THE NATURE, IMPACT AND POTENTIAL OF EXTERNAL MENTORING FOR TEACHERS OF PHYSICS AND OTHER SUBJECTS IN ENGLAND

FULL REPORT

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SECTION 1: INTRODUCTION

CHAPTER 1. RESEARCH AND POLICY CONTEXT

This report presents the main findings of the 'Modes of Mentoring and Coaching' (MoMaC) research project, an investigation into the nature, impact and potentially broader applicability of the work of regional mentors associated with three national support programmes for teachers of secondary science in England. We begin by providing a brief overview of the context and rationale for the study (Section 1.1) and a description of the support programmes examined (1.2). In Section 1.3 we outline our conceptualisation of mentoring and coaching, and explain our use of the term 'external mentoring', and in Section 1.4 we provide an account of the research design of the study, including the methods of data generation and data analysis employed.

1.1 CONTEXT

It is widely recognised that there is an international problem of teacher shortage in certain subject areas, which is related to difficulties both of recruiting and retaining such teachers (Ingersoll, 2003; Osborne & Dillon, 2008). One consequence of this is that in some secondary schools, shortage subjects, which in the UK include physics, chemistry and mathematics, are by necessity frequently taught by non-specialists[1] (Moor *et al*., 2006), who in many cases may not possess an adequate grasp of relevant subject content and subject pedagogy. All of this has implications for pupil learning, for pupils' willingness and ability to study these subjects to higher levels, for the production of future generations of (for example) scientists and teachers of science, and in turn, for the future competitiveness of the economy (Royal Society, 2006; Royal Society, 2008).

Within the UK, both policy-makers and the professional science community, represented by organisations including the Institute of Physics (IOP) and the Royal Society for Chemistry (RSC), have sought to address these issues by funding and developing a series of initiatives for supporting the teaching of science in schools, including programmes designed to support non-specialist teachers of physics and chemistry. Three such programmes, namely the *Physics Enhancement Programme* (PEP), the *Science Additional Specialism Programme* (SASP), and *The Stimulating Physics Network* (SPN), are of particular interest in that they have incorporated not only formal training in subject content and subject pedagogy, but also the opportunity for participating teachers or trainee teachers to access a Regional Support Mentor (PEP), Regional Advisor (SASP) or Teaching and Learning Coach (TLC) (SPN) – subject specialist teachers whom we collectively term 'external mentors' (EMs).[2]

[1] There is presently no agreed definition or usage of the terms 'specialist' and 'non-specialist' teacher (SCORE, 2011). In the report cited above, Moor *et al*., (2006) refer to subject specialists as those who have undertaken a degree in (or incorporating some study of) the subject, or who have studied the subject as part of initial teacher training (p.i). For the purposes of this (MoMaC) research project, subject specialists were considered to be those who had studied the subject as a *major* component of an undergraduate and/or postgraduate degree, although this working definition may not have been shared by all of our research participants. We also acknowledge that teachers who have not studied a subject as a major part of a first or postgraduate degree might nonetheless be considered to be subject specialists if they have successfully completed a Subject Knowledge Enhancement (SKE) course or have gained relevant knowledge and experience in industry which, in the case of science teachers, might be formally recognised through membership status of the Institute of Physics, Royal Society of Chemistry or Society of Biology.

[2] It should be noted that the PEP and SASP programmes only included provision for regional or external mentors during their pilot phases, where the mentoring component was funded by the Gatsby Charitable Foundation (Shepherd, 2008). This element was dropped when the programmes were rolled out nationally.

Since the 1980s, mentoring and coaching as methods of facilitating the professional development of trainee and in-service teachers have become increasingly widespread in the UK and many other parts of the world.[3] They are associated with a number of potential benefits for mentees and schools, including those relating to teacher socialisation, skill development, job satisfaction and retention (Wang & Odell, 2002; Hobson *et al.,* 2009). However, mentoring and coaching have typically been carried out by (normally more experienced) colleagues employed by and working in the same schools as the teachers or trainees they have been supporting, and the research evidence on mentoring and coaching relates almost exclusively to such workplace or 'internal mentoring'. While the approaches to mentoring and coaching associated with the three programmes outlined above differ in various respects, what they have in common, which distinguishes them from more traditional approaches to mentoring, is that they are provided by mentors or coaches *external* to the school / institution in which the trainee or established teachers being supported are based. The MoMaC research project set out to explore the nature and impact of the external mentoring and coaching associated with PEP, SASP and SPN, and to consider whether it might have potentially wider applicability to teachers of these subjects.

1.2 AN OVERVIEW OF THE SUPPORT PROGRAMMES UNDER INVESTIGATION

The Physics Enhancement Programme (PEP)

PEP, which was first introduced in its pilot phase in 2004, aimed to support graduates who do not have a traditional physics degree and to equip them with the necessary skills and subject knowledge to become specialist physics teachers. It began with a six month physics enhancement course (PEC), provided by a higher education institution (HEI), after which those who successfully completed the PEC went on to undertake a programme of initial teacher preparation (ITP)[4], namely a postgraduate certificate in education (PGCE). During the pilot phase of PEP, the IOP appointed a number of experienced teachers of physics to act as part-time, regionally based providers of what has been described as 'light touch' mentoring (Shepherd, 2008). Participants could access this for up to two years after the completion of the PEC, which normally took them to the end of their first year in teaching and the completion of their newly qualified teacher (NQT) induction period. The mentoring component was introduced (and funded by the Gatsby Charitable Foundation) because of concerns that the enhancement courses would provide insufficient time to '*achieve and sustain gains in subject knowledge*' (Shepherd 2008, p.4). Physics Enhancement Courses (without the external mentoring component of PEP) now form part of a wider government-funded national programme of Subject Knowledge Enhancement (SKE) courses covering mathematics, physics and chemistry.

The Science Additional Specialism Programme (SASP)

SASP, launched in 2007, was an accredited programme of continuing professional development (CPD) designed to enhance practising science teachers' knowledge of either physics or chemistry where this was not their original specialism.

[3] Different writers mean different things by mentoring and coaching, while others use the terms interchangeably. An explanation of what we mean by the term is given in section 1.3 below.

[4] We use the term *initial teacher preparation* (ITP) to refer to what is variously described as initial teacher training (ITT), initial teacher education (ITE), and pre-service training. Our preference for the use of ITP has been explained elsewhere (e.g. Hobson *et al.,* 2008).

Again the courses were led by HEIs and supported by the IOP, and also in this case by the RSC. The mentoring component of SASP was, as for PEP, envisaged as 'light touch', with contact intended to be periodic rather than intensive and to have an element of flexibility and a '*greater component of school-based visits*' (Shepherd 2008, p.5). The IOP/RSC's '*Role description for mentors*' stated that the mentors (or Regional Advisors) were expected to '*establish a friendly and professional relationship with the mentee*', to support the learning of concepts and skills, facilitate access to resources and networks, and '*support the mentee in setting and reviewing their own short, medium and long-term goals*' (cited in Holland *et al*., 2010, p.71). Contact between mentors and mentees was envisaged as continuing for two years. SASP became nationally available in 2009 and, as with PEP, now forms part of the wider SKE programme for new, existing and returning teachers.

The Stimulating Physics Network (SPN)

The SPN, funded by the Department for Education (DfE) (formerly DCSF), is a support network for teachers and pupils of physics in England, set up and run by a partnership of the IOP and the Science Learning Centres. One of the major components of the SPN is provided through the work of 23 Teaching and Learning Coaches (TLCs). Each TLC is employed on a part-time basis to provide bespoke programmes of support for the teaching and learning of physics in each of 12 schools in their region. The schools were identified as in need of support on the basis of criteria such as a low take-up of A-level physics and the absence of specialist physics teachers. The role of TLCs is thus quite broad and includes 'whole-department' and 'whole-school' support, but our interest for this study relates to TLCs' support for teachers' continuing professional development (CPD), and in particular any one-to-one or group coaching or mentoring that they undertake.

The external mentors associated with the PEP, SASP and SPN programmes were all experienced teachers of science. Most were still employed as teachers, while some were recently retired and/or combining their EM roles with other teacher development or consultancy work. Many of the EMs were or had been heads of department in schools, and some had worked on university-administered ITP programmes.

While formal evaluations of the PEP, SASP and SPN programmes have been carried out (at the commencement of our research two were still in progress), these have a broader focus on the programmes as a whole and, with the exception of the SASP evaluation (Holland *et al*., 2010), have not been able to examine in any depth the nature and impact of the mentoring and coaching strategies employed. In addition, no evidence exists that would support a comparison of the range of approaches to mentoring and coaching employed *across* the three programmes. Indeed, there is little international evidence which attempts to compare and contrast alternative approaches to mentoring and coaching and to evaluate their relative effectiveness.

In addition to the three programmes outlined above, a pilot programme was introduced in 2009 to offer mentoring and support to would-be or beginning teachers of mathematics and science, during their final year of ITP and their first two years of teaching. Through this '*Starting Out*' programme, funded by the Training and Development Agency for Schools (TDA) and managed by the Learning and

Skills Network (LSN), beginner teachers in three regions (London, East of England and West Midlands) could 'opt in' to one of three different kinds or 'models' of mentoring support, referred to as:

- *subject mentoring*, where one mentor supports a small number of mentees through termly face-to-face meetings and online support;
- *e-mentoring*, where after an initial meeting one mentor supports around 10 mentees, largely online; and
- *network mentoring*, where one mentor supports a larger number of mentees (<25) through local events and group meetings that provide opportunities to meet others in a similar position, together with online support.

While the MoMaC research team was interested in Starting Out, at the commencement of our research an evaluation of the programme was well underway, conducted by the National Foundation for Educational Research (NFER), and in order to minimise burdens on participating beginner teachers, we decided not to generate our own data on the programme. Instead we sought to collaborate with NFER, which resulted primarily in sharing research instruments, in an attempt to ensure some commonality of data generation and facilitate a comparison of findings across the two studies. We subsequently undertook a critical review of the final report of the Starting Out evaluation (MacLeod *et al*., 2012), alongside other literature relating to this programme, to inform the conclusions and recommendations of our study, which are provided in Chapter 8.[5]

1.3 A WORKING DEFINITION OF MENTORING AND COACHING

As indicated earlier, we use the term (external) mentoring in general terms to refer to the work of PEP 'Regional Support Mentors', SASP 'Regional Advisors', and SPN 'Teaching and Learning Coaches' (TLCs). However, not all of the work associated with the three support roles is consistent with some definitions of mentoring. Before proceeding to outline the research design of the MoMaC study, we provide some exploration of the terms associated with the roles.

The terms 'mentoring' and 'coaching' are often used interchangeably, though they tend to mean different things to different people. Most authorities on the matter (e.g. Clutterbuck, 1992; Kram, 1985; Malderez & Bodoczky, 1999) see mentoring as the broader of the two concepts, an interpretation with which the present authors concur. For the purposes of this report, mentoring refers to the support provided by '*a more experienced practitioner (mentor), designed primarily to assist the development of the mentee's expertise and to facilitate their induction into the culture of the profession*' (Hobson *et al*., 2009, p.207). We see coaching as one of a number of potential mentor roles, notably one which relates to support for assisting mentees' skill development (Malderez & Bodoczky, 1999; Hopkins-Thompson, 2000).[6] We recognize, however, that some writers adopt a broader conceptualisation of coaching which incorporates some functions normally associated with mentoring, such as a focus on the psychological well-being of the 'coachee' (Popper & Lipshitz, 1992).

[5] We should note that the TDA and DfE decided, prior to the completion of the evaluation, that they would not roll out the Starting Out programme, and that the LSN have subsequently gone out of business.

[6] The full range of mentor roles (Malderez & Bodoczky, 1999) is outlined in Chapter 2 (Section 2.3.2) below.

Given our understanding and interpretation of mentoring and coaching, as set out above, henceforth in this report we mostly use the term mentoring, as the broader of the two concepts and one which potentially incorporates coaching.

1.4 RESEARCH DESIGN AND METHODS

1.4.1 OVERALL DESIGN

The MoMaC project employed a *sequential mixed method design* (Tashakkori & Teddlie, 1998), beginning with a scoping phase (in early/mid 2010), which informed a 'qualitative' research phase (2010-11), which in turn informed a 'quantitative' research phase (autumn 2011).[7] This design enabled us to explore existing knowledge of the mentoring and coaching components of the programmes under investigation, and to facilitate detailed insights into the lived experiences of PEP, SASP and SPN participants (qualitative strand), whilst exploring similar issues amongst a larger national sample of teachers (quantitative strand).

The research was conducted in accordance with the ethical guidelines of the British Educational Research Association (BERA, 2004).[8] For example, all participants were granted the opportunity to give or decline their informed consent to take part in the study, as well as the right to withdraw their consent, while efforts have been taken to ensure the anonymity and non-traceability of participants, including the use of pseudonyms in Chapter 6.

1.4.2 METHODS OF DATA GENERATION, SAMPLING AND DATA ANALYSIS

The *scoping phase* began with a review of existing literature, analysis of existing datasets and informal interviews with relevant stakeholders associated with the programmes under investigation. The literature reviewed at this stage included:

- Scott, P. and Ryder, J. (2007) *Physics Enhancement Project (PEP) Evaluation: Final Report.* University of Leeds.
- Holland, M., Hudson, T., Cripps, C., Barley, R. and Wolstenholme, C. (2009) *Evaluation of the Mentoring Extension to SASP: Report at End of First Year* (Revised). Sheffield Hallam University.[9]
- Johnson, S., Riazi-Farzad, B., Reiss, M., Hallam, S. and Rogers, L. (2008) *Evaluation of Stimulating Physics: Final Report on the Pilot Phase*. Institute of Education, University of London.
- Lord, P., Harland, J., Flack, J. and Straw, S. (2010) *Starting Out – interim report. The evaluation of the TDA-funded pilot concerned with mentoring early career science and mathematics teachers.* National Foundation for Educational Research.[10]

The datasets analysed included:

- IOP and RSC SASP Regional Advisor support record forms;
- IOP TLC School Support Programme record forms;

[7] We use inverted commas here to acknowledge that the distinctions between qualitative and quantitative research, methods and data are somewhat simplistic and exaggerated, as Hammersley (1996) and others have shown.

[8] These ethical guidelines have subsequently been revised and updated (BERA, 2011).

[9] This interim report was superseded by the final report of the SASP mentoring evaluation (Holland *et al.*, 2010), which we also reviewed (subsequent to the scoping phase of our study) and draw on in this report.

[10] This interim report was superseded by the final report of the Starting Out evaluation (MacLeod *et al.*, 2012), to which we refer in Section 1.2 above, and again in Chapter 8 of this report.

- Transcripts of interviews undertaken with PEP participants for the IOP's 'Peptalk' magazine[11]

The informal interviews were conducted with the evaluators of the PEP pilot, the evaluators of the SASP mentoring extension and five stakeholders associated with the PEP, SASP and SPN programmes. All literature and data were analysed thematically against the broad research aims referred to in Section 1.1 above.

The outcomes of these analyses informed the methods of data generation to be employed during the remainder of the MoMaC study, and (in particular) the development of protocols for the initial interviews conducted during the qualitative research phase, which we now outline.

The first strand of the *qualitative phase* of the research involved part-structured interviews with:

- external mentors from the PEP, SASP and SPN programmes, and
- mentees from across the same programmes, to elicit these participants' experiences and perceptions of external mentoring; and
- PEP and SASP participants who had not had access to an external mentor, to explore their views about the potential value of external mentor support which was not presently available to them.

Given the relatively small number of PEP mentors (7) and SASP regional advisors (8), we invited all of these to take part in our interviews, together with a stratified sample (by region[12]) of all teacher mentees who had given permission to be contacted by email. This amounted to a total of 155 PEP mentees and 90 SASP mentees. We also invited a stratified sample of 12 TLCs, and since we had no direct means of identifying teachers who had accessed TLC support, those TLCs who agreed to participate in our research were also asked to invite teachers they were supporting to participate in the study. Finally, four providers of 'post-pilot' PEP and four providers of post-pilot SASP (based on their geographical proximity to existing fieldwork sites) were asked to facilitate the research team's access to 'unmentored' participants on their programmes.

As a result of these recruitment efforts, part-structured interviews were conducted with:

- 19 external mentors from across the PEP, SASP and SPN programmes;
- 47 mentees from across the same programmes; and
- 10 'post-pilot' or 'unmentored' PEP or SASP participants.

A more detailed breakdown of the achieved interview sample, and the distribution of participants across the three programmes, is provided in Table 1.1 below.

[11] We are grateful to the IOP and RSC for providing us with access to these data and securing the necessary permissions. The record forms analysed were completed by EMs to evidence the support provided to mentees. The Peptalk magazine is a free bi-monthly publication produced by the IOP and distributed to PEP participants and other interested parties.

[12] We sought to ensure that participants in different parts of the country were represented.

Where possible, and in the majority of cases, interviews were conducted on a face-to-face basis. Where this was not possible, participants were interviewed via telephone or asked to give their responses to our questions via email.

The second strand of the qualitative research phase comprised case studies of the work of six external mentors, involving:

- either direct observation of a sample of face-to-face mentoring, or the collection of data relating to 'remote' mentoring – notably email communication between mentor and mentee;
- follow-up, part-structured interviews with mentors and mentees.

The case study participants were selected using purposive sampling, following the analysis of data generated from the earlier part-structured interviews, to facilitate the examination of the variety of approaches to mentoring in use. They comprised:

- 2 PEP mentors (including 2 observations, retrieval of email exchanges between a mentor and 5 mentees, 3 mentee interviews, 1 additional mentor interview);
- 2 SASP mentors (including 2 observations, 2 email exchanges, 3 mentee interviews, 2 additional mentor interviews);
- 2 SPN Teaching & Learning Coaches (TLCs) (including 3 observations, 7 interviews with teacher or head of department participants, 3 additional TLC interviews).

Further information about the case study participants is provided in Chapter 6, where we present our case study findings. Table 1.1 below provides a summary of all interviews conducted for the qualitative research phase.

The interview data from the first strand of the qualitative phase were transcribed in their entirety. Eight of the mentor and 12 of the mentee transcripts were initially subjected to an inductive analysis, '*a process of coding the data without trying to fit it into a pre-existing coding frame*' (Braun & Clarke 2006, p.83), where members of the research team read transcripts and independently identified important emerging themes. The researchers discussed these interpretations in light of the MoMAC research aims and this led to the production of a coding frame which was used for subsequent thematic analysis of the full set of the transcripts using qualitative data analysis software (MAXQDA).

Table 1.1 Interviews conducted

	PEP (including case study interviews [13])	**SASP (including case study interviews)**	**SPN (including case study interviews)**	**Total (including case study interviews)**
Mentors / TLCs	5 (6)	6* (7)	8 (11)	19 (24) [14]
Mentees	19 (22)	9 (14)†	19 (26)	47 (62)
'Unmentored' PEP and SASP participants	6	4	N/A	10
				Total 76 (96)

* Two of the SASP mentors were supporting teachers of Chemistry.

† Two of the SASP mentees were being supported for their teaching of Chemistry, the remainder were supported for Physics.

[13] Some mentees who took part in the case study work had not previously been interviewed; whereas all case study mentors/TLCs had previously been interviewed.

[14] During interview, it transpired that one of these participants was also a Starting Out mentor, and the interviewer took the opportunity to elicit her/his experiences and perceptions of the programme, which we refer to in Chapter 8.

The interviews conducted for the case study strand of the research were transcribed in full and these transcripts were analysed, along with notes from the observations of face-to-face mentoring and email evidence relating to 'remote' mentoring, to produce the case studies reported in chapter 6. The initial drafts of the six case study reports were sent to the relevant mentors, who were asked whether:

(i) they felt these were an accurate reflection of their work;
(ii) they had any concerns about any of the content;
(iii) they would re-affirm their consent for us to publish these accounts of their work;
(iv) they wished to make a brief comment which might be included in our report.

In general, the mentors were satisfied with the case study accounts, and comments to this effect are included in Chapter 6. In two cases, minor revisions were carried out to the drafts, in response to mentors' expressed concerns about some of the detail potentially compromising their anonymity or non-traceability.

Data for the *quantitative research phase* were generated via the Teacher Voice Omnibus (online) Survey, administered by NFER in autumn 2011. Informed by the emergent outcomes of our qualitative analyses, and in collaboration with NFER colleagues, the MoMaC research team developed a number of questions to be included in the survey of a national panel of primary and secondary teachers. These questions were designed to explore:

- the extent to which teachers of Physics and other sciences were typical or untypical of those of other subjects nationally, in relation to the matters explored in our research;
- the extent to which teachers of other subjects and at different stages of development might benefit from the kinds of 'external mentoring' support associated with the PEP, SASP and SPN programmes; and
- the factors which might encourage or discourage teachers from accessing such support, were it to be available.

The MoMaC survey questions are provided in Appendix I of this report.

The survey was completed by practising teachers from 1210 schools in the maintained sector in England. The teachers were drawn from the full range of roles in primary and secondary schools, from head teachers to newly qualified class teachers. There were 4054 primary teachers in the panel, of whom 849 responded to the survey. Of the 3527 secondary teachers who comprised the panel, 709 responded. As we can see from Table 1.2 below, the overall response rate was 21 per cent. Of the total number of respondents to the survey (1558), 54 per cent were from primary and 46 per cent from secondary schools.

Table 1.2 The survey sample

	Total sample	Achieved sample	Response rate (per cent)
Primary teachers	4054	849	21
Secondary teachers	3527	709	20
Total	**7581**	**1558**	**21**

Ninety-eight of the secondary respondents identified themselves as teachers of physics, and three of these indicated that they already had access to an external mentor. Of the 95 teachers of secondary physics who stated that they did not have access to an external mentor at the time of the survey:

- 41 were women and 54 were men;
- around a third (n=33) said that they had studied physics as a major part of their first and/or a postgraduate degree;
- 34 had been teaching for no more than 10 full years, 38 had between 11 and 20 full years' teaching experience, while 23 had been teaching for more than 20 years.

Further information about the survey sample is provided in Appendix II.

Survey data were analysed via SPSS software, using both descriptive and inferential statistics. In presenting descriptive and aggregated statistics, we report both actual and weighted percentage responses to particular questions, where the latter figures could be considered to be more representative of the national population of primary and secondary teachers.[15]

Regarding the use of inferential statistics, standard non-parametric tests such as the chi-square test were employed to investigate whether emergent findings, such as associations or differences between different variables or categories of respondent, were likely or unlikely to have occurred through chance alone, and whether such findings within our sample might reasonably be inferred to the wider population of teachers in England. A probability or p-value of less than five per cent ($p<0.05$) suggests that the finding is statistically significant or unlikely to have occurred by chance alone.[16]

[15] The weightings were applied to the data to compensate for an under-representation of teacher respondents from schools judged to have lower socio-economic status, based on pupils' eligibility for free school meals. Further details are provided in Appendix II.

[16] It should be borne in mind that where a result or a pattern of differences is found to be 'statistically' significant, this does not necessary imply that it has any educational significance or practical importance. Conversely, non-statistically significant results might sometimes reveal valuable findings.

1.5 CONCLUSION

Having outlined the methods of data generation and analysis employed in the MoMaC research, we now go on to present the findings of those analyses. Drawing on our analysis of data generated for the qualitative phase of the research, the focus of Chapters 2-6 is on external mentoring support for secondary teachers of physics associated with the PEP, SASP and SPN programmes. The outcomes of the analysis of data from the relatively small number of Chemistry SASP participants and their mentors are then reported in Chapter 7, along with the findings of our analyses of Teacher Voice Omnibus survey data, relating to the potential demand for external mentoring amongst both primary and secondary teachers of a range of subjects. The outcomes of our critical review and secondary analysis of the literature and data relating to Starting Out are incorporated into our concluding chapter (Chapter 8).

SECTION II:
THE NATURE AND IMPACT OF EXTERNAL MENTORING FOR TEACHERS OF SECONDARY PHYSICS

CHAPTER 2. TYPES OF SUPPORT PROVIDED BY EXTERNAL MENTORS

2.1 INTRODUCTION

This chapter focuses on the kinds of support provided by external mentors (EMs) associated with the PEP, SASP and SPN programmes. It begins by discussing the nature of the contact between mentors and the trainees or teachers they support, whom we frequently refer to as mentees.

2.2 TYPES AND FREQUENCY OF CONTACT

Across all three programmes, both mentors and mentees reported that contact between them most commonly took place on a *face-to-face* basis and/or via *e-mail*. Some mentoring and support also occurred through *telephone conversations*, while a minority of mentors and mentees communicated via *text messaging* and/or *social networking sites* such as Facebook.

Face-to-face contact included both *one-to-one* meetings between the mentor and mentee (often at the mentee's school, occasionally at the mentor's) and *group meetings*. Group meetings were sometimes formal occasions such as school-based workshops for groups of physics teachers, and sometimes more informal get-togethers such as evening meals or visits. Other opportunities for face-to-face contact between mentors and mentees occurred at various events, including regional and national conferences, such as the Association for Science Education (ASE) annual conference, which mentees were encouraged to attend. Most EMs engaged with individual mentees via a number of different channels of communication, as suggested by the following excerpt from an interview with a SASP participant:

He's been on the end of email and the end of the phone ... text, we've met for coffee, he actually came back to my house once, he's been to the school ... several times. (SASP mentee)

While the balance between the different forms of contact outlined above varied to some extent across individual mentors within each of the programmes, there were also general differences of emphasis across these, partly reflecting the intended aims of the programmes and the particular briefs of the PEP mentors, SASP regional advisors and SPN TLCs. Specifically, our evidence suggests that SASP mentors tended to undertake more school visits to work with individual mentees than their PEP counterparts, who were more likely to engage with their mentees through email communication and informal get-togethers. TLCs were much more likely than the other EMs to engage groups of physics teachers in school-based workshops, and less likely to support mentees via more remote forms of communication such as email.

The *frequency of contact* between EMs and mentees varied over time, according to need, and depending on the type of contact involved. While some teachers who were eligible for EM support did not take this up (see Chapter 3), for those who did, the contact typically ranged from once a week to once a term. However in some cases PEP and SASP mentor-mentee dyads exchanged up to 20 emails in a month at particular times of need. In general, for PEP and SASP participants the frequency of contact declined over time, notably after the first 12-18 months, as participants became more confident about teaching and about teaching physics. The picture was a little different for SPN participants, where face-to-face contact between the TLC and groups of teachers (typically departments) remained fairly constant but there was an increase in both face-to-face and remote forms of *one-to-one* contact over time, as some teachers initially introduced to their TLC through a group activity began to request individual support:

...after doing a session I will often sit in the staffroom for half an hour. It's a little like a clinic and teachers will come along and ask questions that they wouldn't in front of the head of department. (TLC)

Across all three programmes, contact could be – and was – *initiated* by both mentees and EMs, though EMs would tend to make contact with and offer support to individual mentees (PEP and SASP) or through the school coordinator (SPN) if they had not heard from them for some time:

Contact was initiated at different times by each of us although if [EM] *hadn't heard from me for a while he would email to check if any support was needed.*
(SASP mentee)

2.3 TYPES OF SUPPORT PROVIDED

The general aims of EMs across the PEP, SASP and SPN programmes were to help participating trainees and teachers become effective (or more effective) teachers of physics, and through doing so to encourage their retention in the teaching profession. In carrying out their roles and seeking to achieve these aims, our evidence suggests that the majority of EMs tailored the support they provided to the individual needs of their mentees and the schools in which they were based. Such individualized support was facilitated, in some cases, through needs analyses conducted by mentors at an initial meeting, and/or through responding to participants' specific requests for assistance. In general though, EMs were found to address seven main kinds of support need. These are listed below, together with illustrative quotations, in approximate order of frequency of mention and emphasis in our interviews with mentors and mentees across the three programmes. (The number of mentees and/or mentors who specifically referred to each of the following kinds of support is provided in parentheses.[17])

[17] The reader is reminded that 45 physics teacher mentees and 17 physics mentors were included in this analysis. The frequencies given are indicative and should not be assumed to represent the exact number of mentees who received or mentors who provided each kind of support listed, and in most cases will underestimate the true figure since some interviewees did not always have the opportunity to talk about all of the types of support discussed here, while it is unlikely that at the time of their interviews all participants will have been able to recall all types of support provided.

2.3.1 ADDRESSING SEVEN KINDS OF SUPPORT NEED

(1) Support for subject pedagogy – how to teach physics, or particular aspects of the physics curriculum in schools (39 mentees; all 16 mentors)
I remember when I was doing my PGCE and he came to see me in my school and he helped me with this low, bottom class and I found it so hard to pass physics across to them as a teacher and he gave me some tactics on how to go about it. (PEP mentee)

When he came in [to school] *we discussed the space project but while he was there I spoke to him about teaching moments to a Year 9 class because ... it never works. But he gave me some pointers and turned it round to look at why it didn't work, rather than to try it and have it fail.* (SASP mentee)

...What I find is it is one thing knowing it... This subject ... some areas are just dry and if you're not careful the kids will be thinking 'I'm never going to do this after secondary school' and that's one thing we are trying to avoid. So [EM] *comes in with ideas of ways to make it more engaging, things that the kids are actively involved in, little things you wouldn't think about, like bending water with a ruler ... The kids are like 'wow!' Just things like that to make the subject more interesting.* (SPN mentee)

(2) Support for subject content knowledge (25 mentees; 14 mentors)
[EM] *delivered training sessions to myself and other non-physics specialists in my department on key areas of the KS4 physics curriculum. These were all within P6 and P7 of the 21st Century Science ... The training sessions delivered by* [EM] *were organised to tackle particular areas of weakness in subject knowledge.* (SASP mentee)

Recently we were going through the delivery of electricity as a topic – some teachers were not particularly understanding of some elements of this. [EM] *picked this up from their body language and explained further. I think* [EM] *was attuned to that and adjusted his approach appropriately.* (SPN mentee)

There are several indications in our data that some of the teachers being supported were unaware of (or perhaps reluctant to acknowledge) limitations in their subject content knowledge. Where EMs became aware of this, or perceived it to be the case, they sought to address it in as sensitive way as possible, without drawing attention to it – what we might call *support for subject content knowledge by stealth*:

They [SASP mentees] *didn't understand the physics themselves and I had to be tactful so I'd talk about the methodology of using experiments and practicals and hence go over the subject knowledge without them feeling they were having a theoretical Physics lesson and knowing there was a non-judgemental face who would help them over the hurdles.* (SASP mentor)

I think it is important to provide the types of support they are asking for and I am doing that. Having said that some teachers have indicated that they are happy with their subject knowledge and don't need support with that but in providing other sessions I have discovered that this is not always the case so try to subtly correct any misconceptions, e.g. about radioactivity, in the sessions that I provide. (TLC)

(3) Support for mentees' emotional wellbeing (15 mentees; 9 mentors)
When we talk on the phone we sometimes have a long conversation about the stresses, and the whole thing at the end of the summer when the school was talking about becoming an academy. So he's, for want of a better word, someone I can off-load to. (PEP mentee)

Of course as a teacher you sometimes get stressed, if the girls don't do well, despite the fact we are in an inner-city school where most people don't expect them to do well, my nature is the type that would worry about it ... So yes in terms of getting really stressed and talking about them not doing well and [EM] *will say things like 'don't be silly, of course they will do well, you're teaching them well, they are doing this well, they are doing that well'* (SPN mentee)

(4) Support for general pedagogical techniques (teaching methodologies)
(7 mentees; 5 mentors)
Any discussion about teaching at those meals has been about general teaching, it wasn't really about particular physics topics...The very nature of the stage we're at is that people are more concerned about things like classroom management... (PEP mentee)

[EM] *gave me some tactics on how to ... make* [pupils] *listen to me and ... one of the things was because I'm a foreigner I had to slow down talking – less talking more activity based* [teaching/learning]... (PEP mentee)

(5) Support for building mentees' confidence as teachers of physics
(5 mentees; 7 mentors)
The majority of teachers [supported by TLCs] *aren't physics specialists. It is important to build a working knowledge but it is also about boosting confidence. TLCs are talking about physics teaching but in doing so are able to help [teachers] with their confidence, so they are not just teaching by the book but are more confident to be more creative.* (TLC)

I taught biology, it was abysmal, Year 7 biology, I used to get put in front of the class to teach biology and it was outrageous, if the parents had known, I'd got no background whatsoever, it would be worksheets a lot of the time to keep it narrow. What you need if you're a non-specialist, you need to try and like the new subject but above all you need confidence and one thing that gives people confidence is some 'wow' stuff, something the kids will really like and you understand and you want to get in the classroom and show them, that is the kind of stuff I try to impart. (SASP mentor)

(6) Support for career progression (6 mentees; 4 mentors)
He's helped with applying for jobs, I remember when we were doing the PGCE we met up and he had a look at a couple of application letters and went through them and how to write out an application form, that was really helpful. (PEP mentee)

Yeah I've talked with him several times because he teaches at a grammar school and so do I and I've talked to him several times about routes for climbing ladders. He's a head of department and I've talked about what exactly is involved in that and tried to ascertain if that's something I would want to do, or if I'd prefer to be a head of year and that kind of progression. (PEP mentee)

(7) Support for developing mentees' resilience (3 mentors)
I think … I am able to offer a perspective on the issues they encounter and to encourage them in how to overcome them, [to explain] *that they are not on their own in experiencing these issues,* [helps them to see] *that there is light at the end of the tunnel. Occasionally, there are quite serious matters of mistreatment or personality clashes, where I have been able to help the teacher to resolve them and to re-assure them that they are in the right and that that is a way forward.* (PEP mentor)

For example, [mentee], *on her first teaching post she got no support so I went in and talked to her … about the whole ambiance and the lack of support. And she actually gave up that job, but she was positive enough to say 'I'm going to go off and teach' [elsewhere] and I guess there was a bit of help from people like me saying 'You're a good teacher, don't give up just because this isn't a good experience' She then went on to do supply and then move on to get another job in another place … she was almost instantly happier once she'd actually made the decision to give up that post.*
(PEP mentor)

2.3.2 SPECIFIC SUPPORT STRATEGIES

In addressing the seven broad kinds of support need outlined above, EMs employed a large number of more specific support strategies, including:

(a) Providing or facilitating access to teaching resources
(15 mentees; 10 mentors)
He had a whole workshop of resources we could use ... so we could bring them into the classroom and use them... (PEP mentee)

Rather than go home and struggle and read books and go on the internet, now we can phone the TLC or email her. E.g. we wanted to watch an A level lesson and TLC tried to find a lesson but couldn't find one but gave us a link to Teachers TV[18] or something like that ... that we could watch over and over again. (SPN mentee)

(b) Helping mentees with lesson planning (11 mentees; 8 mentors)
He gave us a couple of ideas of how he puts his lesson plans together and has given us templates of when he's been observed. So he has shown us how to differentiate the work and given us resources to have a look at and stuff like that… He … said 'if someone comes to observe you this is what they'll expect in terms of lesson plans' (PEP mentee)

Initially we were looking at planning lessons and it was quite successful and it helped my teaching watching someone else doing it... (SASP mentee)

(c) Helping mentees to use specialist equipment (12 mentees; 6 mentors)
I couldn't do the practicals, I was stuck with equipment that I didn't know how to assemble; he came along and showed me how to do it. (PEP mentee)

In term 1, he also came to my school and demonstrated how to use the 'Air Track' to me and the technicians because it was a new piece of kit ... what different things we could use it for – speed, momentum, collision theory ... Because he left it set up in my class, I used it later that day with my kids. (SASP mentee)

[18] Teachers TV was a government funded TV and online video service, launched in 2005, primarily designed to support the professional development of the school workforce. It ceased to operate in 2011 after the Department for Education withdrew funding.

For example, [TLC showed us] *how to use the vandergraaf generator: this is a traditional piece of kit but he showed us how to use it safely without electrocuting anyone!* (SPN mentee)

(d) Modelling teaching and practical work (7 mentees; 8 mentors)
I went to [school] *where he worked and I sat through the lessons and there* [was] *lots I was taking in and noticing. I'd been to another school but the kind of way he put things into context and I've stolen lots of his A level ideas and tried to replicate them here like making sound go through light waves and I loved the idea so much.* (SASP mentee)

I have taught model lessons to pupils with 4 or 5 teachers watching. A lot of staff don't trust Teachers TV videos as they think they are unrealistic and their schools and classrooms aren't like that. (TLC)

I do virtual physics lab sessions with NPL [National Physics Laboratory] *software. I do a series of practicals or demonstrations that they may not have seen before, which either replace things they may have seen before or are completely new to them, which will excite, engage or certainly make it easier to demonstrate or to teach.* (PEP mentor)

(e) Help with planning schemes of work (9 mentees; 5 mentors)
I got out my scheme for magnetism for Year 8 and he had a look at that and suggested where it needed tweaking, because we were struggling with delivering practicals. So [EM] *had a look at the order that we were teaching it in and made some suggestions about how we could change it.* (SPN mentee)

Some want[ed] *support with schemes of work so I've basically used my schemes of work, stuck them on a disk and sent them to them, and then talked them through things after that. Sometimes it's been topic specific where I've discussed how they might look at one little bit, say the mechanics topic at A level...* (PEP mentor)

(f) Providing 'a shoulder to cry on' and enabling mentees to share confidences (8 mentees; 6 mentors)
I'll ask him questions or discuss it if I've had a bad day. (PEP mentee)

I may well just sit down with someone for half an hour and we may just chew over a problem they have. (TLC)

(g) Team teaching with mentees (4 mentees; 6 mentors)
I asked him to come in to school because I was teaching GCSE 'Momentum' to a big class. I thought it was boring, I asked him to help me team teach and to give me some ideas to make it more interesting. We planned the lesson by email and then he came to teach it with me. We split the class into two groups and rotated round. The students loved this – my mentor was very positive about me and said how good a Physicist I was. It helped me concentrate on a small number of kids and be able to discuss new approaches to make more the topic more interesting. [SASP mentee]

With one [mentee], *who was quite informal and didn't plan very much in advance, he would ask me to come and I would turn up and not know what was needed in advance.*

I would sit in lessons with him and just join in so team teach informally. With another I went in to plan a lesson with a teacher and then went back to (more formally) *team teach it with them. My time in lessons was not a sense of me watching them teach, it felt more like a joint effort.* (SASP mentor)

(h) Helping mentees deal with specific problems (6 mentees; 4 mentors)
When my school burnt down ... He told me who to get in touch with, people who might be able to help me... (PEP mentee)

I was writing a triple science physics scheme of work and it was really... the language was getting really complicated, and so we sat together and we put it into like an idiots' guide version. (SASP mentee)

They do ring up saying 'this happened, what do I do? ...Children who are a pain, staff who are a pain in their schools, where they [feel that they] *are not being treated fairly...* [etc.] (PEP mentor)

(i) Observation of mentees' lessons (5 mentees; 5 mentors)
A minority of EMs had observed their mentees teaching in order to inform a subsequent discussion about their professional development, though both mentors and mentees had mixed feelings about the use of this strategy. Of those mentees who had not experienced or in some cases not been offered this kind of support, some indicated that they would have liked it but others would not, for reasons which were familiar to the EMs:

It would have been useful to have a physics specialist to come in and see the way I teach physics. To see the ways I could perhaps change how I do it. (PEP mentee)

I'd love the idea of informal observation – not ones that go on your record – that could lead to suggestions for good ideas… [The EM] *coming in and observing me and giving me ideas.* (SASP mentee)

I would feel uncomfortable with that because I'm always very aware that my physics knowledge isn't perhaps as good as it could be. (SPN mentee)

Some teachers think of lesson observations as judgements and assessments and there's a reluctance even though that's not what I'm about, and I understand that. I was a classroom teacher for 19 years and I didn't like being observed even in that 19th year. (SASP mentor)

Two EMs who had not employed this support strategy said they would be willing to do so if asked, but that '*I think it would feel quite judgemental*' (TLC) and '*...the aim* [of external mentoring] *is to avoid an Ofsted type approach*.' One of these mentors felt that they would benefit from more training if they were to employ observation in the role, while one EM mentor who had used this support strategy referred to it as '*the hardest thing to do as it involves a level of trust, so you need to build up relationships first and don't push it*' (TLC).

In addition to supporting mentees directly in the ways outlined above, EMs also sought to facilitate mentees' access to alternative sources of support, most notably through:

(j) Cultivating, and encouraging mentees to engage with, a peer network (14 mentees; 6 mentors)
To me they did a really good job in terms of keeping the rest of us in touch with each other ...They would arrange a curry night or something and you would turn up and meet your peers and compare notes and whatever. (PEP mentee)

The main focus of the events is to make my support available, but to maintain the contact between the delegates themselves. (PEP mentor)

(k) Encouraging mentees to become part of the broader science community, for example through engaging with the ASE and IOP (8 mentees; 4 mentors)
[The EM] *emails with details of conferences and workshops and events...* (PEP mentee)

Through the IOP we went to the PEP and SASP conference in York. We – myself and the other Regional Advisor – did the rocket launch workshop for the IOP. We demonstrated experiments and I delivered a session on roller coasters with one of my mentees. From this the mentees got loads of ideas to take back to school as well as social contact. (SASP mentor)

Reflecting on the various kinds of support provided by EMs, we can see that all five of the established mentor roles (normally associated with mentoring provided by colleagues within the school / institution) were in evidence, namely the roles of mentor as:

- *Model* – to inspire and to demonstrate;
- *Acculturator* – to induct the mentee into a particular professional culture;
- *Sponsor* – to 'open doors' and introduce the mentee to the 'right people';
- *Provider of psychological support* – to provide the mentee with a safe place to release emotions or let off steam; and
- *Educator* – to listen, to coach and to create appropriate opportunities for the mentee's professional learning (Malderez and Bodoczky, 1999).

That said, it is not clear that all five roles were played by EMs associated with each of the three programmes. In the following section we briefly discuss variation in EM support provided across PEP, SASP and SPN.

2.4 VARIATION IN SUPPORT PROVISION ACROSS THE THREE PROGRAMMES

Apart from the general tendency for TLCs to work mostly with groups of physics teachers in particular schools and for PEP and SASP mentors to work more with individual teachers, which reflected the differing aims of the programmes, in other respects the biggest variations in EM support provision occurred between the PEP on the one hand and SASP and SPN on the other. In particular, PEP mentors tended to provide relatively less support for their mentees' subject content knowledge but more support for general pedagogical knowledge, for building

mentees' resilience, and for their career progression, particularly through 'careers advice' such as that relating to job applications and interview preparation. PEP mentors also did more to facilitate peer networking amongst their mentees, most notably through arranging informal get-togethers such as group meals.

Reflecting again on the five mentor roles outlined above, our evidence suggests that PEP mentors were most likely to perform each of these roles and could thus be considered to be more fully 'mentors', with SASP and (especially) SPN mentors fulfilling a relatively narrow set of support roles which (despite the lack of consistency with which the various terms are employed) could be said to be in keeping with the official names attached to the roles (SPN Teaching and Learning *Coaches*, SASP regional *advisors*, and PEP regional *mentors*). As suggested above, variation in EM support provision across PEP, SASP and SPN reflects partly the original role descriptions and partly the generally differing needs of the primary beneficiaries of the support provision, relating for example to their career stages – PEP mentees were all beginning teachers, while SASP and SPN mentees were largely (though not exclusively) more experienced teachers.

2.5 CONCLUSION

In this chapter we have outlined the nature of the support offered and provided by external mentors of secondary teachers of physics, showing that EMs addressed seven different kinds of support need amongst their mentees, and employed a wide range of specific support strategies in attempting to meet those needs. We have also noted some variation between the work of EMs associated with the PEP, SASP and SPN programmes. Some potential implications of findings presented in this chapter (and other findings reported in Chapters 3-7) are discussed in the final chapter of this report (Chapter 8). We now proceed in Chapter 3 to report the various factors which encouraged and restricted trainees' and teachers' take-up of the external mentoring support that was available to them.

CHAPTER 3. FACTORS INFLUENCING THE TAKE-UP OF EXTERNAL MENTORING

3.1 INTRODUCTION

This chapter comprises three main sections which deal, in turn, with:

- the extent to which secondary physics teachers (and trainees) in schools and colleges do – or might – take advantage of external mentoring;
- factors which encourage take-up of EM support;
- factors which restrict the take up of EM support.

Within each section we begin with our main focus on the EM support associated with the PEP, SASP and SPN programmes, before going on to report relevant findings from our interviews with PEP and SASP participants who did not have access to an EM, and from our national survey of teachers.

3.2 THE TAKE-UP AND POTENTIAL TAKE-UP OF EXTERNAL MENTORING

3.2.1 PEP, SASP AND SPN TEACHERS WHO HAD ACCESS TO AN EM (INTERVIEW FINDINGS)

Across each of the PEP, SASP and SPN programmes, there was variable take-up of the EM support from eligible teachers and schools, while those who did engage with an EM did so to differing degrees. Most external mentors indicated that between one third and two thirds of eligible teachers and schools had taken advantage of the support.

The fact there was variable take-up of external mentoring is both understandable and desirable insofar as teachers have different needs and mentoring is supposed to be responsive to need. Furthermore, some participants in our study suggested that those who did not take up the offer of EM support didn't '*really need it*' (PEP mentor), for example, because they '*already had the support in their school*' (SASP mentor), or they '*are completely self-sufficient and are happy and don't need any help*' (PEP mentor). However, other participants (including 9 mentors) indicated that some trainees, teachers and schools that had not taken up the support, or had done so only to a minimal degree, were amongst those that most needed it. One stakeholder, for example, stated that some teachers '*thought they were fine but weren't*'. The reasons that some of those eligible for EM support took advantage of this while others did not are explored further in sections 3.3-3.4 below. First we briefly consider whether those secondary teachers of physics who did not have access to an EM might have appreciated this.

3.2.2 PEP AND SASP PARTICIPANTS WHO DID NOT HAVE ACCESS TO AN EM (INTERVIEW FINDINGS)

Of the ten recent PEP and SASP participants we spoke to who were not eligible for EM support:

- five indicated that they would have taken up the offer had it been available;
- four suggested that they might have done so; and
- one said he would not have done so.

(Again, the reasons given in support of these responses are explored below – specifically, in Sections 3.3.3 and 3.4.2.)

3.2.3 NATIONAL SAMPLE OF SECONDARY PHYSICS TEACHERS (SURVEY FINDINGS)

When the 95 secondary physics teachers who did not already have an EM were asked in our survey whether or not they felt they might benefit from the opportunity to be able to access an EM[19]:

- 33 per cent (38% weighted) said yes;
- 46 per cent (42% weighted) said no; while
- around one in five were unsure (see Table 3.1).[20]

The reasons given by those (31 teachers) who indicated that they might benefit from the opportunity to work with an EM for physics are discussed in Section 3.3.4 (Table 3.5) below, while the reasons given by those who did not feel they would benefit are provided in Section 3.4.3 (Table 3.6).

Table 3.1 Did secondary physics teachers feel they might benefit from having an EM?

	No. of respondents	Per cent (%)	Weighted %
Yes	31	33	38
No	44	46	42
Not sure	20	21	20
Total	**95**	**100**	**100**

It is clear from the data reported above that there exists a demand for external mentoring beyond those secondary teachers of physics who have had access to PEP and SASP mentors and SPN TLCs. Further analyses of the survey data presented above show that:

- There was a significant association between respondents' gender and their responses to this question ($p<0.05$), with a higher percentage of male respondents stating that they did not feel they would benefit from an EM, and a higher percentage of women indicating that they were unsure (Table 3.2);
- A higher percentage of respondents who had taught for ten full years or less stated that they felt they might benefit from the support of an external mentor, with a higher percentage of relatively experienced colleagues giving a 'no' or 'not sure' response (Table 3.3).[21]

In addition, there was a statistically significant difference between the responses to the question of whether they might benefit from EM support given by those teachers who indicated that physics was a major part of their first and/or postgraduate degree and those who did not[22] ($p<0.05$): perhaps surprisingly, a higher percentage of respondents who stated that physics was a major part of their first and/or postgraduate degree indicated that they might benefit from the

[19] An external mentor was defined for respondents as: *an experienced subject specialist teacher, not connected with their school, who works in a purely supportive capacity and is able to provide face to face or online support for their subject knowledge, subject pedagogy or other teaching-related issues.*

[20] As reported in Chapter 1, three secondary physics respondents stated that they already had an external mentor.

[21] This finding is not statistically significant, perhaps predictably given the relatively small number of respondents and the three-way comparison involved in this analysis. In Chapter 7 we show that, amongst a larger sample of both secondary and primary teachers of a range of subjects, those who had completed no more than five full years of teaching were statistically more likely than those who had been teachers for a longer period to state that they might benefit from the support of an EM (see Section 7.3.1, Tables 7.4a and 7.4b.)

[22] Around a third (33) of the 95 respondents who did not have access to an EM stated that physics *was*, while approximately two-thirds (61) stated that it *was not* a major part of their first and/or a postgraduate degree. (One respondent did not answer this question.)

opportunity to access an external mentor, while over a quarter of those who did not have physics as a major part of a first or postgraduate degree stated that they were 'not sure' (see Table 3.4).

Table 3.2 Whether respondents would like an EM by gender

		Whether would like an external mentor			
Gender		Yes	No	Not sure	**Total**
Male	N	14	24	3	**41**
	Per cent (%)	34%	59%	7%	**100%**
	Weighted %	48%	48%	4%	**100%**
Female	N	17	20	17	**54**
	Per cent (%)	32%	37%	32%	**100%**
	Weighted %	31%	37%	32%	**100%**

Total n = 95.

Table 3.3 Whether respondents would like an EM by career length

		Whether would like an external mentor			
Career length (no. of full years in teaching)*		Yes	No	Not sure	**Total**
0-10	N	15	15	4	**34**
	Per cent (%)	44%	44%	12%	**100%**
	Weighted %	44%	47%	9%	**100%**
11-20	N	10	17	11	**38**
	Per cent (%)	26%	45%	29%	**100%**
	Weighted %	35%	37%	28%	**100%**
21+	N	6	12	5	**23**
	Per cent (%)	26%	52%	22%	**100%**
	Weighted %	36%	43%	21%	**100%**

Total n = 95.
**Some of the categories used in the survey were merged due to low numbers of respondents.*

Table 3.4 Whether respondents would like an EM by physics as major component of degree studies

		Whether would like external mentor			
Was physics major part of UG/PG degree		Yes	No	Not sure	**Total**
Yes	N	12	20	1	**33**
	Per cent (%)	36%	61%	3%	**100%**
	Weighted %	43%	53%	3%	**100%**
No	N	18	23	17	**58**
	Per cent (%)	31%	40%	29%	**100%**
	Weighted %	37%	36%	27%	**100%**

Total n = 91 due to missing responses from four respondents.

3.3 FACTORS ENCOURAGING THE TAKE-UP AND POTENTIAL TAKE-UP OF EXTERNAL MENTORING

3.3.1 PEP, SASP AND SPN TEACHERS WHO HAD ACCESS TO AN EXTERNAL MENTOR (INTERVIEW FINDINGS)

Analyses of data generated from interviews with external mentors, trainees and teachers who had access to EMs, together with other stakeholders, reveal that there were five broad categories of factors which promoted the take-up of support. These were:

(1) issues associated with school-based support;
(2) relative benefits of external support of the kind associated with the PEP, SASP and SPN programmes over school-based support;
(3) attributes of the particular external mentor to whom trainees or teachers had access;
(4) characteristics of individual trainees and teachers to whom the support was offered; and
(5) mentees' ease of access to the EM.

We consider each of these in turn.

(1) Issues associated with school-based support

A number of limitations of – or other issues associated with – school-based support for trainees' and teachers' professional development encouraged the take-up of EM support. In their interviews, five mentees and three mentors indicated a belief that the schools in which some of the mentees worked, or were based, were generally unsupportive of trainees' and teachers' professional development. Our data suggested that this was a particular problem for beginner teachers, who are perhaps most in need of support:

My first mentor was a physics specialist but I couldn't go to him about anything at all ... he was a nice guy but he was very blasé about it, 'don't worry about it', he didn't really seem to take it seriously. (PEP mentee)

Generally I didn't feel that I was in the right school. I was teaching the subject for the first time but there was no support. I was going out of my mind... My notice was given towards the end of September, they asked me to stay, promising to support me and I said the things I needed to be there and it never happened... (PEP mentee)

[One mentee] *was basically shoved in schools as cannon fodder ... She wasn't given support in terms of classroom management, she wasn't given support in terms of dealing with kids ... She was promised a physics set but she hasn't been given it. She's been given all the classes the head of department couldn't handle and then she's being told as an NQT 'you can't handle this class'.... And I have to say that the vast majority of people who drop out post PGCE, it's down to the school. They don't feel they are being given support within the school environment...* (PEP mentor)

More specifically, many schools were not able to provide specific support for subject content knowledge or subject pedagogy (12 mentees; 7 mentors), often because there was no physics specialist within the school:

My school always backed me up and wanted me to do as much as possible re the physics mentoring BUT subject-wise I was on my own so didn't get any subject support. (SASP mentee)

I'm the only one who has done anything in physics so they look to me as being the expert. And because of my route into science I've got gaps and I don't always know the answers. So it's nice to have somebody else to turn to... my head of department ... has got no physics knowledge at all, or very little, and my induction tutor is a French teacher and doesn't understand science at all... when my induction tutor came in [to my lessons] *he would say 'it was very noisy'. Well yes because they were doing a practical and it does get like that during a practical, it's not French. Also he didn't understand the need for pupils to move around and didn't understand that we have to do maths in science.* (SPN mentee)

There is no physics specialist in the school so before the TLC support, if we had a problem we had to work it out ourselves. Sometimes we would be tearing our hair out. The TLC has opened up lots of avenues. (SPN mentee)

[PEP mentee] *was really chucked in at the deep end because she was the only physics teacher on site and there was an A level physics teacher who was retiring and didn't have any schemes of work in place or lesson plans or anything, and basically said 'right they are your class, get on with it'.* (PEP mentor)

Three mentees indicated that they were keen to enlist the support of the EM because, while there were physics specialists in their schools, these were perceived to be practising outdated rather than inspiring and innovative methods:

Other physics teachers in school are not unapproachable but a bit old school. They don't try new things. There is little excitement and encouragement. (SPN mentee)

In schools where colleagues possessed the knowledge and expertise to provide the support needed, some mentees were very conscious of existing demands on these colleagues' time and were reluctant to add to them (5 mentees; 4 mentors), while others felt uncomfortable seeking their support due to problematic relations (5 mentees):

There's no one in the school with a physics degree but our head of department [has] *taught physics most of the time. He's been there so he's our resident expert. He's very good ... but you're always aware when talking to colleagues that they have other things to do and taking time out of their day and he is head of department and you certainly can't say to him 'can you come and observe?' because he's teaching his lesson and he has to set his work. It's making work for them.* (SASP mentee)

I think that's the reason I'm doing so well now because I've got someone to talk to... I did have issues within the school when I first went to my first teaching job, it was teacher related and politics within the school and [EM] *gave me loads of good advice...* (PEP mentee)

One of the more prominent motivations for seeking support from their EM was a feeling amongst some mentees that they weren't able to be open about their perceived limitations or development needs with school-based mentors, line

managers or other colleagues who might potentially have been able to help (12 mentees; 3 mentors):

During PGCE whatever you ask your mentor they would judge you on and [think] *'why doesn't she know that?'* (PEP mentee)

If I said to my head of department I didn't know how to do this, I didn't want him to think I was an idiot... (SASP mentee)

I can openly admit when I started at this school that I wouldn't go to anyone because you are so scared, you're trying to establish yourself, you don't know anyone, you don't know people and how they might judge you and you're scared of how people may judge you... (SPN mentee)

On a more positive note, relating to school-based support, some heads of department, faculty or other senior colleagues in schools had clearly encouraged and facilitated mentees' ease of access to the EM (8 mentees)

This had been set up by the head of faculty who thought both A level teachers might benefit from [EM] *coming to support them in this way*. (SPN mentee)

(2) Relative benefits of external support

In discussing factors which had encouraged mentees to take up the support of their EM, both mentees and mentors pointed to a number of perceived advantages of the kind of external support provided by PEP and SASP mentors and SPN TLCs, compared with existing school-based support.

These included:

- the fact that EMs had more – and dedicated – time to support mentees (7 mentees; 5 mentors)

There's a time issue too. I know if I ask a question they'll take time to sit down and answer it. (PEP mentee)

We can organise a time that's convenient for both of us and I don't feel I'm making calls on his time because that's part of his function. (SASP mentee)

TLC support is 100 million times better than other physics teachers. In school they help but haven't got time to dedicate an hour one to one. With TLCs you can think what you want to do and it is dedicated time. (SPN mentee)

- the belief that EMs could offer an independent and/or broader perspective (4 mentees; 8 mentors)

The value of what we do, I think ... is to give the students and then the early career teachers someone completely independent to talk to. If they have a concern about something that they have done or want to do and if they don't know how to approach making something happen or dealing with an issue ... then they've got someone to come to. (PEP mentor)

It's very different getting to speak to someone who is in your own school... when you speak to people teaching in other schools you get a much wider perspective of what goes on. (SASP mentee)

I think [TLC support] *is a positive because they are getting an external view of it ... It's asking for a fresh perspective on things*. (TLC)

- mentees' perception of the EM as supporter not judge (10 mentees; 6 mentors)

...during PGCE whatever you ask your mentor they would judge you on and [think] *'why doesn't she know that?' but with* [EM] *there is no judgement*. (PEP mentee)

Partly in consequence of the two points listed above:

- Many mentees found it easier to be open and speak candidly about their professional development needs with an EM than with a school-based colleague or line manager, or a university tutor on PEC or SASP (13 mentees; 9 mentors):

Students ask [EM] *if they don't want to look foolish*. (University-based stakeholder)

Externally you could be quite open and honest and really discuss the issues, there's no one they're going to tell, you can really be honest. (PEP mentee)

Just the fact that he wasn't in my school was brilliant, so if school issues would occur, so if I said to my head of department I didn't know how to do this, I didn't want him to think I was an idiot but with [EM] *he wouldn't think that at all,* [he was] *kind of outside the loop... I could be completely open and honest*. (SASP mentee)

You know [TLCs] aren't going to be judging or gossiping about you. It might be embarrassing to admit to someone in school that you don't understand something or have forgotten things. (SPN mentee)

Having someone independent of their own job, someone they can talk to openly about what's on their mind without the fear of compromising their position, that's very useful... I think it gives them the freedom to ask questions and to explore the possibilities more. I think if it is being provided by someone in your school, if I'm training my own team they aren't going to have the same freedom to ask me questions and to perhaps appear stupid. They might feel there are consequences to asking those daft questions. I don't think they are daft but they might think so. (PEP mentor)

A relatively small number of interviewees (1 mentee; 3 mentors), all associated with the SPN, also suggested that an 'external voice' – especially one associated with a national subject association – can carry more weight, and that teachers sometimes find it easier to accept the need for change from such a figure than from a school-based colleague:

[Compared with a school-based mentor] *the TLC is the stronger role. Teachers see the TLC as more of an authority. Being backed by the IOP helps in this regard*. (TLC)

Teachers see an external mentor as 'the font of all knowledge'. (TLC)

We've got excellent physicists in school, I think it's just different how [TLC] *does it. It's probably a certain amount of... it might be different accepting something from somebody else rather than a colleague*. (SPN mentee)

One EM also stated explicitly what others hinted at, in suggesting that:

As an outsider you can be more challenging as there are no relationships to risk. So as a TLC I try to expose their misconceptions, but wouldn't do this if based in the school as it would be too risky. (TLC)

(3) Attributes of individual external mentors

In their interviews, several (17) mentees who had taken advantage of the support of EMs pointed out certain attributes, qualities and characteristics of mentors which had encouraged them to do. Amongst these, mentees considered it important that mentors were experienced teachers who were knowledgeable, enthusiastic and passionate about physics. Mentees also valued and sought the support of mentors who were approachable, patient, non-judgemental, positive, encouraging, respectful, supportive and flexible, while they were appreciative of mentors who had an informal approach to their work, were proactive in making contact and working with them, and who showed a genuine interest in them.

[EM] *had everything. I think he had the ups and downs and the frustration and he had all 14* [SASP mentees] *and we were like his class, like his kids... We get some people coming in to school over several years, you know them but it's not the same. You know them but you don't know them. The one to one thing and the fact that* [EM] *did make so much effort to find out about where we were and how we worked and what we could and couldn't do and then try to fix some of the issues, and it's made a huge impact.* (SASP mentee)

You can say anything to him... he's very patient ... he's been very proactive and very flexible'. (SPN mentee)

A couple of things really. I mean he is a subject specialist but I would be having contact with him if he wasn't... his personality is such that he makes you feel very comfortable about it. (SPN mentee)

(4) Characteristics of individual mentees

A number of participants (5 mentees; 5 mentors) intimated that the extent to which mentees were able to take advantage of the support of EMs was also related to their (mentees') own personal characteristics and traits in a number of ways. These included trainees and teachers being committed to their professional development, being able to recognise and acknowledge their support needs, being willing and able to seek or accept EM support, being open to constructive criticism, and being sufficiently organised to be able to find time and/or motivated to give up some of their own time to meet with external mentors.

I was keen to have [TLC] *come into my lesson and share his expertise*. (SPN mentee)

Those who made best use of the support were the ones who were the most organised and had set aside a couple of hours in advance of a half term to discuss what they would need support with over that half term. (SASP mentor)

They're very open to constructive criticism which I think is wonderful. (TLC)

In addition, we note some (or further) evidence that the readiness of mentees to take full advantage of EM support may be influenced by the pressure of external factors as well as personal characteristics. One mature PEP mentee stated (without prompting) that, for her, the more subject focused support provided by EMs (incorporating subject content and subject pedagogy):

...would be better not in the NQT year when you're ever so stressed but one year later when you're ready to start taking on new things and improving your teaching skills. (PEP mentee)

Since her mentoring had been carried over into a second year for personal reasons, it could be argued that this recently qualified teacher (RQT) was in a better position than most to make this judgement, although her experience of and response to her 'NQT year' may not have been typical. Indeed, as suggested earlier, some NQTs (like their more experienced colleagues) were keen to enlist an external mentor's support for their subject knowledge and pedagogy, while we also saw in Chapter 2 (Section 2.4.1) and will see in Chapter 4 (Section 4.3.3) that some took advantage of and benefited from the emotional support offered by external mentors to alleviate the kinds of 'stress' referred to by the mentee quoted above.

(5) Mentees' ease of access to the EM or the mentor's overt availability

Some participants (7 mentees; 2 mentors) also indicated that the take-up of EM support was encouraged where mentees recognised mentors' overt availability and had relative ease of access to the mentor:

Basically that I know that I can always contact him... I know that I can always email him and ask for help or advice. (PEP mentee)

I find an email most helpful, I can send a message and get a reply more or less straightaway ... if [EM] *is on* [Facebook] *I'll ask him questions or discuss it if I've had a bad day ... we* [mentees] *are all on his friends list.* (PEP mentee)

I think it was mainly him saying 'I am here to help you' and that's what he's done. He's on the phone, email, I can call him, I know I can call him and I know he'll deal with me on an individual basis. (SASP mentee)

3.3.2 NATIONAL SURVEY RESPONDENTS WHO HAD ACCESS TO AN EM

The three secondary physics teachers in our national survey sample who stated that they 'already had an external mentor', indicated that the following considerations had encouraged them to take up this support:

- I welcome additional support to facilitate access to or help with teaching resources or equipment (2 respondents)
- I welcome an independent perspective on some issues (2)
- I welcome additional support to develop my subject content knowledge (1)
- I welcome additional support to develop my subject pedagogy (1)
- I welcome additional support to develop general pedagogical techniques (1)
- Lack of a subject specialist in school (1)

- Lack of collaborative ethos in school (1)
- Performance management and/or other issues make it hard to talk about any difficulties within the school (1)

3.3.3 PEP AND SASP PARTICIPANTS WHO DID NOT HAVE ACCESS TO AN EM

When those (10) PEP and SASP participants who did not have access to an EM were asked what might encourage them to seek the support of an EM, were it to be available, the five most frequently mentioned responses related to:

- support to develop their subject content knowledge (7 interviewees)

Going to someone who wasn't on the SASP or at school, I'd probably want to sit down and go through more theoretical physics ... I think [if I'd had access to an EM] *I'd have done better with the A level. A level is the crunch because not having a physics degree I'm not one step ahead of the students, some of them are really good at physics and they would be really good at maths and going on to do physics degrees and if I'm having to get back to them on things; it would be nice if I was more confident and then I'd be able to do extension work. If you have A* grade students and you don't stretch them enough you might be letting them down.* (SASP participant)

- welcoming an independent perspective on certain issues (6)

Certainly, yes [I'd have welcomed access to an EM]. *My big bugbear at the moment in school is lesson planning: when I was in teacher training, going through the process or putting a lesson together it was dead simple but now we've got people talking about differentiation, you listen to them and one person's view seems to be completely different to another person's point of view, they've all got these buzz words and you think 'I've got three bosses here, all three of them have different ideas of what I should be doing'*. (SASP participant)

- additional support for their subject pedagogy (5)

What I would like is more in the way of physics practicals for students to do to help them to see particular points and ... what would be really nice would be a list of apparatus and actual tasks for students to do which are known to be good tasks in that they will promote learning. (SASP participant)

- access to or help with teaching resources or equipment (5)

I just think it would nice to find resources, it would save so much time, resources that are actually working... [I]*f you go to a school that doesn't have resources it's good to have your own little kit.* (PEP participant)

- issues making it hard to talk about any difficulties within the school (3)

Someone externally could be useful, if you want to ask a question about your subject knowledge and you don't want to look stupid, even something as simple as that, I can see the value of it. (PEP participant)

In addition, two participants suggested that they might have been encouraged to seek the support of an EM as a result of general lack of support in their schools, two because they would welcome support for their emotional wellbeing, one because of issues with their line manager, and another for careers advice.

3.3.4 NATIONAL SURVEY RESPONDENTS WHO DID NOT HAVE ACCESS TO AN EM

We reported in Section 3.2.3 above that, of the 95 secondary physics teachers who responded to our national survey and indicated that they did not already have access to an external mentor, 31 suggested that they might benefit from the support of a physics EM. Table 3.5 below reveals the factors these respondents said might prompt them to seek the support of such a mentor, were it to become available. The most frequently given responses were that teachers would welcome additional support to develop subject content knowledge and subject pedagogy, with approximately two thirds of respondents citing each of these factors.
In addition:

- over half of the respondents also cited the lack of a subject specialist in their school as a reason for seeking external mentoring;
- over two-fifths said they would welcome support to facilitate access to or help with teaching resources or equipment;
- around a third said they would appreciate additional support to develop general pedagogical techniques; and
- a third also indicated that they would welcome an independent perspective on some issues.

Table 3.5 Factors that would prompt respondents to seek EM support

	N	Per cent (%)	Weighted %
I would welcome additional support to develop my subject content knowledge	21	68%	67%
I would welcome additional support to develop my subject pedagogy – how to teach my subject(s)	19	61%	66%
Lack of a subject specialist in school	18	58%	58%
I would welcome additional support to facilitate access to or help with teaching resources or equipment	14	45%	43%
I would welcome additional support to develop general pedagogical techniques (teaching methodologies)	11	36%	33%
I would welcome an independent perspective on some issues	10	32%	35%
I would welcome additional advice or guidance regarding career progression	6	19%	19%
General lack of support in school	5	16%	21%
Performance management and/or other issues can make it hard to talk about any difficulties within the school	5	16%	17%
I would welcome additional support for my emotional wellbeing	5	16%	17%
Pressure to conform to the school's teaching and learning models	5	16%	11%
Lack of collaborative ethos in schools	5	16%	10%
Issues with a school mentor or line manager	2	7%	3%

Total number of respondents = 31; percentages do not sum to 100 as respondents could give more than one response.

3.4 FACTORS RESTRICTING TAKE-UP OF EXTERNAL MENTORING

3.4.1 PEP, SASP AND SPN TEACHERS WHO HAD ACCESS TO AN EXTERNAL MENTOR (INTERVIEW FINDINGS)

Seven main factors help to explain why some trainees and teachers did not take up the opportunity to access the support of an external mentor, or did so to only a limited extent:

(1) time constraints in general (11 mentees; 8 mentors) and/or a lack of space in participants' school timetables (2 mentees; 4 mentors);
(2) geographical distance from the EM (13 mentees; 2 mentors);
(3) school-based gatekeepers not facilitating access (5 mentees; 10 mentors);
(4) satisfaction with existing means of addressing support needs (9 mentees; 3 mentors);
(5) self-sufficiency or confidence about subject knowledge and pedagogy (4 mentees; 3 mentors);
(6) inability to recognise or reluctance to acknowledge support needs (7 mentors);
(7) participant and mentor not 'getting on' (2 mentees; 2 mentors).

We briefly outline each consideration below and provide illustrative quotations, though we would note that some of these factors were closely related and that for individual trainees the lack of take-up of EM support was usually explained by a combination of these (and occasionally other) factors.

(1) Time and timetabling constraints

When those trainees and teachers who did not take advantage of the offer of EM support (or did so only to a minimal degree) were asked why this was the case, a common response related to a lack of time to do so. One PEP participant simply stated that he was '*Too busy*', while a SASP participant said that ' *time I suppose is always an issue*', and a physics teacher in a SPN school noted '*Sometimes people are too busy teaching!*' Some interviewees also drew attention to timetabling issues and other school-based pressures:

One [school] *for example, the head of physics left at the end of last term... Physics is being taught by non-specialists, nobody has got time to actually put in after school. There is no school time available*. (TLC)

(2) Geographical distance from EM

Time considerations were also tied up with another frequently given explanation for a failure to take advantage of the support of an EM, that of the geographical distance between prospective mentee and mentor. This appeared to be a particular issue for PEP participants, where the 'light touch' nature of mentoring meant it was less commonplace for mentors to make school visits:

After completing the PEC I haven't seen him, mainly because of the distance. (PEP mentee)

The main constraint was distance... The social events, meals ... provide us with an option to meet up. But they are always in [region] *and that's too far for me*. (PEP mentee)

A couple of the guys went to observe [EM] *but it was so far away from me, it was a bit too far so I didn't observe him.* (PEP mentee)

(3) School-based gatekeepers not facilitating access

It is clear from the accounts of mentors and mentees that in some cases, school-based gatekeepers did not facilitate teachers' access to the external mentor, or the external mentor's access to some or all teachers in the school who might potentially benefit from their support. This can be explained by a number of factors, including matters relating to: school and departmental organisation; leadership and communication; issues with succession planning; the possibility that external mentoring is not seen as sufficiently high priority amongst competing demands on teachers' and leaders' time; and a perception that some heads of department or faculty may have felt threatened by the potential presence of an expert physics teacher in their school:

A few schools want me to work with the physics teachers and don't give me the opportunity to work with those biologists and chemists who teach some physics, and who would need it most. This tends to be where there is a distinct physics department as opposed to science teachers working together... It would be helpful to have greater or more access to 'guarded' schools and the teachers who would benefit from the support but aren't given access to it. (TLC)

Some schools don't become or remain involved, e.g. sometimes there is a breakdown of communication when teachers are passed on by the initial contact, e.g. head of department. Sometimes senior management are not very supportive so don't take advantage of the opportunity of supporting their less experienced colleagues. Sometimes there is simply nobody in the school to drive it forward – it's not a priority for the schools. (TLC)

The head of science signed up for it and then she said she was looking for jobs, and didn't want to progress in case she got a job. (TLC)

[A]*bout half the schools are very enthusiastic but some are not so, and these tend to be the ones with heads of physics and teachers who have a more traditional approach to teaching physics and don't want to engage with alternative ways of doing it. They feel potentially threatened by what is being done so ... are slightly shy of seeking CPD support, saying they are OK with their subject knowledge and pedagogy and therefore do not need help with this.* (TLC)

As the selection of quotations presented above may suggest, this factor was a particular issue for TLCs who, unlike PEP and SASP mentors, were less able to gain access to potential beneficiaries of their support outside of school time. Nonetheless some PEP and SASP participants and mentors also bemoaned the fact that their schools would not always release mentees to attend out-of-school CPD opportunities which EMs had organised or were encouraging them to attend:

It's just annoying we can't get time off even though it's for my improvement. (PEP mentee)

I mean sometimes I wanted to go down with a cricket bat and talk to the head teachers of some of the schools and say 'grow up a bit, stop treating your staff this way or you won't have any left'. ...There is a huge investment has gone into this and some

schools just don't appreciate it. Last July we had a few people who couldn't come to the Liverpool conference because the heads would not let them have half a day off school. And we had the same with ASE. One of [the mentees] *was told that she couldn't come because there was just a 10 minute registration period to cover. She was actually using her free periods to come up, and you just think this is absolutely ridiculous. And these are school leaders... What really needs to happen is someone really spells it out to heads the difference between chemistry, biology and physics. It's not just science. They need to realise what a good opportunity these conferences are.* (PEP mentor)

(4) Satisfaction with existing means of addressing support needs

A fourth explanation for non- or minimal take up of EM support by some trainees or teachers was that they considered their support needs were being met from other sources, normally in such cases from within their schools:

If I was at a school that didn't have another physics teacher there [EM] *would be really helpful...* [but] *probably for something like a practical I would've just asked other people in my department. I could see if there wasn't someone in my department,* [EM] *was the next point of contact...* (PEP mentee)

In both my placement schools I had fantastic mentors and was getting really good support. This was also the case on my PGCE; I felt I already had all the support I needed... This isn't a criticism of [EM]; *it's just that I didn't need him.* (PEP mentee)

We are very lucky here, we do have another physics specialist so ... there is also someone here that I can go to directly. (SASP mentee)

(5) Self-sufficiency or confidence in subject knowledge and pedagogy

Some participants were sufficiently confident about their subject knowledge and pedagogy, and/or largely self-sufficient when it came to developing an aspect of knowledge or pedagogy:

I don't use [EM] *much because, of the three sciences... physics was always my strongest ... I'm a mature teacher and I wanted physics to be my subject but once I got in to it my physics came flooding back... I could imagine ... the support would be important because some people would struggle with some of the concepts of physics, not from my point of view but certainly for others.* (PEP mentee)

I was unusual in that I had a Physics degree and went to PEP to refresh my knowledge because I had done my degree a long time ago. (PEP mentee)

I'm quite a social person and into networking so I know other teachers in the area and I do have contacts and I do quite a lot of that so I am quite active... (PEP mentee)

(6) Inability or reluctance to recognise or acknowledge support needs, and to seek support

While some teachers and trainees did not seek the support of an EM because they were sufficiently confident in their knowledge, skill or ability to develop these, others (and perhaps some of the same participants) did not recognise that they had support needs, or else were unable or unwilling for various reasons to acknowledge these or seek the support they needed:

It is sometimes difficult where teachers think they have the subject knowledge but don't. So ideally I would have one-to-one follow up discussions with those individuals but they haven't asked for that support because they do not recognise the need… some teachers think their subject knowledge is better than it is. (TLC)

The head of department feels there's no problem there but I think the pupils could get more out of physics and more could be going on to do physics A level. (TLC)

I imagine there are other teachers who could improve their teaching [and] *would benefit from the sorts of things I've been sharing but we all know there are some teachers who are not particularly reflective practitioners so I'm not going to reach them.* (TLC)

Some teachers might need support but aren't coming for it. Some don't perceive the need because they don't have a culture of professional development in the school. (TLC)

One EM suggested that it is sometimes a greater challenge getting more experienced teachers to recognize their support needs and accept help than it is with beginners:

I think it is relatively easy to get to the younger or less experienced teachers who need support, and they I think acknowledge and recognise that they need quite a lot of support. Where I think we do have a bit of a problem and I'm not sure we can solve this one is that there are a number of the more experienced teachers who may not be physics specialists and who have developed a certain approach to teaching physics, often in a bit of a vacuum. And… they are not unconfident about it so they don't always recognise that they need help. And sometimes when I offer support there's a certain amount of defensiveness. (TLC)

It was also suggested that some PEP and SASP participants might have felt they could have benefited from EM support but were less assertive or confident and therefore less likely to approach their mentor for assistance, or else considered that it '*would have been a sign of weakness to ask for help*' (stakeholder interview). One PEP mentor suggested that '*there is an element of people who are struggling* [with teaching] *struggle to ask for help as well*', while an SPN participant explained her reluctance to take full advantage of the support of her TLC on the grounds that:

...you don't want to leave yourself open do you, never leave yourself open to [someone] *thinking I'm stupid... You always try to protect yourself a bit.* (SPN mentee)

(7) participant and mentor did not 'get on' (2 mentees; 2 mentors)

Finally , a relatively small number of participants indicated that one contributory factor explaining why some trainees and teachers did not take advantage of the EM available to them was that the two people did not get on or the mentee failed to 'warm to' the EM:

I never really got to know him, we never really got that relationship going... I perhaps could have made more effort but it was the distance and it was a personality thing. There were a couple of social events I went to early on but I didn't really warm to him. (PEP mentee)

If I'm honest I do know that the PEP mentor came to introduce himself it didn't come across very well, I don't remember what it was but I do remember thinking someone was like pestering... (PEP mentee)

3.4.2 PEP AND SASP PARTICIPANTS WHO DID NOT HAVE ACCESS TO AN EM

When those PEP and SASP participants who did not have access to an external mentor were asked what might discourage them from seeking access to an EM, were one to become available to them, the most common responses resonated with two of the considerations outlined above, namely:

(1) satisfaction with existing means of addressing support needs (4 participants)
I personally don't think [having access to an EM] *would've been beneficial; you can speak with those you've already built up a relationship with.* (PEP participant)

I can see that [access to an EM] *could have been* [helpful] *if I was struggling with a particular topic, it can be helpful to have someone else explain something to you but actually my personal situation, I wouldn't have particularly benefited from that, my father is a physics teacher, my husband is an engineer and* [university tutor] *was very good at explaining things, I clicked with the way he explained things...* (PEP participant)

(2) time or timetabling constraints (2)
Hypothetically it would be great, really beneficial ... it might have enhanced the PEP … to have a couple of days where we watched a physics teacher or someone came in … and said 'these are some ideas, specific for teaching this topic in physics' … [But] *I don't know how you could do it, I mean your timetable is so heavy … I'm not sure how you'd fit it in.* (PEP participant)

3.4.3 NATIONAL SURVEY RESPONDENTS WHO DID NOT HAVE ACCESS TO AN EM

As reported in Section 3.2.3 above, of the 95 secondary physics teachers who responded to our national survey and indicated that they did not already have access to an external mentor, 44 stated that they did not feel they would benefit from the opportunity to do so. The reasons they gave are listed in Table 3.6, which shows that the majority of these respondents felt that they were sufficiently confident about their teaching and subject knowledge, and felt they were able to access any support needed from within their school or from other sources, while about a third also cited time constraints.

Table 3.6 Factors that would discourage respondents from seeking EM support

	N	Per cent (%)	Weighted %
I am sufficiently confident about my teaching and subject knowledge	34	77%	79%
I am able to access any support that I need within my school and/or from other sources	33	75%	78%
I do not feel I would (or do) have sufficient time to and non work based commitments	15	34%	37%
It wouldn't (or doesn't) look good to have to ask for help	1	2%	3%

Total n = 44.

3.5 CONCLUSION

In this chapter we have drawn on the analyses of both interview and survey data to discuss the actual and potential take-up of external mentoring, and to report a range of factors which have been found to encourage or discourage the actual and potential take-up of external mentoring amongst secondary teachers of physics. In Chapter 7 we examine the extent to which the demand for external mentoring may extend to teachers of other subjects in both primary and secondary schools, while in Chapter 8 we discuss some possible implications of our findings. First, we proceed in Chapter 4 to a discussion of the perceived impact of the work of PEP, SASP and SPN external mentors.

CHAPTER 4. THE IMPACT OF EXTERNAL MENTORING

4.1 INTRODUCTION

In this chapter we focus our discussion on the perceived benefits of external mentoring support, based on the accounts of the trainees and teachers supported, the mentors themselves, and the key stakeholders that we interviewed. While previous studies have found that mentors themselves benefit in a number of ways from being involved in a mentoring relationship (Hobson *et al*., 2009), we were most interested in this study in the potential impact of external mentoring on mentees (and their pupils and schools), and this is the focus of this chapter. We begin by considering whether, in general, the mentees we interviewed found the EM support helpful.

4.2 DID TEACHERS CONSIDER THE SUPPORT OF THE EXTERNAL MENTOR HELPFUL?

Out of the 45 PEP, SASP and SPN mentees whose interview transcripts were coded, 40 clearly indicated that they found the external mentoring support helpful, with four having mixed feelings about the support and only one considering that the support was not helpful. Broken down by programme, the responses were:

- PEP (19 interviewees): 15 helpful; 3 mixed; 1 not helpful;
- SASP (7 physics interviewees): 7 helpful;
- SPN (19 interviewees): 18 helpful; 1 mixed.

For the five participants who did not give an unequivocal indication that the support of their EM was helpful, this can mostly be explained in terms of three of the factors identified in the previous chapter as discouraging some trainees and teachers from taking up EM support, namely: (a) the opportunity to access what the participants considered to be effective existing sources of support, which they felt rendered the additional support of an EM superfluous; (b) a lack of geographical proximity to the EM (in the case of some PEP participants), compounded by time constraints; and (c) a failure to 'click' with the EM.

Despite this small number of exceptions, and although we cannot claim that our findings are representative of all teachers of secondary physics who have had access to and/or been supported by an EM[23], it is clear that the vast majority of mentees have enjoyed a positive experience of external mentoring and would recommend it to others, should they have the opportunity. We now proceed (in Section 4.3) to outline the various reported benefits of external mentoring, before briefly discussing (in Section 4.4) whether particular benefits tend to be associated to a greater or lesser extent with PEP, SASP or SPN mentoring.

4.3 THE REPORTED BENEFITS OF EXTERNAL MENTORING

The claimed benefits of external mentoring can be grouped into five general categories, namely:

(1) Impact on mentees' professional knowledge and skill base;

(2) Impact on teaching and learning;

[23] Since some of our participating trainees and teachers were recruited with the help of their mentors, it is likely that our participants were amongst those more likely to take advantage of EM support and to perceive it to be beneficial.

(3) Emotional impact;
(4) Enhanced recognition and career advancement;
(5) Impact on department, school and teaching profession.[24]

Before outlining a range of perceived benefits of external mentoring under the headings listed above, we should note that a more general benefit, which helped to realize some of the more specific ones listed below, was that the work of EMs compensated for a lack of satisfactory school-based support (explicitly mentioned by six mentees and four EMs), which we saw in Chapter 3 was one of the factors which encouraged mentees to take up EM support. The following excerpts from mentee and mentor interviews are illustrative:[25]

[EM] *is much more physics support as well because the mentors in school support you on how to teach rather than* [subject] *content. So* [EM helps with] *the physics knowledge and how you go about teaching physics*. (PEP mentee)

[One mentee] *was basically left high and dry in her own school. I got an email from her saying she was a bit worried about this. So then it was a case of a telephone call ... just to find out how things were and that kind of opened up the whole situation of 'I'm the only physics teacher and I'm being asked to do upper sixth as well, the existing head of department is retiring and he has no notes at all, nothing is set up, the kids have got these ancient text books', that kind of scenario*. (PEP mentor)

Sometimes there isn't anybody there [in school] *to support them or there are people there but they just don't have the time.* (TLC)

It is also clear that while some of the benefits reported below result from mentees working directly with the EM, others also result, at least in part, from mentees' increased involvement in the local physics or science teaching community, or from collaboration with their peers in other schools, which we saw in Chapter 2 was something that external mentors sought to encourage and facilitate. Some participants (5 mentees; 2 EMs; 2 stakeholders), particularly those associated with PEP, were keen to refer to such networking as a benefit of external mentoring in its own right and/or as a means to the realization of other benefits:

I'm not sure we [PEP participants] *would have kept in touch* [without the EM], *and us keeping in touch... is going to be really important. They can share ideas and resources between them and being in different schools I don't think teachers often get enough opportunity to do that... I think it has had a big impact...* (PEP mentee)

I think people would lose out if they didn't have access to someone like [EM]. Also it makes you feel part of the whole thing. Feel part of wider [community]... *the world of physics.* (PEP mentee)

[24] We recognize that the various reported benefits of external mentoring that we outline could be categorized in alternative ways, and that there is overlap between a number of the benefits listed. While some specific benefits could have been included in more than one of the general categories that we employ, for reasons of clarity and to avoid repetition, we present each perceived benefit only under the general category in which we feel it best fits.

[25] Here and elsewhere in this chapter – given its focus – we give primacy (in the form of verbatim quotations) to the accounts of those who received external mentoring support over those who provided it.

We are providing that sort of peripheral support and we help them to feel part of a community. So 'you are not alone' and physics teachers are part of a community and are human beings and can have fun and all the rest of it.
(PEP mentor)

4.3.1 IMPACT ON MENTEES' PROFESSIONAL KNOWLEDGE AND SKILL BASE

External mentoring was said to have helped develop mentees' professional knowledge and skill set in four main ways, as outlined below.

- **Improved subject knowledge** (13 mentees; 5 EMs; 1 stakeholder)[26]

[Working with EM] *has really improved my subject knowledge of physics.* (PEP mentee)

The physics I was teaching was wrong. [EM] *didn't say anything then* [while witnessing this] *but came to me afterwards and said 'we need to fix this now'... I think he was there to do a job and really he did that job which was to guide me to the point where I was more confident about my subject knowledge...* (SASP mentee)

One concept I found very difficult was electricity, I know what electricity is, I know it's something that could kill you but what is it? What makes electricity? And I never understood that, never, never.... And it is something that I understand now... My knowledge and understanding of the subject has deepened immensely. (SPN mentee)

Electricity, this is one thing that some teachers find very hard. One teacher was extremely shaky on electrical things and I can remember spending several hours on a couple of occasions talking through basic electrical stuff and all the time the questions coming back to me showed fundamental misunderstanding. You have to be a little bit tactful at the same time but I think her electricity teaching went a lot better by the time I'd finished with her. (SASP mentor)

- **Increased commitment to professional development** (8 mentees; 1 EM; 1 stakeholder)

I remember the first two or three times that we met, he talked for over an hour. I realised the things I was struggling with and there was nothing we couldn't talk about, he gave me the courage to take a step forward. (PEP mentee)

[Working with an EM] [d]*efinitely helped me in my career and kept me focused on improving my teaching skills and knowledge.* (PEP mentee)

I'm more likely to sit and watch a programme about physics to get further ideas, I don't know if you saw that programme last night, I think it was an Horizon programme, it was very good, he was looking at what a degree actually means, he was saying heat energy doesn't really exist and they were coming up with all these concepts. {*And is that the kind of thing that's come from working with EM?*} *Oh yes because I wouldn't have watched that before.* (SASP mentee)

[26] Mentors also helped mentees improve their knowledge of and ability to use technical equipment, which was reflected in their increased use of practical work and reduced reliance on textbooks in teaching physics (see Section 4.3.2 below).

[Having a TLC] *reinforces my want ... to teach better.* (SPN mentee)

- **More reflective teachers** (4 mentees; 4 EMs)

[During a group meal] *one guy who was going through the book with his class, it was done in quite a military way. It's not actually the best way, so there was a discussion about that... it gave me an opportunity to see or question how I was doing it.* (PEP mentee)

I would say that [the work of the EM] *is quite important in terms of consolidating the* [PEP] *group after they've dispersed... it is useful to be able to speak to other teachers in other schools. You know there are other types of schools and you can get a bit consumed with your own school and think that is the only way, so it's useful to see the different perspectives...* (PEP mentee)

- **Increased awareness of regionally based opportunities for off-site learning for their pupils** (6 mentees; 2 stakeholders)

...I'm sure I would have missed out on things [without EM support]... *He ... put us in touch with someone from the University who comes round schools doing Hologram workshops – I wouldn't have known about this without my mentor. He put me in touch with the* [regional] *Physics network which you can take GCSE pupils in to. ... He also arranged a trip to go on the Oceanography boat... It was very interesting, gave me another opportunity to take pupils out if I wanted to develop my kids' out of school learning.* (SASP mentee)

4.3.2 IMPACT ON TEACHING AND LEARNING

According to the accounts of mentees and stakeholders as well mentors themselves, the work of external mentors has impacted on teaching and learning in school classrooms in a number of related ways, as we highlight below.

- **Increased use of practical work in teaching physics** (19 mentees; 5 EMs; 1 stakeholder)

The demonstration [EM showed me], *I use it quite often, for pressure and gases. You heat a little bit of water in a can. When it's boiling the steam pushes out all the air and then you quickly transfer it to cold water and it condenses the steam back to water and crushes the can at the same time. It's a really good demonstration that takes two minutes and I've used that several times.* (PEP mentee)

All this rusty old equipment at the back of the cupboards, we've been able to get it out and use it and it's not just collecting dust anymore... The fact that we can actually do the experiments, I'm a strong believer that if you actually do something you are more likely to remember it. (SASP mentee)

It's just given me different ways of looking at [teaching physics]. *The kids will probably react better to it. You know regardless of what you show them on the board it's never as good as showing them in some kind of practical application and having these little weights rolling down these obstacles and seeing the collision is really what you are trying to deliver to them.* (SPN mentee)

- **More interesting, exciting or enjoyable lessons** (13 mentees; 4 EMs)

[EM helped by] *making* [teaching] *more exciting which massively helps, especially in physics.* [He showed me] *how to make slime* [for] *when we're teaching polymers and doing science club... It's more about making physics fun and enjoyable and not so dry. They* [pupils] *just enjoy it and they start to be confident.* (PEP mentee)

The person in school is actually an engineer in her previous life, she has a very sound knowledge of all the theory, actually how to use the formulae and what I need to look out for. But [EM] *has been more useful in providing the more interesting ideas as well as taking me through the nuts and bolts of the theory but he is able to give me sort of exciting ideas on how to deliver what is a very dry subject...* (SASP mentee)

[What has been most helpful is] [p]*racticals you can use with kids to make lessons more interesting, and therefore help improve learning. For example, that thing with two* [connected] *gas jars and cold water with blue dye in one and hot water with red dye in another* [placed below the cold water jar] *to show convection. That's really dramatic... Also the digital thermometer and other gadgets... I have used those and it has been much better than how I taught before. The kids tend to find convection really tedious, for example, so this has really helped.* (SPN mentee)

- **Teaching becoming more accessible to pupils** (15 mentees; 1 EM)

The other thing [EM] *helped for is how to make physics more accessible to lower level kids, we do have quite a large number of less able students, they are unable to grasp the basics of physics and it's sometimes because there's a barrier up and* [it is necessary] *to simplify it even further.* (PEP mentee)

We were using, getting together a tray of sort of fun things you can use to deliver physics ideas, specifically girls as well so things like little ping pong balls that have buzzers on so when you make contacts on them they actually buzz so you can use them in a big group of people and if one person takes their hand away the buzzing stops so you can use that to demonstrate electrical circuits, things that flash, things that make noise, things that feel peculiar, all those sorts of ideas... Also using things like up to date technology, things like webcams to show or not show infrared and ultra-violet so just getting all the equipment together really and looking at innovative ways that you can get ideas over to children. (SASP mentee)

When he brings in gadgets and stuff and says 'have you thought about doing it this way?' and you think 'no actually', you can make it accessible, for me that's what [the major benefit of external mentoring] *is.* (SPN mentee)

How [EM] *is encouraging us to teach physics helps those students who learn best by seeing things, through experiments and practicals, rather than by hearing it.*
(SPN mentee)

- **Reduced reliance on textbooks** (6 mentees; 4 EMs)

Most helpful was knowing there was someone there to help me with ideas when I got stuck. In my teaching this meant that rather than a book work lesson, I could do a demonstration and find something that the kids could relate to. (SASP mentee)

[Without TLC support] *I think for me I'd still be heavily reliant on text book work.* (SPN mentee)

- **Increased focus on (or less avoidance of) subject knowledge in lessons** (2 mentees)

In terms of planning, the kids will ask you a question, something about physics and you're hoping no one will ask you a question... And in chemistry I would be like 'ask anything' because I know I can answer it but in physics… Now it's no longer like that. (SPN mentee)

Because of the increase in confidence, the knock on effect is that you don't feel as daunted by it as much, so you're not forever putting the physics side of things to the back because... When I think about delivering some of the topics, some of the fear has gone... We don't feel frightened to do the practical, it's not that we feel frightened it's... how are you going to answer the question that particular thing throws up. [Without the support of the EM] *I'd still be putting the physics to the back.* (SPN mentee)

Together the various reported impacts outlined above help to explain what is perhaps the most important or significant one of all, namely:

- **Enhanced pupil understanding and learning** (16 mentees; 2 EMs)

[EM] *told us which workshops to go to which would be helpful for the kids to understand particular aspects, we went to those and it really showed us how we could do things because we would have a better understanding of the subject, like marking the work considering what I'd taught them before, the same topic as I'd taught before. It's been a real improvement on the kids... Yeah, in terms of grades and levels.* (PEP mentee)

My teaching has improved as a consequence [of EM support] *and ... value added on to the bottom set, one girl got a pass, she went from a G to a C, the grades flew up through up the scale, I didn't get a single G, got a few C's and some B's. And more importantly I had kids turning up to my physics lessons who at one point struggled to write their names... so yeah, the evidence is there.* (SASP mentee)

I was looking at my Year 8 class and asked them to define current and most of them just said a flow of charges and some said flow of electrons and I was like 'yes!' because you now understand this' and I was pleased I could actually tell them something that has taken me so many years to finally understand... What we haven't done as a department is sit down and look at the impact, but in terms of ... the results that's something that anyone can see from the results, the results we had last year have improved, the results we're getting now and the differences, the difference from last year in physics [is considerable]. (SPN mentee)

4.3.3 EMOTIONAL IMPACT

There are seven ways in which the provision of external mentoring had an emotional impact upon or enhanced the wellbeing of participating trainees and teachers.

- **Increased confidence in subject knowledge and the teaching of physics** (26 mentees; 12 EMs; 1 stakeholder)

[Without EM support] *I don't think I'd be confident in physics, I don't think I would be confident enough ... I think I would be teaching biology, my safe subject.* (PEP mentee)

Without a doubt [EM support] *gave me far more confidence in my teaching ability...* (SASP mentee)

If you're not confident teaching something, it comes across in your lessons and the kids will pick up on it straightaway. So if you're confident and you feel like you're in control of the knowledge that you're delivering... it's a big headache gone. (SPN mentee)

- **Reassurance of having someone (or someone else) to whom they could turn in time of need** (19 mentees; 4 EMs)

It was really good to know that someone was there who was looking out for me and was willing to provide any help if I needed it. So far I've been teaching to GCSE but next year I'll be teaching to A level and I'm sure [EM] *will help me in that. And for someone like me, someone who hasn't done physics A levels or done it as part of their degree, you're going to get the odd insecurity. So it's good to have that access.* (PEP mentee)

He was always there, no matter what happened if you sent an email you got a reply, he'd reply more or less immediately, I think it's the security of knowing that meant that actually I only asked for help when I needed it but it's knowing that, it built up our own confidence in what we were doing, knowing there was someone there to talk about it. (SASP mentee)

He's helped emotionally because you know if you're stuck there's someone out there and he's so helpful and positive so even if it's a simple question like how to calculate speed he'll give you lots of advice and how to teach it... [The m]*ost helpful* [part] *was knowing there was someone there to help me with ideas when I got stuck.* (SASP mentee)

So it's nice to have somebody else to turn to... It just makes me feel a little bit more comfortable knowing I have got somebody there. It's like I'm a stage on now really... You know when you are on the PEP it's all support and then you go on the PGCE and you are let loose a little bit aren't you, and then in your NQT you've got your NQT mentor, head of department and all of that, but in this year [second year of teaching] *you're freer aren't you... I like being more autonomous but I quite like having somebody there if I need them.* (SPN mentee)

- **Increased enjoyment of or more positive and enthusiastic about teaching** (10 mentees; 4 EMs)

I think [without EM support] *I'd have felt I was slogging through it, the ideas we were able to get together on the static course made it more of an alive subject rather than this dry thing that I felt I just had to get through before I could get to teach chemistry or biology again. So certainly my subject knowledge feels more secure, I enjoy teaching it more... Also the other opportunity getting to go to the ASE Conference, that was my second or third time to go, it certainly meant that I find physics more engaging myself so of course has changed my teaching so instead of looking a bit drawn and tired and possibly bored when I'm teaching, I'm more enthusiastic about it as well...* (SASP mentee)

I'm beginning to like [physics] *which is strange but I'm beginning to like it.* (SPN mentee)

[EM support] *has made me more passionate about the subject and given me an outlet to express it.* (SPN mentee)

- **Reduced anxiety or stress** (10 mentees; 3 EMs)

At the beginning of the year was when I was most vulnerable, that was when it was most beneficial... You could go and see him about everything and anything if you were stuck. At the beginning of your teaching career it can be very difficult and stressful, and it can be quite hard so they do support you and provide you with help. (PEP mentee)

Certainly on the SASP course itself, I went into the course feeling quite anxious about my subject knowledge and specifically the practical work that you get with physics because I just hadn't experienced a lot of it myself when I was at school whereas with biology and chemistry I was pretty secure with it. So he definitely put my mind at rest with that quite big issue. (SASP mentee)

[I]*t's given me more confidence, I cannot lie because [before] I more or less transferred my fear to the* [pupils]... (SPN mentee)

- **Overcoming isolation** (9 mentees; 2 EMs; 1 stakeholder)

To me they did a really good job in terms of keeping the rest of us in touch with each other... I thought that role was invaluable really because you can be working in a bit of a vacuum... (PEP mentee)

[Without EM support, including facilitation of peer networking] *I guess I wouldn't have anyone to sort of talk to about… because being in* [region], *I moved away for my own personal reasons, but I don't really know people down there. The only people I do know are at school, people who are in some way involved in school, so you can't necessarily talk to them about certain things... If you start isolating everybody in the classroom by not giving them the funding to go then to these things, you are starting to shut them in the classroom and you don't get any improvement. So the quality of teaching, you don't get to share any of these ideas.* (PEP mentee)

Because I was the only Physicist in my school it's been nice to talk to someone else. (SASP mentee)

There is no physics specialist in the school so before the TLC support, if we had a problem we had to work it out ourselves. Sometimes we would be tearing our hair out. The TLC has opened up lots of avenues. (SPN mentee)

- **Increased resilience** (2 mentees; 2 EMs)

[Without the support of the EM] *I would've done what most* [teachers] *did in the department after the fire* [which burned down the school]. *I would've cracked. I handled it quite a confidently, I was quite positive, personally after the fire, I handled it differently, they were like 'oh my God, it's over' but I said we just needed to get on with it and* [EM] *put me in touch with someone to get things from and another couple of schools gave me text books and that was through* [EM] *saying everybody will want to help*. (PEP mentee)

I think part of training to be a teacher, one of the best things is knowing other people are going through the same things as you are. Knowing that there is a learning curve and although some people are higher and some people are lower you are all going through it. You share ideas, distress with each other and it helps you stick with it. It's hard to say if I didn't have that I wouldn't have stuck with it. I can't really say, but it certainly has helped keep me going. (PEP mentee)

They think because they've got the PGCE they're a teacher because they've got the rubber stamp or what have you, and ... if they go to a tough school and they are not really a sure teacher they might struggle with it and therefore you need to reassure them that... there is light at the end of the tunnel... I have seen quite a few examples of people who have been fine and I have seen examples of people who've dropped out of teaching as well... I mean to be totally honest there are quite a lot of success stories, people who have stuck at it. It's about perseverance really and not giving up and as long as you aren't completely off the ball... (PEP mentor)

- **Development of identity as teacher of physics or 'all round' science** (2 mentees; 1 EM)

In terms of thinking of myself as a science teacher who is a science teacher all round, yes [EM has had an impact]... *Just for me as a person ... there was always a subject in science that I didn't like, I was scared of and ... I have conquered this thing, it's massive for me. I'll tell you how important it is to me: about the* [pupils' examination] *results, I called my father in* [country] *and told him and he was like 'wow', because he knows that Physics and myself we had no relationship at all...* (SPN mentee)

4.3.4 ENHANCED RECOGNITION AND CAREER ADVANCEMENT

- **Enhanced career progression and promotion prospects** (3 mentees; 5 EMs; 1 stakeholder)

One SPN participant suggested that as a result of her work with a TLC she could now see herself applying for posts that she previously considered would have been out of her reach:

It would for me have been 'well how you can be head of faculty with these deficiencies in this area [subject knowledge]*?' But now, yes, I would think about it... I don't feel I have any deficiency so if I went for an interview and they asked if I could teach physics then the results show it.* (SPN mentee)

A minority of external mentors across all three programmes also indicated that mentoring support had enhanced mentees' career progression and promotion prospects, though PEP and SASP mentors were more cautious in claiming this on the grounds that it was difficult to differentiate the impact of the mentoring from the broader programme:

In terms of career progression I don't know how they would have progressed naturally but my gut reaction is they prospered because lots have had promotion. Schools want to keep people who can teach physics. (SASP mentor)

One [SASP participant] *in* [region] *went from main scale to second in department. One woman successfully got promotion to head of department. Another was able to move to an 11-18 school to teach A level and wouldn't have been able to do this previously. Three or four in total have had promotions during the time of contact and this was definitely because they could now offer physics but it is hard to say if this is because of the mentoring or because of SASP more generally.* (SASP mentor)

I can tell you that it does have an impact on career progression. A few of the teachers have gone on to do a SASP course, for example, and actually become much more qualified. And one or two have gone on to become heads of physics and I don't think they would have been able to do that without the increased knowledge of the subject. (TLC)

- **Becoming a 'leading light' within the department, an 'expert' other teachers can call on for support** (4 mentees; 1 EM)

I've been able to advise colleagues as well and all this rusty old equipment at the back of the cupboards, we've been able to get it out and use it and it's not just collecting dust anymore. (SASP mentee)

4.3.5 IMPACT ON DEPARTMENT, SCHOOL AND TEACHING PROFESSION

One potential benefit of external mentoring to the broader departments and schools in which mentees are based results from some mentees becoming recognised as a 'leading light', since this provides a **potential source of professional development to other teachers**. And as one EM put it:

I think that some [mentees] *at least will feel more able to contribute to the wider life of the Department through the support gained through these sessions.* (PEP mentor)

In providing support for colleagues, mentees, like the external mentors who supported them, are also potentially **freeing up some of the time of heads of department** and/or any school-based subject specialists who may otherwise have provided such support themselves.

Another reported benefit of external mentoring, beyond those which accrue to the mentee, includes:

- **Stimulating increased discussion about Physics and teaching Physics, and greater collaboration, within departments and schools** (3 mentees; 2 EMs)

I got some demos of physics practicals I don't think any teacher has seen before and I was able to give feedback to my colleagues and they were like 'that's fantastic'. (PEP mentee)

This [TLC] *session will be discussed within the department at the next departmental meeting and we will talk about how we will use it within the faculty. A lot of the material we're covering in the sessions we're hoping to incorporate into our schemes of work.* (SPN mentee)

Another SPN participant also stated that without the work of the TLC '*Physics wouldn't be so high on the agenda*' and that the support had created '*good opportunities for teamwork and collegiality*'.

There is evidence from different sources that external mentoring is helping to achieve one of the major goals behind its inception, and this is undoubtedly one of the most significant reported benefits given the shortage of physics teachers in schools, namely:

- **Enhanced teacher retention** (10 mentees; 7 EMs; 1 stakeholder)

A number of PEP participants stated that without EM support they 'might not have completed' their PEC, PGCE or NQT Induction, while at least one PEP mentee suggested that he felt working with the EM had an impact on the likelihood of him remaining in the profession:

Because he's still really enthusiastic and really happy and enjoys his job and so you know that's possible... it's nice to have a positive person to kind of encourage you, to have a positive influence about, a happy person to encourage you to keep going. (PEP)

A university based stakeholder we spoke to was clear that the PEP EM in their region had 'saved' one participant 'from leaving the profession' and that 'more would have fallen by the wayside' without his support, while a PEP mentee in a different region suggested that without the kind of support provided by her mentor:

Many [beginner teachers] *might find it hard to continue. It is fantastic having somebody out there, out of the school context... the support is great.* (PEP mentee)

Another PEP mentee referred to the potential impact on teacher retention of the EM encouraging continued networking between peers based in different schools:

I'm not sure we all would have kept in touch [without the EM], *and … the people from the* [PEC] *course keeping in touch is for us, well I think for them staying in science teaching, is going to be really important. They can share ideas and resources between them and being in different schools I don't think teachers often get enough opportunity to do that.* (PEP mentee)

While most of these data relate to PEP, there is some evidence that the potential impact of external mentoring on teacher retention may extend to participants outside of this particular programme: one SPN participant stated, for example, that the support he was receiving '*reinforces my want to continue to teach...*'

4.3.6 OTHER POTENTIAL BENEFITS OF EXTERNAL MENTORING

There were some indications from a minority of mentees and mentors that in some cases, external mentoring may have also contributed to a number of benefits for which the data generated for this study do not provide conclusive evidence, but which appear highly feasible. These include:

- **Mentees being given more A level teaching** (1 mentee; 2 EMs)
- **Increased pupil take-up of physics** (1 EM; 1 stakeholder)
- **Increased engagement of female pupils in particular with physics** (2 mentees)

Our data show somewhat more clearly that in some cases, external mentors worked with and helped to improve the knowledge and expertise of laboratory technicians, with consequent benefits for the teachers / departments these were supporting (3 mentees; 1 EM). One SPN mentee explained how, prior to the TLC's support, her department's technicians '*had no idea how much work was involved in A Level'* and lacked the requisite knowledge in general, while the school also lacked appropriate equipment. The EM was asked to provide support for the technicians, ran several sessions with them and was said to have raised their confidence, understanding and enthusiasm:

Before, it was like 'we're [just] *gonna do our basic work' ... Now they go far beyond what I ask them to do* [and] *are more open to requests*. (SPN mentee)

The group of technicians in question were said to keep a folder containing queries which they would put to the TLC on his next visit to the school.

Finally, while it was only explicitly and directly mentioned by one participant, and despite the investment in terms of time that mentees need to commit, it is reasonably safe to conclude from our data that their participation in external mentoring can reduce mentees' workloads and/or make these more manageable, for example, through the provision or sharing of resources, or the increased capability of technicians:

I'm trying to get [mentees] *to ... share information with each other, to make their lives easier. Because it is the first two years* [in teaching] *that is the worst bit, it's a nightmare with planning everything. Whereas if they can share it with it each other it cuts down their work load...* (PEP mentor)

4.4 VARIATION IN THE REPORTED BENEFITS OF EM ACROSS PEP, SASP AND SPN

Earlier in this chapter we have mentioned, in passing, some apparent differences between the benefits of external mentoring associated with PEP, SASP and SPN respectively. Here we identify and briefly discuss the most notable differences in this regard.

- First, **PEP mentees were more likely than SASP and SPN mentees to report that EM support had helped them overcome isolation.** This is perhaps to be expected given that PEP mentees were relative newcomers to teaching and school staffrooms, while most SASP and SPN mentees were more experienced teachers who were more likely to have existing school-based social and support networks.

- Secondly, as we saw above, **PEP mentees were also more likely to report that external mentoring had influenced their retention** and likelihood of remaining in the teaching profession. Again this reflects the career stages of the mentees: the majority of SASP and SPN participants were established teachers who had made a decision to invest in their capability to teach physics, which suggests an existing commitment to remaining in teaching, while PEP participants had relatively recently ventured into the unknown and even with the best intentions could be said to have a much less stable commitment to remaining in the profession. In addition PEP mentors appear to have been able to help some mentees navigate the 'reality shock' (Gaede, 1978) or 'transition shock' (Corcoran, 1981) often experienced by new entrants to the profession, typically often associated with coming to terms with the harsh realities of a full or relatively full timetable, and/or with pupil indiscipline (Veenman, 1984).

- Thirdly, **PEP mentees were** *less likely* **than SASP and SPN participants to report improvements in their subject content knowledge.** A potential explanation for this finding is that as beginning teachers, PEP mentees are likely to have been less confident about and to have a greater need for EM support for general pedagogical knowledge and skills and the emotional demands of teaching. Such an explanation finds some support in the following quotation:

I've never seen it as a teaching physics thing, I just see it as those [beginner teachers] *going through the same process. In fact any discussion about teaching at* [the networking] *meals has been about general teaching, it wasn't really about particular physics topics... The very nature of the stage we're at is that people are more concerned about things like classroom management* (PEP mentee).[27]

- Fourthly, **PEP mentees were also** *less likely* **to indicate that external mentoring had helped bring about increased pupil understanding and learning**. This could be explained by the fact that SPN and SASP mentees are generally more experienced teachers, and thus more likely to notice any impact on pupil learning and the factors that helped bring this about, with PEP mentees having relatively little to compare with. Another possible explanation is that, as suggested above, PEP mentors need to provide relatively broader support for their mentees' general and subject pedagogical knowledge and psycho-social needs, as beginner teachers, whereas SASP mentors and SPN TLCs can focus their energies more exclusively on subject content and subject pedagogical knowledge, which might be more likely to affect pupil learning in the short term.

- Finally, SPN participants were less likely than PEP and SASP mentees to state

[27] This point and quotation echo to a certain extent some evidence presented in Chapter 3 (Section 3.3.1), where it was suggested that some newly qualified teachers were so focused on trying to deal with the stresses of their first year in teaching that they were not ready or able to take full advantage of the offer of support for their subject content and/or subject pedagogy. It should not be concluded from this, however, that newly or recently qualified teachers of secondary physics (or other subjects) require less support for their subject content knowledge than more experienced colleagues, and we show in Chapter 7 (Section 7.3.2, Table 7.8a) that this does not appear to be the case.

that they benefited from the reassurance of having someone to whom they could turn in time of need. This may be partly explained by the relative differences between the EM roles, with TLCs tending to provide relatively more face to face training and coaching for groups of teachers but having less contact with individual mentees outside of their school context. It may also have something to do with the fact that PEP and SASP participants tended to be more likely to be taking on 'something new' via their PEP and SASP programmes (and associated assignment- and school-based work), which may have created a greater need for reassurance.

4.5 CONCLUSION

In this chapter, we have focused our attention on the perceived impact of external mentoring. We have reported that the vast majority of participants who took advantage of EM support found this advantageous, and have outlined a number of perceived benefits of external mentoring, which we have categorized as: impact on mentees' professional knowledge and skill base; impact on teaching and learning; emotional impact; enhanced recognition and career advancement; and impact on department, school and teaching profession. Some of the benefits of EM reported in this chapter are illustrated more fully in Chapter 6, which presents case studies of the work of six external mentors. Before that, in Chapter 5 we examine the factors which the various participants in our study associated with the effectiveness of external mentoring and which seem most likely to maximize its impact.

CHAPTER 5. FACTORS INFLUENCING THE IMPACT OF EXTERNAL MENTORING

5.1 INTRODUCTION

In this chapter we outline various factors which our evidence suggests are influential in relation to the potential impact of external mentoring. Perhaps unsurprisingly, there is a certain amount of overlap between this discussion and that provided in Chapter 3 relating to the factors influencing the take-up of external mentoring. We should note that, compared with the foci of our earlier findings chapters, relatively few of the participants interviewed for this study gave clear and explicit accounts of factors which they felt had influenced the impact of external mentoring, and that the following discussion relies rather more than previous chapters on our (the research team's) broader analyses and interpretation of the data. For this reason, and although we still provide supporting quotations from mentee, mentor and stakeholder interviews to illustrate some of the points made, we do not in this chapter make reference to the number of participants who referred in interview to the particular considerations discussed, while we do where appropriate occasionally make reference to the broader literature on mentoring.

We begin in Section 5.2 by discussing issues relating to mentors' ability to gain access to teachers who are potential beneficiaries of their support, and vice versa, and go on in Section 5.3 to identify a wide range of factors, relating to both mentors' and mentees' characteristics and working conditions, which our evidence suggests influence the impact of external mentoring.

5.2 EM ACCESS TO TEACHERS IN NEED OF SUPPORT: THE PIVOTAL ROLE OF THE SCHOOL GATEKEEPER

In order to be able to have a positive impact on trainees and teachers who need and would potentially benefit from their support, EMs need a reliable and effective way of gaining access to such teachers; yet as we saw in Chapter 3, this was not always the case, especially for TLCs:

In a few schools yes [I feel I have made a difference] *but I think for the amount of time I've spent I don't feel I've had a big impact and a lot of that is to do with* [some] *schools not engaging*. (TLC)

One senior stakeholder associated with the SPN programme stated that to some extent this problem of access reflected a more general issue, which he had witnessed in relation to more than one programme, that:

Schools don't always know how to best make use of external support... such as this... There is lots of free support but it's kind of as if schools need time to learn and training in how to best make use of the support. (Stakeholder)

The interest and willingness of individual heads of department or faculty to seek support for themselves and their colleagues was found to be a significant factor influencing the effectiveness of external mentoring, particularly the work of TLCs:

Last year the head of science wasn't very proactive so I did one session for department and one one-to-one with [teacher/second in department] *after school. When* [teacher] *became head of science she was much more positive so this year, since the*

announcement that the programme would continue, we've had one meeting to discuss the programme and the school's needs, then last week's session and another one is planned. (TLC)

To be successful in the role it is helpful to get the head of physics on board, if there is one, or else the more experienced departmental colleagues. (TLC)

A number of suggestions were made by participants with regard to how EMs (and TLCs in particular) might more successfully secure greater access to those most in need of EM support. Some suggested that it would bear fruit to have direct access to and be able to gain the support of the school's senior management team:

In terms of the initial contact with schools we were given the heads of science contact details but it may have been helpful for the primary contact to have been at a more senior level, for example, because some heads of science were reluctant to come on board and it has sometimes taken subsequent contact with a head or deputy to get things going. (TLC)

It would be helpful to have greater or more access to 'guarded' schools and the teachers who would benefit from the support but aren't given access to it. It is important to win over the SMT. (TLC)

Others, however, suggested that the impact of external mentoring would be limited without head of department (HoD) 'buy-in', especially in relation to programmes like SPN which involve working with whole departments rather than (or in addition to) individual teachers, so attempting to go over HoDs' heads to schools' senior management teams could be counter-productive:

Often when the SLT signed up to SPN the heads of science didn't feel they had ownership... if the head of science doesn't engage then we get nowhere. The programme is about developing whole departments not individuals so you do need the head of science on board. They might not manage it, but they have to allow time for it. (SPN stakeholder)

Despite the potentially pivotal role of the HoD, however, the potential impact of EM may nonetheless be enhanced in some circumstances where *individual teachers (as potential mentees) are aware of available EM support and able to access such support directly*, rather than through a HoD or other gatekeeper. This might be inferred from the following comment by a newly qualified teacher asked to reflect on a recent session provided for her department by a TLC:

I would have preferred the session focus to have been on electricity... with electricity people are much more likely to teach it wrong, even those with a Physics degree... I'm assuming [head of faculty] *chooses these topics and he knows the needs of the department.* (SPN mentee)

When asked whether she had personally been in touch with the TLC regarding potential support in this or other areas, the participant indicated that she wasn't aware she could do so:

I wish I'd thought of that when I was teaching Waves. I haven't done so previously but I would do in future. (SPN mentee)

It is also important to recognize that in some cases the HoD or other gatekeeper might be open to EM support but individual teachers may not be. Indeed there is evidence from the present study that some HoDs strongly encouraged busy and reluctant individual teacher colleagues to work with an EM. However, there is a distinction between encouragement and direction, which may indeed be counter-productive. As we will see in the next chapter, one TLC ('Mike Freeman') stated that while he stressed to schools that individual teachers' take-up of the support offered ought to be on a '*voluntary' basis*, for some visits he was under the impression that the HoD had put out '*a three-line whip'*.

5.3 MENTOR- AND MENTEE-RELATED FACTORS AFFECTING THE IMPACT OF EXTERNAL MENTORING

Where external mentors are able to gain access to teachers (including heads of department) in need of their support, the impact of their work will be influenced by a wide range and a large number of considerations. In what follows we present 18 factors which our analyses suggest were most influential in relation to PEP, SASP and SPN external mentoring, although there are overlaps between some of these, and we would not wish to claim that this provides an exhaustive account.

(1) Individual teachers' openness to mentoring and willingness/ability to learn and change

Previous research relating to school-based teacher mentoring has found that its impact depends to a significant degree on the 'readiness' of the mentee to be mentored and on associated characteristics such as openness, willingness to learn and change, and preparedness to operate outside of their comfort zone (Little, 1990; Roehrig *et al*., 2008; Schmidt, 2008; Valencic Zuljan & Vogrinc, 2007). While it seems unlikely that such considerations are not similarly important in relation to external mentoring, the present study was unable to uncover much direct evidence in this regard, perhaps partly because those teachers and HoDs who were least open to mentoring support were also probably less likely to participate in our research, and partly because (for reasons of social desirability bias – Fisher, 1993) those participating teachers we did speak to were unlikely to state that they were insufficiently open to the idea of mentoring and change (even if they recognised it). Nonetheless, there are indications in our data that in some instances (prospective) mentees were either resistant to the idea of mentoring per se or else defensive or unresponsive to some attempts to support their professional development:

I've not been that interested [in EM support], *it's not been practical. I think if something was there and I thought I needed that then I would go.* (PEP participant)

One of [my mentees], *I had to be quite critical* [after observing one of her lessons] *and she didn't take it very kindly. It's just one of those things, they had windmills and they were doing wind energy, it was an incredibly low level group and they'd got these kits and they spent two periods trying to get some wind energy and not one cottoned on to the fact that the blades had to be angled so that the fans were face on and she didn't help them and didn't even show them a photograph of a real windmill and say 'can you see any difference?' And I when I made a comment about things not really going that far because of this sort of block, she got really quite shirty with me saying they should find things out for themselves and it's a bit like asking them to reinvent the wheel...* {Had she asked you to observe her?} *Yeah, she had asked me to... It was*

just 'do you think I am presenting this wind energy idea in a way that physicists would reckon was', you know... to me that was the thing that kind of hit you in the face really. (SASP mentor)

One TLC stated that the impact of their work was limited in some cases because heads of department were '*not willing to change the scheme of work*', while another described how he had:

...made a series of suggestions and [the HoD had not] *followed up on any of them... If we manage to win another couple of thousand pounds … the head of physics wants to buy software with it. I think 'no, you're telling me you've got problems with kit, we're trying to make physics exciting and interesting, let's actually buy some equipment and do some good experiments!' Clearly their head of physics and I are not thinking in the same direction, I think the result is that the advice just hasn't gone anywhere*. (TLC)

While on the surface teachers' and HoDs' 'openness' to mentoring may appear to be something over which mentors and others have little control, it is argued that this is likely to be influenced by a number of 'conditions for effective mentoring' (Hobson *et al*., 2009), including the context within which the mentoring takes place, the characteristics and suitability of the mentor to whom mentees are allocated, and the training received and strategies employed by the mentors. A number of specific instances of these conditions for effective mentoring are outlined below, in the context of external mentoring provided by PEP and SASP mentors and SPN TLCs.

(2) Mentors' ability to build relationships and trust

In line with research into school-based mentoring (Abell *et al*., 1995; Oberski *et al*., 1999; Hobson, 2012), several mentees and mentors in the present study attributed the success of EM, in part, to the relationships that were developed, notably relationships which were based on trust and normally developed over time:

We have a good relationship and I ... allow him to do most of the talking and I listen. I knew before we started for him to be my mentor, I know that anything that I say is confidential... (PEP mentee)

I was able to go 'I don't understand this' and he would go into layman's terms, it made it so much easier ... it was because I'd known him for such a long time, it's been two-and-a-half years since the start and it's just been, he's always been on the periphery all the time... (PEP mentee)

Teachers need someone to develop a long-term relationship with who they can consult without feeling they will be judged. So they need... someone who will support and challenge in a non-judgemental way. (TLC)

When asked which of two types of support she reported receiving from her EM had been the most beneficial – that provided via social events or knowing he is on the other end of the phone if you need him, one PEP mentee indicated that that they were equally useful and complementary and that she might not '*have felt confident to ring him*' if she hadn't first got to know him through informal group meals.

A mentor's ability to effectively build relationships and trust may be enhanced by a number of factors, including: their independence from the schools in which their mentees work (or are training); the opportunity to work with mentees in a purely supportive capacity, with no role in their assessment; the ability to empathise with mentees; and the opportunity to engage in face-to-face, one-to-one interaction. We illustrate these points below, along with others which our data suggest influence the effectiveness or impact of external mentoring.

(3) Mentors' independence from mentees' schools

I can't think of anyone in my department who I could talk to like I do [EM]... *I think it was* [the fact that] *he was external, I mean ... because he's independent. There wasn't the politics that comes with a school... mentor.* (SASP mentee)

I wouldn't want to say to my boss I don't understand something because I don't want to come across like I don't know anything about physics, so it would be easier to go to someone external in that case. (SPN mentee)

It is sometimes easier to be asked to rethink what you are doing from someone outside the school than someone internally. Although it depends on their relationship with the head of department, in general it is easier to admit you don't understand something to an outsider than to someone who, for example, might have an influence on whether you are about to get a pay rise. Some teachers have said [to me] *'I've never been comfortable teaching this, I don't understand it'.* (TLC)

(4) Mentors being on the teacher's side and not involved in their assessment or appraisal

I know I can ask the teachers here but if you've got a physics question you may not want to ask the teachers here because you feel you ought to know the answer. So it's good to go elsewhere... [where] *people won't think 'hang on we've got a physics teacher here who doesn't know the answer'.* (PEP mentee)

I've used the TLC loads and can ask stuff that I would feel a bit too stupid to ask colleagues that. TLCs don't seem to judge. (SPN mentee)

In some situations it's probably been helpful to have someone [to whom] *they can ask daft questions and know that it won't be discussed later in the staffroom. We're not there to be judgemental, we're just there to help. It's probably comforting to know that there's someone there to ask without your lack of knowledge being exposed to everyone in the department.* (SASP mentor)

The strengths are that you are not passing judgements on teaching. You are passing on ideas, thoughts and help. You are on their side – you're not an inspector... Teachers get hammered from above all the time. It's nice for us to provide something different. (TLC)

Some schools I work with have physics qualified staff in the school but the biologists and chemists teaching physics don't always go to them for support, sometimes just because of time but also because they don't want to look silly in front of their colleagues. As TLCs we make a big issue of the fact that we are on the teacher's side – it is not about inspection, we don't report back to the head teacher, etc. (TLC)

(5) Mentors being empathetic, encouraging, supportive and positive

It has been extremely hard to train as a teacher with two children and my husband works shifts. Other people can come home from their placement and carry on working but I've had to collect the children from different places, feed them, bath them and then I'd have my work to finish off at 8.30pm, so it has been extremely difficult. It's nice to have someone [EM] *there who's understanding and someone who encourages me and is very positive.* (PEP mentee)

[EM's] *general character has been very supportive and understanding, and... it sort of gives you confidence...* (PEP mentee)

(6) Opportunities for one-to-one, face-to-face interaction

Our data also suggest that the opportunity for teachers to be able to access one-to-one support in a confidential setting was a significant factor influencing the effectiveness or impact of external mentoring, as a number of mentors and mentees alluded to:

When I was at school we didn't have tutors and even at university our tutorials were in groups. I've never had that one to one thing before and I think it is important, it makes you feel special and I think that's what you need in order to stand in front of a class, to know you're special. (SASP mentee)

I like the face to face contact because it means you have the person in front of you because if it's by email you may not express yourself as you mean to and when he explains with physics it is better to have face to face contact. I think face to face contact in terms of what I want out of it, I think that's more beneficial because sometimes you want to write stuff down, show me things and all sorts of things, so that's more useful. (SPN mentee)

I prefer to give the support face to face because you can't communicate attitudes in an email conversation. I think I probably spent 75 per cent of my time working face to face and about 25 per cent by email. Though the email was used to do the business things and organisational things. (SASP mentor)

Teachers... are not so open and honest in large groups, but they are in the subsequent one-to-one meetings… (TLC)

In turn, opportunities for one-to-one, face-to-face contact will be enhanced where, for example, both mentors and mentees have sufficient time to engage and are based within close geographical proximity to each other.

(7) Teachers' willingness and ability to find time to engage with the EM and protect agreed meeting times

When asked whether they felt anything had prevented EM support from being as helpful as it might otherwise have been, a number of participants referred to time constraints relating to the school day:

Time really. We don't have enough of it. We have had to do some sessions after school because we can't find the space in the school day. (SPN mentee)

The time, time has gone so fast and we've gone through so much stuff, it would've been useful to have a half day at it rather than a lesson and lunch, just under two hours. (SPN mentee)

Another volunteered:

What I used to feel bad about was when [TLC] *came to help me, like one-to-one, and you have to tell him that 'I have another class' and he had to pack away his stuff.* (SPN mentee)

(8) Mentors having sufficient time to engage with teachers and flexibility to be able to respond swiftly to requests for support

[Having access to an EM] *gave me the chance to speak to someone with a lot more focussed time for me... in the department you can chit chat but it's people's time, it's very precious, unless it's related to something you have to get on with. Whereas if you have a*[n external] *mentor they've got the time and that person is mentoring you so they can guide you a lot more.*
(SASP mentee)

He's always available by email and I can text him as well so the fact knowing that he is available is really useful and also the fact he is proactive and gets in contact with us and says 'I've got this date, this date, would you like me to come in?' He makes himself completely available to us... Sometimes... I've emailed him and said 'I'm teaching a new part of the specification, really not sure what I'm doing, can I have a chat with you?' And he can either come in during the day when I've got a free lesson or other times he's met with me straight after school, so it's quite immediate. (SASP mentee)

The University tutor I hardly spoke to, but with [EM] *I sent him an email and within a couple of days I got a reply*. (PEP mentee)

Not all participants in the present study felt they could make such demands on their EM's time:

As a busy HoD I would have thought that a lot of us going to him would have been difficult in terms of his time. He did say that he was busy. (PEP mentee)

(9) Mentors' geographical proximity to mentees

When asked whether there had been any constraints on the support the EM had been able to provide, one mentee responded '*...only the sheer distance, the fact that I can't necessarily go and see him personally*' (PEP mentee), while another said '*Perhaps if he lived closer he could have come to observe me... Yeah that would have been good*' (PEP mentee). Others considered themselves relatively lucky in this respect:

Luckily for me his college was a five minute trip from my school, so I could pop in whenever I needed help. We had quite a lot of email kind of chats and phone calls but also meeting up with him quite a lot was good help and because he came to quite a lot of SASP meetings we could ask him for help then. (SASP mentee)

If I hadn't been round the corner I wouldn't have gone because the PGCE year is so busy. I wouldn't have travelled twenty miles or so as I was working until 11 at night. There were only four or five of us there (from different cohorts) because of the distance for the others. (PEP mentee)

(10) Mentors' ability and willingness to tailor support to individual needs

In line with earlier research on effective support for teachers' professional development (e.g. Hustler *et al*., 2003), participants in the present study suggested that one of the key influences on the success or impact of external mentoring was mentors' ability to address teachers' specific, individual needs:

[EM has] *made a huge impact... because it's based on the individual, the mentee, so me, and he found out about me in a particular school place... I knew I was taken as a whole, my school and my job, the kids I work with and my department and not lumped together with everybody else... So I got what I needed which is not what other people needed. I think if you go to some of these courses where you're all just biologists or physicists, it's not put into any context and you learn a little bit but you forget it because it's not relevant to you*. (SASP mentee)

[The support] *was good. The best thing about it was that* [TLC] *said 'what do you want to do?' It was very flexible and personalised and so helped us get the most out of it.* (SPN mentee)

[EM] *didn't come to us with his own agenda which is why it worked really well.* (SPN mentee)

The strength of SPN is that it is entirely bespoke. Every school is different. In some schools they just want me to work through the schemes of work with the HoD. In other schools, for example where there is no physics specialist, I am teaching the teachers basic subject knowledge and pedagogy, e.g. electricity and how to teach it. I work both with groups of teachers as well as individual teachers, e.g. to help the teachers to teach A level topics, e.g. astrophysics. Whatever the school want me to do I do it... (TLC)

In contrast to the positive messages provided above, one teacher described how one SPN session she had attended was unlikely to have much impact due to a *lack of attention* to the prior knowledge and needs of the participants:

The material was excellent but pre-conceived, not presented in response to what our needs were, and these weren't established... There was little 'Tell me what your issues are', he was driving the agenda too much… I couldn't follow his modelling at a high enough level, he wasn't adapting it to the level we're at, i.e. not much. (SPN mentee)

In order to be able to effectively tailor support in this way, EMs need to have the requisite experience, knowledge and skill to be able to provide support for the full potential range of mentee needs, including support for subject content knowledge, subject pedagogical knowledge, and general pedagogical knowledge (Shulman, 1987), as well as emotional or psycho-social support (Gold, 1996; Kram, 1985). The support role will also tend to be enhanced where mentees perceive the mentor to be credible.

(11) Mentors having credibility with mentees as passionate subject specialist teachers

Also general teaching, not physics-related just general support, I think that's the reason I'm doing so well now because I've got someone to talk about it... [EM] *gave me loads of good advice and of course he is a teacher teaching now, I think that's important, you can't have a random physicist who's not in school...* (PEP mentee)

I went to the [school] *where he worked and I sat through the lessons and... I saw* [that] *he practised what he preached whereas the other A level lesson I went to at another school was very much old fashioned, I learnt something but it was the way I was taught, it was a chalk board, it wasn't even a white board.* (SASP mentee)

[Being supported by EM] *gave me... confidence in my teaching ability and my awareness of the pressures. Here I've got a practitioner who is established in an area that I wanted to go into and not only could I speak to them about physics but in terms of teaching as a profession and how other professionals deal with problems they come across in teaching.* (SASP mentee)

And even when [TLC] *is talking about it, you can see this man enjoys what he's talking about, he has this passion for physics and I used to think 'how can you have a passion for that? Something as dry as that?' But somehow once you understand it, it just makes it a whole lot different.* (SPN mentee)

(12) Mentors' ability to facilitate and help mentees appreciate the significance of investing in peer networking and support

As suggested in earlier chapters, some of the benefits of external mentoring resulted from peer support which EMs had facilitated and encouraged. One PEP mentee suggested that:

Without [EM], *without that mentoring role, we* [PEP mentees] *wouldn't have formed such a close group... We all came from different places and we're now at even more different places so we don't really see each other so it's good... because even though we saw each other every day* [on the PEC] *we didn't necessarily see each other outside of that and the mentor brought us together to socialise outside.* (PEP mentee)

Another stated that the most helpful support provided by the EM was:

Probably the social aspects and the organisation of getting everyone on the course together. Keeping a relationship with people you've been on a course with, which is sometimes quite difficult. (PEP mentee)

(13) Mentors' ability to facilitate mentees' access to a bank of appropriate resources for teaching

Several mentors and mentees noted that in some schools there is a dearth of relevant resources to facilitate the teaching of physics in a practical and engaging way, and many mentees were appreciative of resources they were provided with, made aware of or helped to access by their EM, sometimes via their attendance at workshops and conferences:

We got a CD of lots of programmes, they were all done by the IOP so we got extra things to use in school... and [information about] *how to use the Science Learning Centre because a lot of schools are starting to use them more now and* [access] *new technology for physics.* (PEP mentee)

The third sort of contact [with mentees] *is* [at] *conferences, like ASE. They come away with tons of resources and stuff from different workshops there. Particularly IOP workshops but also loads of other ones that are there. And they take all of those resources back to the classroom and that's another invaluable thing.* (PEP mentor)

(14) Mentors' willingness and ability to be pro-active in establishing and maintaining contact with mentees

A number of mentors and mentees indicated that, in some cases, if mentors had not been proactive in encouraging prospective mentees to take advantage of the support they were offering (sometimes via school gatekeepers in the case of TLCs), then they would not have done so. As reported in Chapter 2, once established, contact between PEP, SASP and SPN mentors and mentees was sometimes driven by mentors and sometimes by mentees, though EMs would tend to get in contact with mentees if they had not heard from them for some time, and again our data suggest that if this had not been the case, less mentoring would have taken place. One interviewee stated that in Year 2 of the SASP programme in their region, the mentor had to drive the relationship by initiating contact and arranging meetings and that if this had been left to the mentees, little or no contact would have take place.

(15) The provision of appropriate opportunities for the preparation and support of mentors

Other things being equal, mentors will be more effective where they have undertaken specific training for the role, of the kind that allows experienced subject specialist teachers who are becoming mentors to acquire or consolidate the (additional) skills and knowledge needed to scaffold teacher learning and fulfil all mentor roles. Being an excellent teacher and possessing excellent subject knowledge are necessary but insufficient conditions for facilitating teacher learning, as previous studies have demonstrated (Evertson & Smithey, 2000; Yusko & Feiman Nemser, 2008). In addition, some of the external mentors associated with the programmes under investigation valued opportunities to meet with other mentors, share experiences and resources, and provide mutual support.

I've been to the meetings in London where we looked at the role of the mentor, it was considering how much was a coaching role and how much was a mentoring role. It was eye-opening. It was very helpful; most of all the chance to meet with others doing the same role so we could compare approaches. (SASP mentor)

There are meetings in London once every half term to share ideas. This is ongoing... The opportunity to spend a day networking with other TLCs is most helpful since we can bounce ideas off of each other. (TLC)

(16) Consistency and cooperation between EMs and other providers of support for mentees' professional development

In general, mentees will be likely to benefit to a greater extent where external mentoring support connects to other provision for their professional development, and where different forms of provision and support are coherent and complementary. In the present study, we came across some evidence of collaboration in action, such as a PEP mentor and PEC tutor meeting to discuss their relative roles and plan consistent provision, while we also saw some evidence of fragmented provision, including, in some cases, little or no contact between PEP mentors and the PGCE tutors of some mentees. A TLC pointed to a similar issue regarding a lack of coordination between the work of TLCs and Science Learning Centres:

I know some schools have taken on other support, one of the schools is part of the Science Learning Centre and they are doing quite similar things to what I'm doing... I'd say it makes me redundant because the support the learning centre offers is pretty much what I was offering, the workshops for non-specialist teachers are being done by the Science Learning Centre. I found this out by bumping into a mutual acquaintance; the learning centre hadn't told me this was going on. (TLC)

Two stakeholders also suggested that SASP mentoring might have had more impact had it been better integrated with the broader programme, with one of these interviewees stating:

The mentoring was a bit of an add-on. That was one of the weaknesses in a way. It didn't really integrate fully with what was happening on the courses. (Stakeholder)

While coherence of CPD provision is generally desirable, however, sometimes this is difficult to achieve, and we have shown in earlier chapters that in a number of ways external mentors have sometimes been able to compensate for shortcomings in other (notably school-based) support structures for trainees and teachers.

(17) EMs are able to work with both individual teachers and departments

As may have been inferred from some of our earlier discussions, there were indications in our data that it was beneficial for mentors to have the opportunity to work both with individual teachers (the main focus of PEP and SASP mentoring), and with broader departments (the main focus of SPN TLCs), including supporting technicians to better support teachers. In the context of group (e.g. departmental) mentoring or coaching, group dynamics are important, and external mentoring will tend to have a greater impact where individual mentees are willing and able to contribute to discussion in front of their colleagues, especially where such contributions might expose potential misunderstandings. The presence of physics specialists alongside non-specialists can sometimes be problematic in this context. Reflecting on one of his sessions, a TLC commented that he had not expected the specialists '*to leap in so much*' when he was questioning the group, and had thought they would '*hold back more*': '*I dropped hints but* [spoken regretfully] *I needed to go beyond hinting*'.

(18) Mentors have a sufficient degree of autonomy

Finally, a minority of participants indicated that it was beneficial for EMs to be relatively free to exercise their professional judgement in performing their roles, and acknowledged the work of the IOP and Gatsby Foundation in supporting this way of working. When discussing factors which might enhance EM's ability to undertake their role effectively, one PEP mentor said:

Don't be too dictatorial from on high as to what the way to mentor is. That's the key [factor]. *I know quite often it says 'we've got the formula for being a perfect mentor and we're going to roll it out across the country'. The secret is to be flexible rather than like that, and to give the people who are doing the mentoring the opportunity to go out and meet the needs of the people they are mentoring... IOP and Gatsby are marvellous like that. They say 'if you've got a good idea we'll give it a try and see how it goes' and they don't constrain you in that way... they give mentors the chance to do what they know to meet the needs of the students, which teachers naturally do...* [A]*nd* [they give you] *relative freedom over budget as well, if you want to take* [mentees] *out for a meal or what have you: 'that's fine, do what you think is right'. That works. What doesn't*

work is when they say 'you will go out and you will spend money on this, not on this and you will do exactly this because this is the recipe for success...' You can't do that. You need to leave it to the people, the mentors to decide what they will do and to support them. And I think [IOP and Gatsby] *probably do it better than some government organisations.* (PEP mentor)

Two TLC interviewees made similar observations:

One of the strong features of the programme is that as TLCs we are allowed to use our professional judgement and do what we think best. (TLC)

I think if our management at the project had said, for instance, 'you are not allowed to work with technicians', I think that would have caused a problem but they said 'well strictly speaking we're not funded for this but do it anyway because it is useful'. I think it's the fact that the management have had a professional handle on our role within schools, they've not made us constrained yearly by what's written down on a contract... I think that has meant ... I've been able to offer everything I felt was valuable... (TLC)

5. 4 CONCLUSION

In this chapter we have discussed a wide range of factors which our analyses suggest will influence the extent to which external mentoring can have the kinds of impacts on teachers, teaching, pupil learning and schools that we outlined in Chapter 5. Some of these influencing factors are now discussed more fully in Chapter 6, in the context of a more detailed discussion of the nature and impact of the work of six external mentors.

CHAPTER 6. CASE STUDIES: THE PRACTICE OF SIX EXTERNAL MENTORS

6.1 INTRODUCTION

This chapter presents the case studies of the work of six external mentors on the PEP, SASP and SPN programmes. The data for the case studies were generated from a range of interviews, observational field notes and email exchanges. The six case studies provide an overview of the range of work involved in supporting the teachers on the three different programmes. Each case provides an insight into the different ways in which individual mentors have supported their mentees and so the data sets are unique to each case study. Therefore each of the examples below begins with an introduction highlighting the data generated for that particular case study.

The case studies have been selected to present the range of experiences associated with the mentoring and coaching support on the three different programmes. The data are drawn from the work of two mentors on each of the three programmes. We begin with portrayals of the work of two of the PEP regional mentors, Phil and Chris[28], and the various ways in which they support individuals and groups of inexperienced teachers on the PEP programme. There then follow descriptions of the work of two of the SASP regional advisors, Alan and Derek, who each work with experienced teachers with limited subject knowledge pedagogy in relation to teaching Physics. Finally we look at the work of Mike and Robert who, in their role as SPN coordinators, work with groups of teachers in schools.

The case studies are presented here with the consent of those involved, and with some details omitted or changed in order to preserve the anonymity of the external mentors and the teachers they have supported.

6.2 PHIL WILLIAMS

This case study of the work of a PEP regional mentor draws on the transcript of an initial interview with the mentor, Phil Williams, and field notes relating to a group meal involving Phil and three of his mentees (Frances, Rashid and Rosie), together with a post-observation interview with Rosie. It also makes reference to records of email correspondence with five individual mentees (including Rosie), one of whom (Tom) subsequently also agreed to be interviewed.

6.2.1 SUPPORT PROVIDED

Phil Williams (PW) is a practising teacher who at the time of interview was also acting as a regional mentor for the Physics Enhancement Programme (PEP). He had been supporting trainees and NQTs in this way since 2007, and saw his work as '*more like mentoring*' than anything else, though it covered a wide range of activities. In interview PW identified four different kinds of contact, all of which he saw as important: taking members of his group on trips to places where they could take students, or that could prove a resource to widen their own teaching repertoire (such as a science activity centre); arranging social events, where '*they get to talk with people in a similar situation to themselves*'; persuading them to attend conferences such as the ASE; and keeping in regular contact with individuals by email or telephone, and especially with any he perceived as '*having difficulties*', since

[28] The reader is reminded that, as stated in Chapter 1, participants are referred to by pseudonyms.

'*these are the people … where it can help a lot*'. He did not visit them in their own schools as this was within the remit of the PGCE tutors, but in order to gain additional experience pre-PGCE, a few had visited him at the school where he taught himself.

Although he had initially expected that responding to subject-related queries would constitute a major part of the support he offered, in practice he had discovered that '*sixty per cent*' of his work was related to activities aimed at encouraging his mentees to '*swap resources amongst themselves*' and share their experiences '*because they are isolated. A physics teacher in a state school is a rare breed*'. The negative effects of such isolation could be countered '*when they realise other people are having the same issues crop up and that you shouldn't give up in that scenario*'. PW himself saw the resulting '*social network'* that formed between these teachers as '*invaluable*', and thought that the participants too '*value them hugely*'. The get-togethers that he organized also provided opportunities for him to respond to specific requests for subject support or take small pieces of equipment to demonstrate, especially since he felt that such an approach was more natural and so more effective *'than if I were to say, Right, let's all have a one hour lesson on inspiring starters*'.

In addition, PW estimated, around ten per cent of his mentees needed more intensive emotional support related to their individual situations. Again he felt this could be achieved in part by '*very very gentle social engineering*', through putting such individuals in contact with people ' *in a similar scenario*', preferably those who '*have come through it and been fine*'. Encouraging people to see beyond their immediate problems that '*there might be a light at the end of the tunnel*' was an essential part of his approach, especially because as he explained:

it probably takes people anything between a year or two … up to four years to actually become a competent enough practitioner to start to reap the benefits … and they don't always realise that.

However, he also commented that in one case, '*I wasn't quite as encouraging... [and] I felt it was wrong to say of course you can do it if you try really hard*', because he judged that the mentee concerned was not really suited to teaching. Other forms of individual support included responding to requests for advice on job applications, or choosing between jobs. Some varied illustrations of PW's mentoring in action can be seen in the examples that follow.

At a group meal observed during the ASE conference, PW met up with three mentees, Frances, Rashid and Rosie. They talked positively of how good it was to be reunited, and shared their experiences of the reality of teaching. When they described details of their lessons PW joined in with his own examples of similar or different approaches, but without passing comment on what they themselves had said; when they drifted on to more general discussion of the pressures they were under, he gently brought the conversation back to physics, asking '*Can you think of any examples of allowing pupils to fail?*' Later in the meal Rashid talked quietly and discreetly to PW about difficulties he was experiencing with a Year 12 student.

PW appeared to be offering emotional support, but this was a more private exchange within the social situation.

One of the group, Rosie, subsequently agreed to be interviewed about the different ways in which Phil had supported her. She said she had found it easy to turn to him because he was external to her PCGE activities: '*I had different mentors but I felt if I talked to them about any concerns … then that might affect my PGCE*'. At the same time, '*if we hadn't met at a meal I don't know if I would have felt confident to ring him because it would be somebody I didn't know*'. After that first contact '*I always felt like he was there if I needed to talk to him*', and she had continued to keep in touch by email or telephone:

Definitely it has helped my own practice. Just having a relaxed conversation and not feeling you are under any pressure … you know it is completely non-judgemental and private which I think really helps.

She also felt that but for PW's encouragement she would never have attended her first ASE conference where the meal took place. Another function of the group meals in Rosie's view was to provide a context in which PW's mentees could bond into a mutually supportive group:

I don't think we would have necessarily stayed in contact if we hadn't gone for the meals. I think it has had a big impact on us staying in touch… in terms of consolidating the group after it has dispersed.

She particularly valued this because '*you can get a bit consumed with your own school and think that is the only way, so it's useful to have different perspectives when you come back together as a group*'.

PW also provided details of his email exchanges with five individual mentees (including Rosie), one of whom (Tom) subsequently agreed to be interviewed. Hannah, who was about to embark on her PGCE course, had followed up a telephone conversation with PW by emailing him to ask if it might be possible for her second teaching placement to be at the school where he taught himself, as it would provide a good balance to her first one. This had apparently led to more phone calls, and later in the month she emailed again to report her successful completion of her first block of training, and to reinforce her request. Since the school had already made arrangements for one placement he emailed her back to say that this was unlikely, but that it was '*not out of the question*', and he would let her know. Rosie's email was an excited reply to a message PW had left for her, to explain that she had secured a one-year contract which, though for maths rather than physics, would enable her to complete her Induction year. In the spring, PW had emailed Jack to check on his progress: in his reply he reported that '*I am still teaching physics …and enjoying it a lot more this year, though I get* [fewer free periods]*, I seem a lot less stressed!*' PW responded to express delight at this news, and reinforce the point that '*I would say that this is the case over the first 5 years of teaching*'. On the same day, James also emailed to report details of his progress and his satisfaction with teaching and with his school ('*It's been tough work at times of course but a great place to be and get stuck into teaching physics. Supportive staff, good atmosphere*'), to which PW responded '*This is excellent news … You seem very near to mission accomplished*'.

6.2.2. PERCEIVED AND POTENTIAL IMPACT OF SUPPORT

The email exchange involving Tom focused on his request for help on how to present a topic which on the surface '*goes against what the pupils have previously been taught*'. While he understood the reasons for this himself, he felt the need for advice on '*a clear way I can explain this*'. PW's reply led him through the cause of the apparent contradiction in great detail, addressing issues related to both subject content and subject pedagogy. He suggested introducing the pupils to an additional equation which should help them understand the processes at work; but he also took care to validate Tom's own approach: '*This is a classic question which the brighter sparks ask and the fact that you have pre-empted it suggests that you are doing a very thorough job, keep up the good work*'. This email includes an apology from PW for his delay in replying because he was in the act of moving house: Tom's appeal had come on 30th March, the day before he was due to teach the lesson concerned, Phil's reply the following Sunday. However, Tom's grateful reply suggests that he had actually delayed coverage of the topic, confident that PW would reply soon: '*Thank you very much for your answer, it helped me clarify how to put it better to the pupils. I'd hit that wall where I understood it, but was struggling to put it across!*'

Tom's case is interesting because he had no physics background beyond GCSE level, and described himself as being effectively self-taught. He first encountered PW during the Physics Enhancement Course (PEC), and stayed in touch both during his PGCE and even when he had to take a break from the course for family reasons. '*I'm still in contact now.* [Phil] *said if you ever need any advice contact me; I have done so 2 or 3 times since then*'. Tom still has emails from him dating back to 2009. Speaking in interview of PW's practice of bringing his mentees together for social occasions, he commented:

it was almost like work but not; you could … discuss issues about teaching and physics but at the same time it was a night out and enjoyable … All this kind of thing helped the group to get to know each other socially which fostered collaboration amongst us. It was hard to do that on the PEC course itself since it was full time study.

Now that he was based in a school of his own, he was grateful '*to have someone of* [Phil's] *experience to give you reassurance... it's … comforting to know that there's someone there at the end of an email*'.

Overall, Tom described PW's support in the specific case discussed as 'excellent': he saw it as exemplifying the more general impact that such support would have:

it's going to impact on pupils – they'll have more confidence in me if I'm more confident; and if it's a technical issue then they're going to be told exactly what is correct, so their learning will improve.

6.2.3. FACTORS ASSOCIATED WITH POTENTIAL IMPACT

In interview Tom said how much he appreciated PW's occasional messages asking after his well-being: one message left on his answer phone '*completely out of the blue*' had been particularly heartening because at the time he was very busy and was feeling the stress: '*it was really good to know that someone was there who was looking out for me*'. He also spoke with gratitude and approval of Phil's manner: '*a friendly, professional, very supportive manner. He talks to you as if you're a physics*

expert yourself'. This may help to explain why Tom felt that his contacts with PW made him feel '*part of the whole thing*' – a member of the wider physics community. PW himself felt that his credibility as a professional was associated in the mentees' eyes with his status as a practising and experienced teacher: '*they think "This guy has been in this situation for five or ten years so I respect his outlining of the pros and cons of a situation". You need to be a teacher to be a mentor*'. He was also seen as independent of a mentee's school, which encouraged them to be '*completely honest and open*' with him. However, most of the email exchanges suggest in addition that relationships were enhanced by genuine warmth between mentor and mentee, reflected in such messages as '*How are you and the family? Hope you have a lovely Easter*' (Jack). In the emails studied, only Hannah used a less friendly style, and this may have been influenced by her formal request for a placement; but PW also referred to a relatively small proportion of '*fairly self-sufficient individuals*' who saw no need for mentoring support and stayed aloof from his emails.

The combination of PW's tone of professional respect combined with this element of warmth help to explain why Tom saw him as so approachable, and his availability '*at the end of an email*' as '*comforting*'. Another factor might be the non-judgemental nature of the support offered, and PW's evident care to include an encouraging comment in his email responses '*You seem very near to mission accomplished*', '*it gets a little less stressful each year*', '*you are doing a very thorough job*'. Such emails suggest that the potential impact of the support enjoyed by Tom would be fairly typical of PW's work as a mentor. Asked what else he would like from the relationship, Tom's only wish was that it should still continue: that when he began to teach A level for the first time next year he would still be able to access the help which he saw as having a great impact so far on his career progression. As he commented in a more general context, '*I think people would lose out if they didn't have access to someone like* [Phil]'.

6.2.4. CONCLUDING COMMENTS

The inherent style of the PEP mentoring described above relies on the painstaking creation over a period of time of relationships based on familiarity and trust. PW himself stressed that in building such relationships, '*particularly initially I would work very hard to get to know everyone well and that's the key thing*'. Like Tom, he felt it important that his mentoring should be accessible in the longer term through opportunities for informal contact: '*I think it does influence their decision to stay in teaching for sure … if you've formed a good relationship … if they get into trouble later on they'll give you a ring*'. He argued strongly that '*it would be absolutely no good to say that we can make a difference in one year*', and that it is in the early years of teaching when support tapers off that attrition tends to occur:

you could lose these people unnecessarily for… things they don't realise would get better… Often government initiatives do things for one or maybe two years at most and it needs to be done for longer. If it's done for longer it will work.

As evidence he said that he was still in contact with all of his 2008 cohort who had progressed to their PGCE, and about two-thirds from the following year, and that he could think of around four or five mentees out of those two groups who at one time might have left teaching, but had not.

He argued passionately for the continuation of the sort of approach taken by Gatsby and the IOP, in particular its flexibility: '[they] *are marvellous like that … they give mentors the chance to do what they know to meet the needs of the students'*, rather than hedging them about with rules on how to proceed:

What doesn't work is [to] *say you will go out and you will spend money on this, not on this, and you will do exactly this because this is the recipe for success and you will fit*'. Rather he advocated that mentors should retain a degree of autonomy, and be encouraged to '*come back and discuss what worked*': '*sharing good ideas with other people in similar situations is best*' (just as he encouraged his mentees to share theirs).

6.3 CHRIS MAJOR

The data drawn upon for this case study of the work of a PEP regional mentor, Chris Major (CM), comprise the transcript of an initial interview with CM, field notes relating to an informal meeting of CM and a cohort of PEP mentees, and follow-up, post observation interviews with the mentor and Annie and Oliver, two of the mentees who had attended the session.

6.3.1 SUPPORT PROVIDED

The observed session was an informal gathering of PEP mentees and their external mentor, CM, in a restaurant. This was one of a series of regular group meals organised by CM, who intended the meals to offer an:

opportunity for the new teachers to continue to network face-to-face with those they trained alongside. It gives them free access to me, to seek support and bounce ideas around with, without the possible other agendas that might exist with coaches and mentors at school.

There were eight mentees at this session, all were NQTs and had been on the same PEP course together. CM sat in the middle of the group and joined in but did not necessarily lead discussions as the meal progressed. There was a relaxed informal atmosphere and the conversation drifted between talk about physics and science teaching more generally as well as more personal topics ranging from life outside school to the strain of providing cover for other teachers and of Ofsted inspection. After the session, CM explained that this informal support network was something he was consciously trying to achieve. He felt that getting to know others in the same situation –'*knowing they're not alone, is the most important thing of all – teaching is very tough*…', and he hoped (and seemed confident) that the informal contacts created through PEP activities would continue beyond the life of the programme.

As the meal progressed the talk became more centred on science teaching as the mentees exchanged information about experiments that they had tried and various ways in which they were attempting to engage their pupils. They discussed extracurricular provision for pupils that they had introduced in their schools such as *'science clubs'* and visits to a local science centre. One mentee shared out some star charts and galaxy photographs he had received from a magazine and this prompted much discussion with CM relating the resources to some interesting related work going on elsewhere. CM took an active role in these conversations, saying that he always enjoyed '*demos to make a kid think what happens next – what*

happens if you take a bottle of water with a hole in, and drop it … when you drop a slinky…'. The consistent message emerging from the session was for the mentees to attempt to get pupils wondering, to encourage them to think for themselves. When CM spoke like this during the evening there was respectful attention; one mentee commented '*that's a nice one – these are the sort of things I wouldn't know*'. Around the table, the mentees exchanged their positive achievements within the classroom as well as things that had not gone so well, usually science experiments that had not quite worked. One mentee, Annie, spoke at length with another, Oliver, about their experiences of working in the same school (though not at the same time). The school was designated as being in *'Special Measures'* and the two mentees shared strategies for coping with the challenges that brought.

In their subsequent interviews both the mentor and the mentees indicated that this meal was typical of other informal gatherings of the group, though CM commented that perhaps because of its timing at the end of the school year, this meal had an '*end of an era'* party feel. The mentees commented on the importance of the provision of informal networking opportunities and of the regular contact with CM these meals afforded. One explained that over time the discussions during the meals had become '*more open'* to incorporate more sharing of how developments within mentees' personal lives were impacting on their work in the classroom. Annie described how one of the meals in the past had been attended by the university tutors too and this had been very useful for her to '*learn of changes in education as a whole'.*

6.3.2 PERCEIVED AND POTENTIAL IMPACT OF SUPPORT

The mentees said that one of the ways in which they found the session helpful was the opportunity to develop the informal network of support with the PEP cohort beyond the ITE period, with Oliver explaining that *'the meals are a great focus for pulling people together'.* CM felt that the main impact of the group meals was to reinforce the message that he was available to support them and that they could draw on each other too. He explained that his role as someone outside of the school context allowed him:

to offer a perspective on the issues they encounter and to encourage them in how to overcome them, [to see] *that they are not on their own in experiencing these issues,* [and] *that there is light at the end of the tunnel. Occasionally, there are quite serious matters of mistreatment or personality clashes, where I have been able to help the teacher to resolve them and to reassure them that they are in the right and that that is a way forward.*

A key aspect of the emotional support offered by CM was the various ways in which he helped mentees to build their self-confidence. CM said that he hoped that the sessions would help the mentees to make positive contributions to their science department because of this increased confidence. He also strongly suggested that the group sessions helped with retention and that the schools and pupils were benefiting because:

They have confident, forward looking teachers, who see their future in the profession, rather than considering their position in the light of the difficulties experienced by many in the early years of teaching, which these sessions were specifically designed to mitigate.

One mentee explained that whilst she had not needed to go to CM with anything specific as yet, she knew that she could do so and that the informal group meetings meant that she had developed a relationship with him which would allow her to seek his help if necessary: '*If I never went* [to the meetings] *I wouldn't feel right about doing so* [asking for his help]'. She also described ways in which she felt she had benefited from other professional development opportunities, outside of the PEP programme, which were run by CM and/or which he had encouraged her and other PEP mentees to take up. She described how these had '*stimulated*' her and she spoke about one of them during the meal: '*I learnt how to make rockets, it was great, the kids loved it'.*

The two mentees who had worked at the school in 'Special Measures' commented that the chance to meet and discuss strategies during this session had been particularly beneficial for them. Oliver, who was currently working at this school, took advantage of the opportunity to seek CM's advice after the others had left the meal and to share his concerns. CM helped him to '*see there was nothing to be afraid of*', and offered practical advice which he said he would follow.

Oliver also commented that he found the sessions useful for reminding him of the importance of thinking about pupil engagement and that CM was always reinforcing this and the importance of encouraging pupils to be '*inquiring*'. Consequently this mentee was always looking for ways to '*grab their attention*.' He emphasised that he had built up a relationship with CM, whom he had met when he was accepted for the PEP course; and knowing that support was on hand had made *'a big difference'*, especially since accepting the post in the challenging school. He described turning to CM after he had a particularly difficult experience when he was observed teaching a very challenging class: *'I thought the whole world was going to hell'* but he said that talking to CM had helped him to put things into perspective and *'put the ship back upright'.*

6.3.3 FACTORS ASSOCIATED WITH POTENTIAL IMPACT

In addition to his role as a PEP mentor, CM had other demanding work commitments as a physics teacher and teacher educator. For him, *'time and funding'* were the key factors limiting what support he could offer. For example, the group meals were paid for but this session was to be the last funded one. The attendance at the group meals varied and this also had an impact on the support CM could provide, though on at least one occasion this had positive outcomes. CM spoke of a group meal where only one mentee came: during the meal she spoke to him about her particularly difficult school circumstances, which CM described as her '*being bullied*' by her in-school mentor. CM was able to devote two hours giving her bespoke advice on how to handle the situation. He reported that she said this had been *'very helpful'.*

A further factor associated with impact is linked with the ways in which CM has been able to develop relationships with the cohorts he has supported. He said that it had been easier for him to develop relationships with individuals from the later cohorts because he had more opportunities to engage in face to face contact with them in the early stages of the PEC. The fact that the relationships between CM and many of his mentees had been able to develop and grow over time also seems to have been an important factor. Both CM and the mentees we spoke to reported that the atmosphere at the group sessions had changed as they became

more comfortable with each other; they were more willing to discuss matters of a more personal nature and to turn to each other for emotional support. CM also observed that over time their talk and questions to him and each other were *'more focussed on actual, practical issues as their classroom experience has increased'.*

In addition to these group meetings, CM worked with individuals from each cohort supporting them through email contact responding to requests for support with resources, with approaches to planning, teaching and learning and other areas of subject pedagogy. CM also answered their questions about physics, dealing with subject knowledge issues that he believed they otherwise would not ask about in their schools for fear that they may '*perhaps appear stupid'.* He also described situations where he had provided emotional support for individuals, particularly when they were experiencing problems within school. He felt that an important part of his role was to help beginning teachers believe that things *'get better'*. In terms of impact, CM felt that the provision of someone outside of the school context helped his mentees to feel nurtured and helped keep them going:

Taking away the feeling that you are on your own and you are having to make your own way through all these problems, and having someone that you can turn to, even if you never do but you've got somebody there, is bound to help retention.

6.3.4 CONCLUDING COMMENTS

The informal approach to mentoring by this EM seemed to fulfil the needs of those mentees who chose to attend the group meals. This was supplemented by email contact and by invitations to other more formal professional development events run by the mentor. CM was convinced that the ability to establish mutually supportive relationships with peers and to be able to turn to someone external to their school and university contexts were important features in keeping his mentees engaged and enthusiastic about teaching physics. Annie and Oliver both expressed concerns that the decision not to roll out the regional mentoring strand of the PEP pilot might prevent future networking events happening in this way. They indicated that they would want to try to find alternative ways of keeping the networking going.

6.4 ALAN BAKER

This study of SASP mentoring is based on data drawn from an interview with Alan Baker (AB), and field notes from two different examples of his mentoring in action, one with Michael, who was currently teaching A level physics for the first time, the other with Jenny, head of science in a school with no physics specialists on the teaching staff. These are supplemented by post-observation interviews with the individual mentees concerned, as well as with AB himself.

6.4.1 SUPPORT PROVIDED

After over 20 years teaching physics followed by a range of university work, at the time of interview Alan Baker was combining his role as a regional advisor for SASP with other part-time employment relating to the teaching of physics. As a mentor, AB felt it was important '*to get to know participating teachers as people*' and to ask '*what is it I can help you with*?' He also considered that an essential part of the role was to visit participating teachers' schools and get to know their contexts: an example he gave was that talking to technicians could help him to understand teachers' needs. These needs, and the support he found himself providing, could

be wide-ranging. One non-specialist mentee had been tasked by his school with setting up a new A level physics course; another, given the reluctant classes of bottom stream girls, had '*chucked away the textbooks and did more experiments*'; another had welcomed encouragement and advice to help fulfil his ambition to move into teacher education. The one common factor in AB's approach was that '*you do what you think is right for the people*'.

AB was observed by members of the MoMaC research team on two very different occasions, one involving Michael, a biochemist in his fourth year in the profession and currently teaching A level physics for the first time; the other with Jenny, a biology-trained teacher with 14 years' experience, who was head of science in a challenging school and was currently responsible for the introduction of BTEC Science.

Michael had arranged that he and AB should run a joint revision session for students preparing for the following week's A2 examination, with AB covering course elements taught them by another teacher, and especially addressing common misconceptions; however, since no students appeared, in the event the session observed was entirely one-to-one. It began with AB running through his planned revision of the syllabus elements that Michael himself had not covered, but developed into a wide-ranging discussion encompassing a variety of more general issues. Most of Michael's questions were related to subject pedagogy: how to find a simple way of teaching something difficult, how to guide students towards a better way of interpreting examination questions, how to lead them towards reaching a desired conclusion. According to both, their discussions were typical of other occasions at this school; Michael had suggested the revision session because AB had run something similar for him while mentoring him in his previous teaching post. While AB's stated main aim before this session had been to support Michael as requested in his revision of, and revision strategies for, A2 physics, he had responded flexibly to the situation. He also used some of the time to pass on the results of enquiries he had made on Michael's behalf about the possibility of him pursuing an MA in Physics and Education.

Before AB's visit, Jenny had asked him to use it to help her develop a BTEC assignment from some basic physics content; in addition, since this was likely to be his last visit, he aimed to ensure that she felt '*comfortable*' in signing off from SASP mentoring, and also to help her clarify the issues and challenges that still faced her. However, on his arrival the first part of his visit was spent on responding to what she saw as her '*most pressing need*' for advice on what questions to expect in a forthcoming examination. The work on BTEC was based partly on an email exchange in which Jenny had sent outline ideas for a practical science project; AB worked through this, leading her towards clarifying more exactly what she was planning, which objectives she was seeking to meet, and how she intended to respond to the BTEC's intended industrial focus. He also made practical suggestions towards devising and enriching the proposed tasks. Some of his questions seemed intended to challenge her by probing her proposals more deeply, and exploring how the tasks she proposed might work; he also pointed out that some of her ideas would not enable the students to meet all of the examining board's objectives. This interaction took place during the morning; but although Jenny had to be elsewhere for part of the afternoon, AB had made himself available to her

for the whole day, and offered to set up equipment after lunch and demonstrate how her proposed practical science project might work. That session also enabled him to fulfil her other advance request, which was for him to work with the whole Science department, and especially with an NQT who was teaching physics for the first time.

Both examples of mentoring observed demonstrated how AB fulfilled his stated commitment to support his mentees in whatever way they asked. In addition, by responding constructively to Jenny's urgent but unanticipated request for advice on her revision strategy, or talking over with Michael the appropriate options for a Master's degree which he was exploring with AB's support, he was treating them as individuals, and in a way appropriate to their needs.

6.4.2 PERCEIVED AND POTENTIAL IMPACT OF SUPPORT

Although he was clearly disappointed by his students' failure to put in an appearance, Michael was very enthusiastic about the support received: '*for me, the light bulb came on about three different times as I began to understand things*'. He found AB's modelling of how to ask questions particularly helpful: '*he demonstrates the kind of questions I can ask and leads me through these to understandings in ways in which I now know I can lead the kids'*. He described the session as typical of their relationship – '*AB's approach is to lead me to learning, not to teach at me*' – and appreciated the respect shown to him as a fellow teacher, and the validation of his existing practice, which had helped to build his confidence. In the process, he had also gained ideas for two new experiments, which he intended to share with the rest of the department, and would build some of his learning into a new scheme of work for KS3 physics which as key stage science coordinator he would be preparing for next year. As a result of working with AB, he now felt less daunted by the thought of teaching A2 because he now had '*a bank of resources and ideas*', and felt happy to try out new practicals because he knew he knew he could call on AB for help if he experienced problems. While he was quite happy to do his own research on subject knowledge, in terms of practicals '*you can't teach that to yourself, the set of instructions isn't enough … you can't get the tips he gives from books*'. This support was particularly valuable to him because the only other physics teacher in the department was the HoD, who though always on call for help, was limited in the amount of time she could give: Michael was conscious that his work with AB on experiments had considerably lessened her workload. In addition, when a visit from AB was due he always asked her and the physics technician whether they needed help or advice on any demonstrations or practicals, so that '*the benefit isn't just for me*'.

Although his initial aim had been thwarted by the students' non-appearance, AB also viewed the session as typical of his interactions with Michael, and (in spite of the change of focus) saw the outcome as essentially what he had hoped: that some of the ideas and methods they had discussed would feed in to Michael's teaching in the coming year, making him an '*even better*' teacher who shared both ideas and resources with his colleagues.

Jenny's account of her session with AB passed over their urgent initial discussion, and focused on his pre-arranged and '*really useful*' input on the BTEC assignments, and his practical suggestions on the use of equipment, part of which she had herself missed. She confessed that although she felt comfortable with new ways of

teaching chemistry and biology, in the case of physics she always found it hard '*to come up with ideas and put* [them] *into a real life context*'. She was very conscious of how AB's influence and support had both built her confidence and enabled her to teach physics '*in a more interesting way rather than a dry way*': '*Now I'm more confident lessons are more fun*'. Similarly, she thought that the afternoon session should result in staff being '*more likely to get out apparatus and kit*', whereas '*if they are not confident about it they are more likely to rely on videos and text books*'. She also hoped that this ongoing change in how physics was taught in the school would impact on pupil learning, but had no hard evidence for it. As she saw it, the biggest impact of AB's mentoring on the department as a whole had been that partly due to his input and support, they now had a physics technician '*who knew what* [he] *was doing*': this was particularly important given that there were no physics specialists on the teaching staff.

AB's comments were informed by his sympathetic awareness of Jenny's difficult position as HoD in a challenging school, with no specialist to turn to for advice: he said she had often needed to bring up '*unanticipated requests on the day*', involving him in what he described as '*fire-fighting*'. His afternoon session with the whole department had revealed both '*misconceptions*' and some worrying gaps in understanding and knowledge, and he had gone out of his way to make her aware of these in a one-to-one conversation. His concern was evident in his comment that '*I did not think we'd solve the problems, but I have hopefully helped her clarify the issues and challenges*'; and since he judged that '*while they have taken some ideas forward, there is still a lot to be done*', he had also suggested to Jenny that she might apply to join the SPN from April 2012.

Though Jenny saw herself as having no outstanding needs that were still unaddressed, she said in interview that she would welcome the continued opportunity to contact AB on an *ad hoc* basis, though '*the main obstacle is finding the time to access the CPD and put it into practice*'. AB himself was regretfully aware that she was not alone in this view, since other teachers he was supporting had sometimes indicated that they were too busy to try out his suggestions, or that they had too little time to '*sit back and reflect and learn*'.

6.4.3 FACTORS ASSOCIATED WITH POTENTIAL IMPACT

As head of department in a school where the technician was the only physics specialist, the pressures on Jenny were considerable, as AB was only too well aware. An observed conversation with a colleague after her work with AB during the morning suggested that she was already applying what she had just learned, and that his input would have a future impact on the work of the department in terms both of preparation for the forthcoming examination, and of the BTEC coursework. Although she had not been present for the entire afternoon, she expressed gratitude for his work with the NQT, and his practical ideas about the use of equipment: it appeared to be largely in terms of the '*ideas*' he provided that she valued his support, and AB too, in summing up their meeting, commented that '*she has taken away some good ideas*'. In interview she expressed confidence that in the future she could source '*ideas*', or get help to deal with some unexpected '*issue*', through email contact; it was for this reason that she would welcome the opportunity to keep in touch with AB.

Michael, on the other hand, was desperate not to lose touch with AB, because '*considering how far he has got me since January, imagine what he could do for me for a whole year*'. He drew a distinction between the SASP course (which both he and Jenny had experienced) which '*helps people get from one point to another in terms of knowledge*', and the associated mentoring through which '*you achieve a far greater deal*' because it is more personalised. He felt that his work with AB had made him far more adventurous in his teaching: '*I'll try a new practical and if it doesn't work I know I can call AP*'. In addition, his mentoring sessions had rekindled the motivation to find an MA course that would allow him to study physics and physics pedagogy in more depth, since as a result of AB's influence he now saw that '*teaching is not just me standing in front of the class, Physics is a conceptual subject*'. At times their work together appeared more like a duet than a master-class: although AB was constantly checking that Michael understood: '*You OK with that*?' and Michael appeared very comfortable asking questions, both of them were continually throwing ideas into the discussion. In addition, his appreciation of AB's determination '*to lead me to learning, not to teach at me*' suggested that he was learning by experiencing for himself the pedagogic value of AB's advice that '*if they don't say this or notice this then you need to try and guide them into this*…' was a powerful way of helping students to understand a difficult concept.

This degree of relaxed working together was possible partly because Michael's school had been outstandingly supportive, arranging for him to be off-timetable for AB's visits – and as a result the school itself had benefited through his sharing of what he learned. By contrast, Jenny appeared always pressed for time, and trying to juggle her own developmental needs with those of the colleagues who depended on her for support. Even without the further context of a challenging school, her opportunities to take full advantage of the mentoring on offer were bound to be more limited. Yet although Michael was more vocal in expressing his desire for some form of the mentoring relationship to continue, it could well be on Jenny that its cessation would have the greater impact.

6.4.4 CONCLUDING COMMENTS

The two relationships described above show AB reacting to his mentees' needs in quite different ways, dictated at least in part by the contexts in which they taught. Michael, by his own admission, was well-supported both by his school and within his department; Jenny was in the contrasting situation of having to support others, but with no-one in school to whom she could turn for subject-related advice. That AB was able to adapt his mentoring to such very different situations demonstrates both his flexibility and his ability to empathise, as well as the potential breadth of the mentoring approach associated with the SASP programme.

6.5 DEREK CARTER

The data drawn upon for this case study of the work of a SASP regional advisor include the transcript of an initial interview with the mentor, Derek Carter (DC), a series of email correspondences between DC and two mentees, Nancy and Beth, and subsequent interviews with the two mentees. Nancy, a teacher with 16 years' experience, had originally trained as a maths teacher and was now teaching physics and maths on a maternity cover in a school where she was regarded as the physics specialist. Beth was responsible for coordinating physics in her school and the email exchanges took place just before she was due to begin her own maternity leave. In

addition, this case study draws on an interview with Selena about the support she was receiving from DC two years after completing the SASP course.

6.5.1 SUPPORT PROVIDED

DC was an experienced teacher who had also worked in initial teacher education (ITE) with trainee physics teachers, and had been a tutor in a pilot of the PEC course, before taking on the role of SASP regional advisor. In his interview, he spoke about a perceived lack of confidence in subject knowledge and pedagogy across the three cohorts of SASP participants he had worked with. Consequently an important aspect of his early work with mentees involved ways of helping them overcoming their '*trepidations about teaching physics*'. DC explained that, in his view, at the point of initial contact:

a friendly piece of advice or a considerate response can reassure them and once you've got their confidence they turn to you for more practical advice.

DC explained that after this initial attempt to establish contact he would then usually email participants asking them: '*what are you teaching at the moment, can I help you?*' This typically led to a face to face meeting in the mentee's school. DC worked with individuals and their departments in a variety of ways, tailoring the support to specific requests and needs. Often his ongoing support involved email correspondence in which participants would request advice about questions or topics that they did not feel comfortable asking about in their departments, for example: '*I've set my A level group a question for homework and I can't answer it*'. In response to email requests he also often provided resources he had used or schemes of work. Again, DC emphasised that his work with mentees on planning and resources, especially when preparing practical work, was linked to their lack of confidence:

It's amazing how little practical work goes on. I really wanted to encourage them to adopt a practical approach – you need confidence. It's not just about knowing what to do but about having the confidence to do it in the classroom.

He also spent time with individuals in school talking them through specific subject knowledge and trying to model pedagogical approaches: '*what I think I did was try and help with subject knowledge by making it implicit with pedagogy so I would say "I used to try this" or "kids loved this"…*'. Alongside this tailored support for individuals he also ran group twilight sessions on a series of topics '*which from my experience, inexperienced teachers have difficulty with, and they selected the ones they wanted; for example, radioactivity*'. An additional aspect of his work was the support he provided for the departments his mentees worked in. Sometimes this would involve coming into the department and doing some training on how to teach a concept. DC described one example of this kind of work:

I've also been asked to do a bit of CPD with three teachers in one of my SASP schools, so it's my SASP teacher and two others (on Interference, Refraction and digital electronics) so I'll do a PowerPoint presentation in front of these three and show them a bit of theory and practicals. So I'm working within the SASP teacher's department and giving them confidence.

Another aspect of this support at a departmental level was his work with technicians to demystify some of the equipment used with practicals:

Often they would say 'there's a cupboard full of physics apparatus, can you come and explain what there is?' I've done this a few times, gone through what to keep and demonstrated how to use it.

In her interview, Selena gave examples of DC offering a similar range of support to that outlined above, adding: *'basically whatever we wanted he would do his best to help us'.*

The email exchanges between Nancy and DC illustrate the ways in which DC supports individuals, demonstrating much of what has been described above. They cover a six week period during the spring of 2010. The correspondence was initiated by DC:

I feel a bit 'under-used' at the moment, and I know that you are doing little or no physics teaching but if there is any way I could help with regards to physics in your school you just need to shout.

This was followed a fortnight later with another email from DC which was sent to all of Nancy's cohort containing a link to the annual IOP school's lecture series. Two weeks later Nancy contacted DC with a specific request for support. She had been asked by her department to develop some lessons for others in her department to use:

about the physics of fair grounds, with an emphasis on speed, velocity, acceleration, forces, energy experienced in a rollercoaster ride… Have you any resources or [PowerPoints] *or ideas that I could use? Have you got any instructions to build an accelerometer for measuring G forces....and could you explain how it works? ... I think I understand, but I'd like to check. I've only been asked to help out today and the lesson plans need to be in by Monday!!*

DC replied the following day with a lengthy email containing links to resources on the IOP website alongside information about other potentially useful websites including various YouTube videos which demonstrated accelerometers and how to make them. He supplemented these links with the following advice:

The tube accelerometer is simple in the way it works."2g" means that the object experiences a force equal to twice its own weight. To calibrate the device you just put double the weight on the end of the elastic and draw a line at the point to where the elastic extends. For 3g you treble the weight. For negative g you turn the device upside down - this shows you the effect of a force equal to the weight but in the opposite direction. To calibrate the pendulum type accelerometer requires maths which would be beyond GCSE pupils. It's possible to work out the angles for 2g, 3g, etc. so they could write them on even if they don't know where the figures have come from. I can help you out with this if you need me to.

He provided some ideas about how to get the pupils to build their own rollercoasters and provided a link to a video which showed pupils doing this. DC also offered to loan some resources including a dragster racer kit and a compressed air device. An additional email sent later that day included some

attachments and a PowerPoint that DC had used with his PGCE students when teaching about mechanics.

Nancy subsequently sent DC a PowerPoint she had developed about *'the physics involved in a rollercoaster ride'*, and asked if he could check if:

it makes sense… Am I right in thinking that if a coaster is racing at an acc >g that the rider in the cart will still be falling at g and that is why they hit the lap bar? I hope it's all correct, I've really enjoyed trying to sort it all out in my own head! I've attempted to link forces, vel, acc, energy... etc using equations to help explain stuff. May I send you it at a later date to (again) check it all makes sense??

The following day, DC sent a very detailed email which gave some feedback about the PowerPoint as a whole and suggestions about how the information might be made more accessible for the audience:

For Yr8, when the train accelerates down a slope you could think of it as the seat trying to race away from your bottom. But gravity still pulls you down so you remain in contact with the seat. However the seat pushes with a smaller force - you feel to have lost weight. (If the two forces on you were equal and opposite you could not accelerate and therefore would not keep up with the train!)

DC also corrected some misconceptions within the PowerPoint, for example: '*Slide 1. Fire is not a form of energy'.*

As well as this discussion of a particular series of lessons, the email exchange also included a request from DC sent to the whole cohort to share resources and ideas on approaches to teaching *'what I used to call Earth Science…earthquakes P-waves and S waves etc'.* The final two emails involved Nancy asking DC's advice about whether she would be able to cope with the level of subject knowledge required for a CPD course on astronomy at a local university. DC reassured her that she would be able to do so and encouraged her to enrol on the course.

The email correspondence between DC and Beth covered an eight month period in 2010. In her interview, Beth explained that DC came in to meet with herself and her head of department: *'to assess what support we needed and what he could provide'.* The early emails are concerned with logistical arrangements for DC to come in and deliver an Inset session at Beth's school for her and other non-physics specialists within her department on the P7 module of the 21st Century Science GCSE course. Beth asked DC to focus specifically on the topics of parallax and parsecs, and cepheid variable stars. Following the Inset session, Beth emailed DC thanking him for his input: *'the session was very useful. Everyone was very pleased'.* Beth explained in her follow up interview that in these sessions, DC had provided practical ideas and resources. For a while, there is then no further contact apart from a series of emails sent by DC to the whole cohort reminding them of his support, offering to loan resources, and a request for the cohort to think about what additional support they would like on either a physics 'away day' or school-based twilight meeting:

If anyone has any ideas for a visit somewhere I would be happy to get that organised. Alternatively we could get in a visiting speaker, share best practice in particular areas or we could, as before, pick some topics that you are less confident in delivering and

look at those. If you like any of these ideas or you have other suggestions please get in touch.

Later, Beth emailed to ask if he could come into the department and run another Inset session on P6 of the GCSE 21st Century science course. She also asked if he would be able to look at some of the department's apparatus with the laboratory technician. Finally she asked if she could borrow some of the resources he offered in his previous emails. There is then a flurry of emails organising the Inset for the department. Following DC's visit to the school's Beth and DC exchange emails commenting on their perceptions about the success of the training and of his work with the technician trying to set up the ripple tank. In the final emails, Beth gives DC the name of the person taking over her role during her maternity leave.

6.5.2 PERCEIVED AND POTENTIAL IMPACT OF THE SUPPORT

Both Beth and Nancy in their interviews spoke about the ways in which DC's support had an impact on the pupils they taught. Nancy said that *'the pupils have a better understanding'* after DC's input into her work on forces and energy in the fairground topic, whilst the dragster resources loaned by DC to Beth were *'used with an after school club for a number of weeks'.*

Beth described DC's departmental Inset sessions as *'particularly useful'* as they *'gave us a starting point of knowledge and resources to build on'.* She observed that it was the bespoke nature of DC's support that had been particularly beneficial:

There was a positive impact from the sessions, particularly because they were targeted at areas requested by those staff attending the sessions.

She said she felt that the support from DC had given her more confidence *'in teaching certain physics topics'* and without it some topics *'may not have been taught so well'.* Nancy echoed this, saying of DC's support: *'mostly it boosts my confidence'.* Similarly Selena reflected on the ways in which she had developed professionally as a result of DC's mentoring:

When I was teaching I was very uncertain. When teaching the kids I felt I didn't know this but he's helped me. Speaking with him he's encouraged me; because that support is there I've felt easier teaching. When I go in to teach a physics lesson I feel easier because of what he's said. It's not just the physics that he's done, it's discussing it with him and him coming up with these little ideas about how to teach something and that's encouraged me and I feel more confident in front of the class.

DC talked in his interview about the ways in which he felt his mentees could expose any gaps in their subject knowledge, trusting that he would respond in a non-judgemental manner. Selena said that this was because of the face-to-face contact with DC which allowed her to talk to him and get an immediate response as well as his availability via email or telephone: *'He had the knowledge and I could call on that knowledge'.* Nancy spoke about how this had also been the case when DC gave her some advice on her draft PowerPoint presentation, saying that *'he put me right on a few things that I'd got wrong. And I have used it in a lesson and it went quite well'.* She indicated that DC's support for her also had an impact on the wider department:

Although I enjoy physics I'm aware of gaps in my subject knowledge and I lack confidence in the subject, so it's good to have someone to turn to for advice, and there's no other physics specialist in the school where I'm doing supply teaching, and there wasn't in my previous school. I'm considered the specialist so the other physics teacher comes to me for advice, so it is helpful for me to be able to go to a specialist outside of the school.

Despite their lack of prior subject knowledge, after attending the SASP course both Nancy and Beth appeared to be positioned as physics experts in their schools. Having DC as a resource to whom they could turn clearly supported them in this role. DC observed that the people he had supported in the ways described above seemed to *'become leading lights in the school'* with colleagues turning to them for advice. He also observed that *'lots of them have had promotion'.* Both DC and Beth explicitly referred to the ways in which it was the additional mentoring rather than the SASP course itself that had had an impact. Beth commented that the course offered generalised subject knowledge development whilst DC's *'support could then be much more targeted at areas that I or my department still needed support with'.* DC also suggested that his support may have helped some mentees become more autonomous learners: '*there's also the sense that if you mentor them well they* [begin to] *solve their own problems'.*

6.5.3 FACTORS ASSOCIATED WITH POTENTIAL IMPACT

The fact that DC was external to mentees' schools seems to have been an important factor for the participants involved in this case study. As Nancy explained:

I do know that some teachers have an issue with asking people within their school for advice about their subject knowledge because they may feel that they should know what they're talking about and the people might think 'you should know that'. So for those people it is helpful if there is an external person that they can ask.

Analysis of the data associated with this case study suggests that three other factors positively influenced the impact of DC's work; these were his flexibility, availability and ability to offer tailored support.

Conversely, factors which may have limited the impact of external mentoring in this context included mentees' lack of flexibility and lack of time, as Beth observed:

We were lucky as DC was very flexible. However it can be difficult to arrange meetings etc. around peoples' teaching timetables in a school. Delivery of Inset sessions targeting specific areas of subject knowledge were particularly useful. Due to the constraints of time in school it was not possible to spend as much time as we would have liked on these.

During his interview, DC also commented on the mentees' lack of time as a potential barrier to the kind of support he wanted to offer:

A lot of it is down to time pressures. If you've only three free periods a week, you're loath to give them up because you're dealing with more immediate concerns. Extra free periods to help them reflect on subject knowledge and pedagogy would be ideal but some struggled to get time off to attend the lectures during the SASP course. Time allowance for me has been good but it's time for the participants that's inadequate in terms of helping them develop as good Physicists.

Other factors that potentially limited the impact of DC's attempts to support mentees' professional development through out of school events and fostering peer networks included difficulties mentees experienced in getting release from their normal timetables and the fact that many participants had pressing commitments beyond school. As DC noted:

I also offered Saturday schools but the teachers in my cohort weren't keen and they couldn't get release from school and didn't want to give up their Saturdays.

Selena explained that: *'a lot of them were married and had kids; you don't have time'.*

Finally, DC felt that there needed to have been greater awareness of the role of the Regional Advisor so that school leaders and participants might have tapped into his support in a more proactive way:

I think that something ought to be done to raise the profile of the RA so that the participants turn to them naturally rather than in desperation.

6.5.4 CONCLUDING COMMENTS

Despite the various constraints listed above, the data associated with this case study suggest that the participants who took advantage of DC's offers of support received high quality bespoke subject knowledge enhancement and practical pedagogical advice which had benefits for the pupils they taught, for their departments and for their own professional development. More generally, the data reviewed for the case study suggest that the SASP mentoring had made a significant impact. In DC's view:

there are people who are teaching physics better and with more confidence than they would have been if the course hadn't been supported by the mentoring.

This position appeared to be endorsed by the teachers he supported, with one stating that:

The SASP programme is a great starting point for non-specialists to gain the skills to teach physics at KS4, however it does not prepare people with no physics qualifications for teaching triple award GCSE and definitely not A-level. Given the lack of physics specialists in schools there is often not the support in schools needed to further develop staff that have completed the SASP and that support needs to be provided externally. Without support following the SASP I think there is a risk that people will complete the SASP but then not use the skills they have begun to develop on the course.

6.6 MIKE FREEMAN

This case study of the work of an SPN TLC draws on the transcript of an initial interview with the mentor, Mike Freeman [MF], and field notes relating to a whole-department coaching session conducted by him. It also draws on a further post-observation interview with Mike himself, and others with Dawn and Andrew, two of the participants, and with Melanie, their head of faculty, who had set up the event. Briefer reference is also made to a comparable set of records depicting a parallel event at another school.

6.6.1 SUPPORT PROVIDED

Asked to choose between 'mentoring' and acting as 'teaching and learning coach' as the more appropriate description of his activities, MF replied that he had never considered this. On reflection, he thought that 'coaching' came the closer of the two; but at the same time, he said, '*I could live with the idea that I do some mentoring*'. The coaching aspect, which he described as '*focussed support*', involved activities such as whole-department training sessions in which he shared '*in a very structured way*' a body of '*information and thoughts and ideas which have … come from the Institute of Physics*'. In addition to this, however, '*I have spent time with teachers, often in quite an informal way. I make sure they know I am around if they want to talk to me*'. This to him accorded more with the idea of mentoring as a less formal, longer term activity: '*I may well sit down with someone for half an hour and we may chew over a problem they have*'. In this case, he added, he would be '*bringing my* [own] *experience to it*' rather than acting as an emissary of the IOP.

In either case, MF's contacts were almost always face-to-face: as he saw it, '*the strength of the project has been that I show up at a school*', in particular because this gave potential mentees the chance to become familiar with him ('*they don't have to go anywhere ... they get to see me a few times, I think that… has been what's helped the communication*'). While the actual frequency of meeting varied widely between the twelve schools he supported, he estimated that, on average, *'a typical teacher'* in one of these schools would have seen him '*four or five times'* over a six month period.

The coaching session observed had been chosen by Melanie from a menu of activities that MF had provided. While she welcomed the observer (from the MoMaC research team) and MF did the preparatory setting up, participants arrived gradually, bringing and sharing refreshments and quietly discussing their day. The session itself, which focused on Energy, opened with a light-hearted practical demonstration using a plastic bath toy, after which MF asked participants what questions they might ask if they were to repeat this with a class. To begin with the atmosphere was light-hearted; one teacher asked to borrow the gadget for use with his class. Then, using PowerPoint displays, MF invited the group to discuss three statements about energy, because as he said '*energy can get teachers into difficulty*'. When teachers commented that they encountered such examples regularly in textbooks and even in tests, he explained the importance of addressing common misconceptions, and challenged them to consider just how helpful it was to explain some phenomena as examples of energy. Some of the group seemed to be struggling with the idea that the descriptions were unhelpful, and at this point MF involved the physics specialists present in explaining why this was so. He said that the IOP were trying to work with those involved in producing tests and textbooks to bring about a change in their approach, and in the meantime urged his audience to try to teach pupils a '*helpful model that wouldn't need to be unlearned later*'. Some of the group members appeared very conscious of the limitations of their own subject knowledge; but it was noteworthy that they were able to acknowledge this, in front of their colleagues and head of faculty, and were also comfortable about challenging MF himself. After a spirited debate MF moved on to initiate another activity which involved devising an energy-related question based on some of a range of toys set up around the room; meanwhile he continued to urge the participants to focus on teaching to their pupils' understanding, not to the test.

In spite of the fun element, most teachers engaged in this activity seemed genuinely to be 'talking physics' amongst themselves. When one complained to her nearest neighbours that the issue of '*unhelpful explanations'* was '*messing with my head*', they both reassured her and worked together to explain the concepts further, and were subsequently joined in this by the HoF. Meanwhile MF wandered from one group to another encouraging them to formulate questions. As the session drew to a close he acknowledged that he had '*played with their minds*' and urged them to ask further questions individually if they felt the need; some continued to talk to him as he packed up his equipment.

Whole department activities such as this were only one aspect of MF's involvement with the schools within his remit, though an important one, as they provided a conduit through which he could make contact with potential mentees. In terms of individual support he regularly offered advice on subject knowledge and subject pedagogy, as well as lesson observations after which '*most of what I end up suggesting is just general good teaching practice*'. Some of these observations were the result of individual mentoring, others in response to requests from faculty managers concerned about individual teachers and needing advice; he described those supported as '*a real mix*', ranging from teachers without any physics qualifications to specialists in search of expert advice based on observation of their A level classes. While he could remember no direct requests to support his mentees' emotional well-being, he saw such support as implicit in his approach of saying '*If you do this it's going to help your knowledge and that might make you feel more confident*'. One of his less anticipated functions had been to overhaul and advise on a school's experimental equipment, since '*no one with any physics expertise had really grasped it and said "is it working? … if it's not, what do we do next?"'* The result had been that '*they* [were] *doing less and less practical work because non-specialists are uncomfortable*' using unreliable or wrongly prepared equipment. Having uncovered this situation, he had followed it up with a session with the lab technicians, and had since successfully repeated the exercise with other schools as well.

Another form of indirect support mentioned by MF was that '*every now and again you walk into a department and you can see what is essentially a management problem*'. Thanks to his own leadership experience he felt able to use his position as an outsider to '*quietly nudge things in a more helpful direction*', particularly in the context of encouraging '*team playing*'. This was one positive aspect of his situation as a stranger entering the school environment, which he felt could also have its negative side:

there's an element of 'Who the hell is this person?' balanced off against 'Let's do physics'… I think overall, though, it works out to be about neutral.

In Melanie's judgement, though, his impact had been '*hugely beneficial*'.

6.6.2 PERCEIVED AND POTENTIAL IMPACT OF SUPPORT

Throughout the session observed, MF had demonstrated great enthusiasm for physics and for teaching physics, and appeared to have captured the imagination of the wide range of teachers present, notwithstanding any variations in their enthusiasm for, and knowledge of, the subject. Interviewed afterwards, Melanie said she had found this session particularly helpful to her personally because '*rather than one or two practical ideas it made me* [undertake] *some key thinking about the subject that I can take into other areas of physics*'. She had subsequently changed the way she was teaching a KS3 topic. Dawn, an NQT physics specialist, had also found the session useful, though mainly in terms of her KS5 teaching. She said that when she had taught the topic of 'Energy' recently she had raised the issue of the *'unhelpful'* nature of textbooks with the department, and felt that MF's session would have helped her colleagues because '*it gave them something to think about, either confirming what they already knew or questioning something*'. More generally, she thought:

it is good to have someone with subject knowledge coming in because as a department we work through and discuss subject questions and it is nice to have someone to ask.

Andrew, the other mentee interviewed, thought he had already been teaching 'Energy' correctly, but commented that '*the session has given me confidence that I'm on the right track*', though '*Getting students to recognise the complexities of the topic is tricky*'.

Both Dawn and Andrew had been observed teaching by MF, each at Melanie's suggestion, and both had found the experience supportive. Dawn had received ideas for future teaching and some '*really needed*' input on coursework that could make use of the school's limited physics resources; Andrew had been reassured that '*I looked … and sounded confident*', and had benefited from advice on practical demonstrations '*to show how I might explain things more helpfully*'. Personally, he now felt that as a result of MF's mentoring '*what I'm teaching is right and makes sense, which wasn't the case before*'. He also spoke approvingly of MF's overall impact on the school, stating that he had '*brought physics more to the top of the agenda*'.

MF himself was more guarded in his assessment of his impact, though he said that all but one of the evaluation forms returned after the session observed had rated it 'good' or 'very good'. He was also heartened by the signs that he was developing a good working relationship with the department: '*the non-physics specialists are willing to give up their time to attend the sessions*', and one teacher unable to attend had briefly come along to apologise. What he found more difficult to gauge was whether his work with teachers would translate into impact on pupils.

6.6.3 FACTORS ASSOCIATED WITH POTENTIAL IMPACT

Subsequent discussions with MF revealed that he saw the particular activity observed as somewhat atypical of others at this school, as the topic involved was far more controversial than most he was asked to cover. He said that next time he addressed it he would modify his approach: '*I'll make it a lower level and assume no prior knowledge*', partly because he had noticed that one of the group, whom he had not met before, was '*deeply troubled*' by the controversial nature of the topic. He saw the diversity of needs, knowledge and experience as '*one of the difficulties of doing these sessions*', since he never knew quite what range to expect. As he said

in a different interview, '*If a teacher is struggling with a specific thing I need to address it – with pupils you know where they're at*'. Sometimes when physics specialists attended they could be part of the problem, as in a session (also observed) in another school where '*the physicists were unhelpful because they kept coming in with their answers. This can make it difficult for the non-specialists to reveal their lack of understanding*'.

Melanie was effectively concurring when she said that while she knew that some of her department had welcomed MF's provocative approach in challenging received wisdom, she accepted that '*you needed to be confident in your physics… to do so.*' However, as she pointed out, his style '*is open and supportive and not at all judgemental. He has got good interpersonal skills and if people are stressed he can sense that and back off*': as Andrew had said in the context of MF's lesson observation ('*He wasn't coming in to pick holes in what I was doing, but to support*'). That Andrew was alive to the distinction may have been partly due to the culture of his school: as Dawn noted, '*our department seem to be very into these kind of discussions*'.

While Melanie found MF's style '*refreshing*', because he was '*not engrained in the school culture*', MF commented that her department seemed '*more open*' than others he worked with: '*In some schools I feel part of the team but in others I'm kept at arm's length*'. In departments in such schools, MF commented, often '*the biggest problem … is the physicists themselves, who are sometimes resistant*'. Sometimes, he thought, '*they feel that my IOP label challenges their expertise*'. A possible example of unhelpful specialists was observed in another school: Robert, a participant interviewed after a whole-department event, had felt that some non-specialists had been inhibited from contributing actively to the discussion because two of the physics teachers were openly scoffing at what they said, and could be heard saying '*Oh yeah, oh no, is that what people really think?*' Robert's own verdict on the session was that it was less successful than it might have been because teachers were merely told there would be '*training on Tuesday*', without any further information.

The timing was also unfortunate in terms of the school calendar, while the session had had to be rushed because the time agreed had not been ring-fenced. Russell, the head of physics at the same school, said in interview that he himself had no involvement with the non-specialists who taught physics '*unless they come to me for help*'; his comment on an IOP twilight session delivered at his school was that '*our teacher-technician came; most of the department didn't have much to do with it*'. While he said that it was important to raise the quality of training, he also explained that '*I don't necessarily have time to come up with that stuff myself, so it's good to have someone external. If it helps raise their confidence, it's good*'. On the occasion observed, he had invited MF to the school to help non-specialists address pupils' difficulties with physics. MF himself commented after the event that he had not expected the physicists to attend: while he always wanted his sessions '*to have the flavour of being voluntary*' and stressed this as part of his offer, in this case he suspected that a '*three-line whip*' had been in force. '*The key*' however, to a successful session, was '*whoever is the lead contact giving enough time and energy*': in his experience, '*when it really takes off, they'll make time, delegate, drive the agenda*'.

Reflecting on what had been achieved that afternoon that would not have happened without his presence, MF concluded that it had probably been possible to reach more people in this way than through some other form of intervention. In his initial interview for this research he saw the on-the-spot aspect as one of the strengths of TLC support:

showing up at the school and training teachers in their own schools makes a big difference… you can take account of the context and the equipment that they have. And how else can a school manage to secure effective subject-based training for – say – six teachers at a time?

6.6.4 CONCLUDING COMMENTS

Melanie's final comment in interview was '*I'm just hugely positive about the support*': but as MF himself made it clear, its success was due partly to the openness and positive approach of her school. In such a climate, teachers such as Andrew had been enabled to grow in confidence, feel good about asking for help, and enjoy teaching physics. Andrew himself was very conscious of what his teaching might have become in a rather different environment, and a passionate advocate for the future continuation of such programmes:

It means that if you can't ask questions and deal with misconceptions and challenge yourself, you'll have to get help from people who are less equipped to help you, and go with the established way of doing things, and not make physics lessons as exciting as they can be and as MF is helping us to make them. How MF is encouraging us to teach physics helps those students who learn best by seeing things, through experiments and practicals, rather than by hearing it. As a result pupils are engaging more with what's going on in the lessons … for example because they're hooked by looking at a pair of scissors pointing up into thin air through the use of a very strong magnet.

6.7 ROBERT CAIN

The data drawn upon for this case study of the work of a SPN external mentor comprise the transcript of an initial interview with the TLC, Robert Cain (RC), field notes relating to an in-school departmental coaching session led by RC, and follow-up, post observation interviews with RC and two of the teachers being supported. These were the head of department, Bill, who had been in the school for 6 years and Nick, a teacher of 19 years' experience, who was the teacher in charge of physics.

6.7.1 SUPPORT PROVIDED

The observed session was a SPN coaching session which took place after school in one of the science laboratories. This was the second session that RC had run for the department that term. The content of the session had been negotiated in advance with the SPN coordinator in the school and was a specific request to help the teachers develop ideas for practical investigations to support their preparation for their Assessing Pupil Progress (APP) foci that term. The planned topics for the session were 'forces and motions' and 'sound and light'.

At the beginning of the session, there seemed to be an informal atmosphere, with the participants, 8 teachers and 3 laboratory technicians, sitting around one large table enjoying coffee and biscuits as RC set up the equipment for the session. It seemed that there was an already established rapport between RC and the group, which comprised both experienced and relatively inexperienced colleagues. There

were no physics specialists present or employed at the school generally: '*we're mostly chemists and biologists*' was the observation of Nick, the SPN coordinator in charge of physics teaching within the school.

RC introduced the topics through use of PowerPoint, explaining sounds as movement of air particles and demonstrating the movement of sound waves. He discussed and demonstrated some ways of explaining sound and pitch, including the use of different types of equipment such as a music box, sound pig, bouncing rice, wobble board, and a bottle of water and Alka Seltzer. He also explained some typical misconceptions that pupils had in relation to the topic. Throughout the session he involved the participants in the activities, for example, he asked one of the participants to make a sound with a straw, and then cut the straw 'mid-squeak' to show how the length of an instrument affects pitch.

The focus of the session changed as RC moved on to discuss forces and motion, and explained how he would use a rocket launcher and dragster launcher. He demonstrated this through using small and inexpensive toy cars that are wheeled back and then propelled forward when released. RC set the participants tasks that they could use with pupils: '*what's the relationship between how far you wheel it back and how far forward it goes?*' The participants worked on these in groups and discussion followed about how the activity might work and be adapted for use with pupils. When the focus of the session moved on to sound and light, RC asked what activities members of the department already used for these topics and indicated which of these he considered to be good ones for using in class whilst also suggesting some alternatives. This included online resources such as 'Google Moon' and 'Google Mars', and the NASA video 'Toys in Space'. At the end of the session RC offered to do some extra coaching on diffraction for those who were able and interested to stay behind.

When asked about the ways in which he worked with schools, RC said that the content of his SPN coaching sessions was always responsive to the demands of the group he was working with. This observed session came about because the department were concerned about how to best support their pupils with the APP foci for physics. After the session RC explained that:

They wanted ideas for Assessing Pupil Progress, a set of investigations for Key Stage 3, and gave a number of topics they were potentially interested in, e.g. forces, space and sound. I felt this was a little broad but felt I should respond to the brief and then ask them to narrow it down for a follow up session in July.

RC explained that most of the work he did with departments involved him having a specific area to focus on, such as forces, and that it involved demonstrating how to avoid teaching misconceptions. He pointed out that '*often teachers have misconceptions that need to be addressed before* [subsequently] *discussing how to teach to address pupils' misconceptions'*. He emphasised that he endeavoured in his sessions to develop an informal relationship with the teachers so that they learned to trust him:

They know I'm a physicist and am there to help so they are very happy to have their misconceptions exposed. They are not afraid to have their conceptions open to critique and to critique those of each other. I think this is because I've set it up as a friend so it's not judgemental.

Two of the participants in the observed session explained that they felt the session was typical of RC's very practical approach: *'he is amazing in the way that he presents physics and is motivating for both teachers and pupils'*. In addition to the group sessions with this cohort, RC had also team taught two lessons at the school, including one on particle physics which four other teachers came to watch. One of these commented that *'it was really good to see physics taught by a physics specialist'*.

RC explained that this bespoke mentoring and coaching was a feature of the way he liked to work with schools. He saw his role as being there to *'support and not to assess'* and said it was important not to forget that the majority of teachers he worked with were not physics specialists. He thought it was important to get them talking about physics teaching and in doing so he was aiming to help them increase their confidence in teaching physics: *'so they are not just teaching by the book but are more confident to be more creative'*. He aimed to provide support that was tailored to different departments' needs. Most of the support he provided took the form of twilight sessions in schools but he also offered to do demonstration lessons and to team teach. He also commonly worked with departments on redrafting schemes of work to include more practical approaches and (again) to challenge common scientific misconceptions. RC observed that whilst:

in theory all [departments' and individual teachers'] *needs differ…in practice ... they* [tend to] *ask the same things, e.g. 'can you help with* [teaching] *electricity?'*

6.7.2 PERCEIVED AND POTENTIAL IMPACT OF THE SUPPORT

After the session, RC said that he thought that there would be a positive impact for the department's upcoming work in relation to the focus on APP:

They've got more ideas and resources, and germs of ideas for the [pupil] *investigations. This and the next visit I see as a pair, so the outcomes from both will feed into the investigations and the assessment of these.*

In his interview after the session, Bill said that he thought that the session would help his staff to think about what they are teaching. He noted that it had helped to challenge some misconceptions and felt that it brought '*physics alive'*. As well as this whole departmental level of impact, Bill felt that this and other sessions run by RC have led him personally to *'become more thoughtful'* and that this one in particular will change *the way I teach electricity'*.

Nick said that he thought the session had been useful in terms of helping the department to develop resources and ideas for their APP work:

some simple inexpensive materials we could use with kids... some of the ideas I hadn't seen before, e.g. the coat hanger starter, the bottles of water and Alka Seltzer practical.

Nick went on to explain that this session like others RC had provided helped the teachers to help the pupils learn because: '*when we use the activities with the pupils they are more motivated. They enjoy the lessons more. They are accessible'*. A key factor in this success appears to have been the fact that the department's work with RC had led to an increase in confidence. Nick linked this increase in confidence to RC's expertise and his ability to connect with the individuals in the department: *'he's very knowledgeable and has got time for us'*. Nick explained that RC's input had helped with subject knowledge, which had led to better planning and teaching: *'it's*

now easier to know what to assess and which activities to use for which topics'. He also had little doubt that RC's work had had a direct impact on pupils in the school:

It increased my knowledge of the physics behind it and it will help us improve our schemes of work. The numbers of pupils opting for triple science GCSE has increased and the number doing A level physics has also been increasing and I think this is partly because pupils' enjoyment and learning have improved and increased.

At the beginning of RC's involvement with the school, the head of department, Bill explained that he had had some reservations, thinking that RC would be:

another of those people who come in to show off but when you ask them a question they don't know the answer. But in fact when you ask the question, RC leads a discussion to come up with the answers we need.

Ultimately, Bill said he felt that as a result of RC's input, the Science department *'were more comfortable with physics ideas'* and that his colleagues were using the ideas suggested by RC in their teaching. He too felt that there had been a positive impact on pupils' learning: *'massively so, progress in one Year 7 class has been quite phenomenal'.*

6.7.3 FACTORS ASSOCIATED WITH POTENTIAL IMPACT

It would seem that for this particular group of teachers, a key factor which had helped RC make an impact was his ability to foster positive non-threatening relationships which the teachers found supportive: *'he initially came and introduced himself and asked how he could help'.* When Bill was asked if he would be happy for RC to observe his colleagues in the classroom, he responded: *'they, we are very comfortable with RC and with each other'.*

RC suggested that the fact there were no physics specialists within the department was an advantage in terms of the ways in which he could work with the group. He explained that this was because they were all at a similar level of need and confidence: *'I haven't come across any antagonism, I think the* [teacher's frequent use of the] *"I'm not a physicist, but" cop out helps'.*

A further factor identified by those we spoke to was RC's ability to convey subject knowledge in an accessible manner through discussions and practical hands-on activities which directly addressed the teachers' misconceptions and led to more informed and engaging lessons. This appears to have led to the department now having a resource bank of ideas and activities which they can draw on in the future.

The perceived impact in this instance of his deliberate attempts to foster informal supportive relationships seems to be a typical feature of RC's approach. RC provided some anecdotal evidence to support this. For example, he reported that one head of science told him that there was '*a real buzz*' after a session he led in one school and that more people came to the second session because of positive feedback which suggested that the first had been *'really informal'* and that colleagues could *'let their hair down'.*

A potentially constraining factor on the impact RC could have was the lack of available time teachers have to work with him in the ways described above and to enact some of the suggested strategies: '*teachers don't have enough time to sit back and reflect and learn'*. RC also suggested that some of the teachers he worked with were *'constrained by the* [prescribed] *syllabus and the* [published] *scheme of work',* and that teachers *'being able to do things in a more creative way would be beneficial'.*

In future, Bill and Nick would like to see the TLC support continue and would like to work with RC specifically on two areas, the first being to support the department's work with their gifted and talented pupils to develop their *'higher order thinking skills'*. A second area of focus would be support with implementing the new GCSE specification, particularly with regard to *'physics practicals we might need for the course'.*

6.7.4 CONCLUDING COMMENTS

Bill and Nick were both glad that the funding for the work of Teaching and Learning Coaches was being extended. They felt that it had a lasting impact on the confidence, subject knowledge and pedagogy of the teachers in their department. When asked if he felt the kinds of external mentoring support offered by RC might usefully be extended to other subject areas, Bill commented:

It would be really nice if we could have a chemistry or biology specialist doing the same thing and providing similar support because obviously we don't know everything about our own subjects.

RC made a similar observation: *'I think the starting point – "I'm here to address misconceptions and support you" – could work in any subject'.*

6.8 CONCLUSION

Although the six case studies draw on the work of mentors across three different programmes, there are areas of commonality both in the support that is offered to participants and the potential impact of this support.

A key element of support is targeted at raising the confidence of the teachers the mentors are working with. Regardless of the stage and experience of the mentees, in all three programmes within these case studies, they seemed to struggle with confidence in terms of their own subject knowledge and pedagogical approaches. An important aspect of the mentors' work was therefore directly related to raising confidence both in approaches to teaching physics and in the teachers' own understanding of the subject. The case studies portray the many innovative ways in which these mentors did this; for example through modelling teaching and learning approaches in their sessions which could be used with pupils, addressing common pupil (and teacher) misconceptions, establishing a peer support network, as well as identifying individual needs in relation to subject knowledge and adapting the support accordingly.

When he was sent and asked to comment on his case study, Derek Carter replied:

I think this forms a fair reflection [of] *my work as a SASP Regional Advisor. The needs of the participants varied but most asked for support with subject knowledge and/or pedagogy at some stage. A small piece of advice often produced a large boost in their confidence. For me this was probably the most satisfying aspect of my role.*

Linked to this issue of teacher confidence is the emphasis within the case studies on the ways in which the various models of mentoring and coaching offer the participants a safe and supportive environment in which to open up and be honest about their subject knowledge and pedagogical needs. Time and time again the fact that the mentor is external to the school situation seems to have an impact on the participants' willingness to admit to gaps in their knowledge or to having problems with classes or colleagues within the school.

Another area of commonality is the perception that the impact of the support extends far beyond the individual mentee. There is a clear sense that pupils benefit because the lessons are more productive, engaging and enjoyable as many comments by the mentees testify. The case studies also demonstrate how both mentees and mentors recognise that the mentoring benefits the department as a whole as well as the individual teacher. In the case of both PEP and SASP mentees often become *'leading lights'* or the recognised 'experts' (acknowledging that they can fulfil this role because they have the comfort of knowing they have their mentor to turn to as an external advisor). The SASP case studies show how the work of the mentor often involves supporting whole departments, including technicians; whilst the SPN model of support involves whole departments who in the best case scenarios end up collaborating with more '*talk about physics*'. The mentors also strive to make their work sustainable by creating peer groups of support (especially with the group meals in the PEP case studies) and by equipping individuals to know how to support themselves as *'if you mentor them well they* [begin] *to solve their own problems'.*

Inevitably the case studies also demonstrate that there are factors which limit the potential or actual impact of the support the mentors can offer. These are related to the time available to do the job as well as the limited time that mentees have to engage with the support offered, within the competing demands of a school day. The support works best when there is a gatekeeper who engages positively with what the mentor can offer so that this can be targeted to, and valued by, those who need it most in schools. Many of the mentors observe that their role is dependent on the relationships they have been able to build up over time with their mentees. There is a sense that longevity makes these relationships sustainable and productive and that the support has to be viewed as a long term investment which in many cases seems to have positively impacted on enthusiasm and ultimately retention.

Whether they are working on PEP, SASP or SPN, the mentors in these case studies demonstrate that their work is multifaceted. They offer a range of ways of working with their mentees and a key strength appears to be their ability to tailor the support they can offer. With SPN (and often with SASP) the fact that the mentors go into the schools means that they are able to offer bespoke support which is responsive to localised departmental contexts. However a feature and strength

across all programmes is the personalized nature of the mentoring and coaching observed. The mentors within these case studies come across as remarkable individuals: not only experts in their field, they also seem gifted in terms of their ability to enthuse and inspire, they have an infectious passion for the subject, they seem able to communicate at all levels and are flexible, often abandoning what they had planned to respond to an emerging concern. They are able to empathise with their mentees and offer emotional support to help overcome feelings of isolation and provide both motivation and (particularly in the case of PEP) a *'light at the end of the tunnel'*.

Without exception the mentees we spoke to in relation to these case studies were overwhelmingly positive about the support they had received from their external mentors and were emphatic about the need for this support to continue in some form or other. Each of these case studies has been read by the mentors and most seemed surprised by the high regard their mentees had for them. For example, when he was sent and invited to comment on his case study, Mike Freeman replied:

I'm happy with and felt very proud reading that. It reinforces that the work I do has a very positive impact, and that I'm good at it, both of which are easy to forget amidst the detail on a bad day. I'm glad to have helped your research, and I hope this has some impact within the Department for Education.

Whilst Phil Williams commented:

I am very happy for you to submit this. I think it is an accurate well researched and positive picture which it would be good for Gatsby to see.

SECTION III: EXTERNAL MENTORING FOR TEACHERS OF OTHER SUBJECTS

CHAPTER 7. THE NATURE AND POTENTIAL OF EXTERNAL MENTORING FOR PRIMARY AND SECONDARY TEACHERS OF ALL SUBJECTS

7.1 INTRODUCTION

This chapter explores the extent to which some of the findings presented in earlier chapters, relating to secondary physics teachers, may be applicable to teachers of other subjects in both secondary and primary schools. The chapter comprises two main sections. The first (Section 7.2) summarizes the results of our analysis of interviews conducted with two mentees and two mentors associated with the *chemistry* SASP, and provides an indication of the extent to which the experience of external mentoring for non-specialist teachers of secondary chemistry resembles that of non-specialist teachers of secondary physics. The second section (4.2) reports our analyses of survey data to examine:

(i) whether teachers of other subjects in both primary and secondary education feel they might benefit from the opportunity to access the support of an external mentor, and what factors might encourage or discourage the take-up of EM support;

(ii) the extent to which teachers of secondary physics were typical of other teachers in these respects; and

(iii) what other factors influenced teachers' reported interest in EM support, including gender, career length, the socio-economic status of their school, and whether or not teachers had studied the subject in question at undergraduate or postgraduate degree level.

7.2 EXTERNAL MENTORING ON THE CHEMISTRY SASP

The main findings of our analysis of interviews with two mentees and two mentors associated with the chemistry SASP are summarized below.

(1) Contact between mentors and mentees took place via face-to-face meetings, telephone and email communication, and included one-to-one contact and group sessions, the latter including visits to places of interest where teachers might take their own pupils.

(2) The main kinds of support provided by EMs included:

- support for subject content knowledge
- support for subject pedagogy
- help with planning schemes of work
- provision of or access to teaching resources
- help with use of equipment
- facilitating access to the broader science community
- support for mentees' emotional wellbeing.

There is also evidence that, as for physics, chemistry SASP mentors tailored their support according to individual need:

The chemistry mentor would ask the mentee what s/he wanted and work one to one with them in specific tutorials dealing with both subject knowledge and pedagogy according to the need. (University-based stakeholder)

(3) Factors encouraging chemistry SASP participants to take up EM support included:

- a general lack of support within school, including the absence of (or of skilled and experienced) chemistry technicians;

In some [schools] *there were problems with technicians, no technicians or poor technicians, that's a big problem… in some cases they were having to prepare experiments themselves, so you were doing two jobs. They had technicians who didn't know what they were doing and weren't very helpful.* (SASP chemistry mentor)

- the lack of a same subject-specialist within the school;

One [mentee] *went on to another school where she was the only chemistry teacher and she found that hard.* (SASP chemistry mentor)

- a need for support for their subject content knowledge and subject pedagogy;

A significant proportion of the [SASP] *participants have no subject expert in their schools. One teacher was told by her school to teach A level chemistry. Her background is Environmental Science. Sixteen students took the A level and 13 got U-grades. She was told by the school to come up with better figures or they will close A level chemistry.* (University-based stakeholder)

- the fact that EMs were overtly available, willing and had dedicated time to support potential mentees;

[Mentees] *could email me or ring me up on evenings or at weekends, whenever. So on a Sunday night they could be on the phone saying 'I'm just planning this lesson, can I just run it past you?' It makes a difference because you couldn't do that with a colleague at work.* (SASP chemistry mentor)

- mentees' commitment to their own professional development;

They were self-motivated and so were interested in their own professional development and those who were most engaged would go the workshops and get involved with the support offered to them. (SASP chemistry mentor)

- mentees' desire for an independent perspective on some matters

Sometimes it's just 'I've got to teach this topic' and one said to me 'my head of department said it happens like this and I don't think that's right so can you just talk it through?' Not all have wanted it but those that have, would've found it difficult without [access to an EM]. (SASP chemistry mentor)

- a perception that it is easier to be open about professional development needs to someone outside of the school

I think it took away the politics of it, they could be open, they could have a moan and groan about the situation they were in which obviously you couldn't do the same if it was someone in the school. (SASP chemistry mentor)

- the role of the EM as supporter and not judge:

That's what's nice about the SASP, we are there solely to help, we're not judging, not assessing or feeding back to their schools, we have nothing to do with that, it's solely a relationship between them and us and I think that is a good thing. (SASP chemistry mentor)

(4) Factors discouraging chemistry SASP participants from taking up EM support included:

- time constraints;

She said 'I'm here if you need me'. I didn't make full use of her by any means, mainly due to time constraints. Have you ever taught?! (SASP chemistry mentee)

- some participants' confidence in their subject knowledge and pedagogy, and/or self-sufficiency in relation to their perceived professional development needs;

I didn't feel I was struggling with anything and so didn't really need the support. With hindsight I feel I knew more chemistry than I thought. (SASP chemistry mentee)

- participants not teaching the subject to A level, where they might have been more likely to feel the need for EM support.

I think it was more to do with how confident they felt about themselves, I had some who sort of said well I don't know what you can do to help me, I feel alright about this. Principally they were none of the A level teachers. (SASP chemistry mentor)

Whilst the lack of appropriate school-based support was a major factor encouraging some teachers to seek the support of an EM, in some cases, issues relating to school-based support actually prevented other teachers from doing so:

I had one [mentee] *up in* [region] *from the second cohort and at the end of the first year the school became an academy and she wasn't allowed to carry on... she said they could only do courses run by a particular company*. (SASP chemistry mentor)

(5) Reported benefits of SASP mentoring for chemistry mentees included:

- improved subject content knowledge;

Not only did it improve my subject knowledge but it improved my ability to provide a course for the kids in the sixth form block so that was good. (SASP chemistry mentee)

- increased practical work in the classroom;

The practical things, he's a chemistry specialist, some of it he's shown me at various labs around the place, that has fed into my teaching and things that I do.
(SASP chemistry mentee)

- increased confidence in teaching chemistry;

I wouldn't have had the rounded chemistry pedagogy, the variety of different things that are out there and the different way of doing things. (SASP chemistry mentee)

I think they are much more confident about handling chemistry experiments in a class situation, certainly more confident about subject knowledge and you can see that they are more able to discuss what they are doing. It moves on from 'how would you do this?' to 'I'm thinking of doing it this way and somebody else has suggested doing it that way, what do you think?' (SASP chemistry mentor)

- increased awareness of off-site teaching and learning opportunities;

[Mentees] *learned how the Catalyst museum could be used as a resource for taking the kids out of the classroom... The workshops helped them to get an understanding of learning within the region, where to take pupils for a visit*. (SASP chemistry mentor)

- overcoming isolation;
- enhanced identity as an all-round teacher of science;
- improved capacity of mentees to support other colleagues with their chemistry teaching;
- reassurance of having someone to turn to when necessary;

[EM] *is very much there if and when I need him, which is great... anything I've asked for he's tried to provide. The biggest part of it was just the hand on the shoulder, still down the line he's always there on the other end of the phone*. (SASP chemistry mentee)

I think a lot of them knew I was always there if they needed it and they found that helpful. (SASP chemistry mentor)

- increase in pupil learning and understanding.

We had a discussion of different ways of calculating yields and I tried it out and it was helpful... I think the students get it better now compared with how I taught it before. (SASP chemistry mentee)

- enhanced career development and promotion prospects.

When asked whether they felt EM support may have made a difference to mentees' retention in teaching or career progression, one mentor stated:

I think it would do, this one person has gone from one school to another and she is running their A level chemistry, which is a step up. {Are you suggesting she wouldn't have been able to do that without the EM support?} *I don't think so, no*. (SASP chemistry mentor)

(6) Factors influencing the impact of chemistry SASP mentoring included:

- mentees and mentors having sufficient time to engage;

Time is the biggest constraint once the SASP course has finished. The teachers have other CPD to get on with. Time is the biggest restraint. (SASP chemistry mentor)

- opportunities for mentees to have one-to-one contact with mentors;

- mentors' willingness and ability to visit mentees' schools to understand the context;
- mentors' ability to develop mentees' confidence;
- the provision of training and external support for EMs.

[The SASP mentor training] ...*was purely on mentoring. That was quite useful, the approach is different, you're coming from what the mentee wants and you're trying to make them take control and come up with solutions*. (SASP mentor)

The findings presented above could easily comprise a summary of some of the main findings of our analyses of data relating to SASP mentoring for secondary teachers of physics. Although they are based on a small sample of participants, these findings suggest that there are no substantive differences between the experiences of teachers of secondary chemistry and secondary physics who were following SASP programmes. In the next section, we examine the potential demand for external mentoring amongst teachers in general, including both primary and secondary teachers of a range of subjects. We also examine the considerations influencing the potential take-up of such support, were it to be available.

7.3 SURVEY FINDINGS: EXTERNAL MENTORING FOR ALL?

In Chapter 3 we reported findings on the proportion of secondary teachers of physics responding to our survey questions who stated that they might benefit from the opportunity to access an EM, and on the reasons given by those who did and those who did not feel that they would benefit. In this section we examine the extent to which teachers of secondary physics were typical of other secondary and primary school teachers in these respects, as well as examining potential variation by career length, gender, socio-economic status of school (in terms of free school meal eligibility), and (for secondary teachers) whether or not respondents were teaching a subject which they had studied as a major part of a first and/or postgraduate degree.

7.3.1 THE TYPICALITY OF SECONDARY PHYSICS TEACHERS AND POTENTIAL DEMAND FOR EXTERNAL MENTORING

Table 7.1 below shows that around half of both primary and secondary school teachers who responded to our survey questions said they felt they might benefit from the support of an external mentor for at least one of the subjects that they teach.

Table 7.1 Whether respondents felt they might benefit from having access to an external mentor, by phase (all subjects)

	Yes		No and/or not sure		Total no. of respondents
	%	Weighted %	%	Weighted %	
Primary	49%	49%	51%	51%	**814**
Secondary	49%	50%	51%	50%	**698**

In order to compare responses by phase, respondents who stated that they would like an external mentor for one or more subjects were treated as "yes" overall, while respondents who did not say "yes" for any subject were treated as "no and/or not sure" overall.

Tables 7.2a and 7.2b examine whether respondents felt that EM support would be more beneficial for some subjects than others. Table 7.2a shows that 33 per cent (38% weighted) of secondary physics teachers indicated that they might benefit from having access to an EM, and that a higher percentage of teachers of most other subjects gave a positive response to this question. For example, over half of performing arts and ICT teachers who responded to the survey stated that they might benefit from EM support.[29] Interestingly, teachers of all three of the main science subjects in secondary schools (biology, chemistry and physics) were amongst those least likely to indicate that they might benefit from EM support, although a significant minority of respondents from these disciplines nonetheless indicated that they might do so.

Amongst primary school teachers, there was little variation by subject, with just under two-fifths of respondents stating that they felt they might benefit from having an EM for each subject area considered – science, English and mathematics (see Table 7.2b).

For secondary teachers, we undertook additional analysis to examine whether teachers' views on whether they might benefit from EM support for particular subjects were related to whether or not they had studied those subjects as a major component of first and/or postgraduate degrees. The results are summarized in Table 7.3. It might be expected that respondents who had not studied a subject to undergraduate or postgraduate level would be more likely than those who had done so to feel they would benefit from EM support for teaching that subject,

and this was indeed the case for a number of subjects, including performing arts, biology, history, ICT and mathematics. However, for other subjects, including physics (as reported in Chapter 3), chemistry, English, geography, and RE, respondents who had not studied these subjects as a major component of undergraduate or postgraduate degrees were *less* likely to say they might benefit from EM support. We should add that while subjects with smaller numbers of respondents have been excluded from this analysis, the number of respondents for some remaining subjects is still rather low, and the differences between the responses to this question of those who had and had not studied their subjects as major component of first and/or postgraduate degrees were only found to be statistically significant for teachers of physics. Hence, the comparisons between subject areas should be treated with some caution, though it is clear that, in general, teachers who had *not* studied a subject they were teaching as a major component of a first or postgraduate degree were *not more likely* than those who had done so to indicate that they might benefit from the support of an external mentor.

[29] Since (as we show below) women and early career teachers were more likely to state that they might benefit from the support of an external mentor, additional analysis was undertaken to explore whether the subject differences reported here might be explained by relative gender or career phase differences in the make-up of our achieved sample. However, the make-up of our sample of secondary physics teachers, in terms of gender and number of years in teaching, resembled and was not significantly different from that of most other subjects, so cannot account for these findings. Neither can the socio-economic status of the schools in which our respondents taught. One possible, at least partial explanation is that secondary teachers of physics and other science subjects may already have greater access than those of most other subjects to external support and teaching resources, through organisations and projects such as Science Learning Centres, the Institute of Physics and the Science Enhancement Project (SEP). A study of CPD by Leaton Gray (2005) found that teachers of science were more likely than those of other subjects to indicate that they had engaged in networking activities with other teachers.

Table 7.2a Whether respondents felt they might benefit from having access to an external mentor, by subject (Secondary teachers)

	Yes		No		Not sure		Total no. of respondents
	%	Weighted %	%	Weighted %	%	Weighted %	
Performing arts	63%	64%	25%	23%	13%	13%	**24**
Art and Design	52%	48%	35%	41%	13%	10%	**23**
ICT	52%	51%	36%	35%	12%	14%	**75**
Citizenship	47%	44%	39%	46%	13%	10%	**38**
English	47%	50%	42%	39%	11%	11%	**109**
Design and Technology	47%	49%	40%	41%	13%	10%	**45**
PSHE	41%	40%	48%	49%	11%	11%	**82**
Maths	39%	43%	49%	45%	12%	12%	**95**
MLF	38%	39%	39%	41%	23%	20%	**71**
RE	36%	38%	47%	46%	18%	16%	**45**
PE	35%	43%	46%	36%	19%	21%	**26**
History	33%	29%	50%	56%	17%	14%	**54**
Physics	33%	38%	46%	42%	21%	20%	**95**
Geography	26%	26%	61%	63%	12%	12%	**57**
Chemistry	26%	28%	52%	49%	22%	23%	**96**
Biology	25%	26%	56%	52%	20%	21%	**102**

Includes all subjects with a minimum of 20 respondents; excludes respondents who stated they already had access to an external mentor.

Table 7.2b Whether respondents felt they might benefit from having access to an external mentor, by subject (Primary teachers)

	Yes			No			Not sure			Total no. of respondents
	n	%	Weighted %	n	%	Weighted %	n	%	Weighted %	
English	300	38%	38%	340	43%	42%	150	19%	19%	**790**
Maths	298	38%	38%	351	45%	44%	139	18%	18%	**788**
Science	310	39%	39%	322	40%	40%	167	21%	21%	**799**

Excludes respondents who stated they already had access to an external mentor.

Table 7.3 Whether respondents felt they might benefit from having access to an external mentor, by whether subject was major part of UG/PG degree (Secondary teachers only)

			Whether respondent feels that they would benefit from an EM				
			Yes	No	Not sure	Total	Total n
Whether subject is major part of UG/PG degree							
Performing Arts	Yes	%	50%	36%	14%	100%	14
		weighted %	54%	31%	15%	100%	
	No	%	80%	10%	10%	100%	10
		weighted %	78%	11%	11%	100%	
ICT	Yes	%	46%	42%	13%	100%	24
		weighted %	42%	46%	12%	100%	
	No	%	55%	33%	12%	100%	49
		weighted %	54%	29%	17%	100%	
History	Yes	%	31%	51%	18%	100%	39
		weighted %	29%	53%	18%	100%	
	No	%	43%	43%	14%	100%	14
		weighted %	33%	53%	13%	100%	
Mathematics	Yes	%	37%	51%	12%	100%	73
		weighted %	38%	49%	12%	100%	
	No	%	43%	48%	10%	100%	21
		weighted %	52%	39%	9%	100%	
Biology	Yes	%	20%	61%	19%	100%	75
		weighted %	20%	60%	20%	100%	
	No	%	33%	42%	25%	100%	24
		weighted %	42%	31%	27%	100%	
Religious Education	Yes	%	39%	48%	13%	100%	23
		weighted %	44%	44%	11%	100%	
	No	%	32%	47%	21%	100%	19
		weighted %	29%	53%	18%	100%	
English	Yes	%	51%	40%	9%	100%	87
		weighted %	55%	35%	10%	100%	
	No	%	33%	52%	14%	100%	21
		weighted %	32%	56%	12%	100%	
*Physics	Yes	%	36%	61%	3%	100%	33
		weighted %	43%	53%	3%	100%	
	No	%	31%	40%	29%	100%	58
		weighted %	37%	36%	27%	100%	
Geography	Yes	%	29%	60%	12%	100%	42
		weighted %	32%	56%	12%	100%	
	No	%	25%	58%	17%	100%	12
		weighted %	23%	62%	15%	100%	
Chemistry	Yes	%	27%	53%	20%	100%	59
		weighted %	31%	46%	22%	100%	
	No	%	24%	48%	27%	100%	33
		weighted %	24%	48%	27%	100%	

Includes subject areas judged to have a sufficient number of respondents and responses in each main category to facilitate meaningful comparisons (i.e. a minimum of 20 respondents overall, including at least 10 who had and 10 who had not studied the subject to first degree and/or postgraduate degree level).
Excludes respondents who indicated that they already had an EM.
*p<0.05

One of the most clear-cut results of our analyses of these data is the finding that, amongst both secondary and primary school teachers, there was a statistically significant association between the number of years respondents had been teaching and whether or not they felt they might benefit from having access to an external mentor ($p<0.01$). Tables 7.4a and 7.4b show that those who had completed no more than five full years of teaching were much more likely than those who had been teachers for a longer period to state that they might benefit from an EM for one or more subjects. Over 70 per cent of secondary and around 65 per cent of primary respondents who had been teaching between 0-5 full years said they felt they might benefit from an external mentor, as did over half of primary and secondary respondents who had been teaching between 6-10 full years – compared, for example, to under 40 per cent of those who had been teaching for 21 years or more.[30]

Table 7.4a Whether respondents felt they might benefit from having access to an external mentor, by career length (Secondary teachers)

	Yes		No and/or not sure		Total no. of respondents
Career length (no. of full years in teaching)*	%	Weighted %	%	Weighted %	
0-5	71%	72%	29%	28%	**78**
6-10	56%	56%	44%	44%	**176**
11-15	49%	53%	51%	47%	**120**
16-20	42%	42%	58%	58%	**104**
21+	39%	39%	61%	61%	**218**

Excludes respondents who indicated that they already had an EM. Respondents who stated that they would like an external mentor for one or more subjects were treated as "yes" overall, while respondents who did not say "yes" for any subject were treated as "no and/or not sure" overall

Responses from those in 'career length' categories 0, 1 and 2-5 full years were combined due to the small number of responses in the first two of these.

*p<0.01

7.4b Whether respondents felt they might benefit from having access to an external mentor, by career length (Primary teachers)

	Yes		No and/or not sure		Total no. of respondents
Career length (no. of full years in teaching)*	%	Weighted %	%	Weighted %	
0-5	67%	65%	33%	35%	**93**
6-10	58%	59%	42%	41%	**212**
11-15	44%	45%	56%	55%	**181**
16-20	47%	47%	53%	53%	**128**
21+	38%	37%	63%	63%	**200**

Excludes respondents who indicated that they already had an EM. Respondents who stated that they would like an external mentor for one or more subjects were treated as "yes" overall, while respondents who did not say "yes" for any subject were treated as "no and/or not sure" overall.

Responses from those in 'career length' categories 0, 1 and 2-5 full years were combined due to the small number of responses in the first two of these.

*p<0.01

[30] Given the small number of respondents who had completed no more than two years of teaching (nine in total), it is not possible to state whether these were more or less likely than teachers who had completed between three and five full years in teaching to feel that they might benefit from EM support.

Amongst secondary teachers in our sample, women were slightly more likely than men to indicate that they might benefit from the opportunity to access external mentor support, though the differences are not statistically significant (see Table 7.5a). Amongst primary school teachers, this trend is more marked *and* statistically significant ($p<0.01$). As Table 7.5b shows, 52per cent of women indicated that they would like an external mentor, compared with a relatively low 39 per cent of men.

Table 7.5a Whether respondents felt they might benefit from having access to an external mentor, by gender (Secondary teachers)

	Yes to one or more		No and/or not sure		Total no. of respondents
	%	Weighted %	%	Weighted %	
Male	46%	49%	54%	51%	**288**
Female	51%	51%	49%	49%	**410**

Excludes respondents who indicated that they already had an EM.
Respondents who stated that they would like an external mentor for one or more subjects were treated as "yes" overall, while respondents who did not say "yes" for any subject were treated as "no and/or not sure" overall.

Table 7.5b Whether respondents felt they might benefit from having access to an external mentor, by gender (Primary teachers)

	Yes to one or more		No and/or not sure		Total no. of respondents
	%	Weighted %	%	Weighted %	
Male	39%	38%	61%	62%	**150**
Female	52%	52%	48%	48%	**664**

Excludes respondents who indicated that they already had an EM.
Respondents who stated that they would like an external mentor for one or more subjects were treated as "yes" overall, while respondents who did not say "yes" for any subject were treated as "no and/or not sure" overall.

Amongst secondary respondents, we may also observe from Table 7.6a that there is a tendency for teachers in schools which have a relatively high proportion of pupils with free school meal status to be more likely to state that they might benefit from the support of an external mentor, but this trend is not statistically significant. Amongst primary teachers, there is no observable trend or statistical association between responses to the same question and the FSM status of their schools (see Table 7.6b).

Table 7.6a Whether respondents felt they might benefit from having access to an external mentor, by FSM eligibility (Secondary schools)

	Yes		No and/or not sure		Total no. of respondents
	%	Weighted %	%	Weighted %	
Lowest 20%	47%	47%	53%	53%	**210**
2nd lowest 20%	46%	46%	54%	54%	**212**
Middle 20%	49%	49%	51%	51%	**146**
2nd highest 20%	55%	54%	45%	46%	**95**
Highest 20%	61%	61%	39%	39%	**33**

Excludes respondents who indicated that they already had an EM.
Respondents who stated that they would like an external mentor for one or more subjects were treated as "yes" overall, while respondents who did not say "yes" for any subject were treated as "no and/or not sure" overall.

7.6b Whether respondents felt they might benefit from having access to an external mentor, by FSM eligibility (Primary schools)

	Yes		No and/or not sure		Total no. of respondents
	%	Weighted %	%	Weighted %	
Lowest 20%	46%	46%	54%	54%	**173**
2nd lowest 20%	54%	54%	46%	46%	**197**
Middle 20%	48%	48%	52%	52%	**179**
2nd highest 20%	45%	46%	55%	54%	**165**
Highest 20%	52%	52%	48%	48%	**99**

Excludes respondents who indicated that they already had an EM.
Respondents who stated that they would like an external mentor for one or more subjects were treated as "yes" overall, while respondents who did not say "yes" for any subject were treated as "no and/or not sure" overall

Perhaps the key finding to emerge from the analyses of data reported above is that there is clearly a demand for external mentoring beyond secondary teachers of physics associated with the PEP, SASP and SPN programmes, and beyond secondary teachers of physics in general. The following section helps to explain why this might be the case, and demonstrates that many of the factors which encouraged PEP, SASP and SPN mentees to take up the mentoring support available to them also apply to primary and secondary teachers of other subjects.

7.3.2 THE TYPICALITY OF SECONDARY PHYSICS TEACHERS AND FACTORS INFLUENCING THE POTENTIAL DEMAND FOR EXTERNAL MENTORING

In this section we examine the factors which survey respondents stated might prompt them to or discourage them from taking up EM support, and we compare these by subject taught, career length and phase. Across these distinctions, it is clear that the two considerations reported to be most likely to *encourage teachers to seek the support of an external mentor*, were it to be available, were the need for:

(1) additional support to develop their subject pedagogy; and
(2) additional support to develop their subject content knowledge.

The main factors which respondents said would *discourage them from taking up EM support* were the perceptions that they were:

(3) sufficiently confident about their teaching and subject knowledge; and
(4) able to access any support that they needed within their schools or from other sources.

Factors encouraging teachers to take up EM support

In Chapter 3 we outlined the considerations that secondary teachers of physics who indicated they would benefit from EM support said might prompt them to take up such support. In Table 7.7a below, those findings are compared with the responses of secondary teachers who indicated that they would like an EM for one or more other subjects. The most notable difference is that secondary teachers of physics were significantly more likely than those of other subjects to state that the *lack of a subject specialist in their school* would encourage them to seek EM support, were it to become available ($p<0.05$), with almost three in five teachers of physics giving this response but fewer than one in five teachers of other subjects doing so. A higher percentage of physics teachers also said they would *welcome additional*

support to develop their subject content knowledge, while in relation to most other option responses (including 'I would welcome additional support to facilitate access to or help with teaching resources or equipment'), the proportion of physics teachers stating that such considerations might prompt them to seek EM support was lower than that of teachers generally, although none of these findings are statistically significant.

A similar comparison amongst primary teachers (see Table 7.7b), reveals that – in line with the findings reported above relating to secondary teachers of physics – higher proportions of primary teachers who indicated that they might benefit from EM support for science than those who did so for English and/or maths, stated that the *lack of a subject specialist in school* and *additional support to develop their subject content knowledge* might encourage them to take up the offer of EM support, were it to be available (though these findings are not statistically significant). On the other hand, primary respondents indicating that they might benefit from the support of an EM for science were statistically *less likely* ($p<0.05$) than those indicating that they might like an EM for English and/or maths to give each of the following responses:

- 'I would welcome additional support to develop my subject pedagogy';
- 'I would welcome additional support to develop general pedagogical techniques';
- 'I would welcome an independent perspective on some issues';
- 'Pressure to conform to the school's teaching and learning models'; and
- 'I would welcome additional advice or guidance regarding career progression'.

Tables 7.8a and 7.8b compare the considerations which might prompt teachers to seek EM support given by respondents who had been teachers for different lengths of time. The most notable (and statistically significant) responses are perhaps that both secondary and primary school teachers who had been in teaching for 0-5 years were more likely than most other teachers to state that they might be prompted to take up EM support by each the following factors:

- 'I would welcome additional support to develop my subject pedagogy';
- 'I would welcome additional advice or guidance regarding career progression'.

In addition, secondary teachers of 0-5 years were statistically more likely than those who had been teaching for longer to state that they would *welcome additional support to develop their subject content knowledge*, while primary teachers of 0-5 years were significantly more likely to state that *pressure to conform to their school's teaching and learning models* might encourage them to take up EM support and that they *would welcome an independent perspective on some issues.*

Table 7.7a Considerations that might prompt respondents to seek EM support, by subject (Secondary respondents)

	Respondents who indicated they would like an EM for physics (n=31)		Respondents who indicated they would like an EM for one or more other subjects (n=304)	
	%	Weighted %	%	Weighted %
I would welcome additional support to develop my subject content knowledge	68%	68%	60%	62%
I would welcome additional support to develop my subject pedagogy	61%	66%	62%	62%
*Lack of a subject specialist in school	58%	58%	19%	18%
I would welcome additional support to facilitate access to or help with teaching resources or equipment	45%	43%	54%	54%
I would welcome additional support to develop general pedagogical techniques	36%	33%	46%	50%
I would welcome an independent perspective on some issues	32%	35%	43%	44%
I would welcome additional advice or guidance regarding career progression	19%	18%	28%	29%
General lack of support in school	16%	20%	21%	21%
I would welcome additional support for my emotional wellbeing	16%	17%	22%	21%
Performance management and/or other issues can make it hard to talk about any difficulties within the school	16%	17%	17%	17%
Pressure to conform to the school's teaching and learning models	16%	10%	16%	16%
Lack of collaborative ethos in schools	16%	10%	17%	18%
Issues with a school mentor or line manager	7%	3%	11%	12%

*$p<0.05$

Table 7.7b Considerations that might prompt respondents to seek EM support, by subject (Primary respondents)

	Yes science (n = 53)		Yes English/maths (n = 88)	
	%	Weighted %	%	Weighted %
I would (or do) welcome additional support to develop my subject content knowledge	66%	67%	60%	61%
*I would (or do) welcome additional support to develop my subject pedagogy (how to teach my subject(s)	53%	54%	72%	73%
I would (or do) welcome additional support to facilitate access to or help with teaching resources or equipment	40%	42%	55%	57%
Lack of a subject specialist in school	38%	39%	26%	28%
*I would (or do) welcome additional support to develop general pedagogical techniques (teaching methodologies)	21%	23%	49%	51%
*I would (or do) welcome an independent perspective on some issues	17%	19%	44%	44%
General lack of support in school	9%	11%	13%	14%
Lack of collaborative ethos in schools	8%	10%	19%	19%
*Pressure to conform to the school's teaching and learning models	8%	8%	24%	24%
I would (or do) welcome additional support for my emotional wellbeing	6%	6%	13%	13%
*I would (or do) welcome additional advice or guidance regarding career progression	4%	4%	23%	24%
Performance management and/or other issues can make it hard to talk about difficulties within the school	4%	4%	13%	13%
Issues with a school mentor or line manager	2%	4%	8%	9%

Includes respondents who indicated that they might benefit from an EM for science but not for maths and English (n = 55) and those who indicated they might want an EM for English and/or maths but not for science (n = 88).[31]
*p<0.05

[31] When asked whether they felt they might benefit from EM support for English, maths and / or science, most primary respondents gave a similar ('yes', 'no' or 'not sure') response for all three subjects. To facilitate comparisons across subjects regarding the considerations which might encourage or discourage teachers from taking up EM support, these respondents were omitted from the present analysis.

Table 7.8a Considerations that might prompt respondents to seek EM support, by career length (Secondary teachers)

	0-5 (n=64)		6-10 (n=107)		11-15 (n=65)		16-20 (n=44)		21+ (n=95)	
	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %
*I would welcome additional support to develop my subject pedagogy	77	73	54	57	57	58	73	74	59	58
*I would welcome additional support to develop my subject content knowledge	73	70	64	68	51	54	66	64	54	55
I would welcome additional support to facilitate access to or help with teaching resources or equipment	61	58	51	52	48	44	57	57	56	57
I would welcome additional support to develop general pedagogical techniques	48	54	50	53	40	39	45	45	33	35
I would welcome an independent perspective on some issues	41	40	42	41	42	42	50	50	45	48
*I would welcome additional advice or guidance regarding career progression	39	39	35	35	31	32	18	17	8	9
Lack of a subject specialist in school	25	24	24	23	18	20	16	17	24	28
General lack of support in school	20	19	18	18	25	29	14	12	22	24
Performance management and/or other issues can make it hard to talk about difficulties within the school	20	18	13	12	20	22	14	12	15	16
Lack of collaborative ethos in schools	17	13	17	19	20	17	16	14	14	16
I would welcome additional support for my emotional wellbeing	14	12	19	17	28	32	20	19	24	24
Pressure to conform to the school's teaching and learning models	13	10	15	13	18	20	11	12	18	20
Issues with a school mentor or line manager	11	9	11	13	14	13	9	9	7	9

*p<0.05

Table 7.8b Considerations that might prompt respondents to seek EM support, by career length (Primary teachers)

	0-5 (n=63)		6-10 (n=126)		11-15 (n=87)		16-20 (n=62)		21+ (n=82)	
	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %
*I would welcome additional support to develop my subject pedagogy	79	80	75	76	61	62	65	63	56	57
I would welcome additional support to develop my subject content knowledge	62	63	63	65	68	67	61	61	55	55
I would welcome additional support to facilitate access to or help with teaching resources or equipment	60	63	56	60	49	49	58	60	52	53
I would welcome additional support to develop general pedagogical techniques	51	53	53	55	38	39	52	53	43	40
*I would welcome additional advice or guidance regarding career progression	33	35	29	29	24	26	13	11	6	6
Lack of a subject specialist in school	32	32	33	34	32	31	37	38	32	33
*I would welcome an independent perspective on some issues	32	32	40	39	52	53	58	56	48	47
*Pressure to conform to the school's teaching and learning models	25	27	20	19	9	11	19	19	11	11
I would welcome additional support for my emotional wellbeing	19	20	18	19	18	21	19	19	22	23
General lack of support in school	17	18	14	15	10	11	10	10	9	9
Performance management and/or other issues can make it hard to talk about difficulties within the school	14	17	10	9	11	13	15	14	15	14
Lack of collaborative ethos in schools	13	15	13	14	8	8	18	18	16	17
Issues with a school mentor or line manager	8	9	9	9	6	6	5	5	7	8

*p<0.05

Table 7.9 compares the considerations listed as likely to prompt teachers to seek the support of an EM by both primary and secondary respondents who indicated they would like EM support for at least one subject. Perhaps the main finding is that there were no statistically significant differences between the phases, although:

- a higher proportion of primary respondents stated that they might seek EM support due to
  - a need for additional support to develop their subject pedagogy, and
  - the lack of a subject specialist in school; while

- a higher proportion of secondary respondents indicated that they might be prompted to seek EM support due to
  - a need for additional advice or guidance regarding career progression,
  - a general lack of support in school, and
  - performance management and/or other issues making it hard to talk about difficulties within the school.

Table 7.9 Considerations that might prompt respondents to seek EM support, by phase (all subjects)

	Secondary (n=335)		Primary (n=420)	
	%	Weighted %	%	Weighted %
I would welcome additional support to develop my subject pedagogy	62%	62%	68%	69%
I would welcome additional support to develop my subject content knowledge	61%	62%	62%	63%
I would welcome additional support to facilitate access to or help with teaching resources or equipment	54%	53%	55%	57%
I would welcome additional support to develop general pedagogical techniques	45%	48%	47%	48%
I would welcome an independent perspective on some issues	43%	43%	45%	45%
I would welcome additional advice or guidance regarding career progression	27%	28%	22%	22%
Lack of a subject specialist in school	22%	23%	33%	33%
I would welcome additional support for my emotional wellbeing	22%	21%	19%	20%
General lack of support in school	20%	21%	12%	13%
Lack of collaborative ethos in schools	17%	17%	13%	14%
Performance management and/or other issues can make it hard to talk about difficulties within school	17%	17%	12%	12%
Pressure to conform to the school's teaching and learning models	16%	16%	17%	17%
Issues with a school mentor or line manager	10%	11%	7%	8%

Includes respondents who stated that they would like an EM for one or more subjects.

In addition to the option responses provided in the survey, respondents were given the opportunity to state 'other' reasons which might encourage them to take up EM support. Most responses related either to existing option responses or other considerations discussed in earlier chapters of this report, including perceived limitations of school-based support, a feeling of isolation on the part of some

teachers, concerns about a lack of appropriate preparation for teaching some subjects or courses, and a need for reassurance as well as support for dealing with particular issues:

I'm worried about our school no longer having the money to pay for courses and the LA no longer having a lit or maths team for example upon whom we could call.

Lack of time at school to discuss and share ideas – very small school, everyone has a lot of responsibility.

Our school is good but there are times when other teachers don't share the same enthusiasm. It would be good to have access to someone who does! An external mentor would presumably have more time than a full time class teacher to stay abreast of new developments and reflect.

As a one man department, being able to discuss classical issues with someone is always welcome.

I am the only teacher of my subject at my school, and received almost no training in how to teach this subject. Would love to know how it's – supposed – to be taught, as I've been 'winging it' for 9 years, and it's hard to do it solo.

It's a new course and no one else in the school has ever taught it – it would be really helpful to know that the course I've written isn't totally wrong – which is what I secretly dread every time I teach/mark the work!

I would welcome additional support in engaging particularly difficult pupils and effectively raising their self esteem.

One respondent suggested that EMs could help them to 'Improve teaching and learning outcomes for my students... particularly at A level', one suggested that the opportunity to access an external mentor 'would be a really good idea for all professional teachers', and another offered a potential explanation for this in the need for teachers to be lifelong learners:

I am a learner too! I think the best teachers should always seek ways to advance their subject knowledge. Things change quickly in education, we need to keep up!

Factors discouraging teachers from taking up EM support

Amongst survey respondents who stated that they did not feel they would benefit from the support of an EM:

- secondary teachers of physics were significantly *more likely* than those of other subjects to indicate that they were *able to access any support they need within their schools or from other sources* (Table 7.10a)[32], while primary teachers of science were significantly *less likely* to state that they were *sufficiently confident about their teaching and subject knowledge* (Table 7.10b);

[32] Since teachers of secondary physics were amongst those *least likely* to have a same-subject specialist within their school, this finding may partly reflect Leaton Gray's (2005) research finding that teachers of science have (or take greater advantage of) networking opportunities with other teachers, and (more generally) the increased number of non-school based initiatives to support science teachers in recent years, including those associated with Science Learning Centres, and the availability of resources via (for example) the Institute of Physics and the Science Enhancement Project (SEP).

- both primary and secondary teachers who had been in teaching for 0-5 years were *less likely* than more experienced teachers to indicate that they might be discouraged from seeking EM support because they were *sufficiently confident about their teaching and subject knowledge* (though this finding is only statistically significant amongst secondary teachers), while relatively recently qualified primary teachers were more likely (but not statistically so) to state that they were able to access any support that they needed within their school or from other sources (see Tables 7.11a-b, below);

- there were no statistically significant differences overall between primary and secondary respondents (Table 7.12).

Table 7.10a Considerations that might discourage respondents from seeking EM support, by subject (Secondary respondents)

	Respondents who indicated they would not like an EM for physics (n = 44)		Respondents who indicated they would not like an EM for one or more other subjects (n = 301)	
	%	Weighted %	%	Weighted %
I am sufficiently confident about my teaching and subject knowledge	77%	79%	83%	83%
*I am able to access any support that I need within my school and/or from other sources	75%	80%	56%	54%
I do not feel I would have sufficient time to engage with EM given existing commitments	34%	36%	37%	37%
It wouldn't look good to have to ask for help	2%	2%	3%	3%

(Secondary respondents)*p<0.05

Table 7.10b Considerations that might discourage respondents from seeking EM support, by subject (Primary teachers)

	Those who said no for science (n=25)		Those who said no for English and/or maths (n=92)	
	%	Weighted %	%	Weighted %
*I am sufficiently confident about my teaching and subject knowledge	60%	59%	83%	83%
I am able to access any support that I need within my school and/or from other sources	32%	27%	54%	56%
I do not feel I would have sufficient time to engage with EM given existing commitments	32%	31%	25%	25%
It wouldn't look good to have to ask for help	8%	11%	1%	2%

Includes respondents who indicated that they would not benefit from an EM for science but might do so for maths and English (n = 25) and those who indicated they would not benefit from an EM for English and/or maths but might do so for science (n = 92).[33]

* p<0.05

[33] When asked whether or not they felt they might benefit from EM support for English, maths and / or science, most primary respondents gave a similar ('yes', 'no' or 'not sure') response for all three subjects. To facilitate comparisons across subjects regarding the considerations which might discourage teachers from taking up EM support, these respondents were omitted from the present analysis.

Table 7.11a Considerations that might discourage respondents from seeking EM support, by career length (Secondary teachers)

	0-5 (n=32)		6-10 (n=91)		11-15 (n=57)		16-20 (n=60)		21+ (n=130)	
	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %
*I am sufficiently confident about my teaching and subject knowledge	66	59	85	82	84	86	77	79	85	86
I am able to access any support that I need within my school and/ or from other sources	59	50	62	63	53	46	58	62	62	62
I do not feel I would have sufficient time to engage with EM...	22	25	34	38	51	45	37	35	34	33
It wouldn't look good to have to ask for help	6	9	4	3	4	4	0	0	2	2

*p<0.05

Table 7.11b Considerations that might discourage respondents from seeking EM support, by career length (Primary teachers)

	0-5 (n=35)		6-10 (n=104)		11-15 (n=98)		16-20 (n=76)		21+ (n=127)	
	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %	%	Weighted %
I am able to access any support that I need within my school and/or from other sources	74	74	62	61	63	63	59	60	64	64
I am sufficiently confident about my teaching and subject knowledge	54	54	79	79	70	70	76	77	74	74
I do not feel I would have sufficient time to engage with EM…	37	35	30	30	36	36	36	34	26	26
It wouldn't look good to have to ask for help	0	0	2	3	3	3	1	2	2	3

Table 7.12 Considerations that might discourage respondents from seeking EM support, by phase (all subjects)

	Secondary (n=371)		Primary (n=440)	
	%	Weighted %	%	Weighted %
I am sufficiently confident about my teaching and subject knowledge	82%	81%	73%	73%
I am able to access any support that I need within my school and/or from other sources	60%	59%	63%	63%
I do not feel I would have sufficient time to engage with EM given existing commitments	36%	36%	32%	31%
It wouldn't look good to have to ask for help	3%	3%	2%	2%

Other than the option responses provided in the closed survey questions, respondents were also given the opportunity to list 'other' reasons why they might be discouraged from enlisting EM support. Many of the reasons given related to the first two of the option responses in the question (and the above table). For example:

I am confident teaching the subjects I teach, or I wouldn't teach them.

I AM the external mentor for my LA for these subjects.

In addition to excellent support within the school, we already have access to a network of colleagues within county.

Perhaps related to the fourth survey option response *'It wouldn't look good to ask for help'*, one respondent stated that (s)he would be discouraged from seeking the support of an EM, were it to be available, by 'Pride!', while another stated that: *In the current climate, the wrong sort of head might use this as evidence that I wasn't performing adequately.*

Other reasons given included potentially prohibitive cost, a perception that the respondent did not teach the subject sufficiently regularly to warrant seeking external support, and the suggestion that EM support may not be very helpful, a perception sometimes informed by previous experience of colleagues acting in a similar role and/or by respondents' perceptions of the credibility of prospective EMs:

I have worked with some before that did not meet the needs of my pupils and school.

If a mentor was in place to support I would be concerned this role would stop them from classroom teaching so therefore may feel they had lost touch with pupils' needs.

Finally, some respondents indicated that while they did not feel the need to access the support of an EM at the time of the survey, this might be helpful at some point in the future, if for example, they were to teach the subject in question at a higher level. Others suggested that EM support might be potentially beneficial for some of their colleagues:

I am not implying that I would not see the value in this, more that for me, at my stage in my career and with the links I already have in the teaching community I do not feel it is appropriate. I feel strongly there are teachers to who this could be a really valuable CPD resource.

7.4 CONCLUSION

In this chapter we have extended the discussion about external mentoring beyond secondary teachers of physics to both primary and secondary teachers of other subjects. In particular, we have examined the extent to which teachers of secondary physics were typical of other teachers in relation to the potential demand for external mentoring, and also examined variation on this issue according to factors including gender and career length. Some of the key findings reported in this chapter are summarized in the final chapter of this report below, where we also discuss some potential implications of these and other findings.

SECTION IV: CONCLUSION

CHAPTER 8. CONCLUSIONS AND IMPLICATIONS

8.1 INTRODUCTION

In this concluding chapter we provide a summary of key findings of the MoMaC research (Section 8.2), consider evidence from related research and evaluation studies (8.3), and set out a number of recommendations for education policy-makers, potential providers of external mentoring, and schools (8.4). We also suggest a number of potential avenues for further research (8.5).

Before any of that, however, we wish to acknowledge that, as with all research studies, the present work is not without its limitations. Firstly, the research design and findings rely largely on participants' accounts, though not exclusively so, given that our case studies also draw on the use of observation and analysis of documentary evidence. In addition, the accounts provided are contributed by a variety of participants with a range of experiences and perspectives, including mentees, mentors, university tutors and other stakeholders, as well as teachers who have not had access to external mentor support. Secondly, we should also note that the qualitative evidence provided relates solely to the provision of external mentoring to secondary teachers, and predominantly to secondary teachers of physics, though we sought through our survey work to examine the extent to which some of the emergent findings from this work might apply to a larger body of primary and secondary teachers of a broad range of subjects. Thirdly, we acknowledge that for the 'qualitative' phase of the research it is possible (and perhaps probable) that the participants recruited to the study (i.e. those who either volunteered or were volunteered by mentors and tutors for our research) were amongst those teachers who were more open to and more likely to take advantage of external mentoring support. With a response rate of 21 per cent, it might also be the case that survey respondents were not representative of all primary and secondary school teachers in England.

However, these limitations should not seriously detract from the potential significance of our findings, for which we have presented strong triangulated evidence across the three main programmes under investigation and from our wider survey, and some of which are also evidenced in related studies, to which we refer in Section 8.3.

8.2 SUMMARY OF KEY FINDINGS

In this section, we summarize the key findings of the MoMaC research, relating to:

- the kinds of support provided by PEP, SASP and SPN mentors;
- the actual and potential demand amongst teachers of physics and other subjects for these kinds of support;
- the factors which encourage and discourage the take-up of external mentor (EM) support;
- the impact of external mentoring;
- the factors influencing impact; and

- the challenges associated with introducing a programme of external mentoring support for teachers.

8.2.1 TYPES OF SUPPORT

Across the PEP, SASP and SPN programmes, EMs were found to address seven main kinds of support need amongst the teachers[34] they were supporting, namely:

(1) support for subject content knowledge;
(2) support for subject pedagogy – how to teach physics, or particular aspects of the physics curriculum in schools;
(3) support for general pedagogy or teaching methodologies;
(4) support for mentees' emotional wellbeing;
(5) support for building mentees' confidence as teachers of physics;
(6) support for developing mentees' resilience;
(7) support for mentees' career progression.

In seeking to address these broad kinds of support need, EMs employed a range of specific support strategies, as appropriate to the individual needs of mentees and schools, including:

- modelling teaching and practical work;
- providing or facilitating access to teaching resources;
- helping mentees to use specialist equipment;
- helping mentees with lesson planning;
- help with planning schemes of work;
- team teaching with mentees;
- providing 'a shoulder to cry on' and enabling mentees to share confidences;
- cultivating, and encouraging mentees to engage with, a peer network;
- encouraging mentees to become part of the broader science community, for example through engagement with the ASE and IOP.

While most support was provided via direct contact between external mentors and teachers, some EMs also provided more indirect support for mentees by engaging with others, most notably through working with laboratory technicians.

8.2.2 THE DEMAND FOR EXTERNAL MENTORING SUPPORT

Across each of the PEP, SASP and SPN programmes, there was variable take-up of the EM support from eligible teachers and schools:

- most external mentors we spoke to indicated that between one third and two thirds of eligible teachers and schools in their regions had taken advantage of the support.

Notwithstanding the main focus of PEP, SASP and SPN mentoring being to support the development of teachers' subject knowledge and subject pedagogical knowledge, it is striking that, having been given access to a mentor, mentees made use of *all* the potential roles of a mentor, which we outlined in Chapter 2

[34] While we generally refer to 'teachers' as the main recipients and beneficiaries of EM support, the reader is reminded that PEP mentors also supported PEC participants and trainee teachers.

(Section 2.3.2), namely as *model*, *acculturator*, *sponsor*, *provider of psychological support*, and *educator* (Malderez & Bodoczky, 1999).

While specific support needs varied from one mentee to the next, there were some general differences between different categories of teachers, most notably between those who were relatively recently qualified and the more experienced teachers:

- for example, the former group tended to appreciate rather more support for their general pedagogical knowledge, and also opportunities for networking with their peers.

Analyses of data from our national survey suggest that there is a clear demand for external mentoring beyond the pool of secondary teachers of physics associated with the PEP, SASP and SPN programmes, and beyond secondary teachers of physics in general:

- around half of both primary and secondary school teachers who responded to our survey questions said they felt they might benefit from the support of an external mentor for at least one of the subjects that they teach.

Amongst secondary teachers:

- teachers of some subjects were more likely than those of others to indicate that they might benefit from the opportunity to access EM support, with teachers of the main science subjects (physics, biology and chemistry) amongst those least likely to state that they felt they might benefit;
- nonetheless, no fewer than a quarter of respondents for any subject gave a positive response.

Amongst primary school teachers, there was little variation by subject:

- for each subject area considered – science, English and mathematics – just under two-fifths of respondents stated that they felt they might benefit from having an EM.

Amongst both primary and secondary teacher respondents, responses to the question of whether they felt they might benefit from the support of an EM were differentiated by:

- number of years in teaching – with relatively recently qualified teachers more likely than their more experienced colleagues to state that they would like an EM for one or more subjects; and
- gender – with women more likely than men to indicate that they might benefit from the opportunity to access external mentor support (though this is statistically significant for primary but not secondary teachers).

It might have been expected that secondary teacher respondents who had not studied a subject as a major component of an undergraduate or postgraduate degree level would be more likely than those who had done so to feel they would benefit from EM support for teaching that subject. In general, however, this was not the case.

8.2.3 FACTORS ENCOURAGING AND RESTRICTING THE TAKE-UP OF EXTERNAL MENTORING

Our 'qualitative' evidence suggests that the most influential factors which encouraged beginning and established teachers of secondary physics to take up the support of PEP, SASP and SPN mentors were:

- *limitations of existing support*, including a lack of appropriate support for teachers' subject content knowledge and/or subject pedagogy, sometimes because there were no physics specialists within their schools;
- the fact that *EMs had more time available to them to support mentees*, relative to school based mentors or line managers, together with EMs' overt availability and mentees' ease of access to them;
- the *personal attributes, qualities and characteristics* of EMs, including their passion and enthusiasm for teaching physics, their knowledge, experience and expertise as teachers of physics, and their positive, encouraging, respectful, supportive and non-judgemental manner;
- the role of the mentor as a *supporter* rather than *assessor* of teachers' teaching, which enabled many mentees to be more open about their professional development needs than they felt they could be with school-based colleagues or line managers, or with some university tutors associated with PEC, SASP or initial teacher preparation programmes.

Analyses of data from our national survey suggest that many of the factors which encouraged the take-up of PEP, SASP and SPN mentoring would be likely to apply to a wider population of teachers, should the opportunity to access EM support become available to them. Amongst other factors, substantial numbers of both primary and secondary respondents indicated that the following considerations might prompt them to seek the support of an EM:

- I would welcome additional support to develop my subject pedagogy;
- I would welcome additional support to develop my subject content knowledge;
- I would welcome additional support to facilitate access to or help with teaching resources or equipment;
- I would welcome additional support to develop general pedagogical techniques/ teaching methodologies;
- I would welcome an independent perspective on some issues;
- I would welcome additional advice or guidance regarding career progression;
- lack of a subject specialist in school.

Interview and survey data suggest that the main actual or potential factors preventing or restricting teachers from accessing EMs are:

- time constraints in general and a lack of space in participants' school timetables;
- geographical distance between mentor and mentee;
- school-based gatekeepers not facilitating mentors' access to teachers, or vice versa;
- mentees' satisfaction with existing means of addressing their support needs;
- mentees' self-sufficiency or confidence about their subject knowledge and pedagogy;

- mentees' inability to recognise or reluctance to acknowledge their support needs;
- teachers and mentors not 'clicking' or 'getting on'.

8.2.4 THE IMPACT OF EXTERNAL MENTORING

The MoMaC evidence suggests that there has been a significant positive impact of the work of PEP, SASP and SPN mentors on the teachers they have supported, and those teachers' schools. The main or most apparent benefits of external mentoring are listed below.

(1) Impact on mentees' professional knowledge and skill base, including:

- improved subject knowledge;
- improved knowledge of and ability to use technical equipment;
- increased commitment to professional development;
- increased awareness of regionally based opportunities for off-site learning for their pupils.

(2) Impact on teaching and learning, including:

- increased use of practical work in teaching physics and a corresponding reduced reliance on textbooks;
- more interesting, enjoyable and accessible lessons for pupils;
- increased focus on subject content by teachers;[35]
- enhanced pupil understanding and learning.

(3) Emotional impact on mentees, including:

- increased confidence in their subject knowledge and teaching of physics;
- reassurance of having someone to whom they could turn in times of need;
- increased enjoyment of and enthusiasm for teaching;
- reduced feelings of isolation, anxiety and stress.

(4) Enhanced recognition and career advancement, including:

- enhanced career progression or promotion prospects;
- becoming a 'leading light' within the department, to whom other teachers can go for support.

(5) Impact on department, school and teaching profession, including:

- the freeing up of some of the time of HoDs and other school-based subject specialists;
- increased discussion about physics and teaching physics within departments and schools;
- improved knowledge and expertise of laboratory technicians;
- enhanced teacher retention.

[35] For some teachers, this includes a reduced *avoidance* in lessons of topics or parts of topics that they had previously not properly understood or lacked confidence in.

As reported in Chapter 4, there was some variation across the three programmes with regard to the benefits of external mentoring, reflecting the different career stages of the teachers being supported as well as the differing aims and emphases of the three programmes. For example, PEP mentees were more likely than SASP and SPN mentees to report that EM support had helped them overcome isolation and had a positive influence on their retention and likelihood of remaining in the teaching profession.

8.2.5 FACTORS INFLUENCING THE IMPACT OF EXTERNAL MENTORING

The MoMaC data highlight a wide range of factors which influence the impact of external mentoring. These include:

- mentors having reliable and effective means of gaining access to those teachers who are potential beneficiaries of their support;
- support for external mentoring from heads of department and senior leadership teams in mentees' schools;
- individual teachers' openness to mentoring, and willingness and ability to learn and change;
- teachers' ability to find time to engage with the EM and protect agreed meeting times;
- mentors having credibility with mentees as experienced, passionate subject specialist teachers;
- mentors' ability to build relationships and trust;
- mentors being empathetic, encouraging, supportive and positive;
- mentors' ability and willingness to tailor support to individual teacher needs;
- mentors' ability to facilitate mentees' access to a bank of appropriate resources for teaching;
- mentors' willingness and ability to be proactive in establishing and maintaining contact with mentees;
- mentors having sufficient time to engage with teachers and flexibility to be able to respond swiftly to requests for support;
- opportunities for one-to-one, face-to-face interaction between mentors and mentees;
- mentors' independence from mentees' schools, and lack of involvement in or association with their assessment or appraisal.

8.2.6 MAJOR CHALLENGES FOR EXTERNAL MENTORS AND PROVIDERS OF EXTERNAL MENTORING

Our evidence suggests that there are a number of major challenges associated with the implementation of a successful programme of external mentoring. For policy-makers and providers of external mentoring, one such challenge lies in establishing programmes and support structures which do not, in themselves, impede the potential impact of the mentors themselves. We have seen, for example, that:

- some PEP mentees occasionally needed more than 'light tough' mentoring; while
- some teachers being supported by PEP mentors and TLCs benefited from greater opportunities to meet their mentor on a one-to-one basis in their school than the programmes ordinarily allowed.

This suggests that, despite the practical need for programmes and mentors to have and work to specific aims, objectives and priorities, there remains a need for some flexibility and for mentors to have sufficient autonomy to facilitate truly responsive and contingent support.

Other challenges facing external mentors or providers of external mentoring include identifying and promoting potential means of overcoming the various factors which have been shown to restrict teachers' take-up or which prevent them from making the most of EM support. The main considerations, such as opportunities for teachers to find sufficient time to engage with mentors, and gaining the support of heads of department and senior leaderships teams, are summarized in Section 3.3 above and discussed more fully in Chapter 3, while some of the means of overcoming them and maximizing the impact of external mentoring are summarized in Section 8.3.5 above and discussed more fully in Chapter 5. Here we wish to highlight just one challenge that we see as especially significant and problematic.

Our evidence suggests that one of the major challenges associated with external mentoring – and with the professional development of teachers more generally – relates to teachers' ability to recognize and their willingness to acknowledge or 'admit to' their support needs. While we have shown that some (or many) teachers appear to be more ready to acknowledge their perceived limitations to an EM than to a HoD, line manager or other colleague in their school, there are nonetheless limits on the extent to which teachers feel able to open up to EMs. One SPN mentee who we quoted in Chapters 2 and 3 stated, for example, that:

I felt more comfortable opening up to [TLC] *about gaps in my knowledge than I thought I would...* [but] *I'm always very aware that my physics knowledge isn't perhaps as good as it could be...* [and] *you don't want to leave yourself open do you? Never leave yourself open to* [someone] *thinking I'm stupid.*

Similarly, we have quoted a TLC (not the one referred to above) who said that '*sometimes when I offer support there's a certain amount of defensiveness*', and a survey respondent who indicated that their willingness to seek the support of an EM would be hampered by their '*pride*'.

Teachers 'defensiveness', or actual or potential reluctance to seek EM support, can to some extent be explained in terms of the '*element of mistrust*' with which they tend to view '*an external person*', at least initially, before '*you get to know the person one to one*' (TLC). In turn, teachers' 'mistrust' or suspicion of internal or external colleagues who can potentially aid their professional development may in some cases have been fuelled or exacerbated by a number of factors, including:

- prior and/or current experience of judgemental mentors;
- what seems to be a general perception that mentoring is a form of 'remedial' support for teachers who need help or are not sufficiently experienced or expert – a perception that is perhaps understandable in a context where formal mentoring is mostly employed as a means of assisting trainee and newly qualified teachers to reach a (minimum) standard of expertise, and coaching is often deployed as a means of assisting teachers who are 'struggling';

- the absence, in some schools, of a collegial learning culture (Hargreaves & Dawe, 1990; De Lima, 2003); and
- the broader 'performativity' agenda with its emphasis on the assessment and inspection of teachers' and schools' 'performance' (Ball, 2003).

In such a context, it is hardly surprising that some survey respondents in the present study indicated that they would not seek the support of an external mentor, if it were to become available, because '*It wouldn't look good to ask for help*' or because '*In the current climate, the wrong sort of head might use this as evidence that I wasn't performing adequately*.'

One of the challenges, then, is to confront the prevailing 'deficit model' of mentoring and to encourage the development of an alternative perception in which teachers who seek or are willing to accept mentoring support are viewed as committed, engaged and learning professionals who understand the life-long learning nature of the profession and are an asset to their organization. Another challenge is to confront the perception, where it exists, that being an enthusiastic, committed 'good' teacher is a sufficient condition for becoming an effective mentor. Amongst other things, mentors also need to have access to the additional knowledge and skills required to support and scaffold *teacher* learning, so effective initial mentor preparation is crucially important.

8.3 EVIDENCE FROM RELATED RESEARCH

While we have come across little research evidence relating to the work of PEP mentors, who, for example, received relatively little attention in the evaluation of the PEP pilot (Scott & Ryder, 2007), the evaluations of *SASP mentoring* (Holland *et al*., 2010) and the *SPN* (Jenkinson *et al*., 2011) provide some valuable points of comparison with the MoMaC research findings. So too does the evaluation of the '*Starting Out*' mentoring and support programme for early career teachers of science and mathematics (MacLeod *et al*., 2012), which we outlined in Chapter 1 (Section 1.2), and a study of the work of *National Strategy Consultants*, who were employed by Local Authorities (LAs) in England to support secondary teachers in implementing the curriculum and pedagogies associated with the (2001-2009) National Strategy school improvement programme (Cameron, 2010). Despite their differences, the common feature of each of these initiatives is that they provided teachers with the opportunity to access the support of a colleague employed outside of the immediate context of their school or institution.

With regard to the ***impact of external mentoring***, there are commonalities between the MoMaC findings and those of studies relating to the other programmes referred to above. Firstly, Holland *et al*. (2010) report a range of benefits derived by teachers who were supported by SASP mentors, including:

- improved knowledge and understanding of the subject (physics or chemistry);
- enhanced subject pedagogical knowledge, including improved ability to differentiate learning;
- more varied lessons;
- increased enthusiasm for and enjoyment of teaching their additional subject;
- increased confidence in their subject knowledge and teaching; and
- more engaged pupils.

Secondly, also in line with the present study, Jenkinson *et al*. (2011) provide evidence that some teachers were '*inspired*' by and developed an '*increased confidence*' for teaching physics through the support of TLCs. Teachers also reported that they appreciated the opportunity to talk about physics, which they '*don't often have time for*', and that they now employed a greater variety of '*teaching methods and new ways to convey key concepts to pupils*' (p.41).

Thirdly, Starting Out mentors were also reported to have contributed to the realization of a number of (similar) positive impacts on beginner teachers, including:

- helping them to make progress towards being a better teacher;
- improved subject knowledge;
- increased awareness of how to access teaching resources;
- expanding their repertoire of ideas, activities and approaches for teaching science/mathematics;
- improved classroom/behaviour management skills, and ability to differentiate learning;
- increasing ability to reflect on teaching; and
- increased confidence and morale.

In accordance with our own findings relating to PEP mentoring, there was also some evidence to suggest that the Starting Out programme '*has been successful in increasing... the number of science and mathematics teachers retained in the profession*' (MacLeod *et al*., 2012, p.27).

Fourthly, Cameron (2010) suggested that despite some serious tensions relating to their role (to which we refer below), SNS consultants could also be regarded as '*a catalyst for deep learning experiences that were drawn from the relevance of the teachers' experiences within secondary schools*' (pp.621-622).

There were also commonalities between the findings of some of these studies and our own in relation to the factors which were said to be influential in ***maximizing the impact of external support*** for teachers. For example:

- both Holland *et al*. (2010) and MacLeod *et al*. (2012) stress the importance in this regard of ensuring that mentoring support is *tailored* to the needs of the participants, and of *mentor training* and *peer support* amongst mentors;
- Holland *et al*. report constraints relating to mentees sometimes struggling to find *time to engage with mentors*, and bemoan the fact that pressures placed on mentees by some schools inhibited their capacity to take full advantage of the support offered;
- MacLeod *et al*. report that fostering a *positive mentoring relationship based on trust* is critical to the prospects of success, and recognize the value of facilitating and enhancing *mentees' access to a peer support network*.

In addition, there is evidence to suggest that Starting Out would have been more effective had the programme provided mentees with more opportunities for *direct, face-to-face contact* with mentors, and had there been fewer problems with the online platform used for 'e-mentoring'. This is illustrated by the following excerpt from the interview transcript of an external mentor interviewed for the present

study, who was also employed as a part-time Starting Out mentor:

I was an e-mentor to a small group of NQTs who had just left their PGCE... I mailed them all regularly, about once a month, but only ever got 2 or 3 responses altogether... In my view the e-tutoring aspect isn't really what NQTs want. They would prefer to talk to somebody face to face... And the concept that as a tutor you'd be able to have an e-group discussion was not feasible. The online platform was too clunky and 15 people couldn't meaningfully have a discussion online. I mean it's hard enough having a 2 way Skype discussion without people talking or 'chatting' at the same time... Very few mentees actually used the online discussion forum because it didn't work very well, and because of the inevitable difficulty of getting a large group of people together at one time and to deal with a topic everyone was interested in. Most conversation that actually took place was about the fact that the mechanism didn't work very well. In the end mentors and mentees resorted to different kinds of contact, normally individual email... (Starting Out mentor)

The evaluators of Starting Out also found that the mentoring relationship was most effective when the subject specialism of the mentor was the same as that for which the mentee was in need of support, since this enabled the mentor to provide in-depth support for subject knowledge and subject pedagogy, as and where appropriate.[36] We noted in Chapter 3 that one of the limitations of school-based mentoring, and of support for professional development more generally, was that some schools were not able to provide specific support for teachers' subject content knowledge or subject pedagogy due to a lack of a subject (in that case, physics) specialist within the school. A similar problem has been reported as inhibiting the professional development of newly qualified science teachers in the United States (Luft, 2009), leading to calls to '*bring* [subject] *content into induction programs*' (Luft *et al.,* 2010).

In common with one of the key findings of our own study, the evaluators of both the SPN and Starting Out programmes provide evidence that some (perhaps most) teachers appeared more willing to acknowledge their support needs to an independent external mentor than to a school-based line manager. In relation to the work of SPN TLCs, it was said that:

Teachers were ... more likely to be open about their insecurities about teaching physics with an outside consultant than their Head of Science. (Jenkinson *et al*., 2011, p.41)

MacLeod *et al.* (2012) also state that the provision of independent and impartial support from someone (a Starting Out mentor) who is not connected to any assessment of their teaching ability is key to positive mentoring relationships, notably because it enables mentees to raise queries or issues which they often feel unable or reluctant to discuss with their line manager or colleagues. The same point was made in a brief report of some of the LSN's internal evaluation work on Starting Out, which also supports some of the contrasts made in the present study between beginner teachers' experiences of school-based and external mentoring:

[36] As is suggested here, with the Starting Out programme it was not always possible to allocate a mentor with a specialism in the subject that mentees were seeking help with.

NQTs... reported that school mentors had lots of other responsibilities and so were less accessible [than Starting Out mentors]. *Several felt they were being a nuisance, or are anxious about asking too many questions of school colleagues/mentors who may be involved in performance assessment. Some had received conflicting advice, or sometimes found very traditional and bureaucratic approaches to teaching and valued the objectivity and expertise of mentors.* (Thorpe, 2010, p.2.)

There is also evidence to suggest that the impact of National Strategy Consultants (NSCs) was limited, in part, because they were not seen by teachers to be independent and were viewed with suspicion and an 'element of mistrust' because they were employed by LAs, whose previous role had been to inspect and quality assure teachers' work. As one of the stakeholders interviewed for the present study explained:

NSC was a support role, there was no assessment or evaluation, but there was suspicion from teachers because they were associated with the local authority… The Local Authority connection is the main difference between that role and that of the TLCs. (Stakeholder)

Moreover, the role of NSCs became compromised, and teachers' suspicion and lack of trust of NSCs were heightened, where teachers perceived or became aware that some LAs and senior members of schools in their regions used NSCs' work as a 'tool for organizational control' (Cameron 2010: 617).

The general point made here is further supported by the comments of one of the TLCs interviewed for the present study, who contrasted his work as a TLC with his work as a LA advisor and stated that teachers:

are not so open and honest in large groups, but they are in the subsequent one-to-one meetings once they realise I am not there to judge them. For example, a head of department in a secondary school said they didn't understand the teaching of electronics: 'I've got no idea and I'm completely reliant on the textbook'. They wouldn't have said this to me in my advisor role as they think I'm there to make a judgement. (TLC)

8.4 RECOMMENDATIONS

In this section we set out a number of recommendations, based on the findings of the present study and our review of related research. We begin by discussing external mentoring support for secondary teachers of physics, the main focus of the MoMaC research, before making the case for external mentoring support for teachers more generally and highlighting a number of priority groups where EM support might be most needed and have most impact. Finally, we set out a number of more specific recommendations for policy-makers, possible providers of external mentoring, and school leaders, and suggest some potentially fruitful areas for further research.

Teachers of secondary physics

The present study has shown that external mentoring support for non-specialist teachers of physics in secondary schools 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: improved physics teaching and more engaged pupils today can lead to more able physicists and teachers of physics in the future.

All of this provides a strong case for funding programmes of external mentoring not merely for teachers following subject enhancement programmes such as PEP and SASP, but for non-specialist secondary teachers of physics (including trainee teachers) more generally. This argument is strengthened in relation to non-specialist teachers of physics who do not have access to the support of a subject specialist within their schools, though we have shown that teachers who do have such access can nevertheless also reap significant rewards from the opportunity to access specialist external support.

Other teachers and priority areas

While most evidence from the present study relates to non-specialist secondary teachers of physics, our analyses of data relating to a relatively small sample of chemistry SASP participants and a relatively large survey sample of primary and secondary teachers of a range of subjects, suggest that the potential demand for and benefits of external mentoring apply to a much wider audience. However, although the introduction of external mentoring for all teachers might well prove a profitable investment in teacher professional development, its widespread adoption does not seem feasible at the present time, given financial constraints. In these circumstances, we recommend that the following groups of teachers are regarded as priority cases:

(1) secondary teachers of physics and other *shortage subjects*;
(2) *non-specialist secondary teachers of all subjects* – notably, those teaching subjects that they have not studied as major components of undergraduate or postgraduate degree courses;
(3) *beginning (trainee, newly and recently qualified) teachers* in both primary and secondary schools;
(4) '*single person departments*' – i.e. teachers who are the only ones in their schools teaching a particular subject;
(5) teachers employed in *challenging secondary schools with a high staff turnover.*[37]

While external mentor support could potentially help teachers in each of these categories to experience a wide range of benefits (see Section 8.2.4 above and the more detailed account provided in Chapter 4), particular kinds of EM support and impact would be particularly apposite for particular groups. For example,

[37] Under the current policy regime within the UK, schools especially those in 'challenging circumstances' are under intense pressure to meet externally imposed targets in terms of GCSE results. This has led to an intensification of training for staff which is about interventions and 'tactics' focused on 'delivery' and 'performance' (Ball *et al.*, 2011), rather than support which is likely to enhance teachers' professional development in a more meaningful way, such as that which enhances their ability to learn from their own and others' experiences.

EM support:

- would help secondary schools in general to retain teachers of shortage subjects;
- would help secondary schools facing challenging circumstances to retain more teachers of any subject;
- would help non-specialist teachers of any subject improve their subject content knowledge and subject pedagogy;
- would help many beginner teachers and teachers working in single person departments to overcome professional isolation;
- would help beginning teachers to improve their general pedagogy, such as classroom and behaviour management, and support them in negotiating the demanding but important early career transitions from trainee to NQT and NQT to RQT.

In relation to teachers who are not teaching their specialist subject, the following excerpt from the interview transcript of a SASP participant in the present study is of particular interest:

I think that [external mentoring] *is extremely important to new Physicists, just because when you finish SASP you're like an NQT because you're teaching a new subject and it's* [a matter of] *finding your feet and getting ideas. So you don't need as much support as an NQT but you do need subject-specific support.* (SASP mentee)

It follows that if an individual teaching a new subject after the completion of a SASP course can feel this way, the case for external mentor support may be stronger still for some of those teachers who are asked to take on the teaching of a new subject without first following a subject enhancement course, as is often the case in a number of subject areas.

With regard to NQTs themselves, and beginner teachers more generally, we have seen that survey participants in their first five years in teaching were more likely than their more experienced colleagues to state that they might benefit from EM support, which is consistent with other research findings on beginning teachers' support needs and the 'hit or miss' nature of existing support provision (Hobson, 2009). We have also noted that while many PEP participants derived a number of benefits from the opportunity to access external mentoring support, some did not feel able to engage with more subject-specific elements until they had completed (and overcome various stresses associated with) their first year in post, or their NQT induction. This, together with strong evidence from the 'Becoming a Teacher' and other research, which shows that some teachers have significant support needs following completion of their induction, suggests that external mentoring support should extend into teachers' second year of teaching (Hobson & Ashby, 2012).

In Table 8.1 below we now make a number of more specific recommendations for policy-makers, potential providers of external mentoring, and school leaders, relating to the introduction of external mentoring support for teachers. (Ticks in the columns indicate those groups to which each recommendation applies.)

Table 8.1 Specific recommendations

	Implications for:		
	Education policy makers	Providers of external mentoring	School leaders
1. Ensure as far as possible that the various conditions for maximizing the impact of external mentoring are met, including:			
1.1 External mentors must be subject specialists in the subjects their mentees teach	✓	✓	
1.2 Mentors must have expert content and pedagogical knowledge of their subject, relatively recent experience of teaching the subject, and appropriate personal qualities (e.g. they should be empathetic, positive, encouraging)	✓	✓	
1.3 EMs must have no involvement in the assessment, appraisal or inspection of teachers in mentees' schools	✓	✓	✓
1.4 Mentees must have sufficient time to engage with mentors (resources should be available to enable this)	✓		✓
1.5 There must be sufficient resources for mentor training and development, including networking and collaboration opportunities amongst mentors	✓	✓	
1.6 Mentor and mentee must have opportunities for face-to-face contact	✓	✓	✓
1.7 Mentor and mentee should be based in reasonably close geographical proximity to each other	✓	✓	
1.8 Mentors should be proactive in contacting any potential beneficiaries of their support		✓	
1.9 Mentors must be willing and able to tailor support to individual teachers' needs	✓	✓	
2. The selection and preparation of mentors, and their on-going development opportunities, should be informed by an emphasis on the features of effective mentors as identified above		✓	
3. EM programmes should be well publicised and measures taken to attract support at school SLT level as well as within departments/faculties (e.g. by publicising evidence of positive impact)	✓	✓	
4. Information and training should be provided for both potential mentees and school stakeholders on how to get the most out of the support available	✓	✓	
5. Attempts should be made to foster a perception of mentoring and coaching not as a 'remedial' strategy but a positive means of supporting all teachers, and teachers who seek mentoring support should be portrayed in a positive light as professionals who are committed to education and their own professional development and lifelong learning	✓	✓	✓
6. No stigma should be attached to any teachers who choose not to accept the offer of external mentoring support, and the door should remain open for them to do so at a later date		✓	✓
7. The assessment role should be divorced from the work of all (external and school-based) mentors, so that mentoring becomes (and is seen to be) purely a support role and teachers are less concerned about potential repercussions of acknowledging their professional development needs.	✓	✓	✓

While these various recommendations are provided with a view to maximizing the potential impact of external mentoring and thus enhancing teachers' professional development and bringing about the various kinds of impact highlighted earlier, many of them would also serve to increase the impact of school-based mentoring and other forms of support for teachers' professional development. In addition, a reduction in the current degree of emphasis on the assessment of teachers, and/or measures aimed at promoting in schools a more collegial learning culture, would help to safeguard the success of future mentoring initiatives, or even magnify their impact.

8.5 SUGGESTIONS FOR FURTHER RESEARCH

We conclude by highlighting the need for further research in two areas, relating to external mentoring and teacher professional development more widely. First, we suggest that it would be valuable to seek confirmation of, and investigate further, the findings (reported in Chapter 3 – Section 3.2.3, and Chapter 7 – Section 7.3.1) that: (1) secondary teachers of physics and other sciences were *less likely* than those of most other subjects to indicate that they might benefit from EM support; and (2) teachers of physics and some other subjects who *had not* studied those subjects as a major part of a first or post-graduate degree were *less likely* to indicate that they might benefit from EM support than those who had done so. A possible suggestion that has been offered for the first finding is that secondary teachers of physics and the other subjects in question may already possess greater access than those of other subjects to external support and teaching resources. Although it cannot explain the variation across subject areas, a possible partial explanation for the second finding is that early career teachers in particular may feel a stronger commitment to their 'own' subject (that which they studied to the highest level and/or in which they were first trained) and be reluctant to devote their limited time resources to another. In addition, this finding may be understandable to the extent that teachers tend to regard mentoring as judgemental, since they are more likely to feel insecure about their subject knowledge for non-specialist or 'additional' subjects. However, research evidence to support any of these hypotheses, or others, is at present inconclusive.

Secondly, the evidence of this and other studies appears to be inconclusive on a fundamental question relating to the recruitment of teachers to programmes of external mentoring. That is, it is not clear whether the categories of teachers for whom external mentoring might be provided should simply be allocated external mentors and encouraged to work with them, or else required to 'opt in' to mentoring support. The problem with the latter approach is that, for various reasons discussed in this report – including the limited amount of time available to teachers, and some teachers' concerns that it might not look good to ask for help – the take-up of EM support might be limited and some of those who are most in need of EM support may not put themselves forward. On the other hand, external mentoring may have more impact where teachers make a deliberate, informed decision to seek the support of a mentor.

POSTSCRIPT: STIMULATING PHYSICS SUPPORT

Following the production of a full draft of this final report of the MoMaC research, the research team was delighted to hear that the Department for Education had agreed to fund an IOP proposal for an external mentoring programme for early career teachers of physics, called Stimulating Physics Support (SPS). The overarching aim of the scheme is to improve the professional development and retention of participants, through a light-touch and flexible programme of subject-focused support initiated at the beginning of ITP, and continuing through Induction and into the second year of teaching. See : http://stimulatingphysicssupport.iop.org/

In presenting the case for the new programme, the IOP had drawn on emergent outcomes of the MoMaC research, as reported in Hobson *et al*. (2010) and Hobson and McIntyre (2011). We would now recommend that policy-makers give serious consideration to piloting a similar programme to some at least of the other categories of teacher identified by us in Section 8.4 above as especially likely to benefit from external mentoring support.

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APPENDIX 1: SURVEY QUESTIONS

Q1a. How many full years of teaching experience do you have since completing (and not including) your initial teacher training?

Please select one box

a. 0 (I am presently undertaking my NQT Induction / have not yet completed my first year of teaching)
b. 1 (I am presently undertaking my second year in teaching)
c. 2-5
d. 6-10
e. 11-15
f. 16-20
g. 21+

Questions 1b, 2a and 2b filtered to secondary respondents only
Q1b. Please identify all the subjects that you currently teach.

Please select up to three boxes	
Art and design	
Biology	
Chemistry	
Citizenship	
Design and technology	
English	
Geography	
History	
Information and communication technology	
Mathematics	
Modern foreign languages	
Music	
Personal, social, health and economic education	
Physical education	
Physics	
Religious education	
Other 1 (please specify)	
Other 2 (please specify)	
Other 3 (please specify)	

EXTERNAL MENTORS

In some regions and subject areas, teachers are able to access the support of an external mentor, namely an experienced subject specialist teacher, not connected with their school, who works in a purely supportive capacity and is able to provide face to face or online support for their subject knowledge, subject pedagogy or other teaching-related issues.

In the online survey the first column of the following grids for questions 2a and 2b will pre-populate with the subjects selected by respondents in Q1b

Q2a. For each of the subjects you currently teach, please indicate whether you feel you might benefit from the opportunity to call upon the support of an external mentor, if the support were available?

Please select one box in each row	Yes	No	Already have an external mentor	Not sure
Subject 1				
Subject 2				
Subject 3				

Q2b. For each of the subjects you currently teach, please indicate whether or not the subject was a major part of your first degree and/or a postgraduate degree?

(Please do not count postgraduate teacher training qualifications as a postgraduate degree)

Please select one box in each row	Yes	No
Subject 1		
Subject 2		
Subject 3		

EXTERNAL MENTORS

In some regions and subject areas, teachers are able to access the support of an external mentor, namely an experienced subject specialist teacher, not connected with their school, who works in a purely supportive capacity and is able to provide face to face or online support for their subject knowledge, subject pedagogy or other teaching-related issues.

Q2c. For each of the following subjects, please indicate whether you feel you might benefit from the opportunity to call upon the support of an external mentor, if the support were available?

Please select one box in each row	Yes	No	Already have an external mentor	Not sure
English				
Mathematics				
Science				

Question 3 filtered to anyone who gave one or more 'yes' responses or one or more 'Already have an external mentor responses' to Q2a or Q2c

Q3. For one or more of the subjects you teach, you have indicated that you feel you might benefit from the support of an external mentor (or that you already have an external mentor). If a mentor was (or is) available to you for this subject/these subjects, which of the following factors might (or actually do) prompt you to seek their support?

Please select any/all that apply

(a) Lack of a subject specialist in school
(b) Issues with a school mentor or line manager
(c) General lack of support in school
(d) Lack of collaborative ethos in school
(e) Pressure to conform to the school's teaching & learning models
(f) Performance management and/or other issues can make it hard to talk about any difficulties within the school
(g) I would (or do) welcome additional support to develop my subject content knowledge
(h) I would (or do) welcome additional support to develop my subject pedagogy how to teach my subject(s)
(i) I would (or do) welcome additional support to develop general pedagogical techniques
(teaching methodologies)
(j) I would (or do) welcome additional support to facilitate access to or help with teaching
resources or equipment
(k) I would (or do) welcome additional support for my emotional wellbeing
(l) I would (or do) welcome additional advice or guidance regarding career progression
(m) I would (or do) welcome an independent perspective on some issues
(n) Other (Please specify) _____

Question 4 filtered to anyone who gave one or more 'no' responses or one or more 'Already have an external mentor' to Q2a or 2c

Q4. For one or more of the subjects you teach, you have indicated that you feel you might not benefit from the support of an external mentor (or that you already have an external mentor). Which of the following factors might (or actually do) discourage you from seeking the support of an external mentor?

Please select any/all that apply

(a) I am sufficiently confident about my teaching and subject knowledge
(b) I am able to access any support that I need within my school and/or from other sources
(c) I do not feel I would (or do) have sufficient time to engage with an external mentor given my existing work and non-work based commitments
(d) It wouldn't (or doesn't) look good to have to ask for help
(e) Other (Please specify) _____

APPENDIX II: THE SURVEY SAMPLE AND WEIGHTING OF DATA[36]

How was the survey conducted?

The NFER Teacher Voice Omnibus November 2011 survey was completed by a panel of 1558 practising teachers from 1210 schools in the maintained sector in England. The survey was conducted online and teachers were asked to complete the questionnaire between the 4th and 16th November 2011.

What was the composition of the panel?

The panel included teachers from the full range of roles in primary and secondary schools, from head teachers to newly qualified class teachers. Fifty four per cent (849) of the respondents were teaching in primary schools and 46 per cent (709) were teaching in secondary schools.

How representative of schools nationally were the schools corresponding to the teachers panel?

There was an under-representation of schools in the highest quintile in terms of eligibility for free school meals in the sample of primary schools and under-representation in the highest and second highest quintiles in the sample of secondary schools. Both primary and secondary school samples had an over-representation of schools with low eligibility for free school meals. To address this, weights were calculated using free school meals factors to create a more balanced sample. Due to the differences between the populations of primary schools and secondary schools, different weights were created for primary schools, secondary schools and then for the whole sample overall. The weightings have been applied to all of the analyses referred to in this commentary.[37]

Tables A.1, A.2 and A.3 show the representation of the weighted achieved sample against the population. Table A.4 shows the representation of the weighted teacher sample by role in school.

[36] This information is an abridged version of a report produced Bernadetta Brzyska of NFER.

[37] The sample was not weighted for missing free school meal data.

Table A.1 Representation of (weighted) primary schools compared to primary schools nationally

		National Population	NFER Sample
		%	%
Achievement Band (Overall performance by KS2 2010 data)	Lowest band	13	13
	2nd lowest band	13	14
	Middle band	14	15
	2nd highest band	16	17
	Highest band	20	21
	Schools boycotting 2010 tests	23	21
	Missing	1	0
% eligible FSM (5 pt scale)	Lowest 20%	20	20
	2nd lowest 20%	20	20
	Middle 20%	20	20
	2nd highest 20%	20	20
	Highest 20%	20	20
	Missing	<1	<1
Primary school type	Infants	9	8
	First School	5	4
	Infant & Junior (Primary)	77	73
	First & Middle	0	
	Junior	7	13
	Middle deemed Primary	0	1
	Academy	2	1
Region	North	31	23
	Midlands	32	30
	South	37	47
Local Authority type	London Borough	11	14
	Metropolitan Authorities	21	21
	English Unitary Authorities	18	19
	Counties	51	46
Number of schools		**16,855**	**757**

Due to rounding, percentages may not sum to 100
Some information is not available for all schools and some schools included more than one respondent

Table A.2 Representation of (weighted) secondary schools compared to secondary schools nationally

		National Population	NFER Sample
		%	%
Achievement Band (Overall performance by GCSE 2010 data)	Lowest band	15	14
	2nd lowest band	18	17
	Middle band	17	22
	2nd highest band	17	20
	Highest band	19	20
	Missing	14	6
% eligible FSM (5 pt scale)	Lowest 20%	20	20
	2nd lowest 20%	19	20
	Middle 20%	20	20
	2nd highest 20%	20	20
	Highest 20%	20	20
	Missing	2	<1
Secondary school type	Middle	5	2
	Secondary Modern	3	2
	Comprehensive to 16	26	22
	Comprehensive to 18	32	42
	Grammar	2	1
	Other secondary school	0	0
	Academies	32	31
Region	North	29	27
	Midlands	33	31
	South	38	43
Local Authority type	London Borough	13	12
	Metropolitan Authorities	21	23
	English Unitary Authorities	19	19
	Counties	47	46
Number of schools		**3,273**	**453**

Table A.2 Representation of (weighted) secondary schools compared to secondary schools nationally

Due to rounding, percentages may not sum to 100.

Some information is not available for all schools and some schools included more than one respondent.

Table A.3 Representation of all schools (weighted) compared to all schools nationally

		National Population	NFER Sample
		%	%
Achievement Band (By KS2 2010 and GCSE 2010 data)	Lowest band	13	14
	2nd lowest band	14	15
	Middle band	15	17
	2nd highest band	16	18
	Highest band	20	20
	Schools boycotting 2010 tests	19	14
	Missing	2	1
% eligible FSM (5 pt scale)	Lowest 20%	20	20
	2nd lowest 20%	20	20
	Middle 20%	20	20
	2nd highest 20%	20	20
	Highest 20%	20	20
	Missing	1	0
Region	North	30	24
	Midlands	32	30
	South	37	45
Local Authority type	London Borough	11	13
	Metropolitan Authoritie	21	22
	English Unitary Authorities	18	19
	Counties	50	46
Number of schools		**20,082**	**1,210**

Due to rounding, percentages may not sum to 100
Some information is not available for all schools and some schools included more than one respondent

Table A.4 Comparison of the achieved (weighted) sample with the national population by grade of teacher

Role	Primary schools				Secondary schools			
	Population*		Weighted sample		Population		Weighted sample	
	N†	%	N	%	N*	%	N	%
Head teachers	16.8*	10	77	9	3.2*	2	7	1
Deputy Headteachers	11.7*	7	89	10	5.3*	3	26	4
Assistant Head teachers	6.5*	4	49	6	11.4*	6	69	10
Class teachers and others	131.8*	79	637	75	160.0*	89	593	85

* Source: DfE: School Workforce in England (including pupil:teacher ratios and pupil:adult ratios), January 2010 http://www.education.gov.uk/rsgateway/DB/SFR/s000927/index.shtml [30 Nov 2011].

†Population N is expressed in thousands

Due to rounding, percentages may not sum to 100

HOW ACCURATELY DO THE FINDINGS REPRESENT THE NATIONAL POSITION?

Assuming that our data are representative of the population at large (and we have no evidence to suggest otherwise) we can calculate the precision of results from each of our samples based on the number of respondents. The smallest number of respondents is for the secondary school sample where we have 709 respondents. In this case we can calculate that all results based on the full sample will be precise to within at worst plus or minus 5 percentage points. This means that we are 95 per cent sure that if we were to collect results from all secondary schools in the country the results we would get would be within 5 percentage points of the results presented in this report. We have marginally more respondents within the primary school sample and hence can be even more confident about our results. For this reason, within any of our samples, the precision of results based on all respondents will be precise to within at worst plus or minus 5 percentage points.

Certain questions within the survey were filtered and in these cases the number of respondents to questions may be much smaller. In these cases we may need to be more cautious about the precision of the percentages presented within the report. Table A.5 below gives a rough guide to the level of precision that can be attributed to each table based upon the total number of respondents. For example, if a table is based upon just 40 respondents we can only be sure that the percentages within that table are correct to within plus or minus 16 percentage points.

Table A.5 Indication of level of precision according to total number of respondents

Number of respondents	Precision of estimates in percentage point terms
30	18
40	16
50	14
75	12
100	10
150	9
200	7
300	6
400	5
650	4