



## **Teaching Better Mathematics**

### **Collaborative inquiry into mathematics learning and teaching**

#### **Revised proposal**

The main aims and goals of the TBM programme are the same as in our original proposal. An appendix presents a schematic overview of the main elements of the programme. However, the funding offered, for which we are appreciative, is less than half of the money we requested, so we have had to think very carefully about how we can achieve these aims and goals.

A first principle is that we should do everything possible to keep the consortium that we have already started to build. Thus money will be allocated explicitly to fund meetings for the five partners. This includes colleagues at Bergen, even though they were not a part of the budget in our original proposal.

However, the work that it will be possible to do has to be trimmed, and this will happen differentially at the five sites. Each partner is drawing on funding from its own college as well as from the project. Each partner is working with schools in its own area. In four of these areas, schools themselves have received funding through the Programme for school development (Program for skoleutvikling<sup>1</sup>) (PSU). This means that developmental activity and research with those schools can proceed to some extent based on the school funding.

The areas of cutback we are proposing include two posts (høgskolelektor at HiA and stipendiat at HiO). We will fund one stipend at Agder (HiA) and one at Sør-Trøndelag (HiST) since these two parts of the project are best developed in conceptual terms. We will fund the work at Bodø in the same proportion as originally proposed. This helps the small group at Bodø to build on the research that has already begun and supports building research capacity at Bodø. It was never part of our intentions to fund the work at Bergen (HiB), since Bergen applied for funding independently. However, the bid from Bergen was not successful. The Bergen team can draw on some research money from their college and start work with schools based on school funding. The consortium will help them to place another bid next year for support in continuing their research. The part of the project at Oslo will be reformulated as a result of the return to full time activity of Bodil Kleve who has been a doctoral stipendiat for the last 3 years. Kleve and colleagues will start work with schools who have received funding and the consortium will support them in bidding for research money next year. The situation at Agder differs from that at the other colleges in the sense that none of the proposed participating schools has been funded in the PSU. A committee from school owners with a consultant from the college is seeking funding from other sources to help schools participate. Work at Sør-Trøndelag will proceed essentially as proposed, with some reduction according to the more limited resource. The following paragraphs indicate in a little more detail what is planned at each college.

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<sup>1</sup> [http://www.utdanningsdirektoratet.no/templates/udir/TM\\_Tema.aspx?id=983](http://www.utdanningsdirektoratet.no/templates/udir/TM_Tema.aspx?id=983)

## **HiA**

At HiA we have a challenge in that none of our proposed TBM schools was given any funding from the Norwegian Directorate for Education and Training (Utdanningsdirektoratet, Udir). Thus, none has the means to start work immediately. Currently, schools are telling us strongly that, despite their interest in our projects they cannot work with us without more funding. This is an important outcome of research which we will feed back to the funding agencies. In the autumn, we will negotiate with the schools to agree which ones will participate in TBM and work with them on a new submission for funding in 2007. At the same time we will continue to seek alternative funding to support initial work. Also in the autumn, we will recruit to 3 stipends (2 funded by HiA and one through TBM). Colleagues at HiA will lead the consortium activity.

In the spring, the stipendiats appointed will start their doctoral coursework and form relationships with TBM schools in which they will participate in developmental research. We plan to invite schools to a workshop in January at which they will present their own developmental goals and start to gain insight into our KUL work in inquiry communities. We will encourage pairings between new schools and those experienced in KUL. In all cases we will encourage schools to set up action in their school related to their particular goals. Ideally in each school we foresee a team of teachers who design together activity for the classroom and explore the use of what has been designed. This would mean all teachers starting to take on a research role, which is an important aim of our project. We shall be researching the whole process of this, mainly through the stipendiats associated with the project. This will be an extension of our work in KUL, and will allow us to address dissemination of the learning that has taken place. Student teachers will be involved in parts of the research connected to their studies in courses on mathematics didactics, and master students may write their thesis connected to the project.

Funding from NFR will be used to provide one stipend and some FoU time for the project leaders. HiA will provide two stipends and some FoU time of researchers in the project. The time available from the HiA research team will be less than envisaged, due to the cutback, and means that most of the research activity will be done by the three stipendiats.

## **HiST**

The idea behind HiST's proposal was to work within the framework of the consortium together with three schools in the Trondheim area – one school in Trondheim kommune and two schools in Malvik with a focus on developing mathematical knowledge through communication and student activity.

The project was intended to include six staff members, working in pairs with each of the three schools, and a stipendiat. Only the schools in Malvik have received funding from PSU, whereas the school in Trondheim will submit a renewed proposal next year. As a result of this we are going into the Malvik schools with more strength than originally intended, but we will keep the contact with the school in Trondheim also and support this school in placing a bid for funding from PSU next year.

The funding from NFR will cover the expenses of the stipendiat in addition to expenses for equipment and travel expenses for participation in conferences and collaboration in the consortium. This means that FoU time for the rest of the staff will have to be covered by funding from HiST locally, and therefore a cut is necessary. We will keep the same number of persons in the project, but the cut will be made in the allocated FoU time for each of these persons. We will retain the idea of working in pairs since this is vital to the principle of competence development. Since we mainly will be working with the two schools in Malvik we will make a change in the sense that at one of these schools two persons will be working with the lower grades (1-4) and two persons will be working with the higher grades (5-7). We hope that the school in Trondheim will obtain funding for its project later, and we shall seek to expand our activity to include also this school at a later stage.

We will start working with the schools in the autumn, and we have already agreed on two seminar days, probably one jointly for the two schools and one separate at each school. In addition we will be working on a more individual basis with teams of teachers at the schools. Two of the staff members in the project are already working with one of the schools. They will continue their activity. The rest of the staff members are new to the schools, and partly also new in the staff at HiST. Hence, they will need some time to get acquainted with the schools. The schools will also need time to relate to the ideas of the TBM project. Work in the consortium will start.

The stipendiat position will be announced with desired starting date 01.01.07. In the spring, the stipendiat appointed will start his/her doctoral coursework and form relationships with the TBM school in which he/she will participate in developmental research. By this time the individual staff member will have mapped out a research area and will be starting field work with selected groups of pupils and teachers.

## **HBO**

In Bodø, the project will proceed mainly as planned, regarding both content, methods and schedule. We will collaborate with Grønnåsen skole (1-7) in Bodø kommune, mainly at grades 5-7. The school does not have funding from PSU, but will contribute some of its «team time» to the project. We will work with Grønnåsen skole to make a proposal for external funding for the project. From HBO two researchers will participate with their FoU time and the time covered by NFR funding. The first year we will, together with the participating teachers, work out a detailed plan for the collaboration, based on the idea of inquiring communities. We will also study theoretically the concept of *revealing learning*.

## **HiO**

The part of the project described in "Prosjektbeskrivelse: Undervise Bedre Matematikk" will be carried out as proposed in collaboration with three schools in Oslo which have received funding through PSU or KPS (Kommunalt Program for Skoleutvikling). Bjørnar Alseth and Ida Heiberg Solem will be the two from HiO who will be in charge of this part of the project which has Numeracy in Primary school as the main focus. Their work will be partly funded by their FoU time at HiO and partly through the funding received by the schools.

The other part of the project at HiO, in which Bodil Kleve and Helga Kufaaas Tellefsen will be in charge, will have mathematics teaching in lower secondary school as the main focus. In the autumn of 2006 we will make contact with lower secondary schools in the Oslo region and have meetings with mathematics teachers in these schools so we can promote appropriate activities according to the teachers' and the schools' needs. We will spend part of our FoU time this year (2006-07) writing a revised proposal to NFR to get further research money to start carrying out the project next year and at the same time encourage and support the lower secondary schools we are going to work with in writing their proposals for funding through PSU. Kleve's and Tellefsen's work with this will be funded through their FoU time from HiO.

## **HiB**

The idea in Bergen was to draw upon collaboration between researchers representing various subjects in teacher education in the context of "praksisnær undervisning" as initiated from the school owners in Sund, Øygarden and Fjell. Without funding from NFR we are planning a limited project in mathematics at two schools; Ågotnes skule (grade 8) and Ulveseth skule (grades 5, 6 and 8). The project will involve 5 school teachers/tutors, 16 student teachers and 4 teacher educators/didacticians. Mathematics learning and teaching is intended to be influenced by the fact that the schools have established an education-industry partnership arrangement ("partnerskapsbedrift"). The learning and teaching of mathematics is organised sequentially at workplaces in industry and in the schools. The student teachers will participate inside and outside schools and the teaching practice will be organised flexibly in accordance with the schedule of the schools. To strengthen the subject-based cooperation, parts of the academic study in mathematics/mathematics education will be taught in the schools where also the teachers participate. The aspects mentioned above make a basis for the learning environment in which *collaborative inquiry into mathematics learning and teaching* is intended to be realised and studied.

We started discussions with the school leaders and teachers in June 2006. The first two meetings between the teachers and the teacher educators will be organised in September; the second meeting will include the student teachers. The collaborative activity will be organised regularly during the year.

The project is funded mainly by the teacher educators' regular FoU time and by extra practice-teaching FoU resources from HiB. The project is intended to be a basis for making a bid for funding next year.

## **Consortium Activity**

### **Theory and practice**

It seems important to re-emphasise our intentions to work with teachers as *partners* in research and development. On the one hand we shall be starting from schools' own analysis of their needs and developmental goals, and helping them to promote appropriate related activity in schools. On the other hand, we shall be promoting our theoretically-based ideas of *inquiry community* and *research-based development*. A major goal of the project is to explore ways in which these two 'hands' can operate simultaneously to achieve goals of both school and college partners.

### **Consortium activity**

Initial work within the consortium will start in the autumn with two meetings. The first will be held as part of a major conference at HiA to support and disseminate the KUL activity. At this conference, the schools in the KUL projects will present outcomes from their learning in the project and look towards the future in terms of their developmental goals. Members of the consortium will participate in discussion in conference sessions and we will hold our first consortium meeting during the conference. Here we will focus on "getting going" dealing with practical issues and agreeing a joint way ahead. This will include talking about future consortium work and perhaps conferences. The November meeting will be the one in which we really start the work together with discussions about theoretical perspectives and research issues. Here we will plan for our further 3 years of work together.

### **Developing research and mathematical capacity in schools**

Two important principles which we must tackle as a consortium concern (1) developing research capacity in colleges and schools, and (2) developing mathematics capacity in schools. We must agree as a consortium how to tackle these goals either locally or consortium-wide. We might envisage, in the second year of the project, offering seminars, short courses or web-based activity on research approaches and on mathematics topics and must consider how to do this within the reduced funding. It may be possible to bid for further funds explicitly for these purposes. We would welcome ideas from NFR as to how we might seek support for this activity.

### **Teacher education**

In our original proposal, teacher education figured strongly as a primary factor in our developmental goals and research agenda. This is still the case in principle, but goals have had to be modified due to the reduction in funding. It is clear from the description above from each of the colleges that teacher education is central to work at HiB and a strong part of work at HiST; at HiST and HiA some of the teacher-education masters students will do their thesis in connection with the project. It is expected too that the project will strengthen the didacticians' competence as teacher educators. At the other colleagues, teacher education will be a focus, but in the background to begin with, while other focuses take priority. However, it is necessary to state explicitly that we see developments in teacher education, and research into these developments, to be a very important long term goal of this overall programme of research. We shall be seeking further funding to be able to fulfil these goals.

### ***And finally ...***

We see the project as continuing according to original goals, with some reduction to proposed activity as explained, but working creatively with existing funding to achieve its goals. The consortium's growing capacity to collaborate and promote research and development will be a major focus of activity. The consortium will support individual members to formulate further proposals and seek further funding. While we recognise that the NFR cannot make promises, we hope it will look favourably on the consortium, its activity and intentions, and be willing to offer further funding in respect of bids that compete well with those from other places.

## **Appendix**

### **Schematic Outline of the Main Elements of the Project**

(See also milestones)

#### **Consortium**

Meetings, workshops and seminars

Theoretical work

Agree consortium management structure

Establish steering committee

Recruitment of secretary

#### **Each College**

*Theoretical work*

*Management*

*Recruitment of stipendiats*

*Work with schools*

Development and research with teachers

Mathematical capacity building

Research capacity building

*Teacher education*

Student teacher development

Teacher educator development

*Research*

Collection and analysis of data

Data base construction and management

*Research capacity building*

Didactician-researcher development

*Publications and dissemination*

*Evaluation*

*Doctoral theses*

Consortium publications and dissemination (conferences etc)

Consortium evaluation

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