Tapping young potential

are we investing enough in science, engineering and technology?

Sa'ad Medhat

Can you imagine a future without scientists, engineers and technologists? It's difficult. Think of all the things we take for granted – improvements to healthcare, better and faster computers allowing us to be more efficient, not to mention enhanced creature comforts.

Do not forget the financial implications. UK plc has enjoyed the spotlight on the world's technology stage for a long time, and has reaped the monetary rewards. It would be easy – but very much a mistake – to become complacent. Scientists, engineers and technologists build the future… Try to imagine them out of the picture. It's not pretty, is it? So, why should we take their continuing presence for granted? The simple answer is that we shouldn't. Like everything else, ability and talent need nurturing.

So, how do we make sure that the best, most able of our young people can understand their talents and take the necessary steps to capitalise on them? How can we make sure that everyone who has the potential – irrespective of gender or class – recognises that there is an important, rewarding and fascinating career out there in science, engineering and technology (SET)?

In short, it's not easy. Unfortunately, a myth has been allowed to perpetuate surrounding SET – some people think it is dirty, badly paid and unrewarding. Some people think it is far too difficult, or just not 'cool' enough.

Clearly, some of our young people are switching off from SET careers, with (over the last ten years) a 30% drop in students taking A-level physics, a 30% drop in students taking A-level maths, with concurrent figures of 20% and 12% for chemistry and biology (see Figure 1). The press is littered with articles about curriculum inadequacies and teaching and equipment shortages, not to mention the fact that engineering has become synonymous with manual work and redundancy and science with nerdy/unethical connotations.

Let us not dwell on this. It is easy to be negative, but quite inappropriate considering the possibilities that are out there. There are things we can do, and we should concentrate on those. Let us look for some answers.

Where can we start to look for a solution? At what age do we need to reach out to children? Apparently, we need to start with the very young. Gender stereotyping, for example, starts from a very early age. According to recent research, '*Children develop ideas about gender roles very early and these are reinforced by parents, teachers and the media. Stereotypes are still strong later in life and women in scientific training are viewed negatively by other students*'[1]. These stereotypes hold true not just for gender, but also for professions. For example, children know what doctors do from an early age and are aware of how important they are. Can we say the same about their perceptions of engineers or scientists?

It quickly becomes obvious that the school room and careers teachers have a big part to play.

Identifying the problem

Needless to say we cannot start thinking about answers until we fully understand the problem, which is why the Engineering and Technology Board (ETB) has been involved with a number of research programmes to get to the heart of the matter.

One research project, commissioned by ETB through the University of

Bath, looks at crucial stages in educational life and tries to find out why talented children are turning away from SET subjects and careers.

Intriguingly, *'Very few science, technology and mathematics (STM) teachers regarded themselves as up-to-date about directions and developments in the engineering field beyond the school curriculum, and identified these as a matter of concern for teachers in general'*[2].

Essentially, it seems as if – from a formative stage – children are being given unclear, and often redundant, messages about SET careers. If teachers are not aware of what's going on, how can we expect their students to be? Clearly teachers need more support.

It is also the case that different things motivate girls and boys. Boys generally rate income and status highly, while girls generally seek careers based on relationships with people. These subtleties need to be understood and factored into careers development.

The Bath University research, which examines teachers' perceptions, views and approaches, goes on further to identify strongly held – but often inaccurate – views that teachers have about engineers and engineering: for example, that you have to go to university to become an engineer. University is not right for everybody, but more and more it is seen as being the only professional route. As the Modern Apprenticeship option has shown, there are plenty of other ways to become an engineer (not to mention getting paid while you are becoming qualified). Considering recent government announcements concerning university tuition fees, this should be an especially attractive option for some people.

However, nothing exists in isolation, and here we should begin to question the role of business and industry. Work experience is highlighted as being an important influence on career choice, but there is concern that the range of SET work experience is limited.

One factor is the lack of links and communication between schools/colleges and industry. Is industry doing enough to promote engineering? Recent government reports indicate a number of initiatives to promote SET being run by business and industry, areas desperate for engineering skills (especially at technician level). However, research from the IER (Institute for Employment Research) into the early career experience of engineering and technology graduates found that 60% of those with engineering degrees had engaged in no further study and few employers had mapped a career progression plan for employees[3]. Is this contributing to the confusion and lack of knowledge experienced by teachers and careers advisers? Does this in turn lead to retention and recruitment problems within engineering? (See Figure 2 over the page.)

Unfortunately, all this means that teachers are often unaware of the real possibilities for their students post-school, both from an educational and professional perspective. Engineering is seen as an abstract, isolated subject, ironically considering the level of impact it has in the 'real world'.

The IES *Ready, SET, Go* study explores the effect of careers services on student choices and looks at the most promising approaches. It concludes that careers support should be student-centred, personal, customised, ongoing and timely for the student. It should also be introduced before key decisions about subject options are made. This is especially true for a SET career, which requires numeric, analytical and logical skills. Considering the drop in participation in maths and science subjects, this does not bode well.

So, what is being done?

The Government announced in July last year that it intended to set up a review of mathematics education. It commissioned an inquiry, chaired by Professor Adrian Smith, Principal of Queen Mary College, University of London, who is expected to produce a report by the end of June 2003.

The inquiry has a very specific focus: 'To make recommendations on changes to the curriculum, qualifications and pedagogy for those aged 14 and over in schools, colleges and higher education institutions to enable those students to acquire the mathematical knowledge and skills

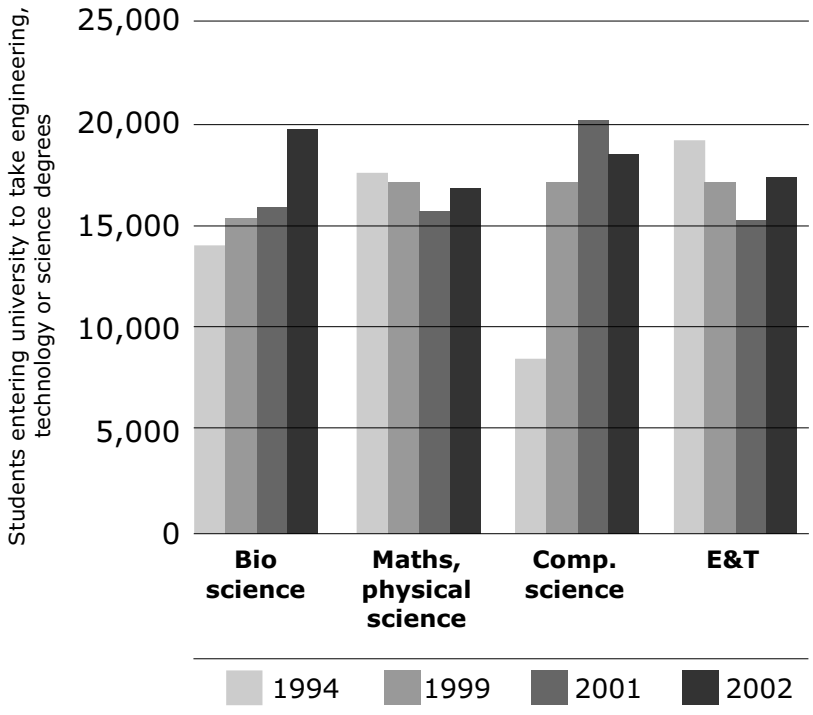

Figure 1 Modest increase in SET students entering university

- Increase dominated by biosciences (+18%) and computer science (+170%)
- 12% drop in physical sciences
- 19% decline in engineering and technology

Source: UCAS Annual Reports and Databases

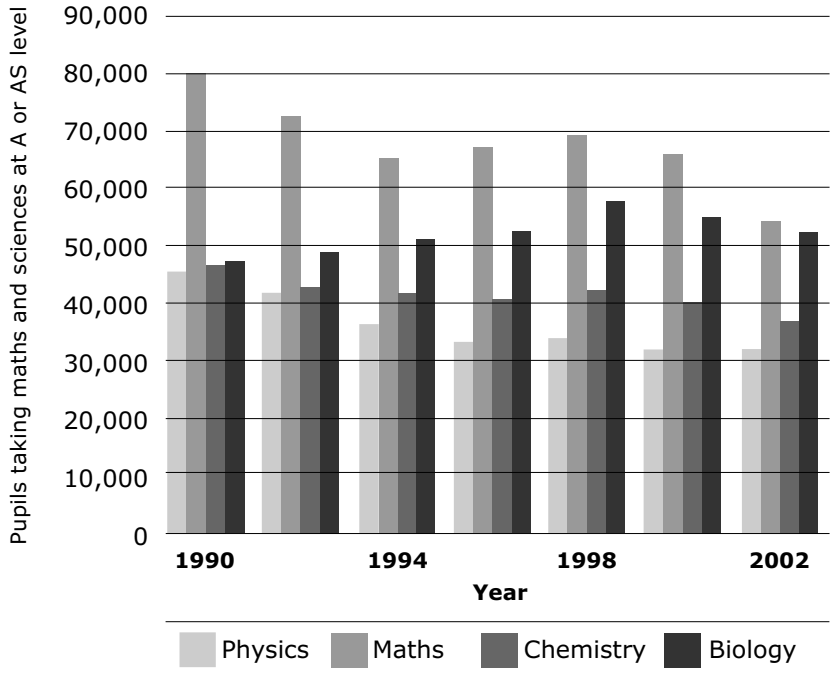

Figure 2 Long-term decline in maths, physics and chemistry at A level entry

In 10 years there has been a:

- 30% decrease in physics A level
- 30% decrease in maths A level
- 20% decrease in chemistry A level
- 12% increase in biology A level

Source: AQA Assessment and Qualifications Alliance (Data applies to England, Wales and Northern Ireland)

necessary to meet the requirements of employers and of further and higher education'. Professor Smith, in outlining the issues he expected the inquiry to address, particularly welcomed input from the wider maths community.

The Government has also tried to introduce schemes to encourage young people to stay in vocational training. Strategies like the Modern Apprentice scheme aim to equip people with real, practical skills, whilst new qualifications (for example GCSE engineering and new science GCSE and AS levels) aim to highlight the possibilities for careers in science, technology, engineering and mathematics subjects. Specialist schools are also at the forefront of promoting opportunities in science, engineering and technology: there are now 12 engineering schools, 24 science schools, as well as technology and maths specialists and many with combined specialisms. Science is the most rapidly growing specialism, with 40 more science schools designated to start work this September, and following the current and next rounds of bidding this number is expected to increase significantly.

Where does ETB come in?

ETB, a partnership to promote science, engineering and technology, works to make sure that the economy, through business and industry, has a supply of appropriately skilled people to match industry's needs and to drive innovation.

Through its programmes, like the EDiSET web portal, it provides simple careers information about all the educational and professional routes open to young people. The *Engineering Careers Resource Catalogue* – available on-line for the first time later this year – provides information for teachers and careers advisers in schools about the wide variety of guidance material produced by organisations working to promote careers in engineering and technology, and most importantly how to order what is relevant to them! EDiSET also provides help with case studies, role models, homework aids, lesson planning and more.

ETB also has schemes, such as 'FutureNet' which provides a support network for over 1,000 young engineers, and 'Network Members'. Both of these schemes draw representatives from the business and industry community to help ETB facilitate the frequently cited need for communication between industry and education.

ETB has been instrumental at stimulating debate over the relevance and demand for newly proposed 'Chartered Technologist' qualifications, whilst investigating the need to enhance the status of existing qualifications – such as the Engineering Technician.

Essentially, ETB exists to make sure that education, training and professional development in science, engineering and technology are as focused, appropriate and productive as possible.

The way forward

We need to identify where responsibility lies. We need to know what our young people require to develop their careers and their potential. We need to involve industry, the media, parents and education. It will not be easy and there is a lot to do, but we are starting from a great vantage point – the possibility of offering our young people exciting and rewarding careers which will end up benefiting us all.

Let's make sure that we make the best of all that potential out there.

References

1. *Ready, SET, Go – Review of SET Study and Career Choices*. Institute for Employment Studies, commissioned by ETB.
2. *STM and Teachers: Perceptions, Views and Approaches*. Department of Education, University of Bath, commissioned by ETB.
3. Early Career Experiences of Engineering and Technology Graduates, Warwick Institute for Employment Research commissioned by ETB.

To learn more about ETB visit www.etechb.co.uk or www.ediset.co.uk for the EDiSET web portal.

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