TECHNOLOGY IN THOUGHT AND ACTION: UNIVERSITY STUDENTS IN TEACHER TRAINING REFLECT ON PUPILS' CONCEPTIONS AND EXPERIENCES OF TECHNOLOGY AS A SCHOOL SUBJECT

Gunilla Mattsson (Göteborg University, Department of Education, Göteborg, Sweden, *(Gunilla.Mattsson@ped.gu.se)*

Abstract

Students in teacher training reflect on school pupils' conceptions and experiences of technology as a school subject. The reflections by the students were mostly related to the practical work for the pupils, with wishes of more of such as design, how to build and construct things and also with wishes of technology placed in the context of everyday life, the subject provided the pupils with a comprehensive picture as well as the school subject should be fun. The pupils who had been taught by teachers, fully qualified to teach the subject, showed an increase of interest in technology and half of these pupils stated that they might consider choosing the technology program in upper secondary school. Furthermore this study indicates that discussions in classrooms about the consequences of technology in society are largely missing. At last the school subject technology must be clarified considering content and aims for the school pupils.

Background, Aims and Framework

The study presented in this paper is about the new school subject named technology, curriculum Lpo94, showing how the university students and pupils reflect on the teaching in this school subject. The purpose is to get a picture of technology in school and in teacher training, and accordingly form the education in university and school to better fit the school subject technology. The Swedish school curriculum in technology is broad-based with contents as development of technology, what technology makes, practical constructions, components and systems and interaction between technology and human needs as consequences and impacts on community, nature and individual persons. Many researchers (e.g. Herschbach, 1995, Vincenti, 1984, Layton 1974, Solomon 2000) have stated that technology among other things includes problem-solving, describing, tacit knowledge in human activity, using knowledge from traditional academic disciplines and interdisciplinary knowledge (Andersson, 1994, 1997).

Most school children have a very vague understanding of what constitutes the school subject technology. The hope is that school-teachers can be more clear and aware in their teaching in technology. The aim of this study is to analyse the written reflections by the university students in technology courses on school pupils' answers about the school subject technology and also about technology itself. Furthermore I myself have analysed the pupils' answers.

One issue in the research for this study is to find what conceptions the university students in technology courses have of the school subject technology. Another issue is to find out the content and the way of working in technology in schools and how this experience may influence teaching in a way to increase the pupils´ future interest in technology.

Methods and Samples

In this study I am working as a researcher, action researcher (Tiller, 1996) and also as a constructivist (Andersson, 1996) teacher in teacher training at Göteborg University in technology courses. The university students study in these courses technology as a school subject, as a part of their teacher training for a nine-year Swedish compulsory school with pupils aged 7-15. I have carried out pilot studies during some years before this investigation and the need of knowledge about the new school subject technology then became evident.

Datasources

The study covered:

- Responses of 258 pupils who answered questions about technology and school subject technology for example What is technology? What do pupils want to do? What was actually done? What was learnt? Motivation? Questions were put in

order to get school pupils' attitudes to and conceptions of technology as a school subject.

- University students (55) made written reflections on pupils' responses.
- University students (55) made brief comments on their own vision for technology education.

Analysis

University students' written reflections were analysed through an iterative process. Common features of their responses were identified and checked with another researcher. 18 aspects were initially identified, though these were later subsumed into 9 categories. As a result the students' conceptions about teaching technology were obtained. The school pupils' responses were then analysed in a similar way and also some teachers' reflections.

Seminars with the students were held to discuss the answers that the students got from the pupils. The pupils' teachers have varying competence from no courses at all in technology to being fully qualified to teach the technology subject. Five teachers fully qualified to teach this subject have let 113 pupils answer the same questions about the attitudes to and experiences of the school subject technology. Some of the pupils discussed their answers with me after answering the questions and so did also some of the teachers.

When I analysed the responses of the 258 pupils I chosed specially the questions/answers which are relevant to discover potential of the future interest among the pupils. It is intended that, through this research, recommendations for technology teacher training can be advanced.

Results

The results show that the statements of the university students covered the *practical work* for the pupils, how *to build and design things* and also technology put in the *context of everyday life*, consistency for the pupils, as well as the school subject was said to be *fun*. The university students also pointed out in their answers the multi-faceted features of technology and the importance of *problem-solving activities*. They also stressed the importance of working with pupils, considering each one's talent and capabilities. The students found that a majority of the pupils had a very *unclear picture of technology* teaching since they often could not describe what they had worked with, what they had learned, in some cases not even recalling whether they had actually had any technology lessons at all.

Yet in the university students' reflections on answers from the 113 pupils about what they had been taught by *teachers fully qualified* to teach the subject (according to the official Curriculum Lpo94) it was pointed out that *almost all the pupils showed an increase of interest in technology*. *More than half of these pupils* stated that they might also *consider choosing the technology program in upper secondary school.*

As a teacher trainer, I have also studied the answers of the pupils. I found that in the answers of the pupils and to some extent also in the students' reflections, d*iscussions about evaluation of the positive and negative consequences of technology were largely missing*. Furthermore, the answers indicated that the *aims of the technology subject had rarely been made clear to the pupils.*

Conclusions and Implications

One of the major aims of technology education is to *develop pupils´ practical skills in designing and making artifacts/objects* as also the students considered. This means that a considerable part of teaching technology ought to be practical work e.g. construction, design and building things and that this practical work should get more appreciation and higher status of practical work seems to promote the pupils, students and teachers. In this practical work there are found problem-solving, individual work and group work, the context of everyday life, creativity and integration with other subjects and much of the source of joy.

The practical work should be more related to theories and ideas behind the technology e.g. scientific ones. When the role of technology in society is discussed, social aspects should be considered. It is important that the citizens in our democratic society are aware of the positive and negative consequences of technology. It is also important to *cooperate with companies and institutions in society and get to know the interaction between the society, technology, nature and human beings.*

The unclear picture of technology teaching in school is often pointed out by the students. *The aims* and framework and the concept of the school subject technology *ought to be explained for and discussed with the pupils.*

It is gratifying that pupils, who had been taught by teachers who were fully qualified to teach the subject, showed increased interest in technology and were positive to choose a high level program including technology. More in-service training for teachers is considering to be necessary. To develop other, not traditional, examinations is a need and the use of reliable assessment will create many possibilities for the pupils to improve their technology knowledge. To sum up there is a need of more time to discuss the didactic words " why, what, how and when" in the teacher training and in the school concerning the school subject technology.

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