Foreword

Prof Sir John Holman, University of York
Until September 2010 was National STEM Director for the Department for Education for England

Like many acronyms, 'STEM' means different things to different people – even to people in the same country.

To some, it is about emphasising science, technology, engineering and mathematics education because of their economic importance to developing – or recovering – economies. To others, it is about exploring the potential of an integrated approach to teaching these subjects in schools and colleges. And there are other nuances too.

Science, technology, engineering and mathematics look very different depending on whether they are viewed from inside or outside the classroom. Inside most secondary schools, they are separate subjects, with mathematics and science having the larger shares of curriculum time and technology and engineering often seen as minority subjects. Yet in the world outside, it is technology and engineering that touch people's lives most immediately and which employ far more people than either science or mathematics.

In the UK and the US, STEM education has become an important part of the economic agenda. The future, so the argument goes, lies in the knowledge economy, of which these subjects are an essential underpinning. This has little to do with an integrated approach to teaching these subjects, and much to do with a perception that more young people need to commit to studying them in the future. Indeed, the new coalition Government in the UK has made clear that – for England at least – the future lies in a subject-based curriculum, with mathematics and science to the fore. One of the first actions of this government was to dismiss proposals for a new primary curriculum in which science and technology were integrated.

So where does this leave the idea of integration in the STEM curriculum, with which this Special Edition of *Design and Technology Education* is particularly concerned? The arguments are compelling: an integrated curriculum reflects the way that these subjects are actually applied in the world. Technology and engineering put science and mathematics in context and show learners why these latter subjects – often perceived as difficult – are so important. Yet the reality in most schools around the world is that the subjects remain in their silos. Why should this be? Compartmentalised curricula and qualifications; the need for specialist teachers, especially in upper secondary schools; the limitations of specialist facilities: all these are part of the inertia that holds the subjects apart.

Whatever may have led us to cluster these four subjects together, it cannot be their similarities, because they have few. Mathematics is a universal educational theme which begins in the earliest years of schooling; engineering is a minority subject in schools but dominates in further and higher education. In secondary schools, science is seen as a key component of a general education; in many countries technology is seen as more important in vocational than general education. These are the practicalities of STEM in schools around the world.

Could research help us to a better understanding of the relationship between these subjects, and how they can be best configured to aid learning and improve attitudes? By its nature, this is an issue that needs to be tackled at a systemic, whole-school level, rather than within any one of the four subjects. It may be that the most fruitful question to ask is not 'How can the teaching of science, technology, engineering and mathematics be integrated?' but 'How can their teaching be better co-ordinated?'. The reality is that, even in countries with a well co-ordinated national curriculum, busy teachers usually operate within subject silos. Yet better interaction between teachers of these four subjects could bring many of the benefits that integrated teaching could bring, with lower barriers to implementation.

I do not know whether 'STEM' will prove to be a passing fashion in education, or signal a profound shift in the way schools think about the relationships between subjects. Even if it proves a passing fashion, it has served to heighten awareness by governments of the importance of these subjects to a country's economic wellbeing, and to alert some schools to the benefits that come when teachers move, however cautiously, out of their subject silos.

j.holman@slcs.ac.uk