Teachers' Professional Development: Case studies from Austria's IMST3

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Introduction: background, aims and framework

Teachers' professional development has been identified as one of the main driving forces for educational reform in the last two decades, especially if communities of teacher-learners are formed (Borko 2004). By providing a network of support for Austrian mathematics and science teachers who develop innovative projects with their pupils, the "MSI-fund for Maths, Sciences and IT" aims at improving both the quality of science teaching in Austrian schools as well as teachers' professional development. It is one of seven measures of IMST3 ("Innovations in Mathematics, Science and Technology", http://imst.uni-klu.ac.at), which is financed by the Austrian ministry of education. The MSI-fund cooperates with teachers and teacher teams by providing workshops about science education and the meaning of content specific pedagogical knowledge (Shulman 1987) as well as about methods for designing, carrying out and evaluating teaching innovations. The seminars are for free and there are financial incentives for written project reports. Our study investigates the effects of such a support system on the professional development of teachers.

We chose to carry out an in-depth study of few projects and teachers in order to identify

- criteria for assessing teachers' professional development
- factors which foster or impede professional development.

As an interdisciplinary team, we combined an action research approach (Altrichter, Posch & Somekh 1993; Krainer 2002; Stern & Krainer 2003) with elements from ethnographic fieldwork (Agar 1980, Herzfeld 2004). We did not only want to contribute to research on professional development but also produce data that might help the teachers reflect on their development (research partnership).

Sociological and educational research on professional development mostly focuses on the teacher's classroom performance (e.g. Lortie 1975, Baumert, Blum & Neubrand 2002). In a broader view inspired by action research (Stenhouse 1975, Altrichter 2002) we included organizational development in school as well as teacher's personal development due to increased reflection on ethical issues, educational goals and career perspectives (Kreis & Stern 2005). For our project we adopted 12 criteria for professional development from earlier studies, but arranged them according to three different contexts, namely classroom (criteria 1-4), school (criteria 5-8) and personal and societal level (criteria 9-12). Thus, the 12 criteria we used were

C1: Innovative teaching and learning: extending the range of teaching methods
C2: Bringing subject knowledge, knowledge of didactics and didactic skills up to date
C3: Creation of suitable conditions for teaching and learning
C4: Taking students' perspectives into account
C5: Teamwork
C6: School development and cooperation with parents
C7: Cooperation with the community and institutions outside school
C8: Public relations

C9: Reflecting the effects of teacher's action
C10: Conscious control of personal professional development
C11: Reflection and change of attitudes and beliefs related to teaching and the job
C12: Reflection of the concept and aims of education

We assumed that teachers would only develop professionally in aspects which they themselves recognized as important for their practical work. So the three key questions of our inquiry were:

1. Which competencies do the teachers themselves want to expand?

2. Which changes in professional development can be perceived?

3. Which kind of support is helpful for teachers' professional development, and does the "MSI-fund" offer this support?

Methods and samples

We focused on three case studies: one rural middle school teacher, an interdisciplinary team of two teachers in a vocational school for kindergarten caretakers in a small town and a team of two teachers in a high-school in the city of Graz. We employed a triangulation of methods and involved different parties in our research (triangulation of research participants). Over the period of six months we carried out at least two in-depth interviews with each of the teachers, asked them for written self-reflections, applied a questionnaire to the students followed by group interviews, carried out interviews with teacher colleagues and the headmasters. The teachers also provided us with photos and their final reports for the MSI-fund. To analyse this wealth of data we used both explorative methods, trying to do justice to each individual case, and the above-mentioned criteria for teachers' professional development in order to make a cross-case analysis.

The rural middle school teacher's approach was to demonstrate the everyday relevance of the natural sciences and to let the 13 year old students perform hands-on-science experiments. Her main concern was to combine science and foreign language teaching. She therefore divided her class in two and taught one group to describe and explain their experiments in English. Meanwhile, the students in the second group repeated and deepened their knowledge through individual study.

The two teachers (one for general didactics and the other for chemistry) in a vocational school for prospective kindergarten teachers had to cope with the fact that chemistry was the least popular subject among the all-female student body. Their idea was to let the 16 year old students select and carry out chemical experiments with the children in kindergarten, using mainly substances from every-day life. The children were generally fascinated by the experiments, a major motivation for the students to get a grip on chemistry as a valuable competence for their future profession.

The team of two physics teachers in Graz developed a curriculum for their high-school combining physics and IT. They divided the classes in two and used the school's ample computer facilities. The 13 year old pupils acquired information on certain topics on the internet, simulated experiments with java applets, documented their results in text files and sent them to their teachers via e-mail. The teachers' aim was to provide students with a reasonable substitute for genuine physical experiments as their school lacked equipment, enable them to learn independently and increase their computer skills and media literacy. The teacher team thus contributed to the school's focus on IT competencies.

Results

Even within the period of only six months the teachers showed significant progress in their professional development. The analysis of our data revealed that their development was not restricted to just a few of the 12 criteria, but rather included almost all of them at the same time. Although we chose the specific cases for maximum diversity, we could also identify some aspects of professional development common to all the teachers participating in our study:

- All three projects were innovative regarding the choice of contents, methods and learning environments. They were all interdisciplinary (even the single teacher combined two distinct subjects, English language and science). Venturing into new ways of classroom practice raised the teachers' interest both in professional communication with colleagues and in learning about results of educational research.

- All teachers had to create conditions suitable for carrying out their projects on an organizational level. This included not only changes in the timetable but also gaining support of other colleagues and the headmaster, and cooperating with partners outside the school.

- A main feature of all projects was the active participation of the students who were encouraged to reflect on their progress, articulate their opinions, and give feedback. The teachers recognized that taking the students' views into account increased their commitment and was thus of major importance for the projects' success.

- As the students became more responsible for their learning progress and got used to studying more independently, the teachers' role gradually changed from transferring knowledge to coaching individual self-steered learning processes.

- A side effect of the project work and the MSI-support was the growing self-esteem of the teachers. Whereas they had initially uttered surprise about our intention to include them in our research and seemed insecure about their achievements, they developed a more self-assured attitude towards the end of our project, balancing self-criticism with pride about their overall success.

The philosophy of the MSI-fund is not to instruct the teachers about alternative ways of teaching but rather to carefully support their own self-steered learning processes and to offer them guidance through peer review and individual coaching (Krainer 2006). In our three cases this strategy seemed to work perfectly and it was most impressive for us to observe closely how the teachers involved made tremendous progress within a rather short time. The down side of such an individualized support system is the great diversity of the MSI-projects, which leads to a considerable amount of work for counselling the projects and problems when comparing and assessing their quality.

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