

Dr Ian Wall,
STEMEC,
Victoria Quay
Edinburgh. EH6 6QQ

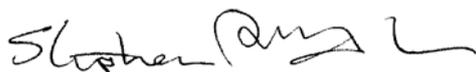
Dear Dr Wall,

STEMEC consultation on Professional Learning Communities

Thank you for the invitation to provide evidence and exemplars of good practice to the STEMEC committee.

As you will see, the Institute has a great deal of experience in building and running such networks and would support the idea of scaling up PLC activity in Scotland. We would be happy to discuss with you the contents of this response or any developments that arise from your consultation.

Yours sincerely



Stephen McGeoch CPhys MInstP

Chair, IOP in Scotland
Science



Prof. Peter Main

Director of Education and



Gordon Doig
Education Manager, Scotland

Professional Learning Communities

Introduction

The Institute welcomes the opportunity to respond to and support the consultation by The Science Technology Engineering and Mathematics Education Committee (STEMEC) on Professional Learning Communities (PLCs). The Institute is a long-term advocate of such communities and has a great deal of experience in setting up and managing them. We have 1700 affiliated schools, have run a number of teacher networks across the UK, including in Scotland and the Republic of Ireland since 2001, and also host community websites and mail lists for teachers of physics.

In Scotland, the physics teaching community has evolved into a vibrant and collegiate network which brings together the enthusiasm and currency of recently qualified physics teachers with the experience and wisdom of the veterans of Scottish physics. Naturally, we think that the Institute has played a major part in the evolution of this highly effective support network through its funding and support of committed coordinators, lay members, infrastructure and national meetings.

In this response we will describe why we thought such support was needed, how we have provided it through our networks and web sites and why we think these approaches are effective.

Preamble

In 2001, the Institute moved to address the longstanding problems with the teaching of physics. The problems included a paucity of development opportunities for teachers, physics teachers being isolated in their school, a lack of structure and support for teachers once they have qualified, a shortage of specialist teachers and, particularly in England, a loss of identity for the discipline (within a subject called science). Consequently, physics teachers could feel isolated, turnover rates were high (half of teachers leaving the profession in the first five years) and much of the physics being taught up to 16 was being done so by non-specialists.

Establishing the Teacher Network

To help address these problems, the Institute set up a pilot of the Physics Teacher Network in 2001¹. The Network provided face-to-face support for teachers of physics; often the support would be bespoke and would take place in a teachers' school (or one nearby). The pilot developed into a full network (including Scotland) and, later to the establishment of the Stimulating Physics Network (see below).

The initial pilot project comprised six Physics Network Coordinators (PNCs) who were supported centrally. The intention was to help the PNCs "to do good things". The six were already involved in providing some level of support although the forms varied widely. These pilot PNCs had targets set and financial support was provided to cover them for their time and to pay the costs for events that they organised.

After the initial pilot was a success, a second wave of PNCs was recruited and the Network has continued to expand. There are now 53 PNCs across the UK and Ireland (7 of them in Scotland).

The Teacher Network in Scotland

The Scottish Physics Teacher Network was born in 2002. The Institute had originally planned to employ three Physics Network Coordinators (PNCs), but matched funding from the Scottish Government increased the number to six. A seventh was added two years later. After three years, the matched funding ran out, but the network was working so well that the Institute continued to fund seven PNCs in Scotland. Each PNC is funded by the Institute for an average of half a day a week; their dedication is such that it is likely that their contribution to physics support goes beyond this.

The PNCs organise full-day, twilight, and evening meetings (sometimes jointly with ASE) all over Scotland. They also run workshops at meetings or conference run by other agencies, such as SSERC^{i, 2} and ASE. The PNCs respond to individual requests for help or advice from teachers or schools and maintain good links with universities. Through these activities, Scottish PNCs have had face-to-face contact with over 500 secondary and 200 primary teachers in the last year alone.

In Scotland, there is a good geographical spread from the Borders to the Highlands, but, unfortunately, coverage is not good for Orkney, Shetland and the Western Isles. Twilight sessions tend to take place in schools. Sometimes that will be the school at which the coordinator works but often it will be another teacher's school. Rural areas can be problematic, as teachers may have to travel long distances to attend. In the Scottish Highlands, it just isn't practical to expect people to travel to a school-based evening session, so day meetings and support via e-mail are usual.

The Scottish part of the Teacher Network runs on a slightly different model from the rest of the British Isles. There are more PNCs per physics teacher in Scotland, partly as a legacy of the initial SEED funding but also to accommodate the geographical spread of the population. The PNCs are more close-knit and more integrated into the education system than those in the rest of the British Isles. This arises from the size of the jurisdiction and the fact that there is a single examination board and hence a tighter focus on what teachers need.

The structure is also slightly different. The Scottish PNCs have their own team leader, Ronna Montgomery, with input and support from the Institute's Scottish Education Manager, Gordon Doig. The Scottish management and leadership are essential to support and develop activity based on knowledge of the education system in Scotland.

However, it is also important that the 7 PNCs are part of a larger network. They receive support and direction from the Network Manager, Gary Williams, as well as support and resources from the

ⁱ The Institute, through the PNCs, the Summer School and its Scottish Manager, has a positive and productive working association with SSERC. No doubt SSERC will submit its own response. However, there is a useful 2011 evaluation of their work, *SSERC's Support for Science Education in Scotland through CPD*.

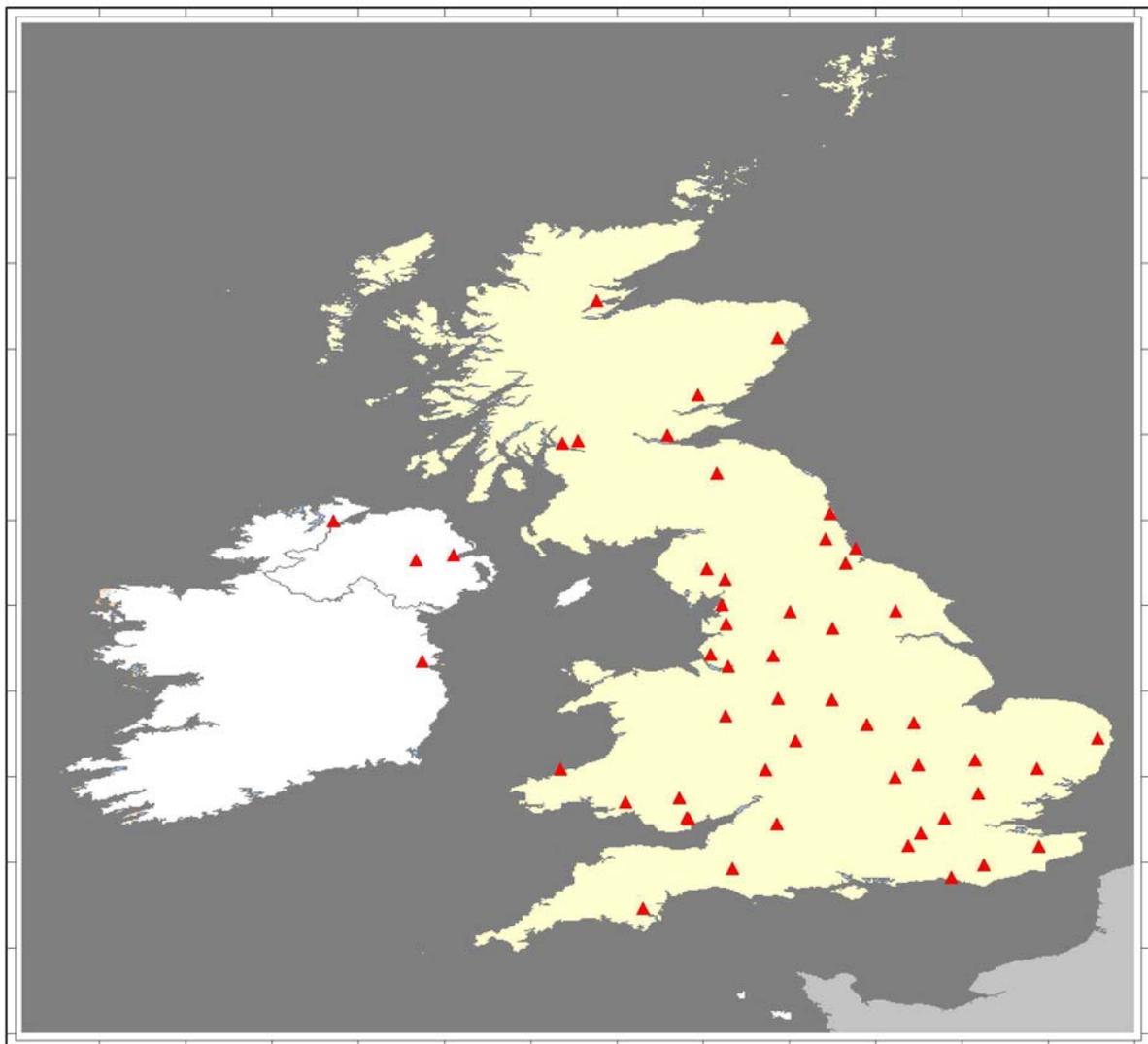
Institute's Education Department in London. And all 53 coordinators share concerns, solutions and ideas on a very active e-mail list and at full coordinators' meetings that take place 3 times a year. It is, if you wish, a community of supporters.

The Physics Teacher Network across the UK and Republic of Ireland

Currently the Physics Teacher Network has 53 Physics Network Coordinators (PNCs) spread across the British Isles (see the map below). The PNCs are typically experienced teachers who work for about half a day of week, during their own time, supporting all those teaching physics or supporting those teaching (or learning to teach) physics, be they PGDE or PGCE students, NQTs, non-specialists, physics teachers or technicians. Every secondary school in the British Isles has the opportunity to make use of the Network and in most areas there will at least have been a termly newsletter delivered to the Head of Physics. While the Network has no desire to turn away anyone involved in physics education in need of help, the predominant target group are secondary schools.

Physics Network Coordinators Map

IOP Teacher Network



The background and activity of a Physics Network Coordinator

PNCs come from a variety of backgrounds. They include experienced, sometimes retired, physics teachers and some relatively new teachers who have exhibited a belief in the importance of sharing good practice.

The type of support that coordinators organise is largely dependent on local need. There may be support for those teaching physics with a non-physics background or, at the other end of the spectrum, encouragement for experienced physics teachers to run workshops³ and spread their own expertise.

Most coordinators organise a mixture of twilight sessions and day meetings. The annual expectation for a PNC is that four twilight sessions will be organised with a day meeting, which is usually a collaborative effort with other coordinators. This should provide a meeting every half term with the exception of the half term in which exams are taken.

The Stirling Meeting and Summer School

The Institute runs an annual meeting for physics teachers (the Stirling Meeting), which attracts just under 200 teachers each year, and, in association with SSERC, a three day residential Summer School, which is, unfortunately, restricted to 20 delegates because of funding issues. Both these events are highly successful, with extremely positive evaluation from the delegates. The Institute's Scottish manager is closely involved with both events and can rely on the help and support of Scottish PNCs when needed.

The Stirling meeting, in particular, plays a big part in enhancing the sense of community amongst Scottish physics teachers.

While physics teachers are ideally placed to provide workshops for other teachers of physics, they usually lack the experience or knowledge to report on what is happening with cutting edge physics research. Therefore, we bring in university academics to talk to physics teachers at day meetings, such as Stirling. Without universities providing speakers for the day meetings, there would be far less interest. It is the balance of up to date subject knowledge and useful pedagogic workshops that make these day meetings so attractive to physics teachers.

This approach has the added benefit of enlarging the community of physics education beyond those who teach in schools, establishing links (albeit loose) with universities and academics. The Institute is keen to promote the idea that a teacher of physics is someone who is doing physics, not a teacher who happens to be teaching physics.

Beyond the Physics Teacher Network

Since beginning more than ten years ago, the success of our Teacher Network has influenced CPD provision more widely. Much of that influence has been based on success in areas which extend beyond those relevant to teaching. For example, the model has been taken up by other organisations possibly because they have seen that it can reach more teachers.

Stimulating Physics Network. The Institute has employed a more intensive version of the original model in the DfE-funded Stimulating Physics Network (SPN), which is aimed more explicitly at non-specialist teachers of physics. The SPN comprises a network of 35 Teaching and Learning Coaches (TLCs), each employed for 2 days a week and each of whom works intensively with 12 schools that have an identifiable problem with physics. Again, the support is bespoke, in-school and, importantly, run with the whole department in the partner school.

The Stimulating Physics Network ran as a pilot from 2007 to 2009, after which the DfE (formerly DCSF) put the project out to tender. The Institute won the tender and has been managing the SPN since 2009 in partnership with the National Network of Science Learning Centres. There have been a number of evaluations of the work of the SPN. Analyses have always shown significant increases in the engagement⁴ of students and with the uptake of physics after the age of 16 (partner schools have reported, on average, a 70% increase for boys and 200% for girls after two years support from SPN)⁵. Additionally, the SPN has, in effect, provided mentoring support for teachers that, has, according to an independent report commissioned by the Gatsby Charitable Foundation, “has had a significant impact on those teachers, with related benefits for their pupils, schools and the education system. We have seen, for example, that external mentoring has helped produce more informed, more adventurous and more committed teachers of physics who are ‘not just teaching by the book’ and who are more likely to remain in teaching. The potential long term impact should not be underestimated”⁶.

Stimulating Physics Support: Mentoring. The Institute has long believed in the power of mentoring for developing and retaining early careers teachers. With the success of the support provided by the SPN, we have now introduced a structured mentoring scheme – Stimulating Physics Support – for Newly Qualified Teachers in the first two years of their career. The aim of this programme, which is running in England, is to reduce the attrition rate amongst those teachers⁷.

Affiliated school

The affiliated schools scheme gives schools a low-cost link to the Institute and provides the schools with support through resources (which are mailed out periodically), a termly newsletter, access to the Institute’s magazine (Physics World) and education journal (Physics Education) and gives the teachers a discount on some events. The purpose of the scheme is, once again, to build links with and between schools by giving access to our work and through notifications of our activities⁸.

On-line support

The emphasis on the Teacher Network has always been face-to-face meetings but the Institute has, in parallel, developed on-line support – initially through e-mail lists and, more recently, through community websites. Internationally, the Institute administers a mail list for Physics Teacher News and Comment (PTNC)⁹. However, the Scottish PNCs decided early on that a discussion forum was needed for Scottish teachers of physics. This is Scottish Physics Teaching News and Comment (SPTNC or SPUTNIK).

SPUTNIK

SPUTNIK is an email bulletin board which now has over 800 subscribers, and typically has between 15 and 30 posts per day. The traffic includes general discussions on pedagogy and the curriculum, alerts on relevant news articles, videos, websites, and new equipment, requests for help on various aspects of physics teaching, and the sharing of new ideas. Often questions will receive 5 or 6 responses within a couple of hours of being posted.

Talkphysics

The success of PTNC and SPUTNIK encouraged the Institute to develop a community website for discussions - Talkphysics¹⁰. This has a number of advantages over the e-mail lists: the ability to set up groups within the site; the ability to embed rich media and to upload documents; and the ability to see the profiles of the professionals who are taking part in conversations. Talkphysics now has over 6000 registered users and a very active news and comment group. It is our hope that it will develop into a rich and deep professional forum through which teachers share ideas, resources and opinions. But, most importantly, they discuss anything that they upload and, we hope, challenge each other to be reflective of their work, their views, their resources and the way that they use them: a truly professional network of reflective practice and development.

However, it has not really taken off in Scotland, perhaps due to some early technical problems. And, in the meantime, a private web repository, SPTR, has grown in Scotland.

SPTR.NET

SPTR was set up in 2004 by a private individual to store and share resources for Intermediate 1, following a discussion on SPUTNIK. Other mechanisms were tried including GLOW. Over the years and after several different websites this eventually morphed to sptr.net in June 2011. Here physics teachers from all over Scotland can share the teaching resources they have produced.

As of November 2012 there were almost 800 registered user accounts. The resource shared through sptr.net now totals over 3GB of documents (there's no video!). The "Browse Resources" page accessible only to registered and logged--in users received over 12,000 views during the month of November 2012.

The domain sptr.net, hosting, development, management and curation of the site are the work and contribution of a private individual, but the resource files, which are stored on DropBox, are contributed by teachers all over Scotland. It is deliberately kept independent of and at arm's length from any organisation in order to avoid inertia, malicious litigation or commercial exploitation.

Reflections on the networks

Community. We are determinedly trying to build a community of reflective professionals who support, work with and test each other on their teaching activities and practices.

Bottom up. The Teacher Network, PTNC, SPUTNIK and talkphysics are all very much bottom up – from the grass roots. They exist by teachers providing support for other teachers.

Bespoke. PNCs (and TLCs) will always discuss with teachers what their needs are. A session will be developed or adapted to suit those needs.

With central provision. However, asking teachers exactly what they want isn't always practical - answers vary. Therefore, PNCs take an approach that offers a “menu” and asks teachers to choose. We provide a number of “Central Workshops” that coordinators can run (see below) but as the Scottish part of the Network has evolved it has drawn less and less on these resources.

Time and place. PNCs offer sessions at times and in places that suit teachers. Often, they will be twilight sessions based in a school. Options may well include workshops run in twilight sessions, a choice of workshops in a day meeting, or the next workshop(s) the IOP should be developing.

Recruitment. We are very careful about the people we recruit and will always recruit someone because of how good they are rather than where they live.

Supporting the supporters. The Institute takes the development of its field workers seriously. We run national meetings, CPD conferences and provide support and ideas for workshops throughout the year. There is a community of community leaders.

Nurturing expertise. As the Scottish Coordinators have almost all been in place for many years, they have become expert in their field - they have had had access to professional development in ways few other teachers have. For instance, some now have 30-40 years teaching experience and ten years of access to quality resources developed through a research base.

Conclusion

The IOP Teacher Network has grown into an effective way to run CPD. It has certainly worked operationally: it is a very effective way of providing and encouraging support of teachers of physics and satisfaction ratings are always very high. The features that enable this popularity include:

- Experienced, enthusiastic and passionate teachers working as network coordinators.
- Cooperative Physics and Education departments in universities.
- Funding to enable coordinators to operate.
- High quality central workshops that allow coordinators to put on sessions more easily.
- An emphasis on people.

On the one hand, the dispersed and pervading nature of the support means that it has always been difficult to measure impact on pupils. On the other hand, the Stimulating Physics Network (see above) has worked intensively with a smaller number of schools and the independent evaluations of its support have always shown significant increases in the engagement with and uptake of physics after the age of 16.

Our experience over the last ten years has allowed the Institute to refine and expand the way we support teachers through professional learning networks. Each of our offering has been planned and built to address local issues in ways that suit the local landscape.

As you can imagine, we very much support the report from the Science and Engineering Education Advisory Group (SEEAG) in January 2012 and the recommendation that Education Scotland and Local Authorities should stimulate development and growth of Professional Learning Communities in STEM, and we would be glad to help where we can.

Links and references

- 1 The Institute of Physics Teacher Network:
<http://www.iop.org/network/>
- 2 SSERC's Support for Science Education in Scotland through CPD, 2011:
http://www.science3-18.org/images/Publications/SSERC%20SCRE_final.pdf
- 3 Teacher Network's central workshops (note that PNCs also run bespoke, local workshops).
http://www.iop.org/education/teacher/support/network/cpd-sessions/page_44093.html
- 4 Independent evaluation of Stimulating Physics Network, Babcock Research, June 2011.
http://www.stimulatingphysics.org/pdfs/SPN%20Final%20Report_FINAL.pdf
- 5 Impact report of phase 1 of Stimulating Physics Network. 2011.
<http://www.stimulatingphysics.org/pdfs/SPN%20Phase%20One%20Impact%20Report.pdf>
- 6 The Nature, Impact and Potential of External Mentoring for Teachers of Physics, Hobson et al, Gatsby, 2012:
<http://www.gatsby.org.uk/~media/Files/Education/Gatsby%20%20Impact%20of%20Mentoring.ashx>
- 7 Stimulating Physics Support – a mentoring scheme for early career teachers:
<http://www.stimulatingphysics.org/SPS.htm>
- 8 IOP Schools Affiliation Scheme:
www.iop.org/affiliation.
- 9 The list of all the Institute's mail lists:
http://www.iop.org/education/teacher/support/discussion/page_41530.html
- 10 The Institute's community website for teachers, Talkphysics
www.talkphysics.org