
SCIENCE AND TECHNOLOGY EDUCATION: A HIGH PRIORITY POLITICAL CONCERN IN EUROPE

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Svein Sjøberg

University of Oslo, Norway

ABSTRACTⁱ

This paper attempts to describe and analyse some challenges facing S&T education by relating these issues to a wider social setting. The paper suggests a series of underlying reasons for why we have problems with recruitment and public image. This is followed by a similar analysis of who needs S&T – and for what purposes. The point here is that the challenge may be perceived differently from different perspectives and interests. Hence, there may also be different views on suitable strategies to solve 'the problem.' A critical description of S&T in *schools* is offered, and some international *recent trends* are briefly described. These trends may provide ideas for possible ways ahead and may underlie discussions of research priorities for associations like ESERA.

1. THE CHALLENGE

Our societies are dominated and even 'driven' by ideas and products from science and technology (S&T). The workplace and the public sphere are increasingly dependent on new as well as the more established technologies. Knowledge and skills in S&T are crucial for most of our actions and decisions, as workers, as voters, as consumers etc. Meaningful and independent participation in modern democracies assumes the ability to judge evidence and arguments in the many socio-scientific issues that are on the political agenda. One might expect that the increasing significance of S&T should be accompanied with a parallel growth in the interest in these subjects as well as increasing understanding of basic scientific ideas and ways of thinking. This does, however, not seem to be the case.

In many countries, the *recruitment* to S&T studies is falling – or at least not developing as fast as expected or planned for. This lack of interest in science often manifests itself at school level at the age where curricular choices are made. In many countries there is noticeable decrease in the numbers of students choosing (some of) the sciences. This trend is further enlarged in the enrolment to tertiary education. A similar trend occurs in some areas of engineering and technology studies. It should, however, be noted that there are large (and interesting!) differences between the various countries and between the different areas of S&T.

Statistical data and most surveys do, however, not shed much light on the underlying causes. *Why* has S&T apparently lost its attraction among young people? Unless one has some ideas about this, intervention programs to increase the interests in S&T are not likely to have success. The following points are attempts to suggest explanations, although some of claims can be backed up with research evidence.

2. DISENCHANTMENT WITH S&T? 13 POSSIBLE REASONS....

Reasons for the doubt in and dissatisfaction with S&T have to be found in the youth culture and in society at large. The decline in recruitment must be understood as a social and political phenomenon that occurs in many (but not all!) highly industrialized countries. This means that the current situation can hardly be explained fully by events or reforms in each individual country. One should seek for more general and common trends found in different countries. The following is an attempt to suggest underlying reasons for the present situation. The first point refers to schools, the other are related to wider social trends.

Outdated curriculum. Many studies show that pupils perceive school science as lacking relevance. It is often described as dull, authoritarian, abstract and theoretical. The curriculum is often overcrowded with unfamiliar concepts and laws. It leaves little room for enjoyment, curiosity and a search for meaning. It often lacks a cultural, social and historical dimension, and it seldom treats the contemporary issues (see later paragraph)

Science: Difficult and 'untrendy'? Scientific knowledge is by nature abstract and theoretical. It also often contradicts 'common sense'. It is also often developed through controlled experiments in artificial and 'unnatural' and idealized laboratory settings. Learning science often requires hard work and intellectual efforts (although school science could and should be tailored to better meet the needs and abilities of the pupils!) Concentration and hard work is not part of present youth culture. In a world where so many 'channels' compete about the attention of young people, such subjects become untrendy.

Lack of qualified teachers S&T are often poorly treated in teacher preparation for the early years. Moreover, the students who choose to become primary school teachers are often those who did not take or did not like science themselves in school. The present decline in recruitment of science teachers is now being felt also in secondary schools.

Anti- and quasi-scientific trends and 'alternatives'. In many Western countries there is an upsurge of 'alternative' beliefs in the metaphysical, spiritual and supernatural. These movements are often labelled 'New Age', and comprises a rich variety of world-views, therapies etc. They include beliefs in UFOs, astrology, several forms of healing. A common denominator is often the rejection of scientific rationality, which they often characterize as being mechanistic, reductionist etc. Although most 'alternatives' reject science, some do, however, also base their ideas on misinterpretations of ideas taken from modern science, like quantum mechanics.

Postmodernist attacks on S&T This may be seen as the more 'serious' and academic version of the critique imbedded in the above mentioned 'alternative'

movements. Many postmodernist thinkers reject basic elements of science, and reject notions like objectivity and rationality. The more extreme versions assert that scientific knowledge claims say more about the researcher than about reality, and that all other 'stories' about the world have the same epistemological status. In this tradition, notions like 'reality', 'truth' etc are seldom used without inverted commas! These postmodernists attacks on scientific thinking have even been called "Science War" in the US, and book titles like "The flight from science and reason" and "Higher superstition" indicate the tone of the 'debate' and how these trends have been met by the scientific community.

Stereotypical image of scientists and engineers. Many research projects indicate that the perceived image of the typical scientist and engineer is stereotypical and problematic. The image of the 'crazy scientist' is widespread, possibly supported by cartoons, plots in many popular movies and in media coverage. Scientists (especially in the hard, physical sciences) are by pupils often perceived to be authoritarian, closed, boring – and somewhat crazy. They are *not* perceived to be kind or helping and working to solve the problems of humankind.

Disagreement among researchers perceived as problematic. Scientists debate and disagree on many contemporary socio-scientific issues (like causes of global warming, effects of radiation, possible dangers of GM food etc.) Such discussions are the normal processes for the healthy development of new scientific knowledge. Recently, such debates are also taken to the mass media and are not (as before) confined to professional conferences and journals. The disagreement in public may, however, confuse and disappoint people who are acquainted with 'school science', where scientific knowledge is presented as certain and uncontroversial.

Problematic values and ethos of science The traditional values of science are meant to safeguard objectivity, neutrality, disinterestedness and rationality. Taken to the extreme, however, these values may seem to justify absence of ethics, empathy and concern for the social implications of science. The search for universal laws and theories may lead to an implied image of science as abstract and not related to human needs. For many people, science is cold and lacks a human face.

Dislike of an over ambitious science? The achievements of science may call for admiration, but also unease. Many people dislike the image and ambitions of modern biotechnology. They have emotional and rational fear about scientists who are 'tampering with Nature', and 'Playing God'. Similarly, many people react emotionally when physicists talk about their quest for 'The Final Theory', also called 'The Theory of Everything' or the search for 'The God Particle' (the title of a book by Nobel laureate Leon Lederman). Such perspectives may attract some young people, but it is not unlikely that the ambitions of modern science will scare others. Many people feel that science intruding areas that they consider sacred – and they do not want a world where science can explain everything. Many people like to think of Nature as sacred and mystical – not as explainable, controllable and rational. Their avoidance of science is a deliberate choice of values – not something that may be 'corrected' by more information from the scientists!

The new image: Big Science and techno-science Science used to be seen a search for knowledge driven by individual curiosity. Scientists have historically rightfully been described as radicals and revolutionaries who often challenged religious and

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