

How do students perceive science and technology?

Svein Sjøberg and **Camilla Schreiner** from the University of Oslo, Norway, explain how they are investigating young people's attitudes towards science and technology.

Introduction

In many highly developed countries, there is a noticeable decline in the recruitment of students to science and technology (S&T) studies. 'Europe needs more scientists' is the title of a report by the High Level Group on Increasing Human Resources for Science and Technology in Europe (EC, 2004). This report examines the condition of S&T in the European Union and pays special attention to the number of people entering S&T education and careers. The title of the report reveals the point: the falling recruitment to S&T studies is seen as a large problem in most European countries. The same tendencies are noted in the USA and in most other countries in the Organisation for Economic Co-operation and Development (OECD).

It is a paradox that the most S&T-driven economies in the world are experiencing a lack of interest in S&T studies and careers among young people. The economic significance to a country of a high number of skilled scientists and engineers is well accepted. But young people do not choose their studies or careers because it is good for the domestic

economy. Instead, they base their choices (when they have such choices) on their own interests, values and priorities. It is obvious that S&T studies and jobs no longer have the appeal in wealthier countries that they had some decades ago.

The lack of interest in S&T in schools and further studies is not only a problem for the economy, but also a threat to democracy, as most decisions in modern societies are highly dependent on considerations that involve weighing scientific arguments against value judgements. A scientifically illiterate voting population can be easily manipulated by propaganda.

For these reasons, it is important to understand the S&T-related attitudes, priorities and interests of the young generation: this is what the Relevance of Science Education (ROSE) study aims to do.

Positive perceptions of S&T in society

When we note the lack of interest in S&T studies and careers in some countries, the first and most obvious hypothesis might be that young people in such countries have negative or

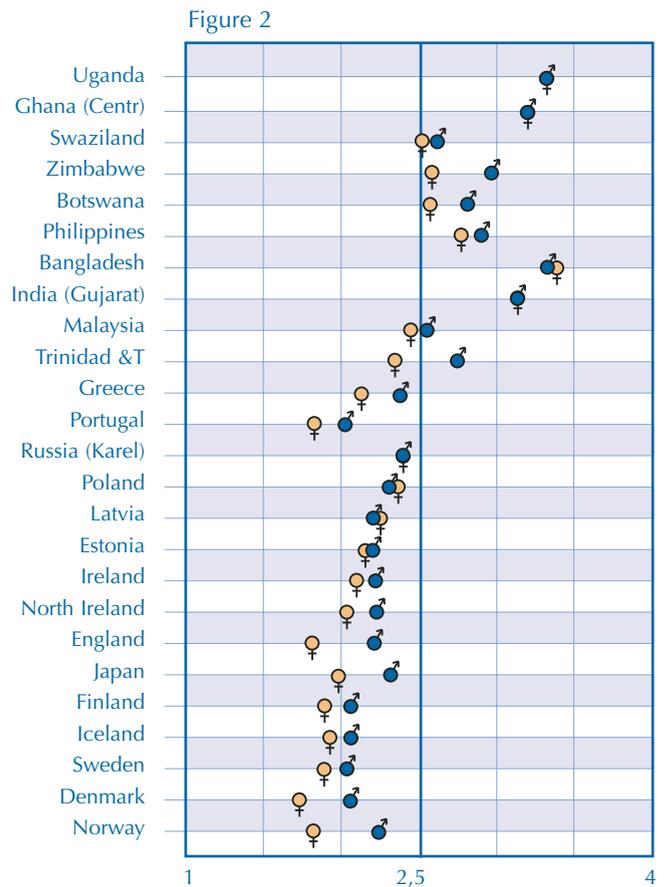
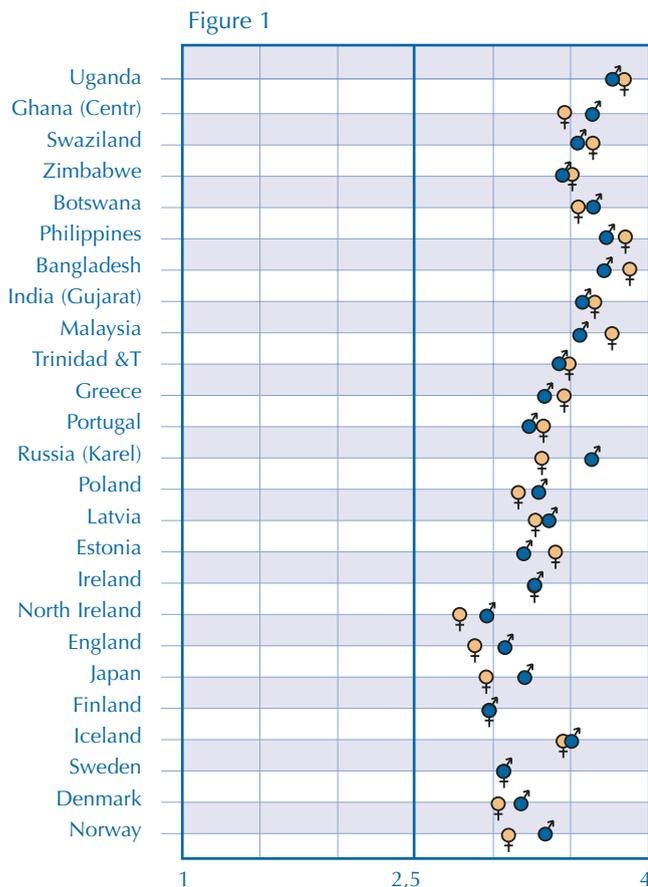
hostile attitudes towards S&T. Such assertions are often voiced in public debates. S&T is blamed for many of the evils of modern societies, like pollution, destruction of the environment, overuse of natural resources and even modern warfare and conflicts. Do young people really base their attitudes on such assumptions?

Several questions in the ROSE study shed light on this question. The results indicate that there is no general hostility against S&T among young people, neither in rich nor poor countries; generally, positive responses were received to statements such as:

- Science and technology are important for society
- A country needs science and technology to become developed
- Science and technology will find cures to diseases such as HIV/AIDS and cancer
- Thanks to science and technology, there will be greater opportunities for future generations
- Science and technology make our lives healthier, easier and more comfortable
- New technologies will make work more interesting
- The benefits of science are greater

“Science and technology are important for society.”

“I like school science better than most other subjects.”



ROSE data showing mean values for girls (open female symbol) and boys (filled male symbol). The scale goes from 1 (disagree) to 4 (agree). Hence, 2.5 is a neutral response, marked with a vertical line. For some countries, only certain regions took part: in Ghana, only the Central region; in Spain, only the Balearic Islands; in Russia, only Karelia. India is represented by the region of Gujarat

than the harmful effects it could have

- Science and technology will help to eradicate poverty and famine in the world
- Science and technology are the cause of the environmental problems.

Most students (aged 14-16) in most countries agree to statements like those listed above, although there are

interesting differences between nations and between girls and boys. In general, boys are more positive (or less sceptical?) than girls about S&T, and pupils in developing countries are more positive than pupils in richer countries. But it is important to note that the overall attitude towards S&T is positive.

As illustrated in Figure 1, girls and boys in all countries show pro-

nounced agreement with the statement “Science and technology are important for society”. Children in developing countries agree more strongly. Gender differences are rather small.

Problematic attitudes to S&T in schools

Although students in all countries share a positive view of many aspects



ROSE (Relevance of Science Education)

ROSE is an international comparative study that investigates the diversity of interests, experiences, priorities, hopes and attitudes that children in different countries bring to school or have developed at school. The underlying hope is to stimulate an informed discussion on how to make science education more relevant and meaningful to students in ways that respect gender differences and cultural diversity. We also hope to shed light on how to stimulate interest in S&T-related studies and careers. ROSE has developed, after consultation with science educators from all continents, an instrument that tries to examine the attitudes of 15-year-old students. The ROSE instrument has around

250 single items – simply worded questions or statements requiring responses on a 4-point Likert scale. This enables the use of standard statistical methods like calculations of means and correlations. About 40 000 students from 35 countries took part in ROSE, and about 10 PhD students from different countries will base their theses on ROSE data. Schreiner & Sjøberg (2004) report fully on the project rationale, development and logistics. Additional information, including reports on data collection from the participating countries, is available on the ROSE website^{w1}. Several comparative articles and international reports have been published and more are planned.

of the role of S&T in society, the attitudes to S&T in schools are more mixed.

As Figure 2 demonstrates, there are large differences between how much students in different parts of the world like school science. In general, students in developing countries like school science very much, whereas students in richer parts of the world are more negative. We also note large gender differences: in some countries, girls dislike school science more strongly than do boys. ROSE also includes a series of questions about how students have benefited from school science, but space restrictions prevent us from detailing these here.

Reluctance to enter S&T careers

Many ROSE items ask young people about the plans and visions they have for the future. Here, we only give the responses to two simple questions: whether the student wants to become a scientist (Figure 3), and whether the student wants to work in technology (Figure 4).

As illustrated in Figure 3, there are dramatic differences between the responses from students in rich and in developing countries. In developing

countries, students have a strong desire to become scientists, whereas students in most OECD countries are reluctant, with average responses of less than 2 on the 4-point scale. We also note the strong gender pattern, particularly in wealthier OECD countries. In many of these countries, the average response for girls is around 1.5, indicating that most of them strongly reject the idea of becoming scientists.

In Figure 4, we see a similar, but even stronger, pattern: working in technology seems to have a much stronger appeal in developing countries than in rich countries. In many wealthy countries, the average response from boys is close to the neutral line (2.5), but the responses from girls are strongly negative. We also note that in Japan, girls and boys are more negative towards working with technology than are students in any other country.

Conclusions

This short article gives an indication of the data and information emerging from the ROSE study. We have only presented summary statistics for four of the 250 items; more details and

advanced analysis will be available on our website^{w1}. The first PhD based on ROSE data has recently been presented (Schreiner, 2006), detailing the analysis of the interests young children have in different topics in science and technology. Based on this analysis, a typology of students is suggested.

Through ROSE, we hope to stimulate an informed discussion on important aspects of S&T and its role in society and in education. Researchers from many cultures are involved in the research and discussions about issues of common concern. International cooperation, networking and capacity building are also intrinsically important. Our hope is that S&T education will be an instrument not only to promote material development and well-being, but also to address basic human values.

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“I would like to become a scientist.”

“I would like to get a job in technology.”

Figure 3

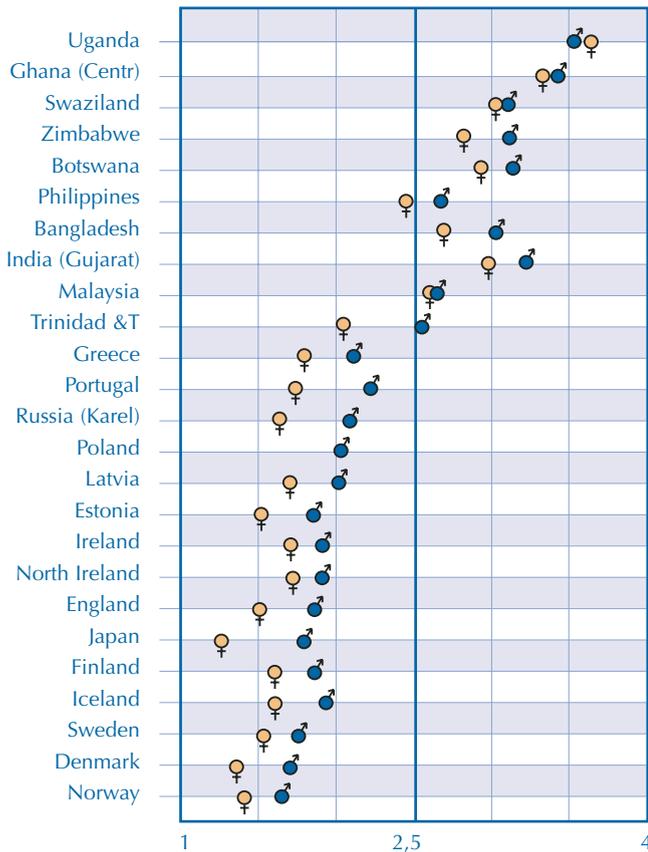
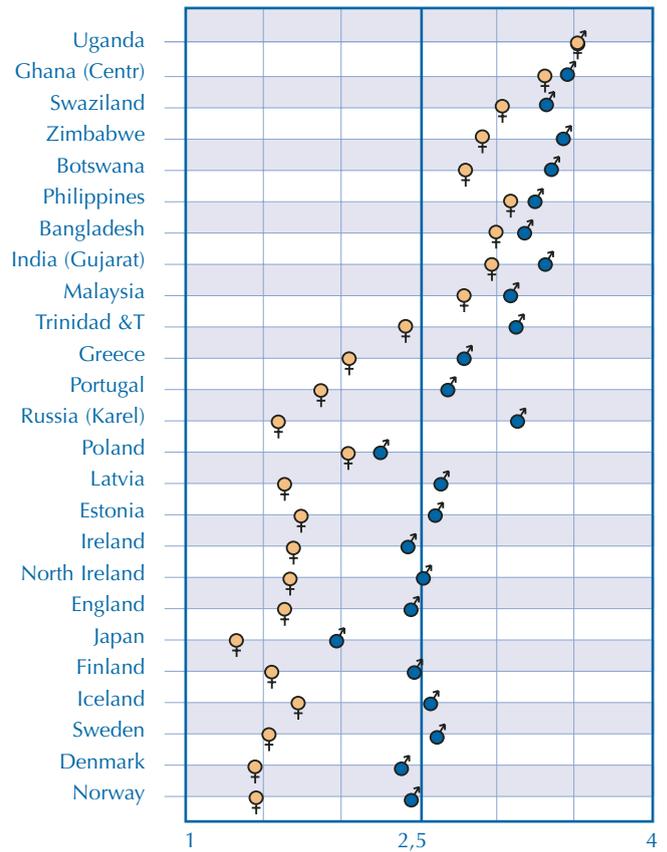


Figure 4



ROSE data showing mean values for girls (open female symbol) and boys (filled male symbol). The scale goes from 1 (disagree) to 4 (agree). Hence, 2.5 is a neutral response, marked with a vertical line. For some countries, only certain regions took part: in Ghana, only the Central region; in Spain, only the Balearic Islands; in Russia, only Karelia. India is represented by the region of Gujarat

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w1 – www.ils.uio.no/forskning/rose

