INSTEM Case study Germany - MLU

Martin Lindner, Oct. 13th, 2014

Introduction

The German educational system does not allow central programmes for the development of learning and teaching materials. The responsibility for all decisions on school education lies in the education ministries of the 16 Federal States. Due to this it was an innovation, that the comparable poor results of the TIMS-Study in 1996 led to cooperation between the national and 15 state ministries to foster mathematical and science teaching in the whole of Germany. It was the first of about 10 programmes of this size in Germany, others dealt with education for democracy, with life long learning or vocational trainings. Political changes led to an end of this cooperation in 2006. However, one of the results of a nation-wide cooperation were the national standards in education, which were 2003 released for the core subjects (German, Mathematics, Foreign Languages, and the Sciences in 2004).

Context description

Program	Funding	Period	Participants
SINUS	Cooperation between the Federal and 15 State governments (BLK)	1998 – 2003	180 schools, each ca. 6 teachers
SINUS Transfer, 1st wave	- as before -	2003 – 2005	450 schools
SINUS Transfer, 2nd wave	- as before -	2005 – 2007	> 800 schools
SINUS Transfer Grundschule Transfer of SINUS to Primary Schools	- as before -	2004-2009	250 schools
Sinus as part of regional teachers professional development	10 different German Federal States Governments	2007 etc.	Widespread in German states
SINUS as a model for FP7 projects in Science Education	EU	2007-2015	12 large European Science Education projects

Tab. 1: Overview on the phases of SINUS
Aims and structure of the programmes see Prenzel & Ostermeier 2003, Prenzel et al. 2002

The program was organized by coordinators on state and on national level. These coordinators were employed at state institutions, like teacher training centers, or at universities. They usually hat a teaching background, a few were researchers or teacher trainers.

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The local context of the German states are dominated by a traditional way of educating teachers at universities and in a subsequent immersion phase of 1,5 years. Once a teacher is employed permanently there is little challenge for professional development. Especially in science teaching this is problematic at least concerning the content of the subjects, as research produces new results constantly. Only few teacher education courses are offered and the tendency of the in-service-teachers to attend them is very little. Main reasons are the workload, the overload of content in the syllabus and the organizational lack of opportunities to join professional development courses. The need for regeneration and the pressure to do homework minimizes the willingness to attend such courses.

Analysis

SINUS ('Increasing the efficiency of science and mathematics instruction') was started in 1998. Learning from the first five years of the SINUS-Program in 2003 a broad transfer programme was launched (SINUS Transfer). These activities now are in a third status: after developing and testing the strategy and concepts the programme in the first phase and getting experience in transferring the basic strategies to new teachers in the second phase the programme came into a phase of dissemination where the work was transferred to teachers and types of schools which were not involved before. This is not longer done on national level, but on the level of Federal States.

The SINUS program became famous when it was identified as a model program for European Science Education development programs. When the European High Level Group on Science Education, led by Michel Rocard, searched for a model to deal with Science Education in 2007, they interviewed the leader of SINUS, Manfred Prenzel, and took the strategy and politics of SINUS into their report (Science Education Now – A Renewed Pedagogy of the Future of Europe). This report became the basis for the launch of 45 Mio Euro for more than 12 European Science Education programs in the 7. Framework. Prominent examples are ESTABLISH, SysCatalist, S-Team, PROFILES, SAILS, etc.

On national level, SINUS did not only influence many Science and Math teachers, teacher educators and researchers. Researchers involved into the program became leading researchers in classroom research and in the “Didactic” field of the academies. They were leading the committees on formulating the National standards in 2003 for Mathematics and the Natural Sciences Biology, Chemistry and Physics. This influenced the textbooks, and by this lead to a more “open” teaching in the subjects. And, also important: many participants of the SINUS teams became subject team leaders in their schools, headmasters, teacher educators or researchers (like the author of this case study).

Characteristics of the program work

Teachers who join the programme meet regularly over a period of at least 2 or 3 years six or eight times a year, usually in the afternoon. They work in teams of 3 - 10 persons. The meetings are filled with classroom orientated development work by focussing on subject issues and methods and combining experience from different teachers. The meetings are used to develop usable tasks, lessons or whole curricula for classroom work. When the members of the team gather again they will evaluate the experiences which were made in lessons held in between. The work is coordinated on regional and state level by professionals. Usually these are teachers who receive a reduction of their weekly workload.

Another important feature of the programme work is to use the methods of learning, which should

be preferred in classroom work. In our meetings only short introduction lectures are held. The essential work takes place in workshops with high activity of the members. The results are published predominantly on the home pages of the programmes so that all participants of the teams could join the developmental process. Joining a learning structure like this works as a model for teaching and learning which helps to break the Socratic method, which still is dominating German classroom teaching and also to finish the role of teachers as single combatant and enforce team-work at schools.

And more, the way of teaching changed from teacher-centred towards a more open approach. Together with a more experimental based way of classroom work is described by the term of "inquiry based science education" (IBSE). This abbreviation became also famous through the Rocard report.

Research activities on a group of teachers in North Germany

The experiences of the colleagues involved in the programmes were evaluated by questionnaires and in interviews. Some results were gained through group interviews in form of a brainstorming. The answers of the interviews were categorized through three experts and calculated with SPSS.

Results and Discussion

The clearest result is the important role of the team-based work. Most of the answers referred to the positive effect of teamwork, of sharing ideas and classroom materials and of the good and friendly atmosphere which could be created in the teams. As group stabilizing factors were mentioned reliability, confidence and sympathy. All of this can be developed by regular cooperation in fixed teams. An ongoing change of persons disturbs the process of growing together.

On the other hand negative experiences again show the strong effect of teamwork: the lack of teachers to cooperate with is sometimes seen to be a hindering factor for a successful work. Personal habits, which hinder teamwork, are also mentioned as most depressing factors in the work, e.g. unreliability concerning common aims and appointments.

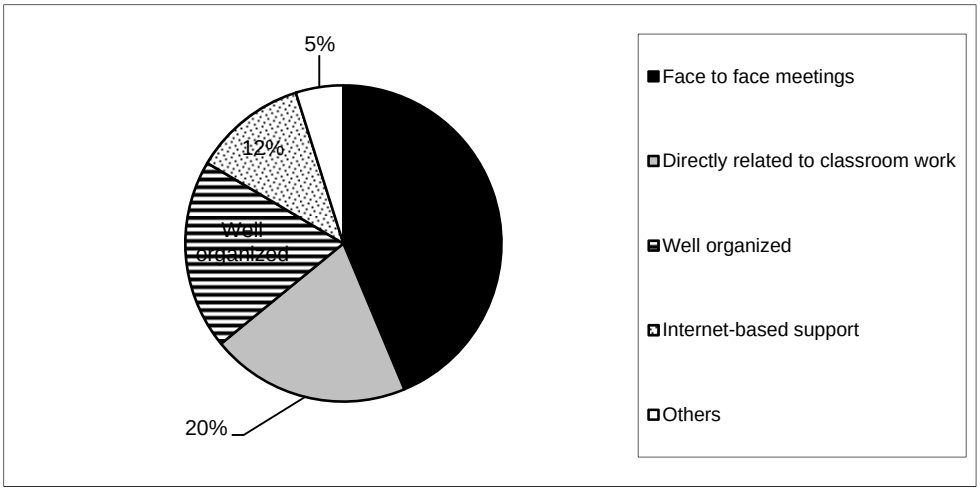

Fig. 1: Assessment of the effect of different factors in the SINUS programme seen as positive by the participants. N = 109

Many colleagues mentioned the acknowledgment through “officials” as a reward and felt accepted in their teaching competence through researchers. This led to statements as: „Being teacher now for 25 years, I have not been taken seriously just like in this programme" Or: „Till now, I was always seen by the ministry as executing something “from above”, now I can contribute through my abilities to the development process“.

Financial motives like reduction of the weekly workload, which were offered to the teachers who participated in the first period of the SINUS-Programme, are less important. Only about 50% of the teachers mention it as a positive factor and consider this as a criterion for their engagement. The effect through acknowledgement is presumably just as important as the economic advantage.

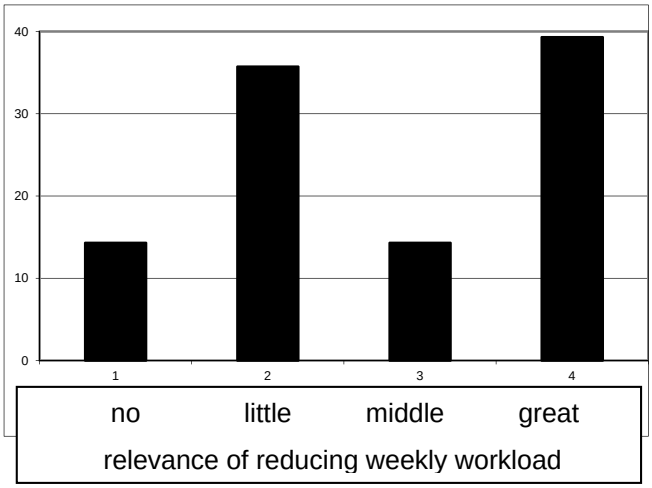

Fig. 2: Significance of reduction of weekly work load (SINUS, n = 45, more than one answer possible)

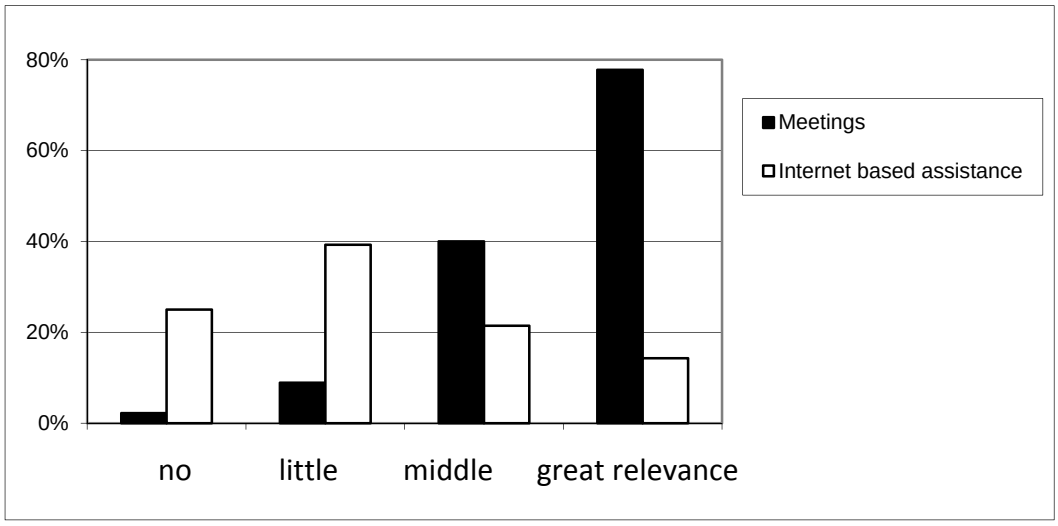

Fig. 3:

Importance of face-to-face meetings vs. internet based assistance (SINUS, n = 45)

In the beginning of the programme the function of the Internet as an exchange and working platform was quite euphorically expected to be high and effective. The experience of the teachers, however, showed a much higher relevance of face-to-face meetings to establish a satisfying work. Recent research (Gräsel et al. 2005) also stresses the importance of teamwork for innovative processes, so that the role of internet-based collaboration should be estimated carefully.

The feeling of belonging together helped the teachers to cope with an increase in heavier working conditions due to a reduction of financial support of school education through the German state governments. Statements as “I like to test new methods and can more easily cope with things which are going in wrong direction” shows a new culture of trail and error learning, which is easier to establish in groups than in lonely work (see also Shulman 1997, Terhard 1999).

The teachers in the programmes also mentioned the following points: „I have never thought about my lessons so much as during my work in the programme”. Some statements indicate the long-term effectivity of teachers’ experience: „I have more confidence in the strength of the students” and "I have another view on the strengths and weak sides of the students".

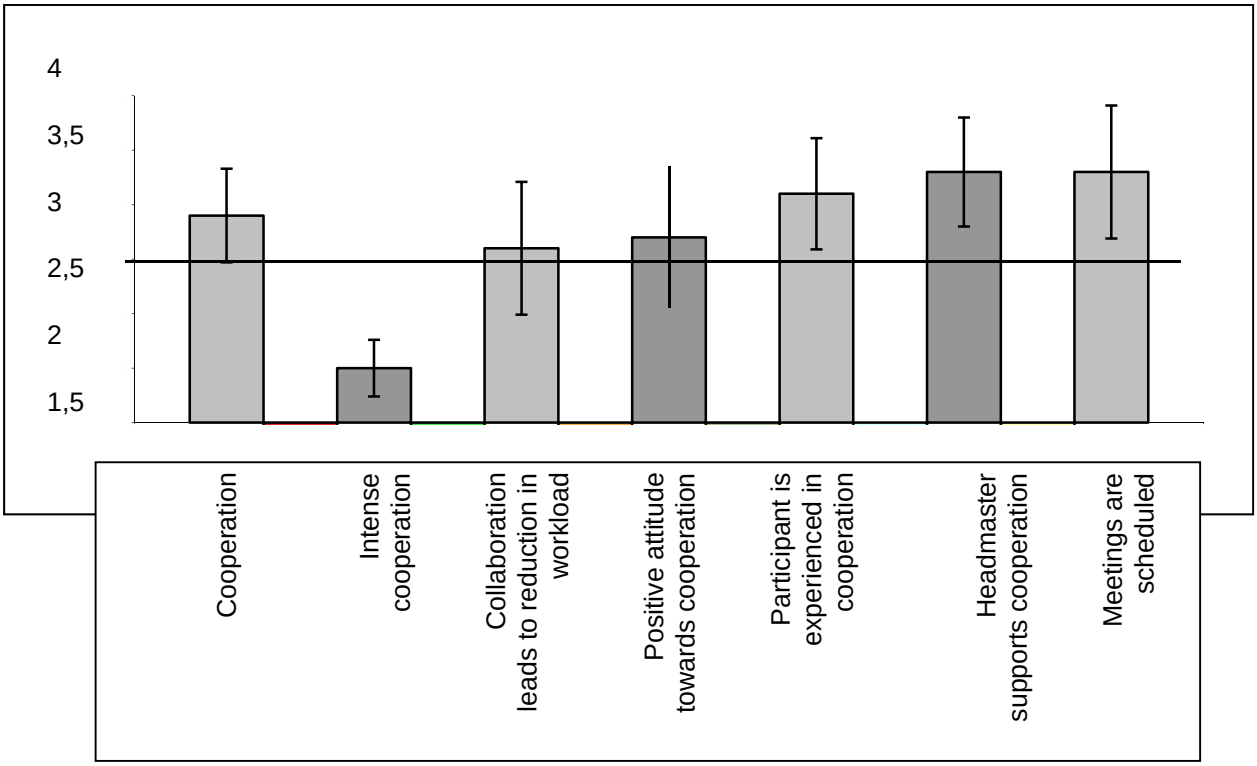

Fig. 4: Answers to the questions dealing with experiences in collaboration in SINUS after 3-4 years of participating (n:=45), 4 point Likert-scale, mean: 2,5

1: strongly disagree, 4: strongly agree. The bar indicates standard deviation.

Asking the amount of collaboration leads to a more differentiated picture (Fig. 4). Even if Cooperation is well accepted and practiced, an intense cooperation like exchange of teaching experience or hospitation of lessons is seldom (second column). Some teachers experience a reduction in workload through cooperation (third column). The positive attitude towards

cooperation was quite high before the programme started and quite a lot of the participants had experiences in cooperation. The last two columns show supporting structures at the schools. If the headmaster supports the cooperation, it is highly effective - as well as a common date in the weekly schedule.

Relation between SINUS and INSTEM

The partner institution of myself is not directly involved into SINUS, but my position is influenced by the work within the SINUS program. I was a state coordinator for SINUS for 10 years, and this changed my professional view on science teaching. After being coordinator and researcher on the effects of SINUS and following programs, I became professor for Biology education. In this function I applied for INSTEM together with partners.
By this the SINUS outcomes and the work with INSTEM is closely linked by my person.
INSTEM is focusing on Inquiry based teaching. This was one of the core ideas behind many SINUS actions, brought to a wider public via “Science Education Now” and by this also influenced the INSTEM application.

Replicability

The best practice characteristics are:

1. working in teams
2. working over a longer period (3-6 years)
3. working on topics relevant for everyday classroom teaching
4. coordination by professionals

Conclusions

The SINUS program influenced my institution in many ways. According to the core idea of IBSE I changed my way of teaching into a more open and student engaging way. E.g., I changed the classical lecture of 90 minutes into an interactive lecture with 20 minutes input, 50 minutes teamwork of the students and 10 minutes lecture time. Another example is the practicum: instead of weekly cookbook-style experimental work the students prepare, organize and evaluate projects with school students. This changes in my teaching is used as a model for other academics, who are changing their teaching style in the direction I developed.

The impact on the territory was described above, and also the challenges.

The potential of SINUS was already addressed by the Rocard report. As it influenced so many programs, the core ideas are widespread in Germany and Europe. However, it needs a lot of man power and a lot of long-term investment, which is sometimes not foreseen in European and national programs.

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