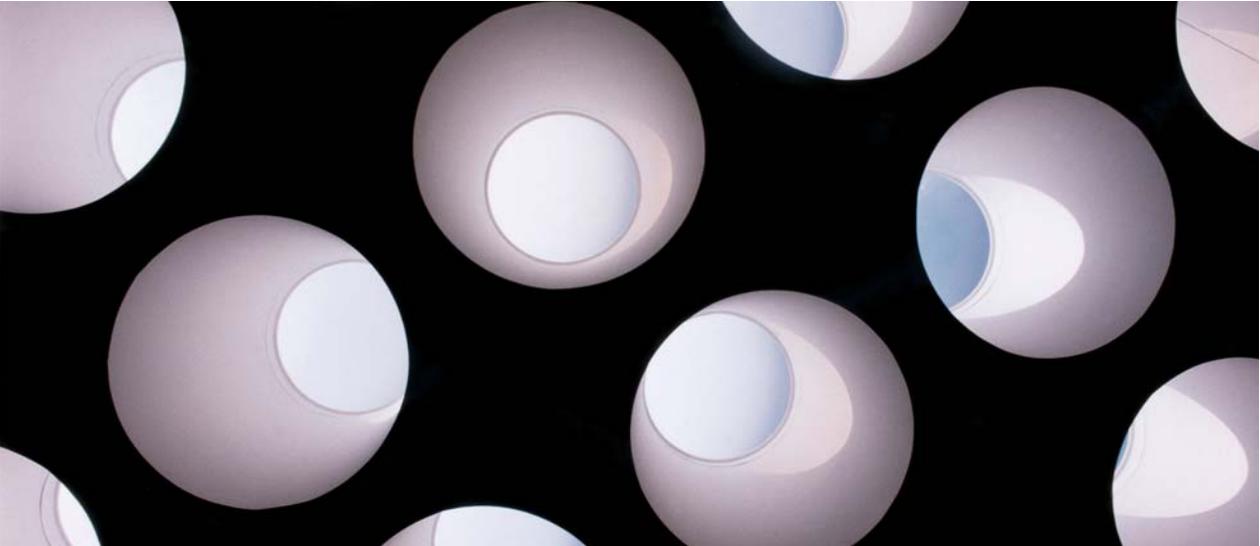




Vetenskapsrådet



## INTERNATIONAL EVALUATION OF DIDACTICS



Swedish, Mathematics and Natural Science

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**VETENSKAPSRÅDET**  
(Swedish Research Council)  
103 78 Stockholm  
SWEDEN

© Swedish Research Council  
ISSN 1651-7350  
ISBN 91-7307-092-0

Cover Photo: Hillevi Nagel/Pixgallery.com  
Graphic Design: Erik Hagbard Couchér, Swedish Research Council  
Printed by: CM Digitaltryck, Bromma, Sweden 2006

To The Swedish Research Council  
Committee for Educational Science

A panel of international experts was appointed in April 2005 by the Committee for Educational Science to evaluate research in didactics for the subjects Swedish, mathematics and natural science. The evaluation covers projects undertaken with financial support from the Swedish Research Council during the years 2001–2003 and is based primarily on written progress reports from the project leaders of the projects evaluated.

The present document reports the findings and recommendations of the expert panel, which hereby considers its task completed. In accordance with the panel's terms of reference, its members accept full responsibility for this report.

April 2006

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## Mathematics didactics projects

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Johansson	Bo	Mathematical symbols and concept formation in mathematics. A study of the development of some mathematical concepts during the early school years
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## Natural science didactics projects

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Bernhard	Jonte	Educational conditions for meaningful learning in science and engineering with interactive technologies
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Linder	Cedric	To inform a scholarly base for teaching physics at university
Pendril	Ann-Marie	Extramural learning
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## Swedish language didactics projects

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Einarsson	Jan	National graduate school in Swedish with a didactic orientation
Englund Hultin	Tomas Eva	Conversation on literature within the Swedish subject in upper secondary school (part of the project Education as deliberative communication – conditions, possibilities and consequences)
Eriksson	Anders	Rhetoric as pedagogy: Rhetorical theory and practice as means to the communicative goals of Swedish schools and universities
Erixon	Per-Olof	Genres in transition – aesthetic writing practices in upper secondary school
Jansson	Gunilla	Collaboration and development within heterogeneous student groups
Kåreland	Lena	Gender perspective on literature for children and young adults in education
Rosén	Monica	Reading literacy in Sweden (SALS)
Samuelsson	Stefan	A strategic effort on reading and writing research
Strand	Hans	CLIL and the use of English and Swedish in school
Thorson	Staffan Alvar	To read is to read is to read ... A project about 16-year-old pupils' reading literacy, reading strategies and inferences

# AN EVALUATION OF CES PROJECTS IN THREE FIELDS

By Professor Ole Björkqvist, Professor Frøydis Hertzberg  
and Professor Elke Sumfleth

## Introduction

Subject didactics (ämnesdidaktik) can be seen as a subcategory of educational science. It can be placed between specific content knowledge and general educational theory, and typically it has a school subject as its point of departure. A popular way of explaining this field of research is to say that it deals with the what, the how and the why of teaching a particular subject: what is it about, how is it (or should it be) taught and learnt, and what is the rationale for the educational decisions taken? There is also a who: what are the needs of the learner? These questions can be dealt with in a historical or a contemporary perspective, and they can be treated more or less descriptively or prescriptively. A particular school subject may be taken for granted, but it may also be critically analysed and even questioned, as may its content and its methods for teaching and learning. In short, subject didactics can be explained as “all those reflections which can be connected to a subject and to the teaching of that subject and which can provide an enhanced understanding of the character of the subject, of its rationale, and of how the subject can be learnt, taught and developed”.

Embedded in this rather critical and explorative attitude to the field there is also a more instrumental approach, where the immediate aim is to improve teaching and learning in a particular subject. In that case the whats and hows will predominate over the whys, and there will be expectations of results in the form of suggestions and advice. In the case of the programme administered by the Committee for Educational Science (CES), one of the criteria for grants is that each applicant should indicate the project’s “significance for teacher education and/or the teacher profession”. Thus, report no. 5 from the CES (Aasen et al. 2005) defines the goals of science financed by the CES as threefold: analytical, critical and constructive. The research undertaken should analyse conditions and challenges in the field of education, it should discuss these problems critically, and it should create a basis for suggesting certain solutions to them. Against this background, the CES

report ends by making a distinction between basic educational research (which may well have the aim of being applied) and interactive sector research (involving both research and development, for instance action research). On the basis of such research, the CES has a responsibility to follow up and evaluate change.

In this perspective there are a great many expectations with regard to the results of subject didactics research:

- They should improve the quality of teaching and learning at schools, universities or other educational institutions, leading to a sustainable development of competencies.
- They should clarify subject-specific sources of difficulties in learning and ways of overcoming them.
- They should provide a basis for the development of tasks and learning environments, including the use of new technologies.
- They should deepen different kinds of literacy for all kinds of students.
- They should have a positive effect on general interest in the subject and on recruitment into further study of it.
- They should improve pre-service and in-service teacher education.

But research in the field of subject didactics is young, and there are far more questions than answers. Furthermore, expectations tend to be too ambitious to be fulfilled. The goals for individual research projects have to be limited contributions to the search for answers to the questions, for example:

- improving the description of situations where learning takes place,
- testing theory-based hypotheses with regard to improvements in teaching,
- influencing interest and understanding through different kinds of group processes,
- investigating critical conditions for learning using interactive technologies,
- analysing effects of out-of-school learning,
- developing specific tasks and learning environments professionally,
- evaluating new conceptions and examples of best practice.

To the extent that basic analytical research occurs, it may be characterized as a search for new ideas and improvements to theory that have a potential to contribute to the solution of problems, with no immediate attempt to implement them. Depending on the research methodology, the results of such research may require further interpretation before they can be implemented in classrooms or in decisions relating to educational policy.

Subject didactics is closely connected with teacher education, and therefore much of the research conducted relates to this phenomenon in the

context of university teaching and research. The same is true of the whole field of educational science. In order to consolidate subject didactics within educational science at the university level, high quality research relating to teacher education is most important.

## Methodology

The project reports submitted describe research that rests on theory and methods drawn from general curriculum studies on the one hand and disciplines such as sociology, psychology, philosophy and history of education on the other. However, these disciplines do not have an autonomous function, but serve as tools for describing and analysing the research topics as such. Although a topic itself might belong, for example, in the field of natural science, the research methods utilized may be taken from social science (e.g. classroom observation and interviews) or from the study of languages (e.g. discourse analysis). The methods used are also dependent on the methodological traditions within the different subjects. From one angle, subject didactics can be characterized by its eclectic attitude to research methods, from another, as a true example of a fruitful convergence of different research traditions.

For the purposes of this review, it seems worthwhile to focus on descriptive research, in which existing conditions are paramount, and prescriptive research, in which the primary focus is on possible implementations. The borderline is not sharp, however, and a specific research project can exhibit characteristics of both types.

Descriptive research projects tend to describe teaching aims, characteristics of students and teachers, subject-specific learning processes and classroom interactions – in short, they provide empirical analyses of situations relevant to learning. They may be qualitative or quantitative.

Prescriptive research is generally focused on the evidential basis for the shaping of an educational reality. This involves both the decisions to be taken by teachers in their classrooms and broader decisions about educational policy. Some of the evidence may be based on direct interventions (intervention research), some on evaluations (evaluation research). Prescriptive research projects can be qualitative or quantitative.

It is also useful to identify research in which the means of implementing new ideas is itself in focus. Developmental research (design research) involves the theory-based development of educational conditions or environments, including validation of the efficiency of implementation. A well-known example is action research. (It should be noted that developmental work as

such is generally not regarded as research. Some kinds of developmental research may also be seen as prescriptive research – there is no general agreement on this.)

The different kinds of subject didactics research are also interrelated in the sense that one kind of research may serve as the starting point for another. This may occur, for example, when research results generate new hypotheses or open up completely new research questions.

Among the research projects reviewed here, there are elements of each of these kinds of research, perhaps with the exception of basic analytical research. There is, however, an imbalance in favour of descriptive work, or at least work that is too strongly dependent on the specific conditions studied for more general implementation of the results to be possible. This does not preclude interest or relevance, however, which is more dependent on the particular research question explored than on the form of the research.

## Research questions

The starting point for each investigation may be a detailed analysis of the theoretical base and of existing research results, in order to determine open questions, deduce hypotheses and set out reasons for the study. The first step may be a theory-driven definition of the main aspects which should be analysed or with which the investigation will deal. However, one might also start by asking questions like: “What happens when...?”, “How do students, teachers, researchers or others react to...?”, “How do students approach the learning environment?”, “How can we further develop...?” or “How do science teachers develop...?” Such studies are not really testing hypotheses, but have an exploratory, qualitative approach, aimed first and foremost at understanding a process. Many of the CES projects could be assigned to this category.

Irrespective of the character of the research question, it is important that it is “researchable”. It must be possible to imagine that the project in question, with the methods that have been chosen and on the basis of the data collected, can come up with answers of some kind. This has been a major concern for the evaluation panel when reviewing the project reports.

## Contributions to the field of practice

One of the main goals of the CES programme is to build a bridge between research and professional practice. All project leaders have therefore been

asked to indicate how their projects contribute both to the scientific field and to the field of practice. The answers to this question vary considerably. In general, several problems arise. Often there is a lack of symmetry between the specific research questions and the results, which again is a consequence of the very general nature of the research questions. Although the results might be interesting, it is difficult to see whether they correspond to the questions posed at the outset. This is most evident when it comes to the question about the contribution made to the scientific field.

As for the question concerning “significance for teacher education and/or the teacher profession”, some interpret it as a matter of dissemination. In general it seems to have been more difficult for researchers to make statements about the contribution of their work to practice than about its contribution to the scientific field.

## Background in research related to the research questions addressed

In many (or even most) of the research reports, there is ample evidence that the field of research is familiar to the project group from previous work. However, regarding “the status of the field of research”, meaning theories in current use, open or well-researched areas etc., which can be seen as an international benchmark, there is noticeable variation. Some reports completely omit such information, giving the impression that the starting point for the research is primarily defined by the previous activities of the research group. (There is, of course, reason to believe that the information may be provided, at least in part, in the text entered with the applications.)

Clarifying the starting point in terms of the status of research in the problem area studied would seem to be an essential component of a research report, particularly in order to substantiate any claims regarding the novelty of the results. The project group should provide evidence of their knowledge about what their contribution to scientific knowledge really is.

In educational science, an interdisciplinary arena in which many approaches meet, some researchers may not be familiar with studies that are related to their research project but may have had a different starting point. As an example, subject didactics may not be considered an altogether new field of research, in that some of its research questions have in fact previously been studied in depth under different disciplinary labels.

To the extent that such unfamiliarity is due to the personal backgrounds of the researchers, it is understandable. Nevertheless, there is reason to pay attention to the established ability of the research groups to do research in the problem areas they have chosen. This can be documented, for example, by earlier, related research reports at an international level by individual members of the group or careful reviews of such research by others, supplemented with information that brings out the methodological qualifications of the group to carry out their research. Of course some allowance should always be made for new individuals entering the field with fresh ideas.

The research groups include a fairly large number of doctoral students. The comparatively small number of experienced researchers (in subject didactics) reflects the situation in Sweden as a whole. Although it is difficult to define an optimal size for a research group, such a group is, in general, more functional if it is less dependent, for example, on one leading individual who may have other commitments.

Another kind of balance has to do with background knowledge of the subjects (Swedish, mathematics and natural science) versus documented knowledge of the relevant educational reality. This balance appears to differ somewhat in the different subjects, with some project groups showing relatively few links with practice.

## Funded projects in relation to other projects

Applications for support have been made for limited projects. In some cases such a project is part of a more extensive one, with other kinds of support coming into the picture. It would have been helpful to see which parts of the wider project have actually advanced as intended, for example if progress in one part has taken place at the expense of another. This has to do with the fact that researchers may be engaged in parallel projects, with limited time available to carry them all out. There is a need for greater clarity about the actual time spent on each project, especially if progress has been slower than expected.

There also seems to be a need for better clarification of what constitutes the research group involved in the project, as opposed to the group of researchers forming a particular research environment (department etc.). Individuals belonging to a group of persons who normally collaborate should not have been listed as belonging to the project group if they have made no visible contribution to the project.

The project reports received include statements about international cooperation. This is described as having taken place at various levels – invited guests, attendance at conferences, networking, documented formal cooperation etc. Some of these activities may not be seen as “cooperation”, in that work has not been done by partners towards a common goal. On the other hand, some projects can be seen to involve a considerable amount of interaction at the international level – with clear benefits for the progress made – simply by linking international experts to them as “experts”. In subject didactics, this partly makes up for the notable lack of professors in Sweden.

## Statements concerning plans for the future

In the instructions for their research reports, the project groups were not asked for details of their intended contributions to continuity in research related to the problem area. This would require a perspective that goes beyond that of an individual project, but it would be informative as regards existing visions, and could thus lend an additional dimension to the assessment of the project’s results, as a contribution to progress on a longer-term research plan. Intended or potential implementations of the results of the present project may (or may not) be incorporated in such a vision. Providing a vision of one’s subsequent research activities is of course not a commitment, but it would be helpful in assessing the potential long-term effects of the project within the scientific community, as a basis for educational decisions and in the form of actually initiated developmental projects.

The research reports provide several instances of fruitful cooperation between different academic departments. To the extent that this reflects an increase in cooperation in research, it can be seen as a healthy development towards functional research groups with greater continuity.

The research reports give evidence of an imbalance in the types of research supported and conducted. Steering more research into underrepresented kinds requires a reasonably good picture of active research groups in the near future and their respective research interests. The reports submitted provide part of that picture, but it would be even more helpful if the researchers were invited to state their visions for the near future more explicitly.

## Comments on the mathematics projects

**2001-5503**

### **Gunnar Berg: History of mathematics in education**

The historical development of mathematical concepts is influential in the shaping of teaching and learning units in mathematics. Concepts relating to infinitesimal processes, the objects of study in this project, are central elements in mathematics. The project is thus well focused, but the connection between the development of the concepts and other variables characterizing educational reality is less fully developed.

There are no obvious complications in the choice of research methods. They have an emphasis on the scholarly study of historic documents.

Good personal connections have been established with international researchers in the field of history of mathematics. There is little evidence of a linkage to mathematics education research in general. The project work is at the frontier of research within this speciality, but the impact on educational science in a broader sense is likely to be limited. The contribution to practice is likely to be indirect – the results of the present project can serve as starting points for later developmental research projects, if initiated.

There is reason to view the theme of the project as lying outside the “core” of educational science. The project seems to be advancing very well.

**2001-3907**

### **Gerd Brandell: Gender and mathematic**

There are a variety of gender issues related to mathematics education, and this project covers some of these issues, with an emphasis on perceptions of mathematics as such. This is central to recruitment to the field, although a wider study would include other aspects, the influence of which may be of comparable importance.

The research design is described in detail and is well suited to the problem investigated. The variety of methods of data collection reflects the need not to reduce the complexity of the issues. The conclusions are drawn with care.

Since Swedish research on gender and mathematics is generally considered to be at a high level, the question of international links is partly one of leadership in the field. The connections and studies quoted represent international research at a comparable level.

Regarding contributions to the field of educational science, the new theoretical knowledge generated appears to be limited, owing to results which so far have been difficult to interpret. The analysis is not yet com-

plete, how-ever. As for contributions to the field of practice there is, in line with the research questions addressed by the project, an obvious applicability to recruitment to the higher study of mathematics and to differentiation in the treatment of boys and girls in mathematics education in general.

The collaboration achieved among the group of researchers involved in the project, representing different universities, appears to be a fruitful outcome.

Funding of the projected has ended, but the work has not been completed. The conflicting findings constitute a challenge for further research.

## 2002-3342

### **Annica Gullberg: The progression of pedagogical content knowledge during teacher training programme in science and mathematics**

This project has as its starting point the development of a tool to monitor teacher education programmes. The work is primarily empirical, however, applying the tool to various kinds and stages of teacher education in science and mathematics. Its aims are very ambitious.

The theoretical framework is a modified model for the structure of pedagogical content knowledge. It is being used in conjunction with particular research methods (e.g. phenomenography) for the study of certain aspects of that knowledge. Basically the overall research design is very flexible, allowing quite different types of empirical studies to be carried out by individual researchers.

The project links a North American perspective on teacher knowledge to teacher education in Sweden. In relation to the otherwise dominant European “didactic” perspective, this invites interesting theoretical questions, the study of which is not part of the project. A number of personal links exist with international researchers.

Although the direct results of the project consist of fairly isolated individual contributions to knowledge in science and mathematics (teacher) education, the framework itself merits further theoretical development and critical scrutiny.

With regard to contributions to practice, it is very likely that the project will affect teacher education in Sweden, at least within the sphere of interaction of its participants. There is, however, little explicit indication of how it will be followed up beyond the completion of the partial studies now being carried out.

The project seems to be progressing according to plan, apart from a shortage of students in science and mathematics.

**2001-3766****Bo Johansson: Mathematical symbols and concept formation in mathematics. A study of the development of some mathematical concepts during the early school years**

The studies undertaken in this project constitute a well-focused contribution to scientific knowledge about mental representations as a basis for procedures in elementary mathematics. It attempts to compare the effectiveness of different representations of numbers in the teaching and learning of mathematics. The project thus concerns one of the pillars of mathematics education, but it takes its starting points in hypotheses that may be open to debate. It is claimed, however, that the logic of the reasoning is supported by empirical results that precede the project itself.

The study has gathered evidence in the form of empirical results, both cross-sectional and longitudinal, concerning young children's use of numbers under various conditions. The data are drawn, for example, from interviews and studies of problem solving in arithmetic. This is a convincing strategy, particularly when structural modelling methods are applied.

Although the theoretical basis is well developed, it includes relatively few references to international research results, and there is a tendency to overemphasize the novelty of the approach, with insufficient consideration of similarities and possible common elements with other theoretical standpoints.

The study involves new elements of theory, but when subjected to wider scrutiny they are likely to need further clarification. The rather sketchy picture of "constructivist theory" having specific implications with respect to representations will be disputed.

The design of the project takes into account implications for practice. If the outcomes of the empirical research, some of them yet to come, lend substantial support to the approach taken in the project, it is certain to affect the teaching and learning of mathematics at the elementary level. Mention is made of a future widening of the scope of the project to include elements of theory that might be neglected in the present approach.

The project is a structurally appealing and worthwhile contribution to the field of educational science, taking on difficulties relating to both theoretical and empirical knowledge.

**2001-5555****Johan Lithner: Meaningful or meaningless school mathematics: The ability to reason mathematically**

A focus on difficulties in learning mathematics is a central justification for engaging in mathematics education research in general. It makes a variety

of problem statements and types of study relevant, as in this project. The selection is based on individual research interests, although there is a common emphasis on “meaning” as a key element in effective learning.

A specific typology of mathematical reasoning is employed to analyse the work of students at different levels and in different environments. Much of the empirical work appears to have the aim of adding substance to this theoretical starting point, which, although it has been developed within the research group itself, has a partial foundation in previous international research. The research group has attained some international respect for its work, and continues to be influenced by and to influence similar work elsewhere.

As contributions to the field of educational science, the new elements of theory relating to mathematical reasoning reflect creativity in the way the mathematical characteristics of problems and mental procedures of students are included in a joint model. Much of the empirical work is still unfinished, however.

The settings for the individual studies tend to make the research results directly applicable to practice. There may be a need for further large-scale studies that take into account ways to overcome problems of dissemination. There is no clear statement indicating in what direction the project will evolve after the present stage.

The work of the research group reflects its strong background in mathematics, and much less so its adherence to general educational concepts.

## 2001-3989

### Hans Wallin: Graduate school in mathematics with didactics

This project differs significantly in its structure from the other ones relating to mathematics, being mainly concerned with support for the development of national expertise in the particular research field of the didactics of mathematics. The justification is a lack of higher-level academics qualified to supervise further research in mathematics education and the need to establish institutional continuity in such research. The individual graduate students are not pursuing research along common lines. What is important is the creation of a “critical mass” of graduate students, regardless of academic affiliation.

The kinds of activities arranged by the graduate school reflect the parallel needs of interaction among the participants and considerable individual freedom in the choice of courses and other requirements. Support for travel is an essential component. Supervision of the work of individual graduate students is normally shared, allowing for an influx of international and national expertise when needed. These characteristics can be

clearly identified in the structure and are appropriate in the way they are realized.

The degree of international involvement on the part of the individual students is quite high. Typical elements, with some variation, are participation in conferences, attendance at specialist courses, and papers submitted to journals. The common courses arranged by the graduate school have also involved the engagement of lecturers from abroad.

In the short term, the project's contributions to the field of educational science consist of the individual dissertations, the scientific value of which will be determined in each particular case. The long-term effect is potentially much more important, producing within Sweden in general and locally at several places a considerably larger number of formally qualified researchers in mathematics education.

The effects of the graduate school on the field of practice will be mostly indirect, through implementations of research carried out in individual studies and through the future work of the graduates, which in many cases is likely to involve teacher education.

There is no clear indication what kind of continuation there will be. Some form of cooperation between universities, which has been remarkably successful in this project, will obviously be a component.

This kind of long-term initiative is possible in a society that attaches great value to the long-term effects of education. The cooperation between different supporting agencies is also remarkable.

## Comments on the natural science projects

2002-2623

**Björn Andersson: Teachers and researchers as knowledge-builders for better school science**

This project could be seen as an action research project. The research strategy, referred to as "design and validation of teaching-learning sequences", includes not only results from a clarification of basic concepts, from a discussion about the significance of content for society, and from research on students' conceptions and motivations, but also teachers' viewpoints and their professional experiences. In a final step in the evaluation, the participating teachers inform their colleagues about their results. With the aim of evaluating a teaching sequence, Andersson poses the useful question: "What are the pupils' attitudes to the designed trial teaching, and what long-term conceptual understanding do they achieve?" The

other research questions are rather wide ones which can hardly be answered in the time available. In addition, the short summary provides very little information about the theoretical background to these research questions. In this project, students' preconceptions and their long-term conceptual understanding have been investigated by documenting various processes, e.g. small-group discussions using video recording and lessons using field notes and diaries. Empirical results are not described, making it very difficult to comment on the project's contributions to the scientific field. The work seems to still be in progress. Contributions to practice consist of presentations and development of material related to this specific research.

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## 2002-2585

### Sylvia Benckert: Context and conversation in physics education

This project could be seen as an intervention research project in which context-rich problems (independent variable) are given to the students to analyse their influence on interest and understanding (dependent variables). In a short sketch of the relevant literature the theoretical background is described, with a view to deducing hypotheses and giving reasons for the research questions chosen. Answerable research questions, which are nevertheless very ambitious, are for example: "What importance do group discussions of context-rich problems have for the development of interest in physics and of understanding of physical concepts and laws? How should these context-rich problems be designed? What are the criteria for an interesting problem? What is the importance of context in the problem? What does gender mean for the construction of interesting problems?"

In this project the group of students included in the study is described in terms of number and formal educational background, but the design of the study is not made very clear. More information about the kind of video analysis used might be helpful, because students' preconceptions and their long-term conceptual understanding are investigated by documenting various processes, e.g. small-group discussions using video recording, interviews and questionnaires. There is a clear description of concrete results, underlining the contributions made to the scientific field. In addition the new knowledge is being integrated into in-service teacher training courses.

An analysis and comparison of the results of this study with those of Glenn Hultman's should provide a deeper insight into this special field of science education research.

**2003-4445****Jonte Bernhard: Educational conditions for meaningful learning in science and engineering with interactive technologies**

Bernhard's investigation is partly an evaluation research project describing the use of given interactive technologies by the teacher. Where technologies were freely chosen by the teacher, the project involves descriptive rather than prescriptive research. But Bernhard also carried out studies in which the researchers were involved in shaping the educational situation. These studies are interventional ones. This project thus shows that different kinds of research can be combined.

The theoretical background concerning the relevant aspects of learning and cooperation is adequately described. With the aim of evaluating a teaching sequence, it might be very useful to ask questions like: "Which aspects of the learning environment direct the students towards the intended object of learning and, in particular, how do students establish links between the real/event world and the theory/model world?" Tangible questions of this kind could help to carry the investigation forward. A mixture of methods is being used, but the method of data interpretation is not described.

The project's contributions to the scientific field and to the field of practice are described in very general terms, but the specific input of this study does not become clear. It may be that it is too early for specific results, as the project started later than planned.

**2003-4440****Sven-Olof Holmgren: Research and development with NTA as infrastructure**

This is a fairly typical evaluation project. The Swedish school development programme NTA (Natural science and Technology for All) is being evaluated, reduced to the unit "Properties of Matter". But no description is given of the aim of the evaluation. Bearing in mind that the project started only a few months ago, the next step must be to formulate the chosen focus of the evaluation in greater detail, underpinned by theoretical reflection. In addition, the late start is the reason why information on the project's contributions to the two fields is not available.

**2001-5531****Glenn Hultman: The form and content of science in the Swedish compulsory school**

This project deals with a similar idea to that of Holmgren. It is an evaluation project with concrete aims. Hultman wants "to throw light on how pupils

are socialized into the teaching of science in school". Consequently, the project shadowed pupils in schools participating in the NTA project. This is important research on learning processes in the classroom.

The second part of the project is concerned with special questions regarding the role of communication, an investigation carried out as an explanatory study in the framework of intervention research. These results could be fruitfully compared with those of Sylvia Benckert. Hultman formulated answerable research questions such as: "What is the role of interaction between teacher and students and between students during lab work? How does communication during lab work contribute to science learning?" The theoretical background provides reasons for these research questions.

This is one of the few projects where the design of the study and the methods used are described in detail. Contributions to the scientific field are adequately described, but contributions to practice should be discussed in more concrete terms. Altogether, this is a proper research project on interaction with practitioners and practice.

## 2002-3219

### Cedric Linder: To inform a scholarly base for teaching physics at university

The overall aim of this project is to develop teaching and extend the possibility of learning in the university physics learning environment. The study is an example of descriptive research with the focus on describing the teaching taking place on university physics courses.

The research questions addressed in Cedric Linder's project show an interesting development during the course of the investigation. They become more precise, as additional aspects such as abstraction or gender arise. The questions also become more concrete, taking into consideration other influencing variables. This is a major project with many research questions deduced from theory and investigated with a combination of different methods, including interviews, questionnaires and videos. But nothing is said about the participants in the study or the methods of data interpretation used.

In this project it is argued that contributions to the two fields of science and practice cannot be distinguished, as the project is situated in the relational domain between teaching and learning. Such a view might be fairly common in educational fields, but a research project will hopefully lead to research results, and these results have to be transformed into recommendations for practice. Pure research results cannot be put into practice directly, especially when the outcomes are described in such general terms.

It is because of this that it is difficult to see the relationship between these results and the concrete project.

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## 2002-3777

### Ann-Marie Pendrill: Extramural learning

This project has a tangible overall aim, which is to measure the impact of science centres on learning and attitudes. It is thus an example of descriptive research. The description of the theoretical background is very brief and not really theory-based, but the specific, important research questions derived from the theory are very tangible ones and might be answerable. One example is: "Could long-term effects of science centre visits be documented, beyond anecdotal evidence?" To investigate questions like this, different methods are used: student and teacher questionnaires and observation. In addition, a drawing competition for school classes is developed.

In the section concerning the project's contributions to the scientific field, students' conceptions of forces and acceleration are described, but the results are not related to the research questions. Regarding the contributions to practice, it is stated that informal learning situations are not integrated into the school curriculum and that teachers need specific help. Some projects for pre-service teacher education are therefore developed.

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## 2002-2729

### Lennart Sjölin: Better learning outcome of microscale laboratory exercises in chemical education

This project is an example of intervention research with a concrete overall aim focusing on the effect of micro-scale experiments in the chemistry laboratory. Besides economic and environmental arguments, there is the research question: "Will micro-scale experiments lead to a better learning outcome as compared to traditional experiments on a macro scale?" The theoretical justification for this question is very poor: the description of the theoretical background mainly reports a major European study on laboratory work, but no reasons are given as to why micro-scale experiments should produce a better learning outcome. Why should differences exist as a result of the scale of the experiment? This project uses a wide range of methods, and it is almost the only one with a detailed description of the study design, which is a classic control group design. Unfortunately, no results are described, nor are any contributions to the scientific field or the field of practice. All the data are now in the process of being analysed.

**2001-5640****Gunilla Svingby: Natural science for sustainable development**

The overall aim of this study is described as being to build up research in science education, with a special emphasis on environmental education. This is not a research goal. But the specific questions are research questions, such as: “How do science student teachers develop a conceptual understanding of some key ecological concepts...?” Owing to the very brief description of the theoretical background, there is a lack of justification for these questions, which might be the result of a general lack of research in this field. But these “how” questions can hardly be answered. This project could be described as an evaluation project, since it analyses the effects of a special science teacher education programme. Alternatively, it could be described as an intervention research project, if the focus is on specific relations between features of the programme and the learning outcome.

This is the only project that gives an idea of the time required to gather the data. It is a longitudinal study extending over two and a half years. A variety of methods are used. The results with regard to the scientific field describe the intentions of the students, but they do not in every case answer the research questions. The contributions made to practice are recommendations and hints that seem to be reasonable, but they are not proven empirically.

**2001-5648****Per-Olof Wickman: How can science become useful in new contexts?**

This project examines the relationship between academic science and science as a school subject, a relationship which seems to be very interesting. Wickman uses a complex multiple theoretical framework, which is represented only by names and labels. Nevertheless, the theoretical background to his various, demanding research questions is made clear. This major project builds on a large number of research questions. To investigate them, different methods are used: besides video recordings, they include interviews and questionnaires. The use of different methods, some more qualitative and others quantitative, leads to a deeper insight into processes of learning and interest and into possible conditions influencing these variables. In addition, this is the only project in which coding procedures are mentioned.

In the summary of this project there is a section on “results” instead of contributions to the two fields. Consequently, the report briefly describes a large quantity of scientific results without relating them to the data. But this is a consequence of summarizing the main points at the end.

## Comments on the Swedish projects

### 2001-5501

#### **Monica Axelsson: The significance of socio-cultural and pedagogical environment on the development of children's literacy**

This project consists of three sub-projects with a common overall aim ("to explore how children in certain sociocultural and pedagogical environments are socialized into literacy") and a common methodology (longitudinal ethnographic studies). Axelsson follows a group of dominant bilingual 5-year-olds for three years, Björklund a group of 1- to 3-year-old monolingual children for one and a half years, and Fast a group of pre-school children from different sociocultural backgrounds for three years. The studies involve material from pre-school, school and leisure time. Specific research questions are: In what literacy situations do children in different environments interact? How is literacy practised on these occasions? How is the children's literacy knowledge received and made visible in pre-schools and schools? A core concept is the identification of literacy events, i.e. situations that involve reading or writing of some sort, and the role of such events for socialization into literacy.

The project report is clear in terms of problem formulation, theoretical framework ("new literacy"), methods and results. The report gives concrete evidence of knowledge of great importance to teachers and teacher educators, and the contributions to practice are explained in a way that shows familiarity with the field. All in all, the project ought to give teachers more insight as to possible ways of supporting children from different cultural backgrounds, and of bridging the gap between out-of-school literacy and school literacy.

The project group has national collaborators and international contacts. The results will be disseminated partly through the forthcoming dissertations of Björklund and Fast and through articles in relevant journals and books, partly by means of oral presentations at conferences.

### 2002-3245

#### **Teresa Cerratto: The use of language technology for writers in the context of learning Swedish as a second language**

The overall aim of this project is to investigate the role of computer-based language tools for writers in the context of learning Swedish as a second language, and also to contribute to the design improvement and development of existing language tools for writing in a learning context. The learners are literate adults, most of whom have a university degree from their

home country. The project can be classified as action research involving three phases: an investigation phase with a focus on the learners' experience of the language tool Granska, a design and development phase in which information from the first phase is utilized to develop a new program (Grim), and an evaluation phase. Throughout the project there is an ongoing dialogue with teachers and students about the tools in use.

The project report provides clear information about the theoretical framework (sociocultural, mediated action) and an extensive report on the design, called "a user-centred approach to language tools development". This means that design and development is iterative, with cycles of design, test, measurement and redesign. Methods include participant observation, questionnaires, interviews, workshops with teachers and students, and texts that have been analysed linguistically.

Contributions to the scientific field and the field of practice are discussed at length. The group has collaborated with national and international partners (including the EU project Kaleidoscope). Two dissertations are planned, and dissemination will also take place through journal articles. A tangible contribution to the practice field is the Grim tool, and courses on the use of this program are offered through Folkuniversitetet.

## 2001-3762 & 5429

### Jan Einarsson: Graduate school in Swedish with a didactic orientation

The aim of this project is to develop Swedish didactics as a field of research and to contribute to research training in this field. The research school is cooperating with 15 universities and colleges and receives students from all over Sweden, students who are offered both supervision and a substantial body of research courses. The courses are partly web-based, partly organized as national meetings over several days, where students participate in traditional literature-based courses as well as in workshops at which they comment on each other's papers.

The research projects involved are funded from various sources and will not be considered individually here. However, according to the report most participants define themselves within a sociocultural framework, and all projects have research topics closely related to practice. This common theoretical and methodological orientation gives the participants a basis for meaningful interaction about their projects, and the CES grant has made such interaction feasible. The grant covers the national meetings, providing funding for the participation of national and Nordic experts and support for travel and accommodation for the doctoral students. It also covers part of Einarsson's salary.

The contribution to the scientific field is mainly through earlier and future dissertations, each of which presents new knowledge. The same is true of the contribution to the field of practice. As the participants are experienced teachers, many of them working in teacher education, there is a close link between theory and practice.

In an academic field that is not yet fully developed and in which senior researchers are thinly spread, contact between doctoral students and resource persons is extremely important. It seems clear that the graduate school in Swedish is playing a major role in this perspective.

## 2002-5433

### **Tomas Englund/Eva Hultin: Conversations on literature within the Swedish subject in upper secondary school**

The overall aim here is to identify speech genres for conversations on literature in upper secondary school classrooms and to analyse the kind of public spaces that are constructed through these genres. Hultin's project is a sub-project under Englund's larger-scale project Education as deliberative communication – conditions, possibilities and consequences.

The study has an ethnographic approach, involving observation, videotaping and interviews in five upper secondary classrooms (Swedish and Swedish as a second language) in which conversations on literature take place. The theoretical framework is drawn from different sources, such as studies of the teaching of literature, theories of communication/classroom interaction, and normative positions regarding the teaching of literature.

Hultin has identified four speech genres: questioning, culturally oriented talk, text-oriented talk and informal book talk. However, she has not finalized her analyses of the kinds of public spaces that are constructed through these genres, and thus the contributions to science and practice are not yet clear. The report provides information on national collaboration and a web link to a list of international contacts for Englund's umbrella project. The results will be disseminated through Hultin's dissertation, planned to be presented in 2006.

## 2001-5163

### **Anders Eriksson: Rhetoric as pedagogy: Rhetorical theory and practice as means to the communicative goals of Swedish schools and universities**

This is an umbrella project comprising five component projects whose common overall aim is "to investigate how rhetorical theory and practice can be used in contemporary classrooms as a means to attain the communicative goals of Swedish schools and universities". Each of the five sub-projects has

its own research questions. Eriksson investigates the educational method inherent in the classical progymnasmata exercises, Sigrell how classical rhetorical exercises compare with the American Rhetoric–Composition and Writing across the curriculum tradition and how such a tool could be used in Swedish schools and universities, Malmbjer how the concept of topic enhance learning, Blüchert how law students acquire the specialized language of the law during their studies, and Hellspong/Kindeberg how the professional ethos of teachers can be strengthened if the teacher is regarded within the framework of the rhetorical tradition. The report shows how each of these projects has its own method and materials, and of course different results as well. When it comes to their contributions to theory and practice, Eriksson points out that rhetorical research is relatively new in Sweden, and that each of the projects is breaking new ground. Some of the preliminary publications are already in use in teacher education, and many of the forthcoming publications seem to be oriented towards at the field of practice.

Of the twelve projects within Swedish didactics, this is the one that has received the biggest CES grant. It involves six active participants with different academic backgrounds at six universities, and includes a national scientific council of established scholars. In addition to the CES grants, the universities have contributed a quarter of the total costs. The project will result in two dissertations and several conference papers and publications, including a special issue of *Rhetorica Scandinavica*.

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## 2002-2564

### **Per-Olof Erixon/Johan Elmfeldt: Genres in transition – aesthetic writing practices in upper secondary school.**

The overall aim of this project is to investigate writing practices developed by students and teachers of Swedish and Swedish as a second language in upper secondary schools, focusing on the negotiation between traditional school genres and new genres in media culture (e.g. poetry and electronic multimodal texts). In addition, there are a number of specific research questions that deal with students' and teachers' conceptions of genre rules and their aesthetic practices. Theory and method are presented only briefly, but the project seems to rest on an extensive theoretical framework, and the method is based on classroom observation and interviews in two school environments. The results are not specified, but there are general formulations like "the results from the project will give knowledge about some of the conditions for communicative practices that enclose the activity for both teachers and students". The project is a product of collaboration between two university colleges and is linked to two national research schools. It has

been presented at various conferences. Apart from a special issue of Educational Studies in Language and Literature which Erixon is co-editing, no international collaboration seems to be involved. The project does not include doctoral students. Plans for the dissemination of results include articles, a book in Swedish and a presentation on a website.

It is difficult to evaluate this project on the basis of the short report given here. The research questions are interesting, but very ambitious, and they are formulated in a way that makes it difficult to see how they could be answered. The methods are described only vaguely and there are no real indications of the results.

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## 2002-2365

### **Gunilla Jansson: Collaboration and development within heterogeneous student groups.**

The overall aim here is to focus on the role of collaborative writing groups in engineering studies, involving students with diverse language and cultural backgrounds. An essential question is how these students benefit from peer collaboration. The theoretical framework is sociocultural, and the method used is audiotaping of students' discussions in 35 collaborative writing groups over a certain period of time. The focus is on what are termed genre-related episodes, i.e. episodes where the participants discuss text formation at both local and global levels. In contrast to similar studies, this project deals with student collaboration groups that arise spontaneously, rather than being arranged by teachers. One sub-project follows a three-year bachelor's degree programme, where the form of the lab report is regulated by written guidelines, the other a one-year master's programme where there are no such guidelines. The material also includes drafts and final versions of lab reports written collaboratively. The study shows that the different conditions for the two student groups led to very different discussions among the students, and that even detailed guidelines were not felt to be sufficient in the process of learning to write the academic genres in question. It also reveals a difference between second language students and native Swedish students. The study highlights the role of the tutor and of collective scaffolding between novices, and it sheds light on the students' process of socialization and the question of how genres are learnt.

The research plan has had to be modified in two major respects: the number of student groups has been reduced from 75–100 to 35, and the original idea of following each student's individual "author profile" by using key-stroke logging had to be given up. These changes are fully explained, and the project is interesting enough as it is. The project is a collaborative ven-

ture between a university and a university college. In addition to the two researchers actively involved, extensive collaboration has taken place with several researchers in the field of writing. No international collaboration is involved apart from participation at conferences and a forthcoming article in *Studies in Higher Education*. One of the researchers is planning for a dissertation in 2008.

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### 2001-5546

#### Lena Kåreland: Gender perspective on literature for children and young adults in education

The overall aim of this project is to investigate how gender is formed in pre-schools and schools, partly by analysing literature for children with respect to the representation of gender, partly by looking at how children use literature. The theoretical framework is manifold, drawing on sources in the fields of literary studies, gender studies and education. The methods used are questionnaires, interviews and observation involving 23 different pre-school departments, in addition to literature analysis from a gender perspective. Reading preferences among a number of pupils in grades 1–3 and grade 6 have also been studied. The results are not specified, but the report includes a few lines on contributions to the scientific field and the field of practice.

The research group seems to consist of five members. Owing to a reduced budget, the scale of the project has also been somewhat reduced. For the same reason, fully organized collaboration with other institutions has not been possible, and international contacts are vaguely described as contacts made at international conferences. One of the project members is planning for a dissertation in 2007, and apart from that the results will be presented through a book and conference papers.

Since the results are not specified, it is difficult to evaluate the project. It is also difficult to understand whether we are dealing with one project with five collaborators, or a number of different sub-projects.

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### 2001-5616

#### Monica Rosén: Reading literacy in Sweden (SALS)

This is an umbrella project comprising five sub-projects with the overall aim of investigating processes as well as determinants of reading literacy, both inside and outside school. All the sub-projects utilize the same material, databases from four large-scale international studies of reading literacy (1970, 1991, 2000 and 2001), but the research questions explored differ. Trends in student reading literacy achievement in Sweden between 1970–2001 estima-

tes and analyses change over time, School and teaching factors attempts to distinguish the characteristics of low-achievement and high-achievement classrooms, Home environment factors singles out as many home environment factors as possible from the databases in order to analyse the influence of such factors on reading literacy, and the impact of independent schools investigates the differences between public-sector and independent schools. Characteristics of poor reading students consists of two studies: one that focuses on different types of reading performance by analysing performance patterns across different reading literacy test items, and one that seeks to understand various features of dyslexia. All five projects have a common theoretical framework, combined with a theoretical and methodological perspective that differs according to the specific research questions addressed. However, most of the analyses in the project are based on multivariate techniques, especially structural equation modelling.

The contribution to the scientific field is clearly described, and the contribution to practice is of relevance partly to policymakers, partly to teacher educators and teachers. The SALS group has collaborated with another national network, FUR ("Prerequisites for educational outcomes"), and several international contacts have been made. The results of the project will be disseminated through four dissertations, articles in international research journals, and reports aimed at broader audiences such as professionals, policymakers, university students and the general public.

This project is one of the largest Swedish educational research projects, and it seems to have been handled in a very professional manner. The research questions are well defined, the methodology appropriate and the results well presented. However, it is not quite clear what belongs to the CES project and what is funded from other sources.

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## 2003-2211

### **Stefan Samuelsson: A strategic effort in reading and writing research**

The overall aim is "to establish a collaboration between Linköping University and Mid Sweden University focusing on reading and writing research and to strengthen ongoing research at each site". The CES part of the project involves two doctoral projects, undertaken by Camilla Kempe and Ulla Damber, both with their own theoretical framework, methods and project design. The focus of Kempe's project is on Matthew effects in reading and writing, the extent to which these effects extend to IQ and to attentional, social and behavioural problems, and whether they also extend to other academic abilities. Her project is a longitudinal study following two groups of children from kindergarten to grade 2, one group diagnosed as children at

risk of experiencing reading failure at school and the other most likely to experience some success. Damber's main questions are related to classroom effects: what classroom and school factors interact to create a school context that promotes good literacy skills, and how do classroom and school factors interact to create such effects? The plan is to assess literacy skills and socioeconomic background (SES) for a range of schools, to identify schools with similar SES factors but different levels of literacy skills, and to examine possible school-related factors that may explain these differences.

Both projects are in their early stages and results have still to emerge. However, our reading of the project report raises certain questions. The research questions posed in the Matthew effect study do not indicate results that can easily be transformed into a contribution to practice. As for the second study, the methodology for the identification of characteristics of effective schools or classrooms is described rather vaguely. The value of the study would be enhanced if it could be related to the vast body of research undertaken within this field.

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### 32001-5635

#### Hans Strand: Content and language integrated learning (CLIL) and the use of English and Swedish in school

The overall aim here is to find out how students' use of and development in Swedish is affected by CLIL (i.e. classrooms where English and Swedish are both used as languages of instruction). What happens to the students' language development in Swedish, how do the use of Swedish and the use of English interact, and do the students' attitudes to the use of the two languages change during their three years of study and, if so, how? The theoretical framework is mainly linguistic and the method comparative – two Swedish high school classes, one CLIL class and one ordinary one, are followed for three years. The material studied consists of video recordings, tests and written student assignments, surveys and interviews, and the data are subjected to activity analysis, conversation analysis, code switching analysis and text analysis. There is no formal national or international collaboration. The results will mainly be disseminated (by Maria Falk) in the form of a dissertation in 2007.

The project has been somewhat delayed owing to illness, and there are no results so far, nor is there any indication of contributions to the fields of science and practice. The topic is highly relevant, but it might be a problem that the research questions are rather ambitious and sometimes not very specific (e.g. "What happens...?" and "Do attitudes change...?"). We also lack information about the kind of criteria that will be used to describe langu-

age development, and no information is given about contact with other research projects in the CLIL field.

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### 2001-5643

#### **Staffan Alvar Thorson: To read is to read is to read... A project about 16-year-old pupils' reading literacy, reading strategies and inferences**

The overall aim of this project is to investigate the reading of poor readers, and (it appears) to see how it can be enhanced through a method referred to as structured text talks (QtA). There are two parts: Reichenberg (PhD student) investigates structured text talks based on material from textbooks used in schools, while Thorson focuses on readers' interaction with literary texts. The specific research questions deal with different aspects of poor readers; the theoretical framework is drawn from reception theory and theories of aesthetic response. Methods involve letters/logs between students and researchers, questionnaires, interviews and videotaped recordings of discussions of texts.

Reichenberg's report is very explicit in its description of method and project design. Her project involves five classes and six teachers. It introduces an element of intervention, as the teachers involved participated in a seminar that included a demonstration of the QtA method. The result was a qualitative change in the character of classroom discussions: for example, the length of teachers' turns and the number of purely factual questions decreased, and the students responded actively to their teachers' and peers' comments. The report from Thorson's project is less concrete. Teachers seem to have been involved, but the overall design is not quite clear. The results from the project will also be of importance for two other projects of Thorson's, and one of Thorson's students will commence his doctoral studies on the basis of this project. Apart from that, the results will be disseminated partly through Reichenberg's dissertation, partly through various publications written by Thorson.

## Summary and recommendations

The CES programme has resulted in a range of interesting projects in the fields of Swedish, mathematics and natural science. This we consider of value in itself. Studies linking their research questions to school subjects make educational research particularly relevant to teachers and teacher educators, and they broaden epistemic knowledge of teaching and learning in general. Since

such projects often receive low priority in competition with projects from general education or pure subjects, providing funding for research of this kind is an end in itself. In this respect the CES programme has obviously succeeded.

The reports cover a range of interesting topics and projects. From a methodological point of view, the projects represent a scale from large quantitative surveys to small-scale ethnographic studies. Some of them may be described as action research or intervention studies, but the majority are descriptive or analytical. Most projects seem to involve more than one researcher, and some are umbrella projects for a number of sub-studies that are more or less independent of each other. Lack of clarity on this point in the research reports makes it difficult to evaluate the relationship between the size of grants and the outcomes achieved. Another source of uncertainty is the fact that many of the projects (even those which should have been finished a year ago) have not yet arrived at their final results.

The majority of the projects are concerned with classroom-related topics. This is probably a natural consequence of the criteria set by the CES: that each research project should be of significance for teacher training and/or the teacher profession. In addition, many projects (and almost all of those concerned with Swedish didactics) mirror a multicultural society, in that they involve students of different social and ethnic backgrounds, even if this was not a criterion laid down by the CES. This may not have been intended by the CES, but it obviously adds considerably to the relevance of the studies.

The projects do not as clearly mirror a multimodal society. A recommendation for future grants might be that more attention should be paid to flexible learning and multimodality. Classical paper-based learning resources will not necessarily predominate over digital resources in the future, and this ought to be taken into consideration when designing new projects. This is particularly important for the field of Swedish didactics, where nearly all the projects can in one way or another be categorized by the term literacy studies, where “literacy” must be understood in its broad sense.

An important part of the evaluation of research projects concerns the relationship between research questions and results. However, only a few of the projects can be analysed according to a pattern of hypothesis–testing–evaluation, for example, which would make it easy to see whether or not the results have provided adequate answers to the research questions. The results obtained from qualitative studies are often not suited to short-format reporting, but need to be described at greater length. In addition to this it is somewhat problematic that many of the research questions are too vague, or too ambitious, or too multifaceted to point to specific answers. It would strengthen the projects in general if applications were expected to be more concrete in this regard.

With some minor exceptions, all the projects seem to involve systematic national collaboration. When it comes to international collaboration, however, only a few projects have systematic contact and collaboration with researchers outside Sweden. It is obviously a challenge to strengthen activities that may lead to closer international contacts.

The graduate schools differ in their structure from the other projects. They seem to be playing a significant role in building up expertise in their fields. However, this cannot be envisaged as something that can be brought about through individual projects, but rather as an undertaking that needs support over a longer period of time. The good progress achieved indicates that the format is functional, and that further initiatives along the same lines should meet with a positive response.

The research groups include a fairly large number of doctoral students compared with experienced researchers, and many of the latter have other important commitments. As mentioned already, this probably mirrors the situation in the field of subject didactics in general. However, the projects would be less vulnerable if they were led by more than one experienced researcher, perhaps even researchers from different universities.

It is the opinion of the reviewers that future project support should be aimed at establishing greater stability and continuity in Swedish research in subject didactics. Some of the projects that we have evaluated represent valuable contributions to this process.

# ACKNOWLEDGEMENTS

On behalf of the Swedish Research Council's Committee for Educational Science, we would like to express our sincere gratitude to the members of the expert panel, professor Ole Björkqvist, professor Elke Sumfleth and professor Frøydis Hertzberg, for all the time and hard work they have devoted to their assessment of the programme under evaluation. Subject didactics has been the dominant area of research in educational science during the first five years of the Committee's existence, and was accordingly chosen for its first research evaluation. Thanks to the integrity and collective expertise of the international expert panel, we are confident that this report will aid and stimulate further development of this field of research in Sweden.

We would also like to thank the researchers under review for assembling the material required for the review process, and for their participation in the meeting with the evaluators.

Stockholm, May 2006

Tjia Torpe  
*Chariman*  
*Educational Science*

Ulf P. Lundgren  
*Professor*  
*Secretary General*  
*Educational Science*

# APPENDIX 1: BACKGROUND OF THE EXPERTS

## Ole Björkqvist

(Born 1946) is professor of mathematics and science education at Åbo Akademi University, Faculty of education, Vasa, Finland. His research interests include mathematical problem solving, assessment, and social aspects of mathematics and science education. He is presently a board member at the of the Nordic Graduate School for Mathematics Education and vice president of the European society for Research in Mathematics Education (ERME).

## Frøydis Hertzberg

(Born 1944), professor of Norwegian didactics at The University of Oslo. Hertzberg's field is the teaching and learning of Norwegian, especially written and oral genres at an advanced level, including academic writing, rhetoric and grammar. She has recently quitted a 6-year period as a Deputy Dean at The faculty of Education and is now concentrating on writing as a cross-curricular competence.

## Elke Sumfleth

(Born 1952) is professor of chemistry education at the university of Duisburg-Essen, Germany. Her research interests are focused on empirical research in teaching and learning of chemistry, including special themes as experimental group work, home-work, visualisation and knowledge structure. She is Dean of the chemistry Department and Head of the DFG graduate school "Teaching and Learning of Science".

## APPENDIX 2: ORGANIZATION OF THE EVALUATION

An overall framework for the evaluation of research support was adopted by the Committee for Educational Science (CES) in February 2005. In the preparatory documents for the decision it was noted, among other things, that:

The goal of the evaluation should be to shed light on the quality of the research performed and its significance for the scientific field concerned, in a national and an international perspective and in relation to the funding awarded by the CES. Questions that may be relevant include: the national and international status of the research, research profile and choice of methods in relation to the status of the research, the development and potential of the chosen field, the financial situation, and the effect of the support provided by the Swedish Research Council.

As areas to be evaluated in 2005, the CES chose didactics in Swedish, mathematics and natural science. In April 2005, a panel of three experts was appointed by the Secretary General, Educational Science (see Appendix 1).

The first meeting between the evaluators and the Research Council's Section for Educational Science was held on 30 May. Abstracts from the selected projects (see Appendix 3) formed the basis for a discussion about how the review should be organized. At that meeting a request for progress reports was also drafted. This was then sent to the researchers concerned, who were asked to submit their reports by 12 September. The request is reproduced at the end of the present appendix. (p. 39).

The evaluators then continued their work, making use of e-mail to communicate, before meeting in Stockholm on 24–25 October to compile an initial draft of their final report. At that meeting Frøydis Hertzberg was entrusted with the task of completing the drafting of this report.

On 2 March 2006 the researchers who had participated in the 2005 international evaluation were invited to a half-day seminar. The aim was two-fold: to offer a chance for the evaluators and the researchers to meet, and to give the latter an opportunity to comment on the preliminary version of the report that had been prepared.

The final report was submitted to the Committee for Educational Science in April 2006.

## Progress Report

to the Committee for Educational Science, Swedish Research Council

The Committee's support for research on the didactics of mathematics, natural sciences and the Swedish language will be evaluated during 2005 by an international expert panel. As a basis for the evaluation, the panel needs progress reports from a number of research projects initiated in the years 2001–2003. In September, requests for additional information and/or clarifications on specific points will be communicated to each project separately.

The report should be limited to a maximum of 5 pages, and be written in English.

*Deadline for submission is 12 September 2005.*

The progress report should include the following headings:

### Part I: Scientific progress

- 1 Overall aim of the project
- 2 Specific research questions of the project (problem formulation)
- 3 Theoretical framework
- 4 Methods and project design
- 5 Results
  - a) Contributions to the scientific field
  - b) Contributions to the practice field (significance for teacher training and/or the teacher profession)
- 6 Comments on changes in research plan or project design today as compared to that in the original application for funding

### Part II: Organizational matters

- 7 National collaborations
- 8 International contacts and collaborations related to the project
- 9 List of doctoral students working on the project, with the starting date and the date of the planned or implemented public defence of the thesis
- 10 Financial situation – summary of funding from the Swedish Research Council as well as other sources
- 11 Plans for dissemination of results

### Part III: CV and publication list

- 12 Short CV for the main researcher
- 13 Publication list, containing journal articles, books or book chapters, conference contributions etc., related to the project

# APPENDIX 3: ABSTRACTS FOR THE EVALUATED PROJECTS

These abstracts are drawn from the original applications in didactics (Swedish, mathematics and natural science). The projects were among the first financed by the Swedish Research Council Educational Science.

## Mathematics didactics projects

2001-5503

Gunnar Berg, UU

**Project title: Matematikens historia i lärande/History of mathematics in education**

**Project:**

Mathematical learning is in some respects a reflection of the history of mathematics. Through learning about the latter, the student's conceptual understanding can be deepened at the same time as historical perspective can increase enthusiasm for the subject and enrich it. The difficulties that upper secondary school and university students often experience with infinitesimal calculus can be related to the problems, especially concerning infinite smallness, with which mathematicians struggled during the development of calculus during the 17th and 18th centuries. The project will largely elucidate the Swedish situation, and this has not been done in much detail previously. We intend to examine the connection between mathematical history and mathematical learning as regards the understanding of infinity and, specifically, infinite smallness. Öberg will investigate how the concept of infinity was understood during the 17th century before Newton and Leibniz presented their versions of infinitesimal calculus. Rodhe is continuing the work he began for his licentiate dissertation, dealing with how infinity and infinitesimal calculus were treated in Sweden during the first half of the 18th century. Berg intends to study the later stage of development which began with Maclaurin's interpretation of infinitesimals. Finally we will make a joint investigation of the connection with treatments of calculus in 19th- and 20th-century textbooks, specifically at the upper secondary school level. With our research we want to provide new perspectives that can enrich instruction in calculus and its applications.

## 2001-3907

### Gerd Brandell, LU

**Project title: Matematik – en manlig domän?/Gender and mathematics**

**Project:**

The project is intended to investigate whether Swedish school pupils and students perceive mathematics as a male domain. Another purpose is to examine whether such an outlook influences girls' and boys' choice of upper secondary school or undergraduate education. In a number of international investigations, researchers have shown that mathematics is regarded as male by many people (both girls/women and boys/men). This has been used as a key explanation for why certain girls/women choose not to take mathematics in their further education. Their possibilities of pursuing higher studies in science and engineering are thereby hindered. The instrument used most in studies of gender-stereotyped views of mathematics has been the attitude scale developed by Fennema and Sherman during the 1970s. It has recently been improved by researchers in Australia, who maintain that, due to changes in society, it can no longer be interpreted as in the past. We will use the new scale and supplement it with interviews to achieve a deepening of what the answers in the surveys reflect. The research is a cooperation between five universities/colleges in Sweden, with the collaboration of the researchers from Australia and of researchers in other countries. We thus have the possibility of making an international comparative study. The great scarcity of students in science and engineering is a social problem and, therefore, knowledge of attitudes that influence the selection and rejection of mathematics is essential.

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## 2002-3342

### Annica Gullberg, HiG

**Project title: Blivande Ma/NO-lärares ämnesdidaktiska utveckling/  
The progression of pedagogical content knowledge during the teacher training programme in science and mathematics**

**Project:**

Teacher education is a process that involves both learning by oneself and developing ideas about how knowledge and values are made understandable to others. In the same way as when students learn at school, the future teachers' ideas about instruction and learning are developed on the basis of their prior knowledge and concepts. Knowledge about the students, their perceptions

and expectations, is therefore necessary for creating relevant content in the teacher education.

Many research projects have investigated pupils' and students' subject knowledge, but there has seldom been an interest in the process that develops the future teachers' pedagogical content knowledge. Thus we intend to follow students in the programme for compulsory school teachers in mathematics and natural science, and to examine the process that develops them from students into professional teachers. Does a real progression in pedagogical content occur in the courses, and how are the students' didactic knowledge and ideas developed? To answer these questions, we use a method that we have previously employed in a pilot project and are familiar with. The students are to plan a couple of lessons on particular topics, answer questionnaires, and then explain their thinking more exactly in interviews. The investigation begins before the students' first course in science and mathematics, and ends during the last term. The progression is followed with repeated questionnaires and interviews. The knowledge obtained will provide new opportunities to improve the teacher education in science and mathematics.

**2001-3766**

**Bo Johansson, UU**

**Project title: Matematiska symboler och matematisk begreppsbildning. En studie av utvecklingen av några matematiska begrepp under de tidiga skolåren/Mathematical symbols and concept formation in mathematics. A study of the development of some mathematical concepts during the early school years**

**Project:**

The aim is to investigate formation of concepts in mathematics at ages 5 to 11. The study comprises two sub-projects. One of these treats the importance of mastering how to write figures and of numerical series for the forms of thinking in order to solve simple arithmetic problems. The other sub-project deals with the significance of numerical concepts of natural numbers, including the positional system, for the forms of thinking to handle simple fractions. These investigations will be carried out both through qualitative interviews and as experiments in instruction. Data collected will be analysed with qualitative as well as quantitative methods. Also included in the project is an overall component of the history of mathematics, intended to give historical parallels and causes for epistemological difficulties in learning arithmetical concepts such as that of fractions. The general purpose is to produce knowledge about early concept development in mathematics

that can be useful for the improvement of mathematics instruction during pre-school and the first school years.

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**2001-5555**

**Johan Lithner, UmU**

**Project title: Meningsful eller meningslös matematik: Förmågan att resonera matematiskt/ Meaningful or meaningless mathematics: the ability to reason mathematically**

**Project:**

The overall purpose of this project is to identify, describe and analyse the character and causes of pupils' and students' main difficulties in learning and using mathematics – with the goal of being able to design, implement and evaluate measures for counteracting the problems and improving the learning environments in schools and universities. As a whole, the project focuses primarily on the later part of compulsory school, the upper secondary school and the university. The chief issues concern how one treats, and could treat, mathematics as a subject in the learning environment, especially as regards the ability to perform and construct mathematical reasoning (which is a central aspect of competence).

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**2001-3989**

**Hans Wallin, MaH**

**Project title: Forskarskola i matematik med ämnesdidaktisk inriktning/ Graduate school in mathematics with didactics**

**Project:**

The Bank of Sweden Tercentenary Foundation (RJ) decided in March 2000 to establish a graduate school in mathematics with orientation toward didactics. The goal is to provide the universities' teacher education and the upper secondary schools with more teachers in mathematics having postgraduate education, and to develop mathematics education as a research field in our country. The graduate school is administered by an executive group. RJ has allocated funds for 15 doctoral candidates and the school opens in August 2001.

The application to the Swedish Research Council concerns financing for five further doctoral posts. It is motivated by the long-term importance of this research for mathematics education in schools, and by the very great interest therein from students and institutions. The graduate school's goal

is that the doctoral candidates should develop their ability to conduct research on learning in mathematics and about education in mathematics, and should produce dissertations of high quality. The dissertation work is to deal with didactic issues. The courses include mathematics, pedagogy, and mathematics education as a research field. Each doctoral student should have an appointment at one of the collaborating institutions. Twelve applications have been received from institutions that wish to collaborate with programmes for postgraduate education. The supervision is done in cooperation between mathematicians, mathematics educators and pedagogues. Appointments are being applied for by 140 persons, many of them extremely well qualified with teaching experience, good mathematical background, good degree work from undergraduate education, and good applications. The executive group decides on admissions in May.

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## Natural science didactics projects

2002-2623

Björn Andersson, GU

**Project title: Lärare och forskare som kunskapsbyggare för bättre NO-undervisning/Teachers and researchers as knowledge-builders for better school science**

### Project:

This project is based upon two concrete problems in the school world. One is the inadequate scientific understanding which, as many studies show, the majority of students have after finishing compulsory school. The other problem is that subject-didactic research results, which could contribute to improved instruction, do not reach out to the teachers and become applied in practice. With these two problems as a point of departure, the project mainly aims to study what happens when subject-didactic researchers and professionally active teachers work together on a common problem, namely how one can instruct so that the students acquire a good understanding of natural science in compulsory school. Starting with available research results and the teachers' professional experiences, sequences of instruction in the areas "a particle theory for material structure", "the theory of evolution", and "genetics and genetic engineering" will be developed and then tested. During this work, attention will be given to how the participating teachers perceive different research results and turn these into practice, as well as to how the students relate to the experimental instruction and what long-term retention they attain. A further

stage in the project will investigate how experiences and results can benefit other teachers in such a way that they improve their own instruction. The project is conducted as a collaboration between Göteborg University and the colleges in Borås and Skövde. Knowledge is exchanged with the universities in Leeds and Lyon, where projects with questions similar to ours are going on.

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**2002-2585**

**Sylvia Benckert, UmU**

**Project title: Sammanhang och samarbete i fysikundervisning/Context and conversation in physics education**

**Project:**

One aim of this planned study is to understand how the use of group discussions with context-rich problems, at both the university and upper secondary school levels, influences the students' interest in physics as well as their understanding of physical concepts. Another aim is to investigate what the content and formulation of problems mean for the students' understanding and interest. An important part of the study concerns gender analysis of the context-rich problems and of the group discussions as environments for learning.

We collect material from student groups in action through video recordings of the groups' work. This material is supplemented with questionnaires to the students and, in some cases, with interviews. Literature studies are used to establish guidelines for how context-rich problems should be formulated in order to be gender-inclusive. Problems are then designed on the basis of these guidelines and are tested in group discussions.

The project involves collaboration between physicists and teacher educators at Umeå University and Mälardalen College as well as upper secondary school teachers in physics.

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**2003-4445**

**Jonte Bernhard, LiU**

**Project title: Pedagogiska villkor för insiktsfullt lärande i naturvetenskap och teknik med interaktiva teknologier/Educational conditions for meaningful learning in science and engineering with interactive technologies**

**Project:**

The overall aim of this project is to study learning environments in science

and engineering instruction where computers are very important for the environment's pedagogical design. Different types of interactive technologies have been used for several years in Swedish compulsory and upper secondary schools as well as universities. Examples of popular interactive learning environments include microcomputer-based laboratory work (MBL), simulations, interactive lecture demonstrations, and modelling. These environments have in common that the phenomena are visualised and that the students can study how physical processes are developed and changed. While the expectations have been great, the reported results are contradictory. However, there is one exception where active student use of MBL has given very positive and stable learning results in numerous studies. In this light it is natural to make further studies of the differences in pedagogical conditions that lead to observed differences in learning. Which aspects of interactive learning environments are critical for reaching intended goals of learning, and how can these aspects be refined and transmitted to other learning environments? To answer these questions, we in the project will conduct extensive data collection that includes quantitative studies with pre- and post-testing, qualitative studies with video recording, participant observations and interviews.

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**2003-4440**

**Sven-Olof Holmgren, KVA**

**Project title: NTA forskning och utveckling/Research and development with NTA as infrastructure**

**Project:**

The aim of this project is to develop material, manuals and philosophy for teaching science and technology (S and T) in public schools, and to study this development from a scientific point of view. The project will be carried out in close collaboration with teachers, educators of teachers, scientists, and representatives of industry and municipalities. The project belongs to an initiative called Natural Science and Technology for All (NTA). It is a nationwide cooperation between the Royal Swedish Academy of Sciences, Royal Swedish Academy of Engineering Sciences, currently 34 municipalities and a number of "free schools".

The idea is to create an activity integrated with the ordinary school curriculum, which not only does research, but also contributes to the development of new teaching patterns for teachers in S and T. The project shall create knowledge about how to teach S and T so that both teachers and students are provided with good science literacy.

There is a great need to study the development of the prerequisites NTA has formed to achieve this. We are conscious about the fact that this application concerns matters on the borderline of what the committee is responsible for, i.e. that it deals both with research and development. However, we see this as a strength with NTA, since to reach the specific goals of the project, we need to know much more about the mechanisms of interaction between the different players and their reactions to the teaching materials.

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**2001-5531**

**Glenn Hultman, LiU**

**Project title: Naturvetenskap i grundskolan – undervisningens form och innehåll/The form and content of science in the Swedish compulsory school and classroom interaction**

**Project:**

In this project we want to carry out sub-studies which clarify the compulsory school's instruction in natural science. The project differs from the customary way of charting what is described as conceptual understanding or concept formation. We focus instead on issues concerning social interaction and communication, and how students as well as teachers become participants in ways of speaking and regarding the world from a natural-scientific perspective. Through analyses from the diverse sub-studies we will hopefully increase understanding of the learning processes. Initially we study classroom interaction, laboratory work and teaching aids. Thus the project focuses upon (1) teachers' and students' work with the material areas of natural science, (2) the laboratory as an environment for learning, and (3) the textbook as a bearer of natural-scientific knowledge culture. The overall aim is to illuminate how students are socialised into the school's natural-science instruction, how the students' interplay both mutually and with teachers is expressed in the classroom, and how students become participants in and learn to master the terminology of natural science. A further purpose is to elucidate how teachers individually or together in teaching teams choose, structure, and themselves become participants in the knowledge areas of natural science. Some central concepts are teacher cultures, subject cultures, teacher roles, socialisation, interaction, and communication. The project is conducted in collaboration between Linköping University and Kristianstad College.

**2002-3219**  
**Cedric Linder, UU**

**Project title: Att etablera en vetenskaplig grund för fysikundervisning på universitet/To inform a scholarly base for teaching physics at university**

**Project:**

In 1990 Ernst Boyer, as the President of the Carnegie Foundation in America, wrote a report on how universities were creating a dichotomy between teaching and research, to propose that educational research be done to develop the conception of scholarship to encompass all aspects of academic activity, including teaching and learning. This research proposal is about informing such evolution of scholarship in university physics contexts. The proposed project draws international partners and physics departments in an old established research university and a new teaching university in Sweden together to collaborate in research on: (a) physics lecturers' notions of scholarliness in the teaching and learning of physics; (b) how students experience good physics teaching and how this affects the role which available learning resources play in their approach to learning physics; and (c) the relationships between lecturers' notions of scholarliness, students' notions of good teaching, how lecturers experience their working environment, and how students experience their learning environment. The collective aim behind these studies is the development of theory to contribute to an evolving conception of teaching and learning scholarship in university physics.

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**2001-3777**  
**Ann-Marie Pendrill, GU**

**Project title: Extramuralt lärande/Extramural Learning**

**Project:**

A visit to a science centre often leaves lasting traces and can play a role in children's choices later in life. This project is aimed at observing pupils and teachers who take part in different extramural activities within their network. We also intend to follow up classes which made class visits at centres in previous years, and to use surveys, knowledge tests and interviews to investigate what is remembered of such visits and whether permanent learning can be proved. The investigations will be carried out partly as an

element of teacher trainees' examination tasks and activity-allocated subject studies.

The project is a collaboration between Borås College and "Navet", Skövde College and "Balthazar-Sinnenas verkstad", Göteborg University, the educational-science and natural-science faculties, the project "Striking Power – Natural Science at Liseberg" and, finally, Chalmers University of Technology and the competition Teknikåttan (western region).

**2002-2729**

**Lennart Sjölin, GU**

**Project title: Goda inlärningseffekter med microscale i laborationer i kemiutbildningen? – GIMMIK/Better learning outcome of microscale laboratory exercises in chemical education**

**Project:**

As a consequence of the goal-directed work to achieve the quality objectives that have been defined by the Department of Chemistry at Göteborg University (GU), and as part of a pattern of improvement activities, we intended to continue the introduction of inorganic experiments at microscope at all educational levels and with high pedagogical standards. We are hereby applying for funds to finance Göteborg's first doctoral candidate in chemistry didactics with an orientation toward university instruction, in a project where we jointly analyse the pedagogical outcome of introducing microscale experiments for the basic courses in general and inorganic chemistry.

The instruction has a goal of pedagogical quality. In our case, this viewpoint must be taken strongly into account when the intention is to introduce an ecologically sustainable laboratory course at microscale. Will the learning effects be as good with microscale in the basic chemistry education as with the usual macroscale method? The project is a collaboration between the Department of Pedagogy and Didactics at GU, the Department of Chemistry at GU, and the Section of Economy and Technology at Halmstad College. Moreover, the project involves greater cooperation with the Iberoamerican University in Mexico City, which is an internationally defined Microscale Center. Previously our pilot project has received some EU support within the Alpha project. Within the framework of the project now applied for, GIMMIK, we also intend to further develop the international exchange in chemistry didactics.

**2001-5640**  
**Gunilla Svingby, MaH**

**Project title: Utbildning för hållbar utveckling. Longitudinell studie över hur lärarstudenter i Ma/NO utvecklar grundläggande naturvetenskapliga begrepp och komplext tänkande relevant för miljökunskap/ Natural science for sustainable development**

**Project:**

The goals of syllabi for 2000 clearly state that students must learn at an early stage to use natural-scientific knowledge so that they can argue on, for example, environmental issues. These issues are complex and demand knowledge from several subject areas, such as natural science, in order to be understood. This investigation focuses on students in teacher education in Ma/NO 1-7 and their knowledge development in natural science.

To understand how a realistic environmental education can be designed, a group of students is followed in a longitudinal investigation. The project examines how they develop natural-scientific concepts that are relevant to environmental issues, and how they develop the ability to use the concepts in discussion of complex environmental issues. On recurrent occasions, all the students are to answer a questionnaire and a smaller group of students is interviewed to obtain answers to the research questions. These are: (1) How does the students' capacity for complex thinking about environmental issues develop during the education? (2) How do the students develop natural-scientific concepts that are relevant to environmental issues?

**2001-5648**  
**Per-Olof Wickman, LHS**

**Project title: Hur blir naturvetenskap användbar i nya sammanhang?/ How can science become useful in new contexts?**

**Project:**

The aim of this project is to study how learning in a certain context is used in new contexts. The focus is specifically learning in science, a subject where there are reported difficulties in helping students to see that what they learn in science can be used outside school. From an educational perspective the project treats the relation between science as research and science as a subject in school and at the university. The purpose is to produce results

that can be used to enhance transfer of meanings from different contexts in science education. The project is later intended to be extended also to contexts outside research and the educational system.

The project will treat education both in school and at the university. The major questions are what the relation is on the one hand between research and education at the university, and on the other hand education at the university and education at high school. The first part of the project studies the relation between how researchers in biology explain phenomena to each other and how they explain the same phenomena to students, to see how explanations are transformed between these contexts and what sense they make. The second part of the project deals with transformations in a similar way, but concerns how students in biology and chemistry at the university learn what counts as valid knowledge and valid explanations, as well as what counts as valid knowledge and explanations in general science courses at high school.

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## Swedish language didactics projects

2001-5501

Monica Axelsson, SU

**Project title: Den sociokulturella och pedagogiska miljöns betydelse för barns literacyutveckling/The significance of socio-cultural and pedagogical environment on the development of children's literacy**

### Project:

The study of children's literacy development has the purpose of examining how children are socialised into literacy. Which literacy situations do children interact in, and how is literacy applied on these occasions? The aim is to expose the knowledge that children bring with them when encountering the school's more formal instruction in reading and writing, as well as to investigate how children's knowledge is received in school. Central concepts for the study are literacy (the ability and preparedness to use reading and writing for creating content in written language, in a way that meets the needs existing in a special sociocultural context), literacy situations (all the everyday occasions where written language plays a role in people's lives), and literacy application (meaning that people use their knowledge about reading and writing in a special situation). The project, which comprises studies of children at pre-school age and is followed up during their first

term at school, has an ethnographic perspective. Three sub-studies are included in the project: (1) About ten children from three different sociocultural environments are followed and observed at home, pre-school and leisure in order to chart which literacy situations they interact in. (2) Two pre-school groups are observed to ascertain the literacy intensity among the children in their mutual interaction. (3) A group of children with Swedish as second language is studied in a pre-school whose personnel work in a conscious manner with the children as they encounter written text through, for instance, book-flow programmes.

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**2002-3245**

**Teresa Cerratto, KTH**

**Project title: Språkliga datorstöd och andraspråksinläring/The use of language for writers in the context of learning Swedish as a second language**

**Project:**

The use of computers has motivated many studies investigating the integration of computers into teaching/learning practices and its educational effect. These studies provide a significant body of research findings supporting the usefulness of technology for language learning. However, so far little is known about how computer-based tools may be adapted to second language learners. The project investigates issues that are related to the use of computer support for learning Swedish as a second language. It focuses on the use of computer-language tools for writers who can fluently write and speak in their mother tongue. The goal is twofold: (i) to study how learners develop their writing practices in the context of learning Swedish as a second language and how learners and teachers, use available writing tools in their training; (ii) to contribute to the improvement of the design of existing language tools for writing in learning contexts.

The problem of supporting a developmental process such as writing when learning Swedish as a second language raises important issues in the field of computer support for learning. This project aims to contribute to a better understanding of the role of technology in learning environments and to provide design principles for the development of computer writing tools for second-language learning purposes.

**2001-5429**

**Jan Einarsson, VXU**

**Project title: National graduate school in Swedish with a didactic orientation**

**Project:**

The basic aim of the national research institute in Swedish with didactic orientation is to develop and establish a research area of the greatest importance for teacher education and professional pedagogy. Swedish is the largest subject in schools, and the research institute's activity will raise its quality by strengthening the connection with research in this area. The institute is also to help fill the schools' and teacher programmes' need for personnel with postgraduate education. Thirteen seats of learning are participants in the collaboration within the research institute. This leads naturally to the use of new forms of instruction such as Internet and Intranet. Cooperation will also occur with the already established postgraduate education and research environments (including other research institutes) that the different seats of learning offer. The research institute is to be international in choice of perspectives, theories and methods. At the same time it will be receptive to the initiatives for research tasks that come from Swedish schools and from the doctoral candidates. The enterprise will be linked to diverse educational practices and characterised by integration between the component subjects. Three themes – "The multicultural world of texts", "Linguistic and cultural practices in development" and "The subject of Swedish in our time" – constitute the core of the work. The research institute is to have a clear organisation, a conscious commitment to guidance, a systematically planned programme of courses and seminars, and organised collaboration.

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**2001-5433**

**Tomas Englund/Eva Hultin, ORU**

**Project title: Conversation on literature within the Swedish subject in upper secondary school (part of the project Education as deliberative communication – conditions, possibilities and consequences)**

**Project:**

The aim of the project is to analyze the Swedish educational system's (compulsory school; Upper Secondary School; teacher training programs; dif-

ferent forms of adult education) future role and potential for preserving, developing, and strengthening a deliberative democracy. Thus, the project focuses issues as educational policies and institutional prerequisites for developing learning processes that can be characterized as deliberative communication, which in turn can be related to deliberative democracy. In other words, the relation between education and democracy is given special attention in this project.

Within the project a number of different studies have taken place, where one common starting point is to look upon the classroom as a public space, where a political, social and cultural multiplicity exists. The studies of the project are held together by following questions: 1) to develop and specify the theory of deliberative democracy in relation to education as a public room. 2) To analyze the prerequisites for compulsory school and other educational settings to be organized as a deliberative, democratic milieu. 3) To analyze the possibilities and difficulties in changing the inner work of schools and other education towards a deliberative democracy.

The part of Englund's project above that was included in the evaluation of didactics in the Swedish language was Eva Hultin's study, Conversations on literature within the Swedish subject in upper secondary school was included. The study in question belongs clearly within the field of didactics of the Swedish subject. The overall aims of this study can be formulated: to identify speech genres within conversations on literature that are organized in the subject of Swedish within Upper Secondary School and to analyze what kind of public spaces are constructed in the classrooms through the identified speech genres.

**2001-5163**

**Anders Eriksson, LU**

**Project title: Retorikens didaktik: Retoriken och dess övningar som en väg till skolans och högskolans kommunikativa mål/ Rhetoric as pedagogy: Rhetorical theory of practice as means to the communicative goals of Swedish schools and universities**

**Project:**

Both schools and universities in recent years have placed increasing emphasis on the students' communicative ability. Rhetoric and its practices have historically been the path to attaining this goal. By tradition, rhetoric has concerned not only the art of speaking, but also the art of writing and reading as well as deliberating and reflecting. Such rhetoric has dominated

Western education for 2500 years, not least in the form of a programme for speaking, writing and reading which is known as progymnasmata. During the past 100 years, however, the connection between didactics and rhetoric has been broken.

The aim of this project is to investigate, on the basis of the spontaneously growing interest in rhetoric, how rhetoric and its didactic programme can be used in today's pedagogical situation to improve the communicative ability of pupils/students. It is then important to clarify the teacher's professional roll as a rhetorical didactician. The project is divided into five sub-projects: (1) Rhetoric's pedagogical programme in a historical perspective. (2) Rhetoric's pedagogical programme in a comparative and critical perspective. (3) Rhetorical practices as tools for elaboration and understanding of the content of instruction. (4) Rhetorical practices as a means of developing communicative ability and genre mastery among law students. (5) Rhetorical didactics as a means of strengthening the teacher role. The goal of the project is to re-establish the connection between rhetoric and didactics for the benefit of, in particular, instruction in writing as a way of learning in the Swedish educational system.

**2002-2564**

**Per-Olof Erixon, UmU**

**Project title: Genrer i rörelse – estetiska textpraktiker i gymnasieskolan/  
Genres in transition – aesthetic writing practices in upper secondary school**

**Project:**

This project is intended to study pedagogical aspects of literature, writing and media in the textual practices that students develop in the field of tension between the traditionally determined genres of written language in the subject of Swedish, more freely creative writing, and contemporary media cultures. The study raises fundamental associated issues of how students and teachers in Swedish, and Swedish as a second language, deal with the relationship between the school as a public sphere and leisure time as a private sphere.

The project seeks answers to the following questions.

- What ideas do students and teachers in Swedish have of genres for writing and the possibilities of violating them?
- Which strategies of negotiation, for how texts should look and what can

be expressed, do students and teachers in Swedish develop when projects are initiated at school for creative writing in the form of poetry and/or multimedia electronic texts?

- How do these aesthetic practices relate to literary socialisation, to traditional genres of written language in the subject of Swedish, and to genre praxis constructed by popular culture and media?
- How do students and teachers in Swedish establish interfaces between aesthetic text practices in the school as a public sphere and leisure time as a private sphere?
- Which thematic patterns appear in the students' texts with regard to reflexivity and identity creation?

**2002-2365**

**Gunilla Jansson, SU**

**Project title: Skrivsamarbete och skrivutveckling i heterogena studentgrupper/Collaboration and development within heterogeneous student groups**

**Project:**

This project's aim is to investigate whether collaboration in writing within linguistically and culturally heterogeneous groups of students can promote development in writing. The investigation will describe and compare the interaction in differently composed groups over time. The idea is that one should be able to see whether teacher support and interaction in the groups have any connection with linguistic and cultural heterogeneity. The project raises issues based upon results from current research on second languages and on writing, and is to be conducted in cooperation between Mälardalen College and Uppsala University. Previous research has shown that collaborative discourse is significant for second-language students' linguistic awareness. This investigation focuses on the process and development of writing in bilingual students with immigrant background. The investigated population is to consist mainly of informants in engineering programmes. Tape recordings and collection of texts will be made in about 75-100 groups on two or three different occasions. In order to discuss hypotheses about writing development, the students' individual author profiles will be related to the writing process as it is manifested in the group interaction. The results may be important for how one can support students' writing. Funds are sought for a doctoral candidate with full-time employment and a half-time researcher during three years.

**2001-5546**

**Lena Kåreland, UU**

**Project title: Genusperspektiv på barn- och ungdomslitteratur i skolan/  
Gender perspective on literature for children and young adults in education**

**Project:**

This project is connected with ongoing social debate about masculinity and femininity as cultural constructions, and with current debate in the area of children's literature. The project is based upon literature for children and young people that is used by the teaching in pre-school and at school with regard to how gender is constituted.

Two approaches are taken. A part dealing with literary history analyses how boys' and girls' socialisation and identity creation are portrayed in literature. Do boys and girls violate the prevailing gender order or not? There is also an orientation toward sociology of literature, where boys' and girls' reading is analysed with the help of questionnaires and interviews. In addition, a selection of reading projects for children and young people will be studied. In a pedagogically oriented part, reader-related aspects will be taken into account, with a focus on both teachers and students. Is gender significant for the teachers' choice of literature? How gender-divided is children's reading today? How is gender constituted in discussions about books at school?

The same texts will be examined by all studies that belong to the project, and the theoretical basis is the same. The project is interdisciplinary and builds upon theories of development and socialisation as well as aesthetic theories. It spans across subject disciplines such as history of literature, pedagogy, psychology and sociology. Relevant to both the schools and the research world, it may have particular importance for the development of instruction and research in the field of teacher education.

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**2001-5616**

**Monica Rosén, GU**

**Project title: Studier Av Läsfärdigheten i Sverige (SALS)/Reading literacy in Sweden**

**Project:**

The aim is to acquire deeper knowledge of literacy among children and young people in Sweden. In this respect, Swedish pupils have previously

accounted well for themselves in international contexts, but the results within the country are very diverse. In SALS, five sub-projects have been defined: (1) a broad description and analysis of literacy development in Sweden during 30 years, both in terms of individual and group differences and in terms of resource changes; (2) an investigation of the significance of factors at school and in instruction; (3) a more profound analysis of important factors in the home environment and outside school; (4) a study of how different forms of school contrast in regard to literacy and instruction; (5) an analysis of pupils with weak literacy. SALS builds upon analyses of already existing data. Sweden, through its participation in four international studies of "Reading Literacy" between 1970 and 2001, has access to a great amount of data with findings about both contextual factors and various kinds of literacy. In addition to reading test data, the databases contain answers on student, teacher, school and parent questionnaires. The analyses will be based chiefly on multivariate techniques. SALS is conducted in a collaboration between researchers in pedagogy at Göteborg University and Kalmar College.

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**2003-2211**

**Stefan Samuelsson, LiU**

**Project title: En strategisk satsning på läs- och skrivforskning/A strategic effort on reading and writing research**

**Project:**

The present project aims to strengthen research on reading and writing which is conducted at Linköping University and Mid-Sweden University. Five topics are given priority in the project: (1) What characterises efficient and less efficient schools in regard to reading and writing skills? (2) To what extent are difficulties of reading and writing a contributory cause of the fact that so many students with foreign background drop out of upper secondary school? (3) Teachers' and teacher trainees' attitude and preparation for work with pupils' written-language development. (4) Upper secondary school students' thoughts about future requirements of reading and writing. (5) How can one counteract negative, secondary effects of literacy during the time in compulsory school?

**2001-5635**

**Hans Strand, SU**

**Project title: SPRINT och svenskan i skolan/ Content and language (CLIL) in integrated learning and the use of English and Swedish in school**

**Project:**

SPRINT, the instruction in different subjects in a foreign language (especially English), primarily in upper secondary schools but also in the compulsory schools, has become a very popular and increasingly common form of instruction in Swedish schools during the 1990s. (SPRINT/CLIL stands for content- and language-integrated instruction.) The idea behind this type of instruction is, of course, to make the instruction in English and other foreign languages more efficient. How SPRINT functions in practice, though, we do not know very much about at present. What happens, for example, with the students' Swedish? Will it be influenced? And will the use of Swedish eventually decrease? These are questions which the project intends to treat. More specifically, the project will answer two questions: (1) What happens with the students' skills in, and use of, Swedish when a larger or smaller part of the instruction occurs in English? (2) What interplay occurs between the students' knowledge and use of English and their knowledge and use of Swedish? The empirical basis consists of classroom observations, tape recordings, tests, marks, questionnaires and interviews. The analyses are made with the help of methods taken from communication ethnography, discourse analysis, code-switching analysis and textual analysis.

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**2001-5643**

**Staffan Alvar Thorson, GU**

**Project title: Att läsa är att läsa är att läsa... Ett projekt om 16-åringars läsfärdigheter, lässtrategier och inferenser/To read is to read is to read... A project about 16-year-old pupils' reading literacy, reading strategies and inferences**

**Project:**

The project's overall purpose is to investigate preconditions for 100 upper secondary school students' reading literacy (self-image, reading strategy, inferences). We also want to investigate the students' perceptions of the authority relationship between text and reader, as well as whether these

perceptions can be developed through structured textual discourses in a perspective of fundamental values.

The investigation is designed as follows. A questionnaire is used to assist charting of the students' self-images and their perceptions of the authority relationship between text and reader. In individual interviews, the 50 students with most experience of reading will elaborate and deepen their answers on the questionnaire. Here their reading strategies and ability to infer are investigated.

In addition, we want to investigate whether it is possible, with the help of structured textual discourses according to Questioning the Author (QtA), to develop the students' perceptions of the relationship between text and reader, and to deepen their understanding of texts.

Also included in the investigation are questionnaires to teachers in Swedish, and in Swedish as a second language, as well as to school principals and school librarians. The questionnaires will tell us more about the preconditions for reading in school (attitudes, availability of books, the books' accessibility for the students, attitudes toward 'our' students' reading of texts, etc.).

Finally, we want to evaluate the teachers' and students' experiences of how guided textual discourses can influence reading literacy and the relationship between text and reader.

# APPENDIX 4: GRANT AMOUNTS PER YEAR

Last name	First name	File ref. no	University	Type of grant	2001	2002	2003	2004	2005	2006
Andersson	Björn	2002-2623	Göteborgs universitet	Project			650	650	650	
Axelsson	Monica	2001-5501	Stockholms universitet	Project		975	975	975		
Benckert	Sylvia	2002-2585	Umeå universitet	Project			650	650	650	
Berg	Gunnar	2001-5503	Uppsala universitet	Project		990	990	990		
Bernhard	Jonte	2003-4445	Linköpings universitet	Project				1 350	1 350	1 350
Brandell	Gerd	2001-3907	Lunds universitet	Project	298	508	325			
Cerratto	Teresa	2002-3245	Kungliga tekniska högskolan	Project			1 100	1 100	1 100	
Einarsson	Jan	2001-5429	Växjö universitet	Graduate school		4 000	4 000	4 000		
Englund	Tomas	2002-2660	Örebro universitet	Project			900	925	950	
Eriksson	Anders	2001-5163	Lunds universitet	Project		1 690	1 690	1 690		
Erixon	Per-Olof	2001-2564	Umeå universitet	Project			754	754		
Gullberg	Annica	2002-3342	Högskolan i Gävle	Project			819	845	845	910
Holmgren	Sven-Olof	2003-4440	Kungliga vetenskaps akademien	Project				1 000	1 000	
Hultman	Glenn	2001-5531	Linköpings universitet	Project		520	520	520		
Jansson	Gumilla	2002-2365	Stockholms universitet	Project			780	780	780	
Johansson	Bo	2001-3766	Uppsala universitet	Project	455	650	650			
Kåreland	Lena	2001-5546	Uppsala universitet	Project		900	900	900		
Linder	Cedric	2002-3219	Uppsala universitet	Project			1 300	1 300	1 300	
Lithner	Johan	2001-5555	Umeå universitet	Project		650	650	650		
Pendrill	Ann-Marie	2001-3777	Göteborgs universitet	Project	620	1 169				
Rosén	Monica	2001-5616	Göteborgs universitet	Project		1 300	1 300	1 300		
Samuelsson	Stefan	2003-2211	Linköpings universitet	Project				1 350	1 350	1 350
Stölin	Lennart	2002-2729	Göteborgs universitet	Project			520	520	520	520
Strand	Hans	2001-5635	Stockholms universitet	Project		500	475	955		
Svingby	Gumilla	2001-5640	Malmö högskola	Project		635				
Thorson	Staffan Alvar	2001-5643	Göteborgs universitet	Project		975	975			
Wallin	Hans	2001-3989	Umeå universitet	Graduate school	800	1 976	2 145			
Wickman	Per-Olof	2001-5648	Lärarhögskolan i Sthlm	Project		990	990	690		

# APPENDIX 5: ABBREVIATIONS

CES	Committee for Educational Science
CLIL	Content and Language Integrated Learning
ERME	European society for Research in Mathematics Education
FUR	Prerequisites for educational outcomes
GIMMIK	Better learning outcome of micro scale laboratory exercises in chemical education
LA	Language and Literature
MBL	Micro computer-based laboratory work
NTA	Natural science and Technology for All
RJ	The Bank of Sweden Tercentenary Foundation
SALS	Studies of reading literacy in Sweden
SES	Literacy skills and socioeconomic background
SPRINT	The instruction in different subjects in foreign language
OtA	Structured text discussion/talks
QtA	Questioning the author

## Universities and Universities Colleges:

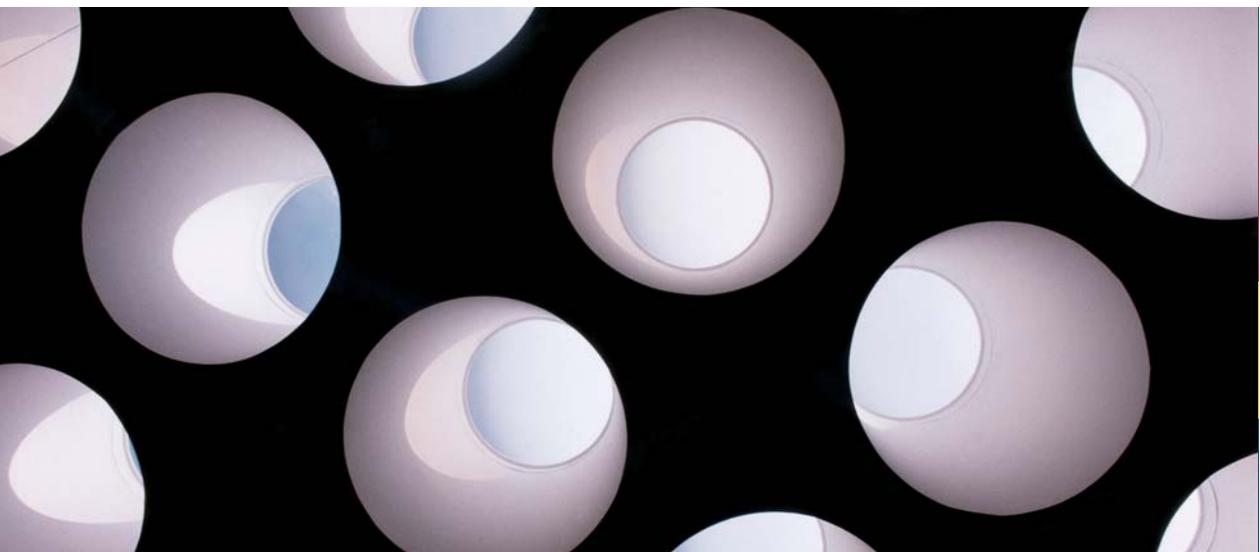
GU	Göteborg University
HiG	University College of Gävle
KTH	The Royal Institute of Technology
KVA	The Royal Swedish Academy of Sciences
LHS	The Stockholm Institute of Education
LiU	Linköpings University
LU	Lund University
ORU	Örebro University
SU	Stockholm University
MaH	Malmö University College
UmeU	Umeå University
UU	Uppsala University
VxU	Växjö University



Within the Swedish Research Council an overall framework for the evaluation of research support was adopted by the Committee for Educational Science (CES) in February 2005.

As areas to be evaluated in 2005, the CES chose didactics in Swedish, mathematics and natural science. In April 2005, a panel of three experts was appointed by the Secretary General, Educational Science, and the result of their work is presented in this book.

The goal of the evaluation should be to shed light on the quality of the research performed and its significance for the scientific field concerned, in a national and an international perspective and in relation to the funding awarded by the CES.



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The Swedish Research Council is a government agency funding basic research of the highest scientific quality in all disciplines. The Swedish Research Council has a national responsibility to support and develop basic research and promote research innovation and research communication. The goal is for Sweden to be a leading nation in scientific research.

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ISSN 1651-7350  
ISBN 91-7307-092-0

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