In England, the decline has been partly attributed to the advent of single- and double-award science GCSEs, which negated the identity of physics as a subject in its own right as well as creating a situation in which specialists in biology or chemistry are required to teach the physics elements of science courses despite their lack of any expertise in the subject.

Added to this is a decline in overall numbers of specialist teachers, as existing teachers retire and are not adequately replaced due to low levels of recruitment. It is estimated that the UK would need more than 700 new physics teachers every year just to stand still. In reality, fewer than 400 are recruited, and half have left after four years in the profession.

This has left a quarter of 11–16 schools in England without a specialist physics teacher, and a sixth—more than 500 schools—not sending any pupils at all on to study A-level physics. The statistics for Blackpool provide a particularly stark example: in 2007, just five students from Blackpool schools went on to take physics A-level. In 2008, just five students who had progressed from the town’s eight schools took physics A-level—all of them boys. Blackpool is a microcosm of the problem that physics is facing nationally.

Charles Tracy, IOP’s head of education

Physics needs backing

Physics is an essential component of the UK economy, with physics-based businesses contributing as large a share as finance or construction. On top of this, knowledge of physics instills transferable skills, developing students’ analytical abilities. A wide variety of employers are keen to snap up people with a physics qualification, as they know it demonstrates a valuable recruit.

To continue benefitting from physics in the future, we will require a steady stream of new physicists and physics teachers. This may seem obvious. Yet the neglect of physics education in recent years has put this under threat.

The number of young people choosing to study physics at 16–19 level has now begun to rise slowly, but, at their lowest, A-level entries had fallen by 40% since 1980. The number of students taking Scottish Highers in physics dropped by 15% between 2001 and 2007 alone.

“In 2007, just five students from Blackpool schools went on to take physics A-level.”

“Trying to understand the world without a physics education is like building a house with no foundations. Physics provides the building blocks to tackle the 21st century’s great challenges.”

Jonathan Flint, chief executive, Oxford Instruments

How to get the best out of experiments is an essential aspect of physics teaching
Supporting school physics

Sharp Laboratories’ Stephen Bold is frank about how bad he believes the situation has become: “We have to wake up to the fact that we do not have a world-leading state secondary science education system any more,” he says.

The Stimulating Physics Network is aimed at remedying this by working with non-specialist teachers to reinvigorate the culture of physics in schools where there is a shortage of specialist teachers. Managed by the Institute of Physics in partnership with the Science Learning Centres and funded by government until 2011, it is aimed at providing an inspiring, coherent and sustainable programme of lessons, activities and continuing professional development.

All secondary schools in England are offered support from a team of 37 Physics Network Coordinators. In around 250 identified partner schools, a network of 23 teaching and learning coaches provide intensive support to whole departments of teachers, helping non-specialist teachers to teach physics more effectively by improving subject knowledge and ‘pedagogical content knowledge’. Charles Tracy explains the latter: “What a physics teacher has to know and understand in order to teach their subject effectively is not two separate disciplines of physics and teaching. It is a combined one: physics teaching.

“With electric circuits, for example, they would need to have a good understanding of circuits (content); they need good understanding of pedagogy; but they also need good understanding of how to wire a circuit, common difficulties children have with that, common misunderstandings, why it matters that you don’t talk about energy being carried by men with bags of coal, and so on.”

The pilot scheme, which ran in 30 schools from May 2006 to June 2009, saw an estimated increase of 30% in the numbers of children going on to study AS-level physics. However, with plans to devolve more authority to schools themselves, there is a risk that centrally funded programmes such as this could be at risk.

As well as continued funding, the Institute recommends that there should be a requirement on subject knowledge for teachers of physics, via accreditation; a process to measure the number of qualified specialist teachers in the system and entering or leaving it each year; and, in the long term, at least one physics teacher per school.

The UK has historically had a strong science base. Measures such as these will improve physics teaching and help to keep it that way.

Further Reading

IOP reports:
- Physics: an investment for the future
- Physics in Scotland: the brightest minds go further
- The Economic Benefits of Higher Education Qualifications

Website:
- www.stimulatingphysics.org

Journals:
- Physics Education
  http://iopscience.iop.org/0031-9120/

Other organisations’ reports:
- AQA National Science Symposium: Are we serious about science?
- Physics participation and policies: Lessons from Abroad
- Physics in schools: supply and retention of teachers