

RECENT DISSERTATIONS

AGNETA BOSTRÖM, 2003:

Chemistry students' narratives. The nuclear submarine that went down, the road of the chocolate bar towards the garbage station and the boiler deposits that looked like a sandwich. (Licentiate's dissertation)

Department of Curriculum Studies and Communication, Stockholm Institute of Education, Sweden

Abstract

The purpose of the thesis is to study how and why chemistry teachers in the upper secondary schools in Sweden use narratives when teaching their subject. The specific questions investigated are:

- How do the chosen narratives add to the content of Chemistry?
- Why did the teachers choose the narratives they used?
- How are the classroom narratives connected to the teachers' life histories?

The theoretical framework is based on social constructivism as discussed by Cobern and Solomon but also on Bruner's understanding of narrative cognition. Narratives are regarded as part of what Shulman has discussed as teachers' PCK, pedagogical content knowledge. The content of science is discussed in terms of Roberts's knowledge emphases that answer the question "Why should we learn Science?" The perspective of Ogborn et al. where scientific explanations can be regarded as narratives or stories, is also adopted.

The data consist of interviews with six experienced teachers. The data were collected over a period of a little more than one year. The data were analysed by means of Russian formalism and narrative analysis and a categorization of the teachers' narratives was made.

The results from the individual interviews show that experienced chemistry teachers use narratives in order to help the students make sense of chemistry. They do this in different ways; it is shown that their narratives are intimately connected to their individual life stories. Their narratives embrace a number of different curriculum emphases and enrich the content of science being taught in the classroom.

The categories of narratives found are the big narrative concerning how everything is connected, narratives concerning nature, narratives concerning ourselves, narratives concerning our society, narratives concerning the atom and its parts as agents and finally narratives that concern the entire world. Further categorizations are suggested and it is shown that teachers' narratives allow more curriculum emphases to be presented in class.

Language: Swedish with summary in English
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RECENT DISSERTATIONS

BERIT BUNGUM, 2003:

Perceptions of Technology Education. A cross-case study of teachers realising technology as a new subject of teaching.

Department of Physics, Norwegian University of Science and Technology (NTNU), Trondheim, Norway.

Abstract

The thesis reports a cross-case study of how a sample of Norwegian teachers participating in a curriculum development project (Teknologi i Skolen) on technology teaching interpret and realise technology as a subject of teaching. The curriculum project is inspired by the subject Design & Technology in England and Wales, and is hence an example of transfer of ideas across national borders. The study has been undertaken by means of interviews with teachers and classroom observations, and reported in terms of what the teachers see as aims for the subject, how they interpret the nature and content of the subject and how they relate it to Science and other subjects in the curriculum. The teachers' views and realisation of technology teaching in Norwegian classrooms are compared with perspectives on technology and education and specifically with aspects of the subject Design & Technology in England and Wales. It is shown how teachers adopt certain aspects of new ideas presented to them rather than the whole rationale of Design & Technology in an interactive manner, interpreted in terms of theory related to teachers' professional frames for teaching.

The cultural influence on how ideas on technology education are interpreted and realised is highly evident in the results of the study. Reflecting the educational ideology in the Norwegian curriculum, the teachers interpret technology as cross-curricular teaching in meaningful context rather than a subject with its own basis of knowledge and identity. Further, teachers place technology teaching in a frame of practical independency rather than related to industry and commercialism, reflecting the dissimilar history and national identity in Norway and England respectively. These broader cultural frames appear to be more important for how the teachers have approached technology teaching than their subject background, which has elsewhere been anticipated to create a bias in teachers' interpretation of technology as a school subject. The study illustrates the importance of teachers' interpretations for how new ideas are realised in schools, and how these interpretations are deeply rooted in the educational and cultural context. This is relevant to consider for the further development of technology in Norwegian schools as well as for understanding education and the transfer of educational ideas more generally.

Language: English
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RECENT DISSERTATIONS

PEKKA E. HIRVONEN, 2003:

Effects of the use of the surface charge theory-based approach to understanding of direct current circuits in university studies

Department of Physics, University of Joensuu, Finland.
Dissertations 36.

Abstract

The aim of this study is to investigate how an instructional approach based on the use of the surface charge theory affects students' understanding of direct current circuits in the first year of university studies. In order to reach the aim, a new course was implemented and studied. The subject group consists of two groups; five case study students and the whole cohort (N=32) including the case study students.

The main instructional ideas of the course are based on the existence of the surface charges. They can be understood as a mechanism that causes adequate electric fields inside wires and components and consequently electron current. The surface charge based micro-level models are needed, if the connection between the domains of electrostatics and DC circuits is meant to be created. The approach explains the operation of DC circuits by using fundamental conservation principles of charges and energy.

The progress of students' understanding was studied by using both qualitative and quantitative research methods. Although the five case study students selected played a major role in this study, the whole cohort was examined as well.

The results show that the implemented course has caused a very positive response to students' learning if the occurrence of alternative conceptions and misleading reasoning models are examined. In terms of conceptual understanding the learning result was average. On the other hand, it was not disappointing even if the expectations were very high. The highest level of understanding, the theoretical one, was reached by only one third of our students. The result was predictable because at this level a student has to master almost perfectly the domain.

Based on the results of this research, the surface charge based approach can be recommended if the aim of teaching is to show and understand how complicated these so-called simple DC circuits actually are, or if a more profound explanation of the concepts of potential and potential difference is meant to be offered.

Language: Finnish with summary in English

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RECENT DISSERTATIONS

LOTTA LAGER-NYQVIST, 2003:

To do the best with what you know. A longitudinal study of how seven student teachers develop their teaching and teacher role in science.

Department of Education, Göteborg University, Sweden.

Göteborg Studies in Educational Sciences 195. Acta Universitatis Gothoburgensis.

Abstract

This thesis aims to deepen the understanding of how student teachers experience science education during their teacher training and during their first year of professional teaching. Seven student teachers participate in this study. Their intentions and epistemic attitudes in planning and carrying out their teaching in science for pupils aged 11-16 are studied, with a particular focus on the pupils' practical work.

Data were collected by interviews and by observations of science lessons during pre-service teaching. Later, when the teacher students worked as professional teachers, they were observed and interviewed at one occasion. Data were collected throughout a period of six and a half years. To analyse the data, an instrument based on Georg Henrik von Wright's 'logic of events' was used. The determinants of action (here: science teaching) are both internal and external. The internal determinants can be described in terms of 'want', and 'ability', the external in terms of 'duty' and 'opportunities'. The analyses of curriculum planning were made from an 'inner' and an 'outer perspective', where the 'inner perspective' refers to the informant's expressions of intentions and of epistemic attitude towards their teaching. In the 'outer perspective' the analyses refer to the student teachers' prior experiences from own schooling and the teacher training programme.

The results show that the teacher education programme had little effect on the student teachers' goals of teaching in the new direction of science education. The informants expressed the wish that their teaching would be fun and interesting for the pupils, but this goal was not reached in performing science lessons. During periods of practice the supervisor's norms were the most influential determinant for planning and performing science lessons, the students' own wishes were set aside.

When the informants worked as professional science teachers, the teaching climate and colleagues at the school itself were the most important determinants for curriculum planning. The teaching performances closely resembled known patterns from own schooling. The pupils' laboratory work had in most cases little resemblance with the demands from the 1994 National curriculum (Lpo 94) or the new ways of regarding science education and pupils' practical work.

The results show that the teacher education programme was not successful in giving the new science teachers the ability to interpret the 'new' goals for science education and to transfer these goals to concrete teaching/learning situations. The opportunities offered by the periods of practice to increase the student teachers' ability to use and become familiar with modern science education methods were not sufficiently utilised. On the other side these periods fulfilled the informants' personal desire to strengthen their leadership and teacher role.

Language: Swedish with summary in English

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RECENT DISSERTATIONS

JARKKO LAMPISSELKÄ, 2003:

Demonstration in Chemistry Instruction in the Upper Secondary School

Department of Chemistry, University of Jyväskylä, Finland.

Research report no. 102

Abstract

The purpose of the study was to examine students' conceptions regarding the combustion of iron wool and the reactions of hydrated copper sulphate and determine how demonstration affects their understanding of these phenomena. It was found that traditional demonstration-based instruction is in many respects an obsolete method. The research project developed a new model of demonstration-based instruction grounded on the cognitive constructivist view of the learner as a constructor of their own knowledge. The learner's observations of the demonstrations become meaningful when the learner links these with their previous learning, interpreting their new knowledge within a framework based on their earlier experiences and in a way that is appropriate to the given situation. Learning was considered in the study as an individual process that is nevertheless capable of being influenced, in essential ways, through social interaction.

The study involves a teaching experiment used to gather data on the feasibility, in upper secondary school chemistry instruction, of a hypothetico-theoretical model of demonstration-based instruction. The research subjects consisted of the teachers and students in the research groups, and the research data were collected from the subjects using several different data-gathering methods. The research interventions took place during a chemistry course taught to and obligatory for all subjects, which covered general and inorganic chemistry. The new method of demonstration-based instruction was used to demonstrate the combustion of iron wool to only one of the two research groups, while the reactions of hydrated copper sulphate were demonstrated to both groups. As regards the students' understanding of the combustion of iron wool, the learning outcomes of the two groups could be compared also with those of four groups taught using what are known as conventional methods.

The findings showed that the new method of demonstration-based instruction makes for more effective formation of memory traces and thus affects the effectiveness of the learner's knowledge-gathering activities. Demonstration-based instruction can promote the learner's learning and help them to build up a well-structured conception of the causal relationships involved in a natural phenomenon. However, this required seeing demonstration-based instruction as a broader process than what has traditionally been customary. It was obvious that a demonstration designed and carried out in a pedagogically appropriate manner prepared the ground for a basic grasp of the given phenomenon; it was seen as a step towards a more in-depth understanding of phenomena.

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RECENT DISSERTATIONS

BRITT LINDAHL, 2003:

Pupils' responses to school science and technology? A longitudinal study of pathways to upper secondary school.

Department of Education, Göteborg University, Sweden.

Göteborg Studies in Educational Sciences 196. Göteborg: Acta Universitatis Gothoburgensis

Abstract

The aim of the study was to follow a group of pupils from the age of twelve until they leave lower secondary school at the age of sixteen to describe and analyse how their attitudes towards and interest in science and technology develop and change but also how this and other factors such as ability, understanding of scientific concepts, gender and home background influenced their choice for upper secondary school. The sample consists of 80 pupils, the whole age group in a school. Data was collected using observations, interviews and questionnaires. The analysis built on the theory of planned behaviour and conceptions research.

Many pupils have a positive attitude towards science but often a more positive attitude towards other subjects. They have duties to their parents but these are not strongly expressed. Their self-efficacy for science follows the same pattern as their attitude; they think they are good in science but not as good as in other subjects. For most pupils it seems as if attitude together with self-efficacy are the strongest determinant for their choice. These determinants are influenced by different factors. Girls and boys perceive science teaching differently but it seems as if the boys are on their way to developing the same critical attitude as the girls have had since long ago. The social background is important as many of the pupils who choose science are from well educated homes but even this group is loosing interest. Good ability is a necessary factor but does not guarantee science will be chosen. Neither has good conceptual understanding a crucial importance but on the other hand there are many pupils who say that they would not choose science as they do not understand science in the way it is taught.

Another finding is that many pupils even at Grade 5 have an idea of their future career which later on is the same as their choice for upper secondary. If science shall have a chance in their lives the pupils must have a positive experience of science from the beginning of primary school through all years. Once they have lost their interest it is very difficult to get them back. The competition for their attention is intensive and the older they get the more difficult it will be to catch their interest and allegiance.

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RECENT DISSERTATIONS

ARE TURMO, 2003:

Naturfagdidaktikk og internasjonale studier. Store internasjonale studier som ramme for naturfagdidaktisk forskning: En drøfting med eksempler på hvordan data fra PISA 2000 kan belyse sider ved begrepet naturfaglig allmenndannelse. (Science education and international studies. Large international studies as a frame for research in science education: A discussion with examples on how data from PISA 2000 can enlighten facets of the construct scientific literacy).

Department of Teacher Education and School Development, University of Oslo, Norway
Dissertation No. 23.

Abstract

How can large-scale international comparative achievement studies (LINCAS) be used within science education as a scientific discipline? The thesis addresses this question by theoretical discussions and by analysis of data from the PISA study (Programme for International Student Assessment). This study was initiated by the OECD and focuses on 15 year olds' scientific, mathematical and reading literacy. The definitions of the domains focus on competencies that are seen as important for participation as a reflective and concerned citizen in a democratic society. The empirical analysis in the thesis focuses on how data from the PISA study can increase our understanding of aspects of "scientific literacy".

The first major part of the thesis discusses LINCAS from a science education perspective. Possibilities and challenges from this perspective are discussed. One of the foci is how these studies are influenced by the agents implementing them, and possible consequences this may have for science education researcher working within the frames of the studies. The possible conflict between a psychometric and a diagnostic perspective is also addressed. Methodological complexity is one major challenge, and methodological issues are discussed in particular. Finally, specific aspects of the PISA study are discussed from a science education perspective.

The second major part of the thesis consists of three chapters presenting analysis of data from the PISA 2000 study:

1. Understanding a newsletter article on ozone- a cross- national comparison of the scientific literacy of 15-year-olds in a specific context.
2. The relationship between scientific literacy and learning strategies in 15-year-olds- an international perspective.
3. The relationship between scientific literacy and socio-economic background in 15-year-olds- a Nordic perspective.

The thesis is concluded by summarising general findings from the second major part. Challenges for future science education research within the frames of LINCAS are also discussed. A key message is that LINCAS have a large unused potential for science education researchers. Despite this large potential, it is also argued that the design of such studies can be modified to enhance the possibilities. In particular, it should be possible to construct tests that measure one or a few cognitive traits with high validity and reliability, and that also can be used in diagnostic analysis of students' understanding of fundamental science concepts.

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