Not least, evaluation data confirmed that one successful approach has been to launch innovations across Federal States borders (Klein, 2008). SINUS modules found their way into curricula, and the Laender signaled readiness to continue the program, at least partly, after the official end (Prenzel, 2007). Concerning the latter, definitely lacking is a shared conception of how to continue and further develop the networks established during the project phase. In this respect, Klein (2008) reminds that even successful innovative projects bear the risk to just contribute to increasing competence of the participants but fail to broaden good ideas and being sustainable. He further points out that distributing basic approaches must hence be framed as being long-term and systematic learning. Particularly, support is needed not only by the participating Laender, but also on a national level.

Definitely, the main difference between the programs is that IMST^2 has also reached the national education level. However, just recently, the German chancellor called for a common meeting (Bundesgipfel) of Laender und Bund concerning education in general.

SUMMARY AND IMPLICATIONS

Since this work started by presenting the state of the art regarding theoretical aspects in mathematics teacher professional development, this chapter has been concerned with the specific situation in Germany. The current educational debate was outlined in order to give an impression of, on the one hand, what subjects are under

discussion within the educational community and, on the other hand, what substantial theoretical background has been provided in the context of various projects.

Even more important, the statements on teacher in-service education provided by the KMK-commission were reflected upon, since they further serve as background to discuss the particular initiative that is presented in the subsequent chapter. Finally, two successful projects were presented and their significance for the discourse on professional development was outlined. Both are very interesting since they draw on many of the theoretical aspects that have been presented in this work. Altogether, the information serves to better understand the current situation in Germany in which the initiative *Mathematics Done Differently* was launched.

NOTES

[1] The *Kultusministerkonferenz* unites then ministers resp. senators of the Laender responsible for education, higher education and research as well as cultural affairs and draws on an agreement between the Laener, cf. http://www.kmk.org/.

[2] COACTIV (Cognitive Activation in the Classroom), http://www.mpib-berlin.mpg.de/coactiv/index.htm

[3] BIQUA (Quality of Education), http://www.ipn.uni-kiel.de/projekte/biqua/index.html

[4] TEDS-M (Teacher Education and Development Study in Mathematics), http://www.iea.nl/teds-m.html

[5] http://www.kompetenzteams.schulministerium.nrw.de/Leitungsfortbildung/

[6] IQB cf. http://www.iqb.hu-berlin.de/

[7] SINUS is the abbreaviation for "Steigerung der Effizienz des mathematisch-naturwissenschaftlichen Unterrichts", cf. http://sinus-transfer.uni-bayreuth.de/

[8] IMST, cf. http://imst.uni-klu.ac.at/

[9] IPN Kiel, http://www.ipn.uni-kiel.de/

[10] Translation of: Das BLK-Programm SINUS beruht auf einem Implementationsansatz, bei dem Lehrkraefte problemorientiert und ausgehend von Modulen ihren eigenen Unterricht weiter entwickeln. Die Umsetzung haengt entscheiden von den vor Ort vorliegenden Bedingungen ab.

[11] Translation of: Waehrend SINUS vor allem als eine seitens der Wissenschaft gesteuerte *Intervention in das Schulsystem* angelegt ist, versteht sich IMST^2 staerker als *Intervention von Mitspieler/innen* im gemeinsamen Bildungssytem [...].