IMPLEMENTING TECHNOLOGY EDUCATION

Not just a question of excellent steering documents

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ABSTRACT

Technology appeared – in different shapes and under slightly different names – in national curricula as an optional or mandatory subject/learning area in several countries in the late 20th century, as e.g. in New Zealand and Sweden. The effort with which the different nations have implemented the new area has varied substantially. But despite these important differences "the technology education community" in nearly all countries have experienced – and sometimes still experience – different degrees of instability and uncertainty.

How come that this situation has prevailed for such a long time? There are of course different national explanations, but also "sticky" structures and traditions that either withhold changes or point them in the wrong direction.

This is an attempt to recognize some of these factors in he relation to the discussion about new curriculum initiatives and their implementation. Different interests and motives behind technology education, confusion regarding the concepts "practical" and "theoretical", the choice between "modern" and "traditional" content are some of these background factors that need attention. This is a very modest trail to pin point some of them.

It goes without saying that the national curriculum and its enclosed documents are important strategic documents. But just as important is the long-term implementation process in which all these documents are going to be interpreted and come into effect. This is when you need a growing number of shepherd's dogs who with a stubborn patience keep the project together, on the same field and for a long time. To change patterns and habits in the school system – on all levels – and among the general public is a challenge!

(I realise that this metaphor may be seen as a bit provoking – not least in New Zealand – but it rests upon my own trust in and admiration for shepherd's dogs…)

1. INTRODUCTION[1]

Both New Zealand and Sweden introduced Technology as part of the general school system in the late 20th century. In Sweden it became mandatory 1980 from level one to nine – at least in the curriculum, less frequently in the classroom – and got its own syllabus in 1994. But it is still, 2007, not thoroughly implemented.

In New Zealand technology was introduced 1995. There are strikingly many similarities between the two countries' curricula when it comes to fundamental ideas and content. Of course, there are differences – after all, we do live diametrically opposite to each other with the whole globe between us!

It has been and still is a challenge to implement Technology in the Swedish schools. That is not to say that nothing has happened since 1994, but given the fact that it is a compulsory subject the number of schools neglecting the area or doing too little is surprisingly high. There are several reasons for this – more of this below.

I am not familiar in detail with the situation in New Zealand but it goes beyond doubt that its authorities have invested substantially more into the development of technology education than the corresponding agencies in Sweden. The current revision of the technology curriculum in New Zealand reinforces this impression. Nothing similar has yet taken place in Sweden.

But despite the important and crucial differences regarding the implementation and development efforts, both countries experience a situation with a not yet established subject or learning area with teething troubles – and we are not alone. Several other countries share the same experience.

The situation is of course much better now than ten years ago. The coming years will be decisive – at least in Sweden. It could either finally take its place and be accepted as a natural and vital part of the curriculum or gradually evaporate and/or merge into science.

But right now it looks as if the seesaw is tipping over in favour of the former alternative: acceptance and development. But in order to facilitate its way along that track it may be useful or even necessary to analyse and discuss the reasons behind this rather peculiar and uncertain position the subject still has after more than a decade – however less so in New Zealand than in many other countries. How come that this situation prevails? Should not more than ten years be enough to introduce and establish a new subject/learning area? People outside the "technology education community" – and even some belonging to it – express their surprise and doubt. What is wrong? Does not this in fact proof that technology cannot exist as a learning area in its own right?

2. LIBERAL EDUCATION, CITIZENSHIP AND ECONOMY

2.1 "THE LIBERAL EDUCATION TRADITION"

New Zealand and Sweden were not the only two countries introducing technology as part of the curriculum for the general school system. Comparable processes took place in other countries as well. We were part of an international trend where the interest in the role of and the importance of technology in society and industry expanded. There are of course different explanations and roots behind this development. Let me just mention

[1] In this paper I have refrained from listing the mainpart of my references. Most of them are Swedish, written in Swedish and not available in English. My intention is to find international references on the different issues, and there are plenty of them. But it was not time for that now and not necessary for the purpose for this paper.

two main and partly contradictive motives who in my opinion have an impact on the situation and still create some confusion.

Due to lack of better alternatives I have called the first one, "the liberal education approach". It is probably a bit misleading and narrow and could be combined with "technological literacy for citizenship" or something similar.

The founding of The Society for the History of Technology (SHOT) 1958 and the journal Technology and Culture 1959 could be chosen as probably just two out of many possible starting points for a widened interest in technology leading beyond the *bolts-and-nut tradition* and technology defined as solely *applied science*. In this wider approach technology is seen not only as a culture in its own right but also as a part of human culture as a whole. The interplay between technology, society and the human is seen as crucial.

Over the years layers of new perspectives closely related to the liberal education approach have been added. The knowledge area has been enriched and expanded. One of many examples is Rachel Carson's book *Silent Spring* played an important role in the growing interest in environmental issues and the role of technology in the following decades.[2] The generally unquestioned belief in eternal economical growth was challenged in Limits to Growth, a report to the Club of Rome 1974.[3] The breakdown of the nuclear power plant Three Mile Island in Pennsylvania 1979 added new dimensions to the human development and use of technology.[4] A late and important contribution in the same tradition is of course the debate about sustainability. Another significant influence is the discussion on technology and gender where authors like Ruth Schwartz Cowan and Cynthia Cockburn are important contributors.[5] If "Technology and equality" fits under my heading "the liberal education approach" or not could be discussed. But it is for certain a necessary perspective in technology education, neglected for a long time.

During the whole period the interest in the philosophy of technology has increased and expands continuously. A number of books presenting the field have been.[6] This fundamental perspective has also been linked to technology education and technological literacy.[7]

So here we find a growing and widening interest in different and important perspectives on technology as a human activity, which have to be included in a subject aiming at "technological literacy for all". But to introduce a new learning area – or restructure an already existing one for that matter – and include perspectives that have not been seen as natural ingredients in that field takes time and stubborn patience. It is a fact that many of these relatively new perspectives and insights are totally unknown to quite a lot of people debating the role and place of technology education today. To not so few of them technology and even technological knowledge are still synonymous with cogwheels, computers or just seen as applied science.

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[2] Carson (1962). *Silent spring*

[3] Meadows and Club of Rome (1974). *The limits to growth : a report for the Club of Rome's project on the predicament of mankind*

[4] Garrison (1981). *The plutonium culture : from Hiroshima to Harrisburg*

[5] See e.g Cockburn (1985). Machinery of dominance : women, men and technical know-how, Cowan (1983). More work for mother : the ironies of household technology from the open hearth to the microwave

[6] See e.g. Dakers (2006). Defining technological literacy : towards an epistemological framework, Dusek (2006). Philosophy of technology an introduction, Mitcham (1994). Thinking through technology : the path between engineering and philosophy

[7] Dakers and Vries (2003). *PATT - 13 : Pupils attitudes towards technology : international conference on design and technology educational research 2003*

2.2 TECHNOLOGY EDUCATION AS A FACTOR IN THE GLOBAL COMPETITION

Another, partly contradictive but more well-established approach to technology education is sometimes linked to the understanding of technology as applied science but starts off from another direction: The need for more people with scientific or technological education in order to keep up and expand the economy – which hopefully will place the nation at the very forefront in the global competition. (Since most nations seem to have this ambition it will probably become a fairly crowded place.)

It is not difficult to understand the reason for this standpoint. In order to keep up and develop a sustainable production and reliable maintenance we do need well-educated and trained engineers and skilled craftsmen and -women. But to let economical and industrial interests define and govern the aim and content of technology education for the general school system narrows in my opinion the knowledge area and exclude essential and necessary perspectives. It may even be counterproductive when it comes to increase the interest in technology among young people. It is in a way to start in "the wrong end".

2.3 THE NEED FOR A BALANCE

To me it is obvious that "the liberal education approach" must be fundamental when planning for a technology education aiming at technological literacy among young students in the general school system. But it is just as obvious that technological literacy also comprises insights into and hands-on experience of industrial and craft technologies – not for vocational reasons but in order to get a general understanding of different areas by exemplary examples.

Therefore technological literacy is so much more than just increase the interest in technology among young people in order to make them choose a technical education and career. When we talk about the general, non-vocational school system the liberal education approach must develop and expand within technology education. To create an interest in technology based on this foundation is probably in the long run a much better guarantee for an improved recruitment to further education within the area.

Ten years ago David Layton published an important article on technology education. *A school subject in the making? The search for fundamentals*.[8] He stressed the fact that there are several stakeholders with more or less contradictive interest in technology education and that some sort of balance is necessary. The problem is that the economical instrumentalist-industrial tradition has often been taken for granted and the liberal education/citizenship approach and its academic base have been underrepresented or totally left out.

"The recruitment argument" has dominated and often even been the only one. There has not been any balance. There are several reasons for this. One is of course strong stakeholders who have a legitimate interest to make their case. But I believe that the main reason is the lack of knowledge of the expanding "liberal education"-perspective on technology as described above, not only among industrial and economic interests, but among a vast majority of people. This partly explains the difficulties the new learning area has met with over the years. You do not see what is left out if you do not know that it exists. So we are in fact facing a huge educational task not only among young students…

The revised curriculum in New Zealand identify these different interest but make – as far as I understand - a strong plea for the liberal education approach.

[8] Layton and Unesco (1994). *Innovations in science and technology education. Vol. 5*

3. MIXED-UP CONCEPTS

The "new" technology education is sometimes criticized for being too "theoretical" and excluding important "practical" skills. The skills mentioned are often linked to textile, wood- and metalwork. These subjects were established in the Swedish schools in the late 19th century. Over the years they have had very committed proponents who have developed and established a theoretical base and a strong position for these "practical" subjects, as they often are labelled. The ideas have even been exported to other countries and known as "sloid" or "sloyed", the Swedish name for the subject.

3.1 "PRACTICAL" AND "THEORETICAL" SUBJECTS AND KNOWLEDGE

The discussion about technology being too theoretical and excluding important practical skills is in my opinion based on a confusion of concepts and dimensions. The issue is basically linked to the philosophy of knowledge and too complicated to sort out here. But just a few important remarks.

The first thing that needs to be clarified is the distinction between "practical" and "theoretical" subjects and knowledge. To my mind this division is totally meaningless and even false. It is of course a very complicated issue but in short: There are no genuine and solely practical or theoretical subjects respectively. To claim that e.g. History is a theoretical subject is nonsense. The traditional school-history has to a great extent and by tradition been a collection of facts, even if there are or ought to be theories as well, e.g. on conflicts, conflict solving, social mobility etc.

It is just as stupid to argue that technology should be an exclusively "practical" subject. What does it mean? That you fiddle around with your hands with no communication with the brain? Of course not! The brain processes the signals it receives from your senses and builds up different types of knowledge of which some could be labelled "theories". There are no solely "practical" subjects without any theory – and no "theoretical" subjects without practise. A carpenter or an engineer may be involved in hands-on activities but that does not mean that they do not have and use theories, of which some may well be tacit and developed through practical experience. But the knowledge is not situated in their hands but in their brains as all other knowledge. The engineer uses "technological theories", acquired through practical experiences and/or by reading and listening.

In technology education it is necessary to abandon the traditional dichotomy practical-theoretical knowledge and realise that there are different ways to conquer and internalise knowledge and insights. To grasp and manipulate an artefact is sometimes the only way to develop a theoretical understanding of its function.

We have to develop a learning area where theory and practise are not two separate entities but seen as a seamless web. But this is the real challenge! We are fighting a tradition that is more than two thousand years old and which basically have had the function to defend and conceal the class structures in society: Theory is more "distinguished" than practise.

But to develop a successful technology education for the 21st century this false and inadequate notion needs to be questioned and debated.

3.2 "CUTTING" OR "CAD-CAM"

Now and then you can hear the argument that the "new" technology education has become too theoretical. The practical elements are forgotten. If one by this mean that the hands-on experience and learning methods are abandoned I am willing to agree. From what is said above it is obvious that these methods are essential and necessary in technology education.

But what I quite often find is that the argument rests upon this false understanding of the concepts theory/practise. It is rather a discussion about content elements. Even if it is a bit risky one may call it a debate about traditional or modern subject matter. The argument seems to be that study elements that were formed and shaped in another situation and for other needs should still be taught.

To me that is perfectly all right but then it has to be for other reasons than technological literacy. Evidently technological literacy demands learning methods that contain construction and deconstruction, hands-on investigation, designing and testing but applied to the world young people live in today. This does not mean that the history of technology and innovations could be neglected, rather the opposite. But the reason for this very important part of technology education is not that the student should become an excellent carpenter but develop and understanding of important building principles through hands-on experience of old and modern methods and artefacts.

But here an open mind is needed since aims, content and methods in technology education have to be adapted to existing social and economical conditions, and there are still plenty of societies where indigenous technologies are important and vital. But for a country like Sweden – and New Zealand for that matter – it would be totally inappropriate to jut to rename sloid and call it technology education. When sloid was introduced in Sweden in the late 19th century an overall aim was something we could call technological literacy for the early 20th century – but not for the 21st.

4. GOOD AND NECESSARY – BUT NOT ENOUGH

The national curriculum and the underlying documents now produced in New Zealand are essential and necessary prerequisites and something for Sweden to learn from – but they are not enough. With my examples above I have tried to show that it is impossible to prescribe and guarantee how intentions, aims, concepts etc in these documents shall be interpreted and realized when they meet with a context where other more or less strong traditions and attitudes exist.

It is then we need a stubborn and patient long-term perspective. If we are successful we will in the end all function as creative and open-minded shepherd's dogs and develop the project together, on the same field and for a long time.

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