OECD Global Science Forum
Steering Committee on Declining Interest in Science Studies Among Young People

Chairman’s Report
By Prof. Jean-Jacques Duby

The apparent decline in student enrolments in science and technology at various levels of the educational system is viewed with concern by many OECD countries, and the Global Science Forum authorized an activity on the issue at its Ninth Meeting. The Steering Committee on Declining Interest in Science Studies among Young People had been asked to determine a precise goal and program of work for further activities under the aegis of the Global Science Forum. A number of conclusions and proposals for further work are contained in this report, for discussion and decision by the GSF. Forum delegates may wish to recall that this issue was again highlighted during the ministerial CSTP meeting in January 2004 as a priority for OECD Secretariat.

Participation

Eighteen Steering Committee members were nominated by the thirteen delegations of Belgium, Canada, Denmark, Finland, France, Ireland, Italy, Japan, Korea, Netherlands, Norway, Portugal and USA. Prof. Jean-Jacques Duby of France has served as chairman. The names of the Steering Committee members are given in the annex. The Committee has held four conference call meetings since January 2004.

Scope of the activity

The Steering Committee first agreed that the fundamental problem is not a declining interest in science, as many opinion studies indicate that science and scientists are still regarded positively even among young people. Rather, the issue appears to be the declining interest in science studies. Hence they proposed to change the title of the activity to “Declining interest for science studies among young people”.

The observed decreases in student enrolments vary from country to country in the OECD area. They affect mathematics, physics and chemistry, and, to a lesser extent, the life sciences and engineering. The questions concerning this complex issue can be divided into four broad areas:

- the amplitude and characteristics of the decline
- the causes of the decline
- the impact of the decline
- what can be done about it

The Steering Committee proposes to exclude from the study the subject of the impact of the decline on national economies and on society in general. These issues may be better addressed by other directorates of the OECD. It also believes that further work should concern especially young people at the early stages (primary and secondary education level) rather than at the later stages (university studies, career prospects). The issues are more complex at the early stages but understanding them may lead to longer-lasting policy initiatives. The importance of the different steps of the educational process and of the consecutive choices young people (and particularly girls) make towards or away from science studies, was one of the major problems underlined. This was termed the “chain” policy-approach, which encompasses activities throughout the educational career (from primary through to tertiary education) and all possible contributing actors.
Proposed programme of work

The Steering Committee proposes to the Global Science Forum a work programme with three elements:

1. A quantitative analysis of the statistical data and trends in different countries to more precisely define the extent of the problem.
2. A qualitative analysis of the reasons for the decline.
3. A review of the solutions that have been undertaken at national level, including an analysis of methodologies and evaluation procedures.

Work has already begun on the first part of the programme (the quantitative analysis) with participation of the OECD secretariat from the Economics Analysis and Statistics Division of the Directorate for Science, Technology and Industry, the Indicators and Analysis Division of the Directorate for Education and Global Science Forum staff.

The Steering Committee proposes that the second and third parts (the qualitative work and analysis of possible causes and cures) should be undertaken by a Working Group nominated by interested delegations. The results of both studies would be presented at a conference that would conclude this Global Science Forum activity. This conference would consist of:

- The presentation of the work carried out by the Working Group, including the results of the quantitative study undertaken by the OECD secretariat and topical presentations by experts on the key issues selected by the Steering/Programme Committee
- Discussions on the policy implications of this study and of possible action plans with governments officials, education and business representatives

The outcome of the conference would be a concise (15-20 pages) policy-level report. The report would contain findings and conclusions based on the work of the Working Group and the results of the quantitative study as well as on the presentations and discussions at the conference.

The delegation of the Netherlands has offered to host this conference during fall 2005.

1. The quantitative study

A preliminary study of the statistical data and trends in different countries using comparable information appeared to be a necessary prerequisite to the project. This study would serve as factual background reference to evaluate the quantitative aspect of the decline. Extensive discussions were conducted with the OECD secretariat, to identify existing data and determine those needed to analyse the extent of the decline. Data available within OECD mostly consist of the number of graduate and PhD diploma awarded, compiled by country/sex/field. In addition, a change in international classification systems in 1997 means that data before 97 need to be disaggregated into the fields of study used since 98. The Steering Committee felt that, although information on science diplomas in tertiary education is important, it does not allow monitoring of the most recent evolution of student’s choices of S&T subjects (since students getting their graduate or PhD diploma had to choose their subject several years before) or assessment of possible drop-out trends at the transition between secondary and tertiary education. It was therefore decided to request additional information on the number of students having a secondary level/high school (Baccalaureat/A-level) diploma in a S&T-related field (by sex), relative to the total number of diplomas, as well as the number of students (by sex) enrolling into tertiary education in S&T subjects, relative to the total number of entrants.

These latest figures may be more difficult to obtain since in many countries, high school systems follow a comprehensive system where students can choose their subjects on an optional basis. In addition, in several countries, secondary education is not uniform at the national level, being the responsibility of states or provinces. However, the Steering Committee found out that some sort of evaluation of students
undertaking high school degree with high S&T content could be generated that will allow trends to be analysed in each country and compared between countries, even though taxonomy and therefore absolute numbers may not be consistent from one country to another. Regarding entrants into tertiary education in S&T subjects, Steering Committee members also determined that these data were available at national level, although specific fields might not be exactly similar from one country to another. Once again, this was not perceived as a problem as the interest of the project is to observe trends within countries over the years. It was therefore proposed to request such information from those countries that are able to, in order to be used as a broad framework, but to leave to each country the task to provide its own definition, as long as reliable data over a period of time could be provided for trends observation, even though such data might only be provided from specific provinces in some countries or for a limited number of years. Finally, the Steering Committee felt that there was no need to separate vocational versus non-vocational education, and that these data could be grouped together, although particular country may wish to provide more detailed data if meaningful.

Regarding data on graduate and PhD diploma, most Steering Committee members felt that governments should be able to disaggregate data from 1993-1996 in “natural science” to “life science” and “physical science” (as taken into account since 1998), and from “mathematics and computer science” to “mathematics/statistics” and “computing”; engineering could be maintained as one field.

This quantitative analysis would therefore provide data and trends on the number of students with high school/Baccalaureat level (end of secondary level education) having taken S&T subjects and those entering tertiary education in S&T fields as well as on graduate and PhD diploma awarded in science and engineering.

Since these data are not all currently available from international databases, it was proposed to limit the analysis to the Steering Committee member countries, plus the United Kingdom and Germany.

The scope and content of this study that could be undertaken by OECD secretariat (Economics Analysis and Statistics Division) would therefore be as follows:

- Number of high school diplomas with a S&T orientation or equivalent data, relative to the total number of high school diplomas, by sex, since 1985
- Number of entrants in tertiary education in S&T-related fields, relative to the total number of entrants in tertiary education (vocational and non-vocational, breakdown in different fields e.g. business/economy, engineering, law, art, social etc… may be provided but not mandatory), by sex, since 1985
- Number of graduate diplomas in life sciences, physical sciences, mathematics and statistics, computing, engineering (vocational and non-vocational), relative to the total number of graduate diplomas, by sex, since 1993
- Number of Ph.D diplomas in life sciences, physical sciences, mathematics and statistics, computing, engineering (vocational and non-vocational), relative to the total number of Ph.D diplomas, by sex, since 1993

2. Qualitative study on causes and solutions

The Steering Committee felt that it could not, at this stage, determine what were the most important causes and remedies, but that this should be the objective of a future Working Group that would begin by reviewing existing studies and find important correlations among them. It did, however, identify six key areas that should be part of the study:

- Attitude and motivation. The Committee suggested to complement the quantitative study analysis with information from qualitative surveys such as the ROSE study that could highlight trends in opinions about science and technology among young people.
• Science education. This includes elements such as innovative ways of teaching S&T (including hands-on practices, intervention of professional scientists in courses, specialised science curriculum and the use of information technologies), a better understanding of the goals the purposes of S&T education (training of future scientists, educating the general population etc.) and the relevance of S&T to society.
• The progressive stages of science education. This would address issues such as science in selection processes, requirements for science studies, and more broadly identification of elements that can lead to the loss of students to science at various stages of education. This could result in suggestions for policy actions to address the problem by targeting the various aspects and moments of choice students have towards or away from science studies.
• The perception of S&T careers by students, teachers and parents (including business as well as academic careers), as well as the impact of role models (such as famous scientists etc.).
• Teacher training, qualification, and development.
• Issues related to gender and ethnic/cultural minorities.

Business involvement, although not a topic in itself, should be taken into account as a horizontal issue/opportunity while considering the other topics. Career prospects may thus be included as a possible stimulant to attract young people to science studies.

The Steering Committee however felt that the controversial issue of the composition of curriculum (including non-scientific subjects) should not be included at this stage of the work. However, ways of broadening curricula of science studies to include the relevance of science to society should be included, as it appears that societal factors may be a factor of attractiveness or repulsion for science studies, especially for girls.

Follow on

The Steering Committee recommends the nomination of an Expert Working Group which will carry out the program of work described by the Committee. A joint meeting between the Steering Committee and the Expert Working Group is proposed for September 27-28, in Paris. The conclusions of the Working Group would be presented during a conference that would conclude this activity and would take place in September or October 2005 in the Netherlands.
Annexe

Steering Committee Members

<table>
<thead>
<tr>
<th>Country</th>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair</td>
<td>Jean-Jacques Duby</td>
<td>École supérieure d’électricité, France</td>
</tr>
<tr>
<td>Belgium</td>
<td>Sabine Borrey</td>
<td>Science division, Ministry of Flanders</td>
</tr>
<tr>
<td></td>
<td>Pierre Feyereisen</td>
<td>Fonds National de la Recherche Scientifique belge</td>
</tr>
<tr>
<td>Canada</td>
<td>William Coderre</td>
<td>Natural Sciences and Engineering Research Council of Canada</td>
</tr>
<tr>
<td>Denmark</td>
<td>Nils Andersen</td>
<td>Niels Bohr Institute</td>
</tr>
<tr>
<td>Finland</td>
<td>Anneli Pauli</td>
<td>Academy of Finland</td>
</tr>
<tr>
<td>France</td>
<td>Pierre Malléus</td>
<td>Ministère de l’Éducation Nationale</td>
</tr>
<tr>
<td>Ireland</td>
<td>Eamonn Cahill</td>
<td>Expert Group on Future Skills Needs, Forfás</td>
</tr>
<tr>
<td>Italy</td>
<td>Enrico Predazzi</td>
<td>University of Torino</td>
</tr>
<tr>
<td>Japan</td>
<td>Takao Kuramochi</td>
<td>Science and Technology Policy, MEXT</td>
</tr>
<tr>
<td></td>
<td>Yasushi Ogura</td>
<td>National Institute for Educational Research</td>
</tr>
<tr>
<td>Korea</td>
<td>Jungil Lee</td>
<td>Korea Institute of Science and Technology</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Jacky Bax</td>
<td>Ministry of Education, Culture and Science</td>
</tr>
<tr>
<td></td>
<td>Roeland Oevering</td>
<td>Ministry of Education, Culture and Science</td>
</tr>
<tr>
<td>Norway</td>
<td>Svein Sjøberg</td>
<td>University of Oslo</td>
</tr>
<tr>
<td>Portugal</td>
<td>João Caraça</td>
<td>Fondation Calouste Gulbenkian</td>
</tr>
<tr>
<td>United States</td>
<td>William Frascella</td>
<td>NSF Directorate for Education and Human Resources</td>
</tr>
<tr>
<td></td>
<td>Barbara Olds</td>
<td>NSF Directorate for Education and Human Resources</td>
</tr>
</tbody>
</table>