

# Physics and: teacher numbers

An Institute of Physics briefing note



Photo: IOP

The Institute of Physics has warned previously of the shortage of specialist physics teachers, including in the last edition of this series of briefing notes.

We now have a better idea of the scale

of the shortage: how many teachers there are at present in England's state schools, how many are currently entering teacher-training, and by how much we would need to increase this number in order for every school to have enough physics teachers to be sure that its students are getting the best possible education in the subject.

Despite a recent small upturn in recruitment, the shortage remains a serious problem. But the Institute believes it has solutions that will help allow the teaching of physics to reach the same level as that of biology, a science that is still well-taught by specialist teachers.

These solutions are partly based on existing IOP projects, while we also recommend the introduction of some new measures aimed at improving recruitment and retention – and restoring physics teaching to its former strength. Prof. Dame Jocelyn Bell Burnell, President of the Institute of Physics

## Teachers are in short supply

This year, around 590 would-be physics teachers will begin their teacher-training courses on their path to Qualified Teacher Status. This is barely more than half the number that the country needs.

The Institute's target figure is 1000 physics teachers recruited per year. This is the number that we would need to attract to the profession in order to increase the proportion of science teachers who are physics specialists to one third – and even this would take 15 years.

England's state schools would then have a total of 10 000 teachers for each science subject. At present, there are around 5800 physics teachers, accounting for just 19% of the total. On average this is 1.6 physics teachers per school – though some have more, so consequently at least 500 state schools in England don't have a physics teacher at all. We are more than 4000 physics teachers short.

With such a low proportion, given that GCSE science programmes are divided equally between

physics, chemistry and biology, it's clear a lot of students are not being exposed to inspirational physics teaching, which is their entitlement.

From 1990 up to this year, there would have to have been 700 physics teachers recruited every year to maintain the strength of the workforce at its previous level. But until recently, this has been closer to 400 a year. Not only this, but 15% of potential teachers don't make it to the end of their postgraduate certificate of education courses, and of those that do half leave the profession within four and a half years – so overall numbers have dropped.

Chris Shepherd, the Institute's teacher support manager, says that the current state of teacher recruitment is "like a bath with the plug out and the taps only half on".

The number of teachers are based on modelling and corroborated by the Royal Society's *State of the Nation* report, published in 2007. A more accurate view will be available following the School Workforce Census, due to take place this October, but at present even the most optimistic interpretations of government data show a huge shortfall in the numbers of teachers that will be needed for the future. >>>

**Teacher recruitment is "like a bath with the plug out and the taps only half on".**

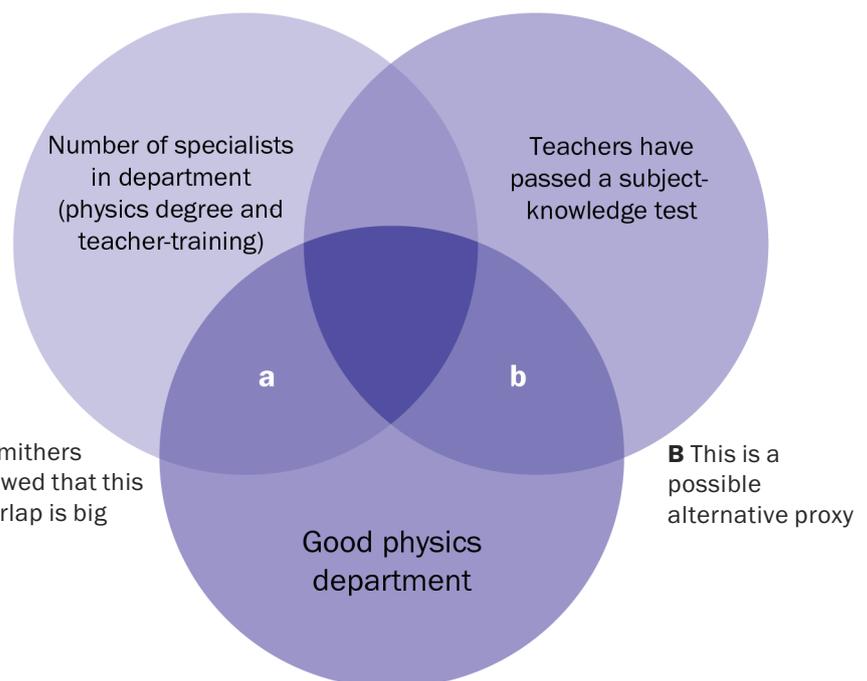
### Why specialists?

There are many aspects to being an effective teacher - good subject knowledge, pedagogy and personal skills are all important. It's possible to measure all of these, but not easily.

A useful proxy is subject specialism. This indicates an interest and ability in the subject, and is easy to measure – we can just ask what subject a teacher's degree was in.

This is not to say that somebody without a physics degree cannot be an effective teacher of physics. But evidence from Ofsted suggests that specialists teach, on average, better-quality lessons, while the 2007 report by Prof. Alan Smithers found that schools with no physics specialist have fewer students going on to take the subject at A-level.

Charles Tracy, the Institute's head of education pre-19, explains: "This is because students are less likely to be exposed to a teacher who makes physics appeal to them, by bringing it to life and showing that it is intuitive and logical."



**A** Smithers showed that this overlap is big

**B** This is a possible alternative proxy

**We need easy-to-measure proxies such as specialism or tested subject knowledge**

# How do we increase teacher numbers?

The long-term solution will require the recruitment and retention of the proper number of specialist physics teachers.

One recommendation is for there to be a requirement for schools to have an appropriate number of physics teachers – and to deploy them properly, since a quarter of physics graduates who enter the profession are teaching maths. Chris Shepherd explains: “What we’re looking for is for students to be taught physics by an unbroken succession of specialists. It’s this that enhances their chances of success.” The idea behind this is that the requirement would be tested by inspection, with schools unable to get a high mark if they fail to meet it.

Another is for better marketing to improve recruitment, and for universities to increase their capacity for training physics teachers. Since, in a typical training establishment, numbers are currently so low, there is usually only one physics tutor compared to two biology tutors, so universities think that they are unable to take on any more physics trainees even if enough applied – and the problem could become self-perpetuating.

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The Institute believes that this could be overcome with a combination of government money and a marketing initiative. Shepherd says: “I think part of the problem is that we have become used to what is a shocking situation. But with better marketing of all routes into teaching, a number of teacher-training ‘supercentres’ could easily be established to reach parity with biology.”

The final recommendation is mentoring to help improve retention. From 2004-11 the Institute has offered mentoring to all those taking six-month subject-knowledge courses, continuing into their first two years as a teacher, including IOP membership, attendance at conferences, phone and email support and the assignment of a teacher mentor to work with.

The idea is to enhance existing networks such as the teacher’s peer group and former teacher-trainer. Surveys of those involved have shown that it’s considered to be beneficial to both the teacher and the school.

These are all long-term solutions. However, in the short term, Key Stage 3 students are more likely to be taught physics by a biologist and it is now common for non-specialists to teach physics topics to GCSE. So they need support through Continuing Professional Development.

The 2006–2009 pilot of the Institute’s Stimulating Physics Network, which was aimed at improving the knowledge of non-

specialist teachers of physics, saw a 30% increase in uptake of physics at AS level in participating schools.

Without measures to incentivise the recruitment and retention of specialist physics teachers, an already serious situation will become irretrievable.

## INTO PHYSICS TEACHING

**Undergraduate:** Aspiring teachers without a degree can take a degree course that also gives qualified teacher status (QTS). This takes four years of full-time study and results in the award of a BEd or BSc with QTS.

Physicists entering in England in 2009-10: **2**

**Postgraduate:** Graduate initial teacher training courses take a year of full-time study based at a higher-education institution and include 24 weeks of school-based placements. Completion earns a PGCE. In School-Centred Initial Teacher Training courses, training is based at and run by schools. Graduate Teacher Programmes allow teachers to work while training. iTeach is an online PGCE programme.

Physicists entering in 2009-10: **571**

**Teach First** is an independent charity providing teacher training to exceptional graduates who might not have otherwise considered teaching, via a two-year programme. Physicists entering in 2009-10: **17**



A class at a Stimulating Physics Network summer school aimed at helping non-specialists to teach physics more effectively.