THE LIMITS OF CURRICULAR REFORM AND THE CHANCES OF TEACHERS' PROFESSIONAL DEVELOPMENT.
MAKING TOP-DOWN AND BOTTOM UP STRATEGIES MEET IN THE AUSTRIAN IMST3-PROJECT

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1. Background, objectives and significance of the study

Like in many other countries, curricula for all types of Austrian schools have been reformulated in the last decade. This gave teachers more freedom to choose contents and methods, and to stimulate cooperation with colleagues who teach other subjects. At the same time standards for learning outcomes (competencies) are about to be introduced and will be accompanied by large scale tests in order to secure comparable results of education in between and within different school types. The disillusioning results of international studies (TIMSS, PISA) comparing the effectiveness and equity of school systems all over the world (OECD 2004) have questioned some of the foundations of Austrian educational policy. The consensus of the 15 (now 25) countries of the European Union to strongly improve primary, secondary and tertiary education in order to meet the economic and social challenges of globalization, puts additional pressure on the Austrian government to conform to the common goals until 2010 ("5 EU benchmarks"). Educational research in various countries has however shown that top-down-measures like centralized reform measures of curricula and school organization do not lead to educational change, but are either ignored or met with resistance.

Austrian teachers generally have a good knowledge of their subject. They routinely adapt the curricular framework to the special conditions at their school, make up their mind what and how they expect their students to learn and for that purpose choose and sometimes develop their own learning materials. Thus they are fairly autonomous in various regards and put many good ideas into practice on a local level. These teachers are potential agents of bottom-up reforms. But every innovator knows from experience that even the most ingenious and ambitious initiatives can hardly be successful and effective on a larger scale if they lack systemic support.

There is a lot of evidence proving that neither top-down reform nor bottom-up activities can spark fundamental changes in a school system. Michael Fullan (1993) argues convincingly that only a combined and balanced effort of both bottom-up and top-down strategies that places teachers centre stage as "change agents" has a good chance to be effective. The Austrian project IMST3 ("Innovations in Mathematics, Science and Technology Teaching") builds upon this knowledge about school reform. Initiated by a team of educational theorists and practitioners and supported by the Austrian Ministry of Education it aims to improve the quality of mathematics and science teaching in Austria over the next decades. IMST3 supports both individual teachers and the

educational system as a whole by connecting all institutions concerned. Seven far reaching reform measures on local, regional and national levels are expected to have a strong impact on classroom routines, school development, teacher education and research in the coming years. A main feature of IMST3 is the combination of top-down and bottom-up strategies, adjusting national educational policy to the challenges of the global knowledge society, and on the other hand empowering teachers to produce and disseminate new ideas and to cooperate in school networks. Alongside IMST3, universities and regional teacher centres have started to develop "competence centres for mathematics and science didactics" in order to be able to inspire, coordinate and evaluate this nation-wide endeavour.

One of the seven reform measures of IMST3 is the creation of the "MNI-fund" ("Mathematics, Natural sciences, Information technology") which supports local projects promoting innovative teaching of mathematics, science and technology by offering financial resources and counselling. Every year up to 160 individual teachers and teacher teams from secondary schools and teacher training institutions including universities participate in workshops of one of six focus groups (1. eLearning & eTeaching; 2. Literacy & standards; 3. Teaching & learning along topics; 4. Analysing classroom interactions; 5. Discovering, investigating & experimenting; 6. Applying knowledge to real life situations & vocational training) and deliver written reports about their projects.

The PDTT-study ("Professional Development of Teacher Teams") is part of the evaluative research programme of IMST3 and was carried out by social anthropologist Anna Streissler and educational scientist Thomas Stern. It investigates how teachers who cooperate with IMST3 tackle the challenges of their profession, develop innovative teaching projects, reflect on their changing priorities in the classroom, and build networks with teacher collegues and institutions beyond school. The research team carried out three case studies as well as a cross-case analysis pointing out commonalities and differences in the teachers' approaches and priorities. The team also investigated the effectiveness of the MNI-fund's support for the teachers in order to draw conclusions about educational reform strategies.

Although it is a small scale study, PDTT attempts to gain a better understanding of how reform measures on the macroscopic (system) and the microscopic (classroom) levels can be adjusted so as to improve the quality of teaching and learning.

2. Underlying theoretical framework

Professional development is regarded as one of the pillars of educational change. The teachers themselves are key players. Without their consent and active and engaged participation major changes of a school system are impossible. Their professional development, i.e. their "continuous extension of competencies through systematic self-study" (Stenhouse 1975) and especially their adaptation to constant change, is the basis of every successful school or school system. It is the capacity to learn and draw consequences from experience and thus balance the complementary dimensions of action and reflection as well as autonomy and networking (Altrichter & Krainer 1996). A main indicator for the success of IMST3 is that teachers extend their pedagogical content knowledge as well as their methodological skills in evaluating their teaching, in collaborating with colleagues and in reflecting about educational goals.

In order to describe and analyse a complex intervention into the educational system and its effects on students, teachers and the school setting, the following theoretical approaches were used in the PDTT-study:

- Systems theory (focus on interrelations between individual development, team processes and organizational frameworks; on schools as "learning systems")

- Action research (teachers as "reflective practitioners": learning from experience; sharing knowledge; taking responsibility; empowering students)

- Constructivist theories about cognition (subjective patterns of knowledge and understanding, learning as a social activity).

3. Research design and procedure

Three examples of good practice were carefully chosen from the overall 160 projects supported by the MNI-fund. They were supposed to be as different as possible, not only in their scientific contents and didactical approaches but also in their school contexts (type of school, rural or urban settings). All three cases were studied in-depth over a period of six months in order to show possible changes in the professional performances. The methodology combined an explorative approach and the use of a set of 12 criteria for the analysis (Stern 2004, 2006), which were further refined in the course of the investigation.

The first case study portrays two teachers, one of chemistry, the other of general didactics at a vocational school for future kindergarten and pre-school teachers (aged 17). Their project combined chemistry education and practical training. The students had to prepare simple chemical experiments, mainly using common household substances, and let the 5 year old kindergarten kids carry them out. Thus the students were compelled to understand basic chemistry in order to be able to show and explain phenomena to the children and to answer their questions. Additionally they enlarged their repertoire for their future professional work.

The second team consisted of three physics teachers, who introduced the new subject "physics and information technology" in their secondary school focusing on computer and media literacy. The students, aged 13, were using the school's computers to make inquiries on the internet about topics in physics. They studied virtual experiments with java applets and wrote protocols about their observations and summaries of their findings, which they sent to their teachers by e-mail. Thus they worked independently, acquiring scientific knowledge and making use of IT in several ways.

The third case study is about an experienced and competent language teacher, who recently was forced to switch from English to science teaching. In a rural school with a highly heterogeneous group of 13-year-olds, she decided to teach science in English. Her pupils were supposed to show experiments to the others and describe and explain them in English. They were thus acquiring communication skills and learning science at the same time.

The main research questions of the PDTT-project were:

- *What competencies do the individual teachers want to strengthen?*

- *Which changes in their attitude and practice can be observed while they cooperate in an educational r&d project?*

      ○ *How can the MNI-fund most effectively support professional development?*

For all three case studies several methods were employed (triangulation). The teachers were interviewed twice, at the beginning and towards the end of the school year. The principal and two colleagues were interviewed, too, and questionnaires were answered by the students, some of whom were then interviewed in order to gain more information. These data were clustered, categorized and analysed with the help of a set of twelve criteria for professional development. Common features and differences between the many perspectives were worked out in order to gain a comprehensive and differentiated view of the cases.

4. Findings

- *How do innovative science teachers choose topics and deal with the curricula?*
  All three teacher teams showed much interest in practical and useful aspects of science and less in textbook knowledge. They chose topics for classroom activities according to their students' preferences and adjusted the curriculum to their own intentions. Venturing on autonomously designed innovations proved to catalyse their professional development in many ways, a complex process which was strongly bolstered up by opportunities to get feedback about their reflective conclusions from team mates and research partners.

- *What competencies do teachers develop while they cooperate in a research project?*
  A large number of teachers are unaware that by engaging in a teaching project they not only manage their students' learning processes, but also improve their own practical knowledge by continuously learning from their own experience. It proved difficult to get answers about their main priorities for professional development and categorize them. Some teachers were keen on deepening their knowledge about chemistry and physics, or e-learning, others were rather looking for new ways how to get students involved in experimental investigations. Although these priorities were quite different, at least two common competencies could be singled out, which all of them found important and worthwhile to be strengthened, (a) exploring students' opinions about their own learning and understanding, (b) participating in school development in order to influence their working conditions. Even during the short period of approximately six months some progress could be shown to have taken place.

- *What is the impact of the MNI-fund on the cooperating teachers?* It turned out that the teachers mostly valued the seminars and workshops for providing an opportunity to share ideas and experiences with other teachers. Networking with their colleagues, designing, carrying out and evaluating their own projects, writing reports about their innovations and seeing them published seemed to boost their morale and self-esteem and encouraged them to take their professional development into their own hands. They found it especially rewarding to gain methodological expertise for investigating their own practice in order to improve it. The financial incentives offered by the MNI-fund seemed to be less important for them.

Whereas governmental educational reform policy is usually met with disregard and distrust by many teachers, a programme which enables teachers to develop their own projects and offers them

support seems to show better results. In all three case studies the MNI-fund successfully acted as a mediator, connecting top-down measures (new curricula, content standards, teacher education, quality assurance) with bottom-up reform activities (instructional innovations, local curricula, school development, cooperative research). Quantitative evaluations also indicate that such a strategy can slowly but surely bring about profound changes on all levels of the educational system by including and making use of the teachers' professional expert knowledge and by further developing it at the same time.

References:

IMST3-Homepage: *http://imst.uni-klu.ac.at*

Altrichter, H. & Krainer, K. (1996): *Wandel von Lehrerarbeit und Lehrerfortbildung*. In: Krainer, K. & Posch, P. (Eds.): *Lehrerfortbildung zwischen Prozessen und Produkten.* Klinkhardt: Bad Heilbrunn, p 33-52.

Fullan, M. (1993): *Change forces: Probing the Depths of Educational Reform.* Falmer Press: London.

Fullan, M. (1999): *Change Forces: The Sequel.* Falmer Press: London.

OECD (2004): *Learning for Tomorrow's World – First Results from PISA 2003*. OECD: Paris.

Stenhouse, L. (1975): *An Introduction to Curriculum Research and Development.* Heinemann: London.

Stern, T. (2004): *Cooperation Between Schools and Universities as a Catalyst for the Professional Development of Teachers.* In: *episteme-1, conference papers*. Homi Babha Center for Science Education: Mumbai. Internet: http://www.hbcse.tifr.res.in/episteme/conf_proc/

Stern, T. (2006): *Professional Development of Science Teachers through Participation in Educational Research*. NARST Proceedings 2006: San Francisco.