SCIENCE COMMUNITY REPRESENTING EDUCATION

Attracting, training and retaining the best teachers

A SCORE response to the Education Select Committee inquiry

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1. SCORE is a partnership of organisations, which aims to improve science education in UK schools and colleges by supporting the development and implementation of effective education policy. The partnership is currently chaired by Professor Graham Hutchings FRS and comprises the Association for Science Education, Institute of Physics, Royal Society, Royal Society of Chemistry and Society of Biology.
2. SCORE welcomes the Education Select Committee inquiry into attracting, training and retaining the best teachers. In summary:

    - There is little evidence surrounding the characteristics that make an effective teacher in the sciences (and indeed other subjects). SCORE strongly recommends there is a real commitment from Government to undertake a longitudinal study into the characteristics of an effective teacher. Only through such a proper evidence-informed approach would it be possible to devise strategies for attracting and selecting the most suitable candidates for teaching and appropriately support Initial Teacher Training (ITT) and teachers in service.
    - There is a known shortage of physics and chemistry teachers. SCORE strongly supports the 6 month Subject Knowledge Enhancement courses for Chemistry and Physics that have helped steadily to address this imbalance.
    - Government should work closely with the learned and professional bodies in establishing, and maintaining, standards as part of a drive to support and increase professionalism in teaching and career progression. This should include the use of chartered status.
    - Teaching communities and networks play a vital role in supporting effective teachers, particularly in schools in challenging circumstances (e.g. those in deprived areas and/or with a lack of subject specialist teachers). This needs to be recognised by Government through its support of learned and professional bodies in developing communities of practice.

What evidence is available to help identify the sorts of applicants who become the most effective teachers, and the strategies known to be effective in attracting these applicants?

3. The evidence for this issue is complex, and is often reported in ways that may be misleading, particularly when referencing evidence from international comparison studies. The Committee should be aware of the dangers in exporting results from individual school systems without regard to their cultural context.
4. Barber and Mourshed (2007) outlined some definable characteristics that can help identify excellent teachers, based on the characteristics of the world's best performing education systems.

    "(The best systems) acknowledge that for a person to become an effective teacher they need to possess a certain set of characteristics that can be identified before they enter teaching: a high overall level of literacy and numeracy, strong interpersonal and communications skills, a willingness to learn, and the motivation to teach''

    They noted that the world's top performing systems recruited from the top of their school system cohorts: the top 5 percent in South Korea, the top 10 percent in Finland, and the top 30 percent in Singapore and Hong Kong. However, that is not the same as saying

that selecting only those with high academic qualifications will ensure future success. The report, in fact, advances the hypothesis that controlling the intake has the effect of raising the status of the profession, which in turn encourages applicants with the desirable characteristics. However there are possibly hidden variables here that mean that exporting this technique to another country may not guarantee success.

5. The search for predictive measures generally seems to yield unexpected outcomes. The recent Sutton Trust report (2011) references a study in the Chicago area (Aaronson et al, 2007) which found that "gender, race, teaching experience, undergraduate university attended, advanced degrees, teacher certification and tenure explain less than 8% of teacher quality". They concluded it is very difficult to predict how good a teacher will be without observing them in a classroom. The Sutton Trust report, however, emphasises that it is possible to predict pupil outcomes through classroom observation by an experienced colleague.
6. Other organisations, such as Teach for America (the US equivalent of Teach First), also found unexpected results when they attempted to refine such observation into predictive models for effectiveness. A study by Duckworth et al (2009) looked at 390 Teach for America teachers before and after a year of teaching. They reported that those who scored high for perseverance and a passion for long-term goals, measured using a short multiple-choice tests, were 31% more likely than others to encourage improved performance from pupils. These virtues seemed to matter more than absolute achievement.
7. Programmes such as Teach for America and Teach First select candidates for a particular type of school. We know of no evidence that the same candidates would have fared equally well elsewhere. Conversely the selection system might end up rejecting candidates who would make excellent teachers in some contexts but not others. We are not sure that we can uniquely define "effective" teachers.
8. Specifically to the UK, research concerning the identification of suitable applicants that would make the most effective teachers is not well understood. There is a real need for the government to undertake a rigorous national longitudinal research programme that carefully controls the many different variables that affect the educational success of a teacher, not only for the sciences but all subjects. Only on that basis can we then attempt to devise strategies that attract and select the most suitable candidates for teaching the sciences.
9. There is a wide acceptance that the best teachers are those who have specialist subject knowledge and a real passion and enthusiasm for the subject they teach. It is less clear however what these qualifications are and what equates to the desired level of subject specialist knowledge.
10. SCORE would like to see a real commitment from the government to a longitudinal study that explores possible correlations between teacher subject specialist qualifications and the quality of teaching and learning. This should include a study into primary as well as secondary teaching.

Whether particular routes into teaching are more likely to attract high quality trainees, and whether the Government's proposed changes to initial teacher training (ITT) will help to recruit these trainees?

11. The enduring emphasis of the English system over the last decades has been to provide a plurality of routes, in an attempt to harness talent from a wide range of sources, to meet the basic need for sufficient trainees. The coalition government plans to continue with this strategy with its introduction of Teaching Schools and School Direct. Such a strategy receives support from Barber and Mourshed (2007) who comment:

    "Most top-performing school systems remove obstacles to entry into the profession by creating alternative pathways for experienced hires. Most of the systems also recognise that they will make mistakes, and have developed processes to remove low-performing teachers from the classroom soon after appointment."

12. However, SCORE is not convinced by the evidence and would like to see systematic research to see whether parallel routes really do attract more recruits or whether competition is merely destructive.
13. This theme of destructive competition between routes is something that has been raised in discussions held between SCORE organisations and ITT science tutors in the context of PGCE courses as opposed to employment-based routes. The latter have been blamed for reducing the capacity for schools to offer placements for the former. This issue has been pertinent to the discussion around the introduction of Teaching Schools.
14. Programmes such as Teach First in England (and Teach for America) have been seen by many as exemplars of best practice in attracting high quality trainees. They draw their intake from graduates with top class degrees, but then carefully select for personal characteristics. However such programmes, which cost more per head than traditional routes, provide exceptional levels of support for the new teachers in the classroom, and engender a heightened sense of community among the participants. This makes it difficult to single out the characteristics of the programme that make for success. We do not know for example whether a group of less academically able candidates would produce the same impact if given the same levels of support.
15. Furthermore, it is not clear that those who fail to get into programmes such as Teach First are not in fact discouraged from joining the profession altogether. Teach First have maintained that their applicants would not otherwise have considered teaching, but we are not aware of any convincing research in this area.
16. What is clear from the English experience is that the provision of six month pre-ITT Subject Knowledge Enhancement (SKE) courses has been vital for increasing the numbers of physics, chemistry and mathematics applicants. Without such courses it seems very unlikely that government targets will be met. SCORE organisations strongly support this government initiative and, due to the high level of subject content covered in the 6 month programme, recognise this as a route to becoming a subject specialist teacher in Physics or Chemistry.
17. Furthermore, SCORE believes that there are strong arguments for extending the length of teacher training courses to 18–24 months, bringing courses more in line with overseas masters level ITT and enabling providers to cover subject knowledge and subject pedagogical knowledge more substantially. Science teacher education has to consider practical as well as theoretical aspects of the subject and therefore needs an extended period of training. Trainee teachers need to learn practical techniques, the management of learning in a laboratory, and also in the outdoors. It must not be assumed that highly qualified graduates, attracted through the bursary offers, will all have sufficient breadth of

subject knowledge to become effective teachers without substantial further provision as part of their ITT course.

18. SCORE welcomes the proposed financial incentives, highlighted in the Government's ITT improvement strategy paper, as a mechanism to attract STEM graduates into teaching careers where there are currently shortages. The Government classifies high priority shortages to include chemistry, physics and mathematics at secondary level. Given the shortage of primary science specialists (the Royal Society in 2010 reported that only 3% of the in-service primary workforce in England hold specialist first degree and initial teacher training qualifications in science). SCORE strongly recommends these incentives are extended to STEM graduates wishing to apply for primary ITT.

What evidence is available about the type of training which produces the most effective teachers and whether the Government's proposed changes to initial teacher training, particularly the focus on more school-led training, will help to increase the number of good teachers in our schools?

19. The evidence again for this is mixed and Hobson et al (2009) in their 'Becoming a Teacher' report:

> *"We are not able to make any reliable claims about the relative capability or effectiveness of beginner teachers trained via different ITT routes."*

However, SCORE strongly believes that regardless of the Department's desire to give schools greater responsibility for teacher training, all trainee teachers should maintain a genuine connection with a Higher Education institution. Both a firm grounding in the philosophy of education and access to the latest educational research are essential in (i) developing understanding of the purpose of education; (ii) developing the role of the teacher; (iii) fostering effective classroom practice including developing an understanding of how young people learn and how to overcome barriers to learning; and (iv) establishing an appreciation of the need for teachers to reflect on their teaching and continually update their subject knowledge and pedagogical skills. The Ofsted 2009/10 report also supports this:

> *''There was more outstanding initial teacher education delivered by higher education-led partnerships than by school-centred initial teacher training partnerships and employment-based routes.''*

20. Barber and Mourshed (2007) in their international comparisons make the general comment that the best performing education systems use four techniques:
    a. Building practical skills during initial training (i.e. real classroom experience)
    b. Placing coaches in schools to support teachers
    c. Selecting and developing effective instructional leaders
    d. Enabling teachers to learn from each other.

    The report cites England as a place where the first technique is already in play, in existing PGCE courses, where two thirds of the time is already spent in schools. It seems unnecessary therefore to increase this further, and may prove counter-productive in organisational terms.

21. However, the most important considerations in considering the most effective type of training may in fact not be matters of principle, but of logistics. It remains to be seen

whether Teaching Schools have the capacity to develop the effective instructional leaders mentioned above, and deploy them in sufficient numbers among future trainees to make a difference.

22. Again SCORE would like to emphasise the importance of Subject Knowledge Enhancement courses and extended PGCE courses in terms of increasing the recruitment into ITT for the physical sciences and mathematics. Without these courses there would be very little scope to meet the Government's targets in these shortage subjects. SCORE welcomes the Government's commitment to address the current imbalance in the number of specialist biology, chemistry and physics teachers. However, it is important to ensure those strategies in place do not inadvertently lead to a lower quality of biology education in the long term.

How best to assess and reward good teachers and whether the Government's draft revised standards for teachers are a helpful tool?

23. There is extensive literature about reward systems for teachers. A common theme is balancing reward for the individual teachers with unhelpful competition between teachers. As is noted later in this submission, pay is a factor in retention, but is not the prime factor. In England the House of Commons Select Committee (2004) noted that schools are notoriously unwilling to use recruitment and retention allowances.

    ''*There is flexibility within the pay system to pay recruitment and retention allowances. These have been little used, however, because of concerns about distortions to the pay system that these would create and because some employers feared that they would be divisive.''*

24. More significant in terms of reward may be some of the other factors mentioned below about freedom to teach and career progression. The Advanced Skills Teacher (AST) status was introduced as a route to enable exceptional teachers to stay in the classroom rather than move into management. We note, however, reports that the role is under used. Furthermore, we are told that many ASTs feel isolated, that as a group Science ASTs are hard to identify, and there is little coherence in their deployment. SCORE urges a more coherent strategy towards registering, accessing and developing ASTs.

25. There are other possibilities for reward, including the use of chartered status[1]. Professional bodies have a role to play here, and encouragement for teachers to seek chartered status has the dual effect of raising the status of the teaching profession, and also bringing teachers closer to the centres of their own subject communities, which has benefits for developing links between schools and universities for example.

26. The government should also consider imaginative developments, such as allowing teachers the freedom to pursue educational or even subject research for a day a week.

[1] For example, the ASE Chartered Science Teacher (CSciTeach) is a chartered designation which recognises the unique combination of skills, knowledge, understanding and expertise that is required by individuals involved in the specific practice and advancement of science teaching and learning. This is underpinned by an annual commitment to Continuing Professional Development (CPD).

In terms of teacher retention this could prove to be cost effective, but would require a structure similar to that of ASTs to allow such an innovation to flourish. It would also allow Awarding Organisations, curriculum developers and professional bodies themselves access to a much larger pool of professional help without removing the individuals from the classroom altogether.

27. SCORE welcomes the Government's commitment to revise standards for teaching (although SCORE is disappointed the revised standards fail to emphasise the importance of subject specific CPD). We feel that in recent years there has been too much emphasis on compliance with a complex and unwieldy set of standards, and not enough on actual systems that allow practitioners to reflect on their practice with the help of an external expert, and sound research based methods. The Barber and Mourshed (2007) prescription of a network of school based coaches is far from a reality in practice. It is reported that National Strategy Science advisers who could have provided this role rapidly became diverted into spending disproportionate amounts of time in failing schools, rather than providing the coaching corps that might have achieved significant change. Professional bodies can play a role here too. The Institute of Physics (IOP) Stimulating Physics Network, funded by the Department for Education, has been successful in bringing experienced subject coaches into schools, and we would like to see similar networks in other subject areas. Similarly the Royal Society of Chemistry (RSC) is establishing and supporting networks for chemistry teachers through their regional coordinators programme.

What contribution professional development makes to the retention of good teachers?

28. The evidence is again complex. Table 10.6 in Moor et al (2006) looked into the retention of science and mathematics teachers. They reported on the strongest associations between satisfaction with specific areas of working life and overall satisfaction and the intention to remain in teaching. Statistically significant factors (Spearman) were:

Science teachers	**Science heads of department**
Pupil behaviour (r =.29)	Freedom to teach (r =.30)
Freedom to teach (r =.25)	Managing workload (r =.26)
Pay (r=.24)	Working hours (r=.25)
Teaching timetable (r=.24)	Support from SMT (r=.24)
Career progression (r=.23)	Pupil behaviour (r=.22)

It should be noted that professional development did not feature in the list, but was relevant to the overall satisfaction of the teachers. The results were very similar for mathematics teachers, but for heads of departments professional development did feature in the list (r=.16). However this begs the question of what types of professional development were then on offer. As far as we know there has been little or no systematic study of the effectiveness of different types of continuing professional development (CPD) in terms of teacher retention or indeed pupil outcomes, and we

would urge the government to commission longitudinal research into this, particularly with respect to subject specific CPD.

29. While SCORE recognises there is little evidence on the effectiveness of professional development in relation to teacher retention, we would like to emphasise to the Select Committee the importance of subject specific CPD. Subject specific CPD should be an entitlement for all teachers. It provides specialist subject teachers with the opportunity to grow and develop in their specialism and remain engaged with their subject. It also helps non-specialist teachers to address the basic gaps or misconceptions in their subject knowledge, conceptual understanding and pedagogical content knowledge (as, for example, in the SKE+ programme which trains existing teachers to develop chemistry and physics as an additional teaching specialism).

How to ensure that good teachers are retained where they are most needed, particularly in schools in challenging circumstances?

30. As mentioned previously SCORE is not convinced that a teacher who is effective in one context will be effective in all other contexts. It seems strange that there is little formal recognition of this, in terms of in-service courses, but it is left for individual teachers to sink or swim in a new context, on the grounds that "they should be able to cope".
31. Hutchings (2005) looked into the motivation of teachers to work in challenging schools. The results were again counter intuitive. Pay, whilst being a factor, was not the most important one, instead a strong sense of team spirit was:

    ''It appears from our data that a majority of teachers choose to work in 'good' schools, where behaviour management is effective. While many teachers believe that pay incentives could solve the recruitment and retention difficulties of vulnerable schools, pay did not generally appear as a key factor motivating teachers' choice…..The main incentive to stay in any school is relationships with colleagues. A positive and supportive atmosphere among staff appears to be a key factor in teacher retention.''

32. The challenge of how to develop a strong team spirit is taken up by Bush et al (2005) in a companion report "Why here?". The report explains that working in a school where you feel valued and where there is clear investment in your professional development is a strong incentive for most teachers. There is clearly a role for professional associations here, particularly in providing subject based networks. The authors also put forward the notion of preparing new teachers as a group for the challenges of these schools. We note that Teach First employs this strategy in bringing its participants together as a large community very early during training, and putting the participants in contact with previous Teach First trainees working in the same schools. It also makes provision to allow teachers to have six days of CPD together during their first year of teaching. Others, such as the Science Learning Centres and SCORE member organisations also provide opportunities for central meetings of groups of Newly Qualified Teachers, which have been welcomed by participants.
33. The IOP ran a mentoring scheme from 2004-2011 for those teachers who had passed through a physics Subject Knowledge Enhancement course. An evaluation carried out by

Hobson and McIntyre (2011) into this and similar schemes looked into their use of external mentors to support the teachers in their early career. The authors concluded:

> ‘‘*On the evidence of these data, there is a strong case for providing beginning teachers of science in England with opportunity to access the support of external mentors who have; teaching and subject expertise; no assessment role; and geographical proximity.’’*

34. The importance of feeling part of some larger community is a recurring theme. McIntyre (2010) looks at long serving teachers in inner city schools, and emphasises the importance of committing to and feeling part of a local community. Teachers, she maintains, play a pivotal role in the relationships between schools and communities and this role needs to be recognised and supported.

35. The question arises as to where such communities or networks can be found. While not specifically citing retention data Ofsted (2010) have commented favourably on the London Challenge school improvement programme. However outside the capital there seem only to be few equivalents, and anecdotally we hear that Local Authorities generally have much reduced capacity to bring teachers together. Again SCORE feels professional bodies can play a crucial role in retention of teachers by providing a community of practice.

References

Aaronson, D., L. Barrow, and W. Sander (2007), *Teachers and student achievement in the Chicago public high schools*, The Journal of Labor Economics 25(1), 95–135

Duckworth et al (2009), *Positive predictors of teacher effectiveness,* The Journal of Positive Psychology

Barber M, Mourshed M? (2007), *How the world’s best-performing school systems come out on top,* McKinsey and Company

Hutchings (2005), *Choice and Equity in Teacher Supply*, Institute for Public Policy Research

McIntyre, Joanna (2010), *Why they stayed: a study of the working lives of long serving teachers in inner city schools*, PhD thesis, University of Nottingham

The Sutton Trust (2011), *Improving the impact of teachers on pupil achievement in the UK – Interim findings*

Ofsted (2010), *The Annual Report of Her Majesty’s Chief Inspector of Education, Children’s Services and Skills*

Hobson et al (2006), *Becoming a teacher: Student Teachers’ Experiences of Initial Teacher Training in England,* University of Nottingham, Department for Education and Skills

Education and Skills Committee (2004), *Secondary Education: Teacher Retention and Recruitment: Fifth Report of Session 2003–04 Volume 1*

Bush et al (2005), *Why here? Report of qualitative work with teachers working in schools above and below the floor targets*, Institute for Public Policy Research

Royal Society (2010), *Science and mathematics education, 5-19: A ‘state of the nation’ report*