

Cooperation between Schools and Universities as a Catalyst for the Professional Development of Teachers

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Objectives and significance of the study

The study is part of IMST², a big scale development project involving about a hundred upper secondary schools in Austria in the years 2000-2004. The two goals of IMST² are

- ♦ to improve the quality and efficacy of mathematics and science teaching by engaging teachers and scientists in a common research cooperation and
- ♦ to design the conceptual foundation of a support system for schools.

The starting point of all IMST²-initiatives are innovative ways of teaching and learning worked out by teachers and written down in their reports. They work mostly in teams, sometimes combining several subjects (biology, chemistry, mathematics, physics). The teachers choose one of four ways of cooperation with other teachers and with scientists, thereby focussing either on (i) Mathematical and scientific literacy, (ii) School development, (iii) Teaching and learning processes or (iv) Practice-oriented research. In all four priority programmes the teachers formulate the specific goals of their efforts, take part in workshops, discuss about topics of current educational research and share practical knowledge about mathematics and science teaching. The whole project is evaluated as an intervention on three levels: classroom (use of more effective teaching methods, strengthening independent learning), school (teamwork among teachers and progress in school development processes) and the educational system (growing appreciation of mathematics and science in the social environment, professional development of teachers). Two research studies were carried out in order to generate information on how effective a cooperation of schools and university, of teachers and scientists can be for improving the quality of teaching and learning, viz. about (i) changes in attitudes, interests and achievements of students and (ii) changes in didactical approaches and professional practice of teachers.

The second study scrutinizes examples of good classroom practice and its repercussions on the professional development of teachers. To this purpose a set of criteria is developed to assess the teachers' progress. This set of

criteria is an instrument for further inquiries into educational innovations.

Underlying theoretical framework

Professional development is understood as a continuous extension of competencies through systematic self-study. 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. A main indicator for the success of IMST² 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. *The central hypothesis of the study is that the importance of reflection and networking is steadily growing in a professional development process.*

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 are used:

Systems theory (focus on interrelations between individual growth, 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).

Research design and procedure

Two case studies are combined with an investigation about teachers' views about professionalism, i.e. about qualifications teachers must have.

The first case study explores and assesses the changes in the classroom routines, teamwork, attitudes and beliefs of a team of mathematics and science teachers who were engaged in a science teaching project about aspects of measurement in mathematics, geography and physics. They collaborated closely with a team of scientists and with each other in their planning and team teaching. In

order to describe their professional development in the course of this year, the four dimensions action and reflection, autonomy and networking are subsequently refined into a set of 12 criteria.

As a research method a “triangulation” procedure is used. Three sets of data are collected by interviewing the team of teachers, questioning the students and analysing the field notes of an observer. The results are clustered, categorized and compared. Common features and differences between the three perspectives (e.g. about student interest, participation and understanding) are worked out in order to gain a comprehensive and differentiated view of the process.

A second case study repeats the inquiry with another group of teachers who developed physical and chemical experiments about electricity for their students. They and a sample of their students were interviewed about the sustainable effects of this classroom innovation regarding a deeper understanding of scientific concepts.

The set of criteria for professional development is used to assess the progress of both teams. The results are used (a) as a feedback for the teachers who use them for further planning, (b) to test the validity of the hypothesis about the growing importance of reflection and networking, (c) to draw conclusions for an effective support system for schools.

In an additional inquiry, a group of twenty teachers was interviewed about their views on professionalism. Their statements are categorized and compared with current discussions in educational science publications to test the underlying hypothesis.

Findings

Professional development of teachers is no longer restricted to their classroom practice. They are increasingly involved in school organization and professional communication. This observation backs the underlying

hypothesis about the growing relevance of reflection and networking for the teaching profession.

A set of twelve criteria has been developed and is shown to be adequate for evaluating professional development processes:

ACTION AND AUTONOMY

Innovative teaching and learning methods
Knowledge of current developments in science and science education
Provision of adequate learning conditions (resources, atmosphere)
Appreciation of students' perspectives

REFLECTION

Evaluation of the effects of the teacher's actions
Consciousness of increases in competencies
Rethinking of attitudes and beliefs
Critical ideas about math. & scientific literacy

NETWORKING

Teamwork within school
Cooperation with people from other institutions
Organizational development
Public relations

Active participation of teachers in an R&D-project proves to be a powerful stimulus for educational change, if it focuses on independent student learning, and if it is supported by an expert team.

References

IMST²-Homepage: <http://imst.uni-klu.ac.at>

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