



University
of Glasgow

The SCRE Centre
Research in Education



2011

SSERC's Support for Science Education in Scotland through CPD

EXTERNAL EVALUATION FINAL REPORT - FEBRUARY 2011

Kevin Lowden and Stuart Hall SCRE Centre with Vic Lally and Rebecca Mancy
Interdisciplinary Centre for Research and Teaching in STEM Education

Contents

	Page
Summary	3
1 Introduction	6
1.1 The SSERC CPD programme for teachers and technicians	6
1.2 Policy priorities for STEM education and associated CPD	7
1.3 Evaluation approach	9
1.4 Scope of the final report	10
2 Phase 2 findings	11
2.1 Introduction	11
2.2 Phase 2 survey	11
2.3 Qualitative evidence gathered	12
2.4 What types of SSERC CPD had respondents taken part in?	13
2.5 Decisions to take part in SSERC sponsored CPD	13
2.6 What did participants think of SSERC CPD?	14
2.7 Impact of SSERC sponsored CPD	15
2.8 Residential courses and the use of SSERC resources	21
2.9 Locally delivered science CPD	22
2.10 Further CPD priorities	22
2.11 Barriers to professional development	26
3 Insights from the research observations of SSERC CPD events	28
4 Conclusion and recommendations	29
4.1 Conclusion	29
4.2 Recommendations	30
5 Appendix 1a - Annotated teacher questionnaire	34
6 Appendix 1b - Teachers' use of SSERC CPD resources	45
7 Appendix 2 - Annotated technician questionnaire	48

Summary

KEY FINDINGS

- The findings of the second and final phase of the evaluation are similar to Phase 1 in that there is an extremely high level of satisfaction with SSERC CPD across teachers in all levels, sectors and subjects. Technicians were equally satisfied with their CPD experiences.
- The CPD is reported by all groups of participants to have impacted on practice. Phase 2 has also provided evidence that SSERC CPD is impacting beyond participants' own practice.
- The relevance of the SSERC CPD to Curriculum for Excellence is acting as a driver in this process. Furthermore, Local Authorities and school management appear to recognise the quality of SSERC CPD and its relevance to the wider curriculum and encourage staff to attend courses and support the dissemination of the CPD among colleagues.
- The CPD has also facilitated access to valuable resources that were subsequently used in participants' schools. Almost all teachers reported that they had introduced or tried new materials and resources following the SSERC CPD. As in Phase 1, the Phase 2 survey also reveals that the majority of respondents have tried new methods of teaching as a result of their SSERC CPD.
- Participants reported the positive impact of CPD on: student learning and performance; teacher-student rapport; staff confidence; enthusiasm and expectations regarding implementation of Curriculum for Excellence (CfE); career prospects.
- SSERC courses are seen as unique in their capacity to provide relevant, high quality CPD that address the need of teachers within the context of CfE and other areas of concern facing schools (e.g. pedagogical and resource issues).
- The quality of presenters and CPD leaders has been consistently acknowledged in their delivery of CPD and provision of on-going support for practitioners. Indeed, the willingness of staff to respond to enquiries from teachers and technicians long after their participation on the courses is a key factor in sustaining the impact of their professional learning and development.
- There is limited availability of science-specific CPD at local level. Where it does exist, most local and indeed much nationally available science is reported to not to be able to match the quality of CPD available from SSERC. Compared to other science CPD, that provided by SSERC was seen as more relevant to teachers' needs, was delivered by experts and provided useful resources.
- Teachers identified a need for on-going CPD that would continue to help them implement CfE (particularly practical approaches) deliver Advanced Higher Science courses and meet the challenge of changes in assessment for some courses.
- Technicians identified a wide range of CPD requirements, including subject-specific courses, as well as those which focused on technology, ICT and health and safety. They also sought greater geographical access across Scotland to CPD and suggested a need for CPD that promoted communication between teachers and technicians in order to provide more effective, systematic science education in schools.
- The availability of funding at school and Local Authority level is becoming a barrier to accessing CPD for teachers and technicians.
- The consistently high levels of reported impact of the programme on practitioners' work across schools reveals that what started as an innovative national CPD programme for teachers and technicians has now become integral to the CPD 'landscape' of STEM education in Scotland. The high level of demand from practitioners reflects this and highlights the reputation of the programme, the quality of the SSERC staff, and the organisation's other activities.

KEY RECOMMENDATIONS

The evaluation has identified a number of recommendations and issues for consideration concerning the future development of SSERC's CPD for teachers and technicians. These relate to curriculum development and developing policies for teacher education and professional learning and development.

Investing in quality CPD for science teachers and technicians

- Faced with a wealth of evidence indicating the value of SSERC CPD, its ability to meet the needs of those teaching and supporting science education in Scotland and the evidence suggesting a sustained impact on classroom practice, we would strongly recommend continued investment in similar SSERC CPD programmes.
- An expansion of SSERC would be a cost-effective way to support this drive. This should include continued and increased funding for SSERC to expand appropriate staffing and resources to work with partners to plan and implement three or five year programmes of national CPD.

Creatively addressing the demand for SSERC CPD

- However, the above comments have to be set in the context of the continued financial austerity faced by Local Authorities. The research has also shown that there is a great demand for SSERC CPD and support and that teachers see the content and quality of other local and national sources of CPD as less able to meet their needs. The funding provided for the SSERC CPD programme has built up teachers' and technicians' expectations. A key question is how to continue this?
- Given the current capacity of SSERC, it is difficult to see how it can meet the demand for science education CPD. It is important, therefore, that SSERC, its partner agencies, Local Authorities, other associated bodies and government explore ways to enhance these partnerships and develop their provision and services to address the demand in a way that allows the quality and impact of the work to be maintained.
- Participant and key stakeholders' comments suggested that SSERC takes on a national co-ordination and leadership role, working in partnership with universities, FE colleges, Local Authorities, professional bodies and industry to design and quality assure CPD that is delivered across Scotland by SSERC trained/approved providers.
- While providers such as universities and colleges might provide outreach CPD to local schools, stakeholders stress that there are issues of ensuring relevance of content to address schools' needs, co-ordination across departments/-

faculties within universities to develop and deliver quality CPD and sustain periodic delivery.

- Some stakeholders suggested focusing CPD developments on school clusters with SSERC-trained local teachers and technicians acting as CPD 'champions' to help co-ordinate and promote CPD. A number of Local Authority Training Partnerships have already been established for technician training. Working within school clusters with principal teachers in science and involving technicians, SSERC could build capacity at learning community level. SSERC could also provide quality assurance and moderation and encourage cross-sector working. The emerging teacher learning communities could act as a scaffold for such developments. This will also develop leadership and ownership and empower teachers to take forward their CPD with support from SSERC.
- There is also recognition that support from Local Authority and school managers to facilitate access to science CPD is crucial to any developments seeking to promote CPD for teachers and technicians.

CPD approaches and formats needed to meet science teachers and technicians' needs

The evaluation has suggested that face-to-face experiential CPD, particularly the residential two-day and two-part approaches can impact strongly on teacher and technicians' practice. Looking to the future, these and other formats appear necessary to meet the needs of practitioners. Again, SSERC and partner organisations need to maintain their on-going development of programmes and explore what mix of CPD approaches are required and, importantly, are feasible. This could involve a repertoire of CPD models and content including:

- A continuation of:
 - The very successful experiential, face-to-face, two-part residential courses that include an action learning component. This allows participants to try new ideas and reflect with peers and CPD leaders. This type of CPD is often regarded as relatively expensive but its cost needs to be set against its potential for improving the science education experiences of pupils in Scottish schools.
 - School-based CPD delivery by SSERC personnel to whole departments and cross-curriculum groups has shown distinct benefits for staff

and offers another potential approach in SSERC's repertoire.

- Non-residential half or whole day focused events that enable staff to address key topics and skills require only limited teacher cover and represent a reduced cost approach for schools.
- Development of on-line and electronic CPD provision to supplement, but not replace face-to-face CPD, supported by SSERC staff via phone and email. SSERC is already piloting an initiative along these lines.

The focus and content of science education CPD to address the needs of teachers and technicians

Teachers and technicians highlighted a particular need for CPD content that focuses on particular topics in order to meet the challenges of providing effective science education within the context of Curriculum for Excellence.

- Teachers' responses to the survey highlighted the need for on-going CPD that would continue to help them implement CfE (particularly practical approaches), the new national qualifications including delivering Advanced Higher Science courses and to meet the challenge of changes in assessment for some courses.
- There is a need for further development of CPD courses that promote leadership across all levels of staff and not just promoted staff. The SSERC leadership courses were highly valued by participants who reported a sustained impact on their ability to manage and lead. Given that the Donaldson Report highlights the need to build leadership capacity across the teacher population, many of the successful elements of the SSERC leadership courses could be tailored to benefit a wider teacher audience.
- There is a need to support science teachers in general science courses who have to teach a science discipline that they are not trained to teach.
- Technicians have identified a wide range of CPD requirements, including subject-specific courses, as well as those which focused on technology, ICT and health and safety.
- Technicians also want more access across Scotland to CPD as well as CPD that promotes

communication between teachers and technicians in order to provide more effective, systematic science education in schools.

- Primary school teachers have particular CPD needs particularly that focus on building confidence to cover 'an enormous science curriculum' and understand the science concepts behind the experiences and outcomes.
- PGDE students most commonly highlighted the need for periodic support to implement CfE, to build their confidence to do this, and to provide guidance on relevant resources. PGDE students identified specific themes for CPD as: delivering Higher and Advanced Higher courses, effective teaching methods and practical approaches that engaged with pupils.

Providing accreditation for science CPD

- SSERC should continue to explore ways to increase the range of accredited CPD it offers from its suite of courses. This is particularly relevant to those courses that include an action learning and action research component. These courses, including those with a focus on leadership, have shown that participants reflecting on their practice, with input from peers, improve their classroom practice and are also likely to have an impact across their schools.

Such accreditation would help practitioners to evidence their professional learning and development over the course of their career and promote systematic development of their skills. Partnership with other providers such as universities working with learning communities might offer opportunities to enhance the delivery and scope of CPD available.

The need for research on the longer-term impact of science education CPD

- There is clear evidence of the impact of SSERC CPD on teachers' practice, their confidence to deliver science education and provide examples of greater pupil engagement. However, a longitudinal study of the impact of SSERC CPD on pupils could begin to examine the potential for such CPD to, for example, increase the number of pupils taking science at secondary level, improve science attainment and increase the numbers of Scottish students going onto STEM at degree level.

In December 2008, SSERC commissioned the SCRE Centre and the Inter-disciplinary Centre for Research and Teaching in STEM Education at the University of Glasgow to conduct an external evaluation of the Support for Science Education in Scotland through CPD programme organised by SSERC for teachers, technicians and student teachers.

In December 2008, SSERC commissioned the SCRE Centre and the Inter-disciplinary Centre for Research and Teaching in STEM Education at the University of Glasgow to conduct an external evaluation of the Support for Science Education in Scotland through CPD programme organised by SSERC for teachers, technicians and student teachers. The research had two main Phases: Phase 1 focused on these stakeholders' assessments of their CPD for the period 2005 to 2008; Phase 2 focused on participants in the CPD programme from 2008 onwards. This report presents the evaluation findings from Phase 2 of the study which looked in detail at the impact of the programme on practice and whether such impact was evident at a departmental and school level. The final section of the report draws on the overall evaluation findings and presents a conclusion and recommendations.

1.1 THE SSERC CPD PROGRAMME FOR TEACHERS AND TECHNICIANS

SSERC is a shared service between the thirty-two Scottish Local Authorities and supports and encourages the effective and safe use of innovative and practical activities in science education to teachers, student teachers, and technicians, as well as elected members and officers of Local Authorities.

The Support for Science Education in Scotland through CPD programme, covering the period April 2008 - March 2011, has been run by SSERC and is funded by the Scottish Government. The programme is largely designed by SSERC and is run in partnership with a number of organisations which include: the Institute of Physics in Scotland, Royal Society of Chemistry, SAPS Scotland, The University of Edinburgh (the School of Chemistry, SIBE). The Association for Science Education (ASE) and the National Science Learning Centre (NSLC).

The programme uses practically-based, residential and non-residential workshops for teachers of biology, chemistry, physics, integrated science, and primary science. The programme also includes leadership courses for new and aspiring Heads of Faculty and CPD courses and events for technicians. The initiative has also seen the development of teaching and learning resources to support implementation of Curriculum for Excellence.

The programme has a particular emphasis on supporting teachers and technicians to deliver science in the context of Curriculum for Excellence and considers how the associated science can be explored through the curriculum. From April 2008 to date some 5,000 teachers and 760 technicians have participated in CPD through the Support for Science Education in Scotland through CPD and wider SSERC programmes. The demand, however, for SSERC CPD courses far outstrips supply, particularly for residential courses.

The programme's courses adopt an interactive approach with a focus on practical work and active learning. Equipment and resources, the value of which is in excess of the registration fee, are provided to each participant to support implementation in the classroom. Participants in the two-part residentials are expected to undertake a classroom-based project; the so-called 'Gap Task'. This is intended to provide participants with a range of new ideas and methodologies to use in their teaching which are then reflected upon with peers and CPD leaders in the follow-up part of the course. The cost of a two-part residential to a school is £100, but schools receive back equipment to the value of at least £200.

This programme has enabled SSERC and its partners to continue to build upon the existing SSERC CPD in science education provided at a national level, including the organisation and delivery of national

science education events and conferences for teachers and technicians. Over the past two years SSERC has developed its collaboration with The National Science Learning Centre (NSLC) and now acts as the conduit for NSLC course delivery in Scotland. SSERC's other activities and services in support of science education include:

- Health and safety advice to schools and Local Authorities.
- Guidance on experiments and practical work.
- Recommendations on equipment and design of specialist accommodation.
- Consultancy and technical information.
- Apparatus testing for safety, performance & conformance with standards.
- Radiation protection advisory services.
- Regular publications - e.g. SSERC Bulletins (Secondary and Primary).
- Websites - www.sserc.org.uk (including SafetyNet) and www.science3-18.org.
- Project management of Scottish Government grant-aided projects including Science 3-18 website and its compatibility with Glow.

SSERC records reveal that the organisation's Dunfermline office receives over 6000 requests each year for support from Local Authority personnel.

SSERC also works closely with the Local Authorities and the Scottish Technicians Advisory Group to develop a range of specialist accredited courses that will, in time, lead to a SSERC Diploma in School Technical Support. To date, nine training units have been levelled and credit-rated by the Scottish Qualifications Authority within the Scottish Curriculum and Qualifications Framework.

1.2 POLICY PRIORITIES FOR STEM EDUCATION AND ASSOCIATED CPD

In 2008 the Scottish Government science base working group reported their conclusions and recommendations derived from a national consultation on the future development of Science in Scotland. The report stated that 'Excellence in scientific research and teaching are key factors in Scotland's current international and economic position' (Scottish Government 2008). This policy concern is longstanding and is reflected at UK

Government level with five independent expert groups, including the Science and Learning Expert Group[1], publishing action plans based on consultation (DBIS 2010). In Scotland the review process highlighted that science education was seen as a 'key element' in sustaining and enhancing the science base in Scotland and to do this 'Local Authorities, schools and teachers needed to be supported to adopt and deliver Curriculum for Excellence'. Indeed, improving Science, Technology, Engineering and Mathematics (STEM) education is seen as a key priority for Curriculum for Excellence. In the report, Science & Engineering 21 - An Action Plan for Education (Scottish Government 2009), Michael Russell, Cabinet Secretary for Education and Lifelong Learning stressed that

...science and engineering are the cornerstones of a successful, sustainable economy and one of the keys to Scotland's future. It is essential that our children and young people understand the importance of science and engineering, both for the development of the skills for learning, life and work that they will need, and for the contribution science and engineering make to the world we live in. It is important too that this understanding is shared by the wider public.

Ministerial Foreword p1 (Scottish Government 2009)

The Action Plan sets out a programme to develop STEM education for the future which includes five work streams that are particularly salient to the work of SSERC, Initial Teacher Education (ITE) at the eight universities (including the Open University) across Scotland and others seeking to promote the capacity of science educators and those who support them. These are:

- 1) *Building capacity and expertise of teachers.*
- 2) *Practical support for teachers and learners.*
- 3) *Increasing children and young people's engagement with, and understanding of real life science, engineering and technology.*
- 4) *Further learning, training and employment.*
- 5) *Improving the public knowledge, understanding and perception of science.*

The Action Plan focuses on developing appropriate curriculum, qualifications and assessment and careers advice and, in addition to drawing on a range of existing and developing practice and resources, it also aims to build on:

[1] <http://interactive.bis.gov.uk/scienceandsociety/site/learning/files/2010/02/Science-and-Learning-Expert-Group-Report-Annexes-31.pdf>

- *models of effective CPD activities such as those identified in the HMIE report on the role of continuing professional development, collegiality and chartered teachers in implementing Curriculum for Excellence*
- *the training for science teachers, non-specialist teachers of science and technicians delivered by the Scottish Schools Equipment Research Centre (SSERC).*

(p2 Scottish Government 2009)

These particular dimensions of the Action Plan further highlight the importance of STEM CPD in Scotland and specifically highlight the role of SSERC in this process.

Recently, the Donaldson Report; *Teaching Scotland's Future - Report of a review of teacher education in Scotland* [2] (Donaldson 2011), made a number of recommendations concerning the future development of teacher selection, training and development in Scotland. Of particular relevance to the work of SSERC were those recommendations concerning the need for enhanced continuous professional development throughout a teacher's career including the development of leadership capacity. The review stresses that 'Career-long teacher education... is currently too fragmented and often haphazard'. It argues that career-long professional learning and development should be at the heart of the process of developing the quality of teachers and their leadership. The review highlighted the work of SSERC in this area

The Scottish Schools Equipment Research Centre (SSERC) provides targeted CPD to improve subject knowledge of primary and secondary science teachers. Their experimental, practical CPD sessions enable teachers to refresh and deepen their own scientific knowledge and understanding, as well as develop materials, resources, and relevant teaching approaches.

(Donaldson 2011 pp74)

The Royal Society (2010) [3] report, *Science and mathematics education, 5-14 A state of the nation* report also highlights the work of SSERC in addressing the professional learning and development needs of teachers and technical support staff and draws attention to the issues of meeting the demand for from teachers. Indeed, in the Royal Society's (2011) [4] follow-up report, SSERC is highlighted as one of a range of key UK providers of STEM CPD that should continue to receive funding because of their effective contribution to subject-specific STEM CPD.

Science and mathematics teachers should undertake subject-specific continuing professional development (CPD) as part of their overall CPD entitlement. Funding should be maintained for the National Science Learning Centre, the National Centre for Excellence in the Teaching of Mathematics and the Scottish Schools Equipment Research Centre, to allow these bodies to continue to support effective subject-specific CPD for science and mathematics teachers.

The Royal Society (2011 P61)

Insights on effective science education CPD

Recently, the National Science Learning Centre (NSLC) and the University of York Science Education Group expert seminars [5] (UYSEG 2010) provided insights on effective CPD for science teachers. They reported that effective CPD can promote teachers' professional self-image and willingness to experiment in their practice. Moreover, research shows that there is an interaction between CPD and the personal and social development that promotes educational change. The expert seminars identified a number of important principles to inform the development of effective CPD for the science education community. These principles include:

- Collaboration between teachers, professional development leaders and researchers can be highly productive in supporting professional development that impacts on practice. Such

[2] Donaldson, G. (2011) *Teaching Scotland's Future - Report of a review of teacher education in Scotland*. Scottish Government . ISBN 978 0 7559 9733 6

[3] The Royal Society (2010) *Science and mathematics education, 5-14 A 'state of the nation'*. ISBN: 978-0-85403-826-8

[4] The Royal Society (2011) *Preparing for the transfer from school and college science and mathematics education to UK STEM higher education A 'state of the nation' report*. ISBN: 978-0-85403-872-5.

[5] NSLC and UYSEG (2010) *Professional Reflections: International Perspectives on Science Teachers' Continuing Professional Development*. <https://www.sciencelearningcentres.org.uk/research-and-impact/research-seminars/ProfessionalReflectionsSeminarReport.pdf>

collaboration can also include teachers being involved in curriculum development which then promotes their own professional development. The NSLC and the UYSEG state that ‘Sustained professional practice is more likely to be sustained if there exists a collegial approach to professional development’ (NSLC 2010 p3).

- CPD should allow teachers to learn from their own and others’ practice.
- Staff require opportunities to implement CPD ideas in schools and have time to reflect on this process.
- A diverse range of CPD is required that reflects context and needs.
- A number of these inter-related principles stress the importance of developing a culture where CPD is valued and recognised as playing an important role in the development of personnel throughout their career.
- The NSLC and the UYSEG (2010) have stressed that there is a need to embed an expectation that science teachers will engage in CPD. This will be enhanced by a wider culture of reflective professional practice throughout practitioners’ careers.
- There is scope for technology to enhance and support individual and collaborative professional reflection.

The role of professional development leaders such as SSERC is important with organisations such as NSLC Science Education Group, the Donaldson Review and Royal Society stressing the key facilitating role of such bodies. Professional development leaders can help act as a conduit between academic research, established good practice and classroom delivery. These CPD leaders can promote ongoing guidance related to different stages of teachers’ careers and help foster reflective practice among teachers.

Collaboration is also important between teachers and professional development leaders in order to impact on practice. Indeed, SSERC works closely with teachers, technicians, Local Authorities, government and relevant professional associations,

including science specialists, to develop relevant and effective CPD.

Within this context, the SCRE Centre was commissioned by SSERC to provide an external evaluation of their CPD programme for science teachers and technicians.

1.3 EVALUATION APPROACH

The research design of the evaluation placed an emphasis on flexibility in order to provide formative feedback to SSERC and their policy colleagues. In response to issues emerging from Phase 1 of the evaluation, a particular focus of Phase 2 was to elicit information on the impact of SSERC CPD on participants’ practice, wider impact across departments in their schools, impact in other schools in their networks and involvement in Local Authority and national science initiatives. This Phase also explored how other sources of support were being used by staff, their views on its usefulness and what additional CPD and support was required to effectively deliver Curriculum for Excellence. While the survey included additional questions to address these areas the evaluation also gathered a significant amount of qualitative information on stakeholders’ views and experiences of different approaches or ‘modes’ of CPD.

Thomas Guskey offers a process for evaluating professional development programmes taking into account local context. The approach includes “collection and analysis of the five critical levels of information.” (Guskey 2000 [6])

- 1) Participants’ Reactions, often demonstrated through their initial satisfaction with the CPD experience.
- 2) Participants’ Learning. Participant’s learning can be demonstrated in writing, through simulations, “full-scale skill demonstration”.
- 3) Organisation Support and Change. This includes whether the CPD promotes changes that are reflected in school and Local Authority level and whether there is interplay between CPD impact and wider local support and resources.

[6] Guskey, T.R. (2000). Evaluating professional development. Thousand Oaks, CA: Corwin Press.

- 4) Participants' Use of New Knowledge and Skills. This key criterion considers whether or not "new knowledge and skills that participants learned make a difference in their professional practice". Evaluation of this dimension should occur 'after a good amount of time has passed since the professional development session'...
 - 5) Student Learning Outcomes. This dimension is often the most difficult to evidence. Has the CPD had an effect on pupils' learning?
- A case study of a school-based CPD model where SSERC personnel delivered content to a whole department.
 - Interviews with key stakeholders including advisory board members and SSERC partners, ie those in a position to comment on the wider education and CPD landscape and the reported impact of the project.
 - Focus groups with a cross section of teachers attending a range of SSERC CPD events. Observation of SSERC CPD events. (N = groups)
 - Telephone interviews/Email proforma (N = 11) with teachers and technicians who attended SSERC CPD to explore emerging themes.

The SCRE Centre evaluation included a focus on all five levels. However, evidence on 'learning outcomes for students' has been provided via teachers' comments and reports on pupil performance and engagement following the CPD rather than separate testing of impact on pupils. Nevertheless, the level of detail and examples provided by many CPD participants regarding improvements in their pupils' performance has provided useful insights on this dimension.

Emphasis of the SCRE Centre evaluation was on dimension 4 - Participants' Use of New Knowledge and Skills. By following up participants a year or so after their most recent CPD the research was able to assess what difference the CPD had made to teacher and technicians' practice. This gap in data gathering was felt to allow sufficient time for the CPD to have impacted on practice.

In addition to the survey, the evaluation included participant observation of CPD events, and in-depth interviews with strategic stakeholders and a number who participated directly in CPD courses.

The main evidence base for the evaluation is outlined below:

- Survey of SSERC CPD participants:
 - Phase 1 - 2008 - 2010: Teachers 171, Technicians 60, students 29 (response rate of 25%).
 - Phase 2 - 2010: Teachers 125, Technicians 80 (response rate of 25%).

The main findings from Phase 1 were detailed in an interim report (2009) which is available from SSERC's website [7].

1.4 SCOPE OF THE FINAL REPORT

This final report presents the overall findings and issues emerging from the evaluation with a particular focus on those Phase 2 findings which provide insights on the nature of the impact of the CPD.

Section 2 reports the main findings from the Phase 2 survey of teachers and technicians who attended SSERC CPD events between 2008 and 2010. Findings from 'closed' (or 'quantitative') questions are supplemented, where appropriate, with 'qualitative' insights from responses to open-ended questions in the survey and information gathered from interviews and focus groups. Section 3 presents a summary of the researchers' experiences of attendance at CPD events, and Section 4 provides conclusions and recommendations.

[7] http://www.science3-18.org/images/CPD2009/SSERC_Eval_interim_rep_Sept09_v3_merged.pdf

Phase 2 findings

2.1 INTRODUCTION

The main findings reported in this section are from the Phase 2 survey of teachers and technicians. Findings are detailed under the key question areas (see Table 1). Where appropriate, these results are supplemented from the extensive open (qualitative) responses provided by survey participants and also from the focus groups and interviews with CPD participants and 'strategic' key informants. Annotated questionnaires for teachers and technicians are included in Appendices 1a/b and 2 respectively.

2.2 PHASE 2 SURVEY

Teaching staff and school technicians who had taken part in SSERC CPD events between 2008 and 2010 were included in a postal questionnaire survey. The Phase 2 survey questionnaire was similar, but not identical, to that used in the previous postal survey (see Interim report 2009). Although it was not always possible to ask the same questions regarding teachers' and technicians' employment and CPD experiences, wherever possible questions were standardised to maximise comparability. Table 1 summarises the main question areas by group.

Unlike Phase 1, PGDE students were not included in the survey since the main focus of Phase 2 was to explore how teachers had used their CPD and resources in the classroom. It was agreed with SSERC and the Scottish Government that Phase 1 had provided sufficient insights on the impact of SSERC CPD on PGDE students.

As with the Phase 1 survey, questionnaires were distributed by SSERC on behalf of the SCRE Centre with completed questionnaires being returned to SCRE in pre-paid return envelopes.

The survey responses

The survey was conducted during October and November 2010 with final responses included in the database in late December.

Table 2 - Survey responses

Client group	Survey numbers	Responses	% responses
Teachers	520	125	24%
Technicians	297	80	27%
Total	817	205	25%

Schools have increasingly become involved in research and the research community has become aware of a growing 'research fatigue' among teachers with a concomitant reduction in postal survey response rates. The overall SSERC survey response rate of 25% is broadly in-line with those experienced in recent postal surveys conducted by the SCRE Centre. The response rate for teachers at 24% is slightly down on the SSERC phase one survey (29%) while the technician response rate at 27% is slightly above the 2009 survey response (24%).

Approach to survey analysis

The relatively small number of responses from technicians has meant that analysis of this data has largely been based on the production of basic frequencies for each question. However,

Table 1 - Questionnaire content by survey group

Teaching staff	Technicians
Background - Gender, age, position, subject experience, stage	Background - Gender, age, position, subject experience, stage
Attendance at SSERC CPD which/frequency?	Attendance at SSERC CPD which?
Reasons for taking part in CPD	Reasons for taking part in CPD
Experience of and satisfaction with the CPD	Experience of and satisfaction with the CPD
Impact of the CPD and use of SSERC resources	Impact of the CPD
Experience of other locally delivered CPD	-
Demand for further CPD	Demand for further CPD

Table 3 - Additional teacher analysis

Variable	Comparisons	Numbers
Gender	Male and female	32 male and 93 females
Age	Younger (up to age 40) and older (41 and over).	61 younger and 64 older
Seniority	Promoted staff and class teachers	42 promoted staff and 81 class teachers
Experience	Less experienced staff (up to 5 years teaching experience) and experienced staff (6 or more years teaching experience) experienced	32 less experienced staff and 93 more
Stage	Primary and secondary class teachers (not including promoted staff)	25 primary and 54 secondary

the greater number of responses from teachers has allowed us, in addition to producing basic frequencies, to explore a number of key variables for statistical significance and note the nature of any differences. Table 3 provides details of this exercise and the numbers of respondents involved.

Statistically significant differences emerging from this analysis are reported in the text. Significance is only reported where it exists at the 1% level to reduce the likeliness that any differences are due to chance.

2.3 QUALITATIVE EVIDENCE GATHERED

As in Phase 1, many survey respondents, particularly teachers, provided detailed comment to open questions. This provided much elaboration on how the CPD had made a difference to their practice and across their schools. These qualitative insights also provided indications of how the CPD had ultimately impacted on pupil engagement and performance. Further evidence of teacher and technician CPD experiences, accounts of CPD impact and information on participants' future needs and factors influencing CPD were gathered during Phase 2 using:

- Seven focus groups were conducted with the main groups of participants, e.g.: School and subject leaders, Science subject teachers, (e.g. Chemistry, Biology, Physics) probationer teachers etc. These groups explored participants' satisfaction with the SSERC CPD, impact on practice in the classroom and across the school, views on effective CPD, as well as views on other

sources of science education CPD and future CPD needs.

- Eleven individuals were included in follow-up telephone interviews or completed a postal proforma. These were used to further explore and clarify certain emerging themes.
- Seven CPD events covering a range of different groups and types of delivery were also observed. These observations provided additional insights on the CPD delivery, and provided the opportunity to talk informally with participants about their experiences.

Data gathering occurred some months after participants took part in SSERC CPD. This gave participants time to begin the implementation of change in their practice.

The survey respondents

In general respondents represented a heterogeneous group of individuals.

Teachers

One hundred and twenty-five teachers responded to the survey (see annotated questionnaire in Appendix 1a). Teacher respondents were most likely:

- female (74%)
- working full-time (90%)
- secondary teachers (67%)
- class teachers (65%)

In addition, 30% of returns were from primary school staff and 34% were from individuals in promoted posts (Headteacher, DHT/AHT, faculty head or principal teachers).

Among the 84 responding secondary teachers, 32% taught chemistry, 30% biology and 29% physics. Ten percent reported teaching more than one subject. None of the responding primary teachers were science specialists.

Thirty-seven percent of teachers had been teaching for 16 years or more while 38% had taught for between 6 and 15 years. Twenty-five percent had taught for up to 5 years. Only one probationer returned a questionnaire. The low probationer representation is explained by the fact that only those who had been on the PGDE event in January 2010 would fall within our Phase 2 sample and SSERC did not have current school addresses for these because they were still in their Initial Teacher Education Institutions.

Technicians

Eighty technicians completed questionnaires, again representing a varied group of individuals (see annotated questionnaire Appendix 2). Technicians were most likely:

- female (60%)
- working full-time (74%)
- employed in secondary schools (89%)

Sixty-eight percent of respondents identified themselves as 'technicians', 18% 'senior technicians' and 6% 'assistant technicians'.

The majority of technicians (80%) provided support for science in their schools but 51% also provided support for other subjects in the school and 27% supported IT/ITC in the school.

Forty-nine percent of technicians had been a school technician for up to 5 years while 26% had been a school technician for between 6 and 15 years. Twenty-five percent had worked as a technician for 16 years or more.

2.4 WHAT TYPES OF SSERC CPD HAD RESPONDENTS TAKEN PART IN?

Teachers

Teacher respondents had been involved in a range of SSERC CPD since 2008. Most frequently they had taken part in:

- Two-part residentials (81%)
- Single day workshops (26%)
- Leadership courses (17%)

Leadership courses were significantly more likely to be undertaken by teachers in promoted posts (80% of promoted staff, 25% of class teachers). We cannot say whether leadership course involvement was associated with any subsequent promotion.

In addition 15% of teachers had also taken part in a PGDE residential (during their student year) and 15% had also taken part in a summer school. In a number of instances respondents had been involved in several elements of CPD or had taken part in the same type of CPD on more than one occasion. Discussions with SSERC personnel confirmed that response numbers reflect the general participation pattern in SSERC CPD.

Technicians

Technicians had, like their teaching colleagues, been involved in range of SSERC CPD. Forty-four percent had taken part in *Microbiology for Schools* while just over a third (34%) had attended *Safe Use of Fixed Workshop Machinery* and 34% had also taken part in *Introductory Physics*. Twenty-five percent of technicians had taken part in *Electrical Safety and Portable Appliance Testing*.

2.5 DECISIONS TO TAKE PART IN SSERC SPONSORED CPD

Teachers and technicians were asked to indicate (on a list of pre-coded questions) the factors which influenced their decisions to take part in SSERC sponsored CPD (see Q9 annotated questionnaires for detail).

Teachers

Among teacher respondents the big influences on their decisions to take part in SSERC CPD were:

- To improve their teaching skills (73%)
- To help implement Curriculum for Excellence (69%)
- To increase their understanding of Curriculum for Excellence (63%)
- To develop their understanding of science in general (61%)
- The reputation of SSERC CPD (60%)

The following were most frequently indicated as no influence on teachers' decisions to take part in CPD.

- Improve career prospects (36%)
- Encouraged by colleagues (36%)
- Improve leadership skills (31%)
- Encouraged by line manager/Local Authority (25%)

Significant associations

There was some evidence that teachers' decisions to take part in CPD were associated with their age, seniority or stage.

Age

Younger teachers (up to 40) were significantly more likely than older teachers (41+) to cite improving career prospects as a big influence on their decision to take part in SSERC CPD (31% of younger teachers, 11% older teachers).

Seniority

Promoted teachers were significantly more likely than class teachers to identify improving leadership skills as a big influence on their decision to take part in CPD (51% promoted teachers, 17% class teachers). Presumably the type of CPD undertaken reflected this difference.

Stage

Secondary class teachers were significantly more likely than primary class teachers to identify the reputation of SSERC as a big influence on their decision to take part in CPD (74% secondary teachers, 17% primary teachers).

Technicians

The big influences on technicians' decisions to take part in SSERC CPD were:

- To develop knowledge of a specific science and/or technology area (73%)
- To improve technical skills (72%)

- To develop knowledge of science in general (58%)
- Encouraged by line manager/Local Authority (49%)

Factors which most commonly had no influence on technicians' decisions to take part in CPD included:

- Encouraged by colleagues (24%)
- Improve career prospects (22%)
- Network with colleagues (17%)
- Encouraged by line manager/Local Authority (15%)

2.6 WHAT DID PARTICIPANTS THINK OF SSERC CPD?

Among both teachers and technicians SSERC CPD was extremely well received. In general, the CPD was acknowledged to be of a high standard, relevant to participants, encouraged them to network with colleagues and provided useful ideas for teaching.

Respondents were asked a number of pre-coded questions regarding their experience of SSERC CPD. Full results from this exercise can be found in the annotated questionnaires in Appendices 1a and 2 (Q10 teachers and technicians).

Teachers

Teachers most frequently completely agreed with the following statements regarding their SSERC CPD experiences. That the CPD:

- Was conducted in a professional manner (99%)
- Gave access to quality support materials (95%)
- Comprised presentations of a high standard (90%)
- Was relevant to their science teaching (89%)
- Encouraged networking with other delegates (88%)
- Provided a number of useful ideas for teaching (87%)

Significant associations

Promoted staff were more likely than their colleagues to completely agree that the SSERC CPD provided support for their leadership development (51% of promoted staff compared to 24% of class teachers). This is not surprising since significantly more promoted staff (80%) than classroom teachers (25%) had taken part in a SSERC leadership course.

Teachers' qualitative comments revealed that:

- SSERC courses were seen as unique in their capacity to provide high quality CPD that was

relevant to participants' needs, articulated with CfE and provided support in tackling other issues facing staff and schools.

- CPD presenters were credible, approachable and aware of the practical, curricular and policy context that teachers were working within. Participants acknowledged that courses were carefully designed to reflect their needs.
- The CPD allowed vital time for reflection and sharing of ideas with colleagues from other schools and Local Authorities.

Technicians

Technicians most often completely agreed with the following statements regarding their SSERC CPD experiences. That the CPD:

- Was conducted in a professional manner (85%)
- Was relevant to their job (80%)
- Comprised presentations of a high standard (74%)

Technicians' qualitative comments provided some further insights including:

- SSERC CPD provided an excellent resource for technicians and was important when developing work in schools and science departments.
- SSERC CPD was unique, there were no comparable programmes in terms of content and quality available to technicians.
- The CPD was targeted on technicians' needs.
- The staff of SSERC were both friendly and very helpful.

SSERC provides a good service to schools and technicians. The many courses I have attended have all been very worthwhile.

SSERC has a well-deserved reputation of excellence in training. Having met other technicians and teachers I am sure that the CPD on offer is both necessary and appreciated.

The SSERC CPD programme has achieved a great deal in a relatively short period. Advancing CPD opportunities for technicians greatly. It would be a shame if this was stopped due to cutbacks or lack of funding as without the leadership of SSERC it would soon revert back to the situation where technicians had little or no access to worthwhile and cost effective CPD.

The SSERC training has been a massive part of my modern apprenticeship and has benefited me greatly in the long run.

I have found SSERC to be a valuable resource not just for CPD but also advice and knowledge. Staff are very helpful, approachable and knowledgeable. It's comforting to know that there is someone to turn to if I need advice.

Technicians' comments on SSERC CPD

2.7 IMPACT OF SSERC SPONSORED CPD

Overall findings suggest that SSERC CPD has had a substantial impact on the majority of the participants and, importantly, has also been translated into changes in practice among teachers and technicians.

Of key importance in evaluating CPD was its impact on practice. The survey asked a number of questions designed to provide information on the impact of the SSERC CPD on participants' practices as well as identifying factors which supported or hindered changes in practice. Full results from this exercise can be found in the annotated questionnaires (Q12-16 teachers' questionnaire and Q12-14 technicians' questionnaire). Further insights on impact were provided in the focus groups.

Teachers

Asked to indicate their agreement or otherwise with a range of statements regarding the impact of SSERC CPD (see annotated questionnaire Q12 for detail) teachers most frequently agreed or strongly agreed that the CPD had impacted in the following ways:

- I have introduced new resources /materials to my teaching (100%)
- I have a better understanding of what SSERC offers (97%)
- My enthusiasm for teaching science has increased (93%)
- I am a better teacher of science (92%)
- My confidence for teaching science has increased (88%)

According to teacher respondents the CPD was less likely to have impacted on their involvement in science developments or contacts outwith their school. This is perhaps not surprising given that the main objectives of the CPD programme was to promote the skills and capacity of individual teachers to enhance their classroom practice. However, over time it is hoped that this process

will influence staff in other departments and across the wider school. Indeed, qualitative responses detailed elsewhere in this report indicate that this is already happening.

Significant associations

Overall there was little evidence of significant differences in teachers' responses associated with their gender, age seniority, experience or stage of teaching. This should be viewed as a welcome finding since it supports the view that SSERC CPD is regarded as relevant and well targeted. It would appear that, irrespective of gender and the sector taught, SSERC CPD is as likely to impact on the practices of experienced teachers as it is on their younger less experienced colleagues.

However, there were a few significant associations which suggest SSERC Leadership CPD represents an important additional support for promoted staff taking a significant role in science developments at departmental and school level.

Promoted teachers were more likely than non-promoted staff to strongly agree that, following SSERC CPD, they had taken a significant role in:

- science developments at departmental level (promoted staff 61%, un-promoted staff 32%)
- science developments at school level. (promoted staff 63%, un-promoted staff 27%)

Moreover, teachers who had taken part in a leadership course were even more likely than those who had not participated in a leadership course to strongly agree on having taken a significant role in science developments at departmental and school level:

- science developments at departmental level (leadership course participants 91%, non-participants 32%)
- science developments at school level. (leadership course participants 85%, non-participants 30%)

Given that 80% of promoted staff had also taken part in leadership CPD this 'increased difference' suggests that, while promoted staff are more likely than non-promoted staff to take a significant role in science developments at departmental and school level, promoted staff who have undertaken SSERC leadership CPD are even more likely than their colleagues to have played a significant role in science developments at departmental and school level.

Impact of SSERC CPD on teaching and practice

Ninety-four percent of teachers reported that they had introduced or tried new materials and resources following SSERC CPD while 63% also indicated having tried new methods of teaching. Only two percent of teachers had failed to implement changes to their practice following SSERC CPD.

Significant associations

Older teachers were significantly more likely than their younger colleagues to indicate having introduced or tried new methods of teaching (77% older teachers, 48% younger teachers). This may underline the importance of SSERC CPD in keeping more experienced teachers up to date with developments in pedagogy, knowledge, and practice within their subject area.

Qualitative examples of SSERC CPD impact on teachers' practice

One hundred and eighteen respondents provided examples of changes they had made to their practice following SSERC CPD. Teachers were also asked to detail whether the impact had extended to other colleagues in their school as well as other schools. Finally respondents were asked to indicate whether the impact was sustainable. Further insights on impact were also provided from the focus groups.

Qualitative information from the Phase 2 survey and focus groups provided a wealth of detailed examples of how the SSERC CPD had impacted on the practice of participants. Primary teachers in particular, reported that the CPD had promoted their enthusiasm and confidence to deliver relevant and quality science content that engaged pupils. Teachers were particularly pleased that their practice was able to address good practice regarding pupils' learning and assessment. Some participants specifically reported that the attainment of pupils had improved as a result of their SSERC CPD.

Science lessons have been highlighted as 'best practice' by HMle. Better teaching which led to better learning. Encourage and supported staff to improve science teaching throughout stages... I've led CPD for all staff.

Primary principal teacher

I have introduced more practical lessons to teach science within my class. This includes using a variety of different resources and allowing pupils to experiment using these resources and learn from hands on experience, making learning science more fun.

I have become more confident teaching science as I have a greater understanding of cross curricular ideas and activities I can utilise in class.

Primary class teacher

Similar themes arose from secondary teachers who emphasised how the CPD had increased awareness of the various ways that they could implement different pedagogical approaches and ideas relevant to both their subject and Curriculum for Excellence.

It definitely has [had an impact] already. I was a wreck. I'd been a principal teacher for a year and a half, a faculty head for a year and a half when I came here the last time and the differences it's made to my department, to me personally... is phenomenal.

The attainment in my department... was a 2 at the time when I came to this, we're now at a 4/5 and that is just incredible, it definitely is and when I went to my CPD manager and said this was a follow-up course ... I didn't have to say another word, absolutely you can go on that.

Secondary teachers, focus group

The volume and range of examples of SSERC CPD content that were reflected in participants' practice was extensive. Teachers elaborated on how resources supplied by SSERC during CPD sessions were used in the classroom to enhance pupils' learning experience. The quality and diversity of experimental opportunities which had helped to engage with a wider range of pupils' abilities was frequently mentioned. More active and collaborative learning and improvements in assessment (Active Assessment, Assessment is for Learning etc.) were also reported.

Use of concept cartoons... more discussion about concepts in science... justify opinions etc. Active Learning ideas... pupils' model concepts such as the flow of electricity... it's much more engaging.

Primary headteacher

Many of the resources and ideas were applicable to inter-disciplinary and cross-curricular working such as the environment, sustainable energy sources, and forensics. The provision of, ready-to-use, lesson resources on USB memory drives was frequently highlighted by participants as an excellent way to distribute tried and trusted resources to teachers who often found their opportunity to be creative limited by available time.

Those teachers who had participated in leadership and expert courses aimed at promoting management skills also detailed how they had been able to implement positive changes in their departments. CPD input from HMle and specialists in negotiation had been reflected in the practice of Faculty Heads and others with leadership commitments.

New methods of presenting work to pupils, the structure of Department meetings has changed... My approach to my job, particularly dealing with staff discipline problems... and pupil interaction has improved.

Secondary faculty head, physics

This course has given me the skills or contributed towards the skills required and the confidence to becoming a principal teacher and I feel more confident to deal with colleagues who are a bit more difficult. I've been given some techniques... about how to lead a good departmental meeting, things like this. The good techniques you need to be a successful department. For somebody who wasn't in that position before is now in that position I think it's a really good basis and grounding for that.

Leadership course, focus group participant

Examples of impact on participants' colleagues and across their school

Teachers' accounts of impact commonly indicated that many of them had been able to pass on what they had gained through their SSERC CPD to others in their department and school. While resources were reported to have enabled other members of staff to implement science activities other staff were also feeling a positive impact on their enthusiasm and confidence. Having quality resources and new teaching ideas had promoted the confidence of participants' colleagues to teach

science. This was particularly evident among primary school teachers.

We're much more enthusiastic [in our] approach to science as we now have some of the resources to teach topics.

Colleagues are using related elements in new methods and had greater access to CfE resources.

Extra resources and fresh ideas for lessons and activities have encouraged other members of staff to implement more science within classes.

Primary class teachers

There were examples of CPD participants returning to their schools sufficiently enthused to implement after-school sessions with colleagues in order to share what they had learned and to distribute the materials obtained on the courses. The availability of these resources meant that participants' colleagues were often reported as keen to adopt them into their own practice. There were also examples of the CPD being reflected in school planning and programmes such as primary teachers re-writing their school's science programme to link more clearly with CfE outcomes and experiences.

Secondary teachers reported embedding the new ideas into courses and getting colleagues to 'buy-into' these developments using in-house training and by putting sample lessons on their school websites. There were accounts of how teachers' were able to spread their CPD learning and ideas to colleagues in other science subjects and sometimes non-science subjects. This enthusiasm had led to other teachers in the school wanting to attend SSERC courses. Again, where the ideas and resources clearly articulated with Curriculum for Excellence, there was increased willingness from colleagues to incorporate and embed them.

I have passed my experiments from SSERC residential course to colleagues and provided them with ideas and approaches to science which support a Curriculum for Excellence and make cross-curriculum links. Also, I have had colleagues peer assess me during Science lessons to experience my approaches and methods.

Biology class teacher, Independent school

Teachers commonly cited the impact of SSERC CPD on teaching approaches across their department and among science colleagues. Many also believed that this had had a tangible impact on pupils' performance and engagement. This was particularly evident where schools had been able to place a number of staff from different science subjects on SSERC courses.

I think the set courses that have been run in terms of promoting active learning opportunities and looking at new resources and how you can use them. I think it's very important that they are continued because I would say that they've probably had the biggest impact on class teaching certainly within our department over the past... We've been lucky to have somebody on the biology course, somebody on the physics course and somebody's going on the science course... they have had a direct impact on what's going on in the classroom and I think we shouldn't lose sight that basically that's what introducing new courses and everything else for is to have a direct impact on the kids.

Secondary faculty head, focus group participant

I was asked to do a sharing good practice session on the monitoring that I had put in place and that was my GAP task and so again shared that with not just PTs around the school, but class teachers as well to see what we were doing in the science department for monitoring and giving feedback.

Secondary teacher, focus group participant

The Department is now working much better together as a team, adopting CfE teaching ideas... Pupils are benefit from it all greatly... and a far bigger uptake of Sciences in S3.

Secondary chartered teacher, chemistry

The procedures have been adopted by others. Staff feel more involved in Departmental Meetings... there's more participation by staff in discussions.

Secondary faculty head, physics

When participants' schools had been inspected, HMIE were reported to have favourably commented on the SSERC CPD practices and resources.

This then appeared to act as a catalyst for increased uptake in the school. Where participants were also members of the school's Senior Management Team, they were also able to ensure that the CPD ideas were able to impact more widely across their school.

Science lessons highlighted as 'best practice' by HMle... Better teaching which led to better learning... Encouraged and supported staff to improve science teaching throughout stages... Led CPD for all staff.

Primary principal teacher

Examples of impact across schools

In contrast to the sharing of ideas and resources in schools following SSERC CPD, there were fewer examples cited of schools sharing lessons learned from their CPD with other schools.

However, where examples were provided these illustrated how the CPD could positively influence science education beyond the initial SSERC CPD participant and provide a 'value added' dimension to the CPD investment. For example, there was an indication that some Local Authorities were trying to systematically facilitate the sharing of experience, practice, and resources from the SSERC CPD across schools. In Falkirk, a primary teacher noted that there were plans to share resources across schools when GLOW was more easily accessible.

SSERC participants were also involved in sharing good practice at in-service events for their cluster schools involving both primary and secondary colleagues.

I was able to share ideas at an in-service day and some colleagues in other schools have got copies to give them a 'starting off' point for creating their own topics. I have been invited to share ideas with secondary colleagues and hope that this will result in better liaison.

I will shortly be doing a presentation to other teachers in my cluster about some of the lessons I did on the [SSERC] residential course. I am source of advice and support in school and across the cluster. I received very positive feedback from HMle on the quality of science teaching in the school.

Primary teachers

They are more willing to have a go with creating new CfE topics and liaising with me about any science connections. Colleagues in my school and other cluster schools have asked to see the topics and ideas stemming from this CPD.

Primary principal teacher

In another primary school, the headteacher explained that science was a cluster priority and that ideas from SSERC CPD were being shared across the associated schools. SSERC trained supply teachers revealed that their role also meant they could share and disseminate ideas and resources across schools that had not been involved in the CPD.

There were also examples of secondary teachers helping to cascade their CPD learning at Local Authority CPD days and seminars. These events often had a wider Curriculum for Excellence focus and looked at how sciences could articulate across the curriculum.

I've loaned SSERC resources to Modern Languages at another school.

Secondary chartered teacher, chemistry

However, there were also comments, particularly from focus group participants, that highlighted concerns about the reduced level of Local Authority CPD and support for science teachers. This was felt to decrease opportunities to share lessons learned from the CPD and good practice generally.

All of these [CPD topics] are extremely important. I am the only Chemistry teacher in my school; we will be losing our QIO... so SSERC will be my main port of call for support.

Secondary class teacher, chemistry

There were examples of secondary and primary schools working together with SSERC CPD ideas in P7 to S1 transition and induction programmes. This process helped further spread the experiences and resources across school clusters.

It has been the most useful CPD (other than post-Grad Primary science) which I have ever been a part of. Every minute was used efficiently with high quality tutoring and expertise delivered in a practical way which I have already adapted for use with all pupils in our school. It has given me ideas for developing CfE topics with a science element and encouraged me to take pupils out to the environment to learn. I have been able to pass ideas on to colleagues in school and the six others in our cluster.

Primary principal teacher

Sustaining the impact of SSERC CPD

Overall, open comments from the survey and focus group discussions suggested that the reported developments in teaching and leadership practices and impact were regarded as sustainable. There were some comments concerning the availability and cost of some replacement resources (such as heat sensitive paper and materials for the forensics experiments). More typically, the resources were seen as affordable and encouraged sharing with others in the school.

Yes as resources are relatively cheap and can be shared by others from P1-7. Networking has helped to share ideas and resources and opportunities to implement CfE.

Primary class teacher

Yes [it's sustainable], all staff are trained and sample lessons are put on our staff website.

Confidence, enthusiasm, willingness to try out new ideas and use Active Assessment is sustainable as I have seen the new ideas working in my class.

Primary principal teachers

Secondary school teachers in particular emphasised the sustainability of their CPD input primarily because it articulated clearly with Curriculum for Excellence developments in their schools and because of take up among their colleagues.

Yes they are built in to the curriculum.

Secondary principal teacher, biology

All colleagues will be involved in teaching.

Secondary principal teacher, physics

Yes – incorporated into lesson planning.

Secondary class teacher, physics

Yes as these practicals work well as part of CfE.

Secondary Class teacher, biology

Only occasionally did secondary school participants mention that factors, such as their subjects being 'exam driven', limited their ability to develop fully the activities they had learned.

Technicians

Technicians also indicated their agreement or otherwise with a range of statements regarding the impact of SSERC CPD (see Appendix 2, annotated questionnaire Q12 for detail). They most frequently agreed or strongly agreed that the CPD had impacted in the following ways:

- I am a more competent technician (89%)
- I have a better understanding of what SSERC offers (88%)
- My enthusiasm for my job has increased (84%)
- My confidence in my working abilities has increased (82%)

Technicians presented a similar picture to teachers when it came to areas where SSERC CPD was less likely to have impacted. CPD was less likely to have impacted on their involvement in networks of colleagues or with technicians in other schools. Again, this is not surprising since the initial objectives of the technician CPD programme was to promote the skills and capacity of individuals.

Impact of SSERC CPD on technicians' practice

Over half (53%) of the technicians reported that they had made or attempted to make changes in their work following the SSERC CPD. Forty-one of these individuals also provided examples of these changes (or attempted changes).

Comments often referred to improvements in technicians' practical skills which meant increased likelihood of successful classroom practical experiments and, therefore, more effective learning and pupil engagement.

SSERC is a good resource for technicians and it is key when developing work in our science dept. CPD I have undertaken has developed my professional skills and actively relevant to my post.

The use of SSERC guidelines has enabled the reintroduction of practical-based science content to lessons.

I've been able to pass on expertise to pupils for their Advanced Highers.

It [SSERC CPD] facilitates the implementation of activities at Standard Grade - promoting practical sessions.

Technicians

Improved confidence, job security and prospects were also mentioned in technicians' comments on the impact of the SSERC CPD.

I've gone from being scared to [being] confident about what I'm doing.

SSERC has allowed me to get promotion - have been modern apprentice in a large science department - not possible without SSERC.

Technician

Technicians' comments reiterated their survey responses that the SSERC CPD had helped to improve the skills and knowledge regarded as directly relevant to their work supporting science teachers. Further, the CPD also improved their confidence and enthusiasm for their work.

It has increased development of my skills and provided a touchstone with other technicians and re-invigorated attitudes to the job and it encourages you to try harder to improve the service you provide in your workplace.

Technician

While technicians were less likely than teachers to mention impact on promoting active networks, they did report that meeting technicians from other Local Authorities, at SSERC CPD sessions, had helped to reduce the sense of isolation many felt through being the only technician in their school. Technicians' comments did reveal that some had set up email groups as a result of meeting colleagues at the SSERC events.

2.8 RESIDENTIAL COURSES AND THE USE OF SSERC RESOURCES

Teachers were asked a number of questions relating to their participation in SSERC residential courses (excluding leadership courses) incorporating a gap task and which could also have provided them with additional resource(s). Beyond ascertaining how many teachers had taken part in such courses the research also asked how these 'free' resources had been used.

The majority of teachers (81%) had been involved in a residential course with a gap task. See annotated teacher questionnaire for further detail. Most of the SSERC supplied resources have been used by teachers. Table 4 (see next page) lists the curricular areas for which resources were made available and indicates how such resources were used. Most commonly teachers reported resources being used in more than one way (47% of responses). This generally meant being used by the teachers in their own class and also by other colleagues in the school. Appendix 1b gives additional detail on the resources used across different curricular areas.

Table 4 - Summary of resource use for all curricular areas

Curricular area	In what ways have resources been used?						
	Used in more than one way	Used by school colleagues	Used in own class	Used in other way	Not yet used (plan to do so)	Not yet used	Total
Biology	20	7	9	3	9	2	50
Chemistry	30	8	14	2	9	1	64
Physics	11	-	7	-	5	2	25
Primary	33	6	29	1	4	-	73
General	61	11	37	-	9	1	119
Total	155 (47%)	32 (10%)	96 (29%)	6 (2%)	36 (11%)	6 (2%)	331 (100%)

2.9 LOCALLY DELIVERED SCIENCE CPD

Forty-eight percent of teachers reported taking part in locally based Science CPD which did not involve SSERC. (See annotated questionnaire Q17/18 in Appendix 1a.)

This CPD did not evoke the same high levels of satisfaction that were associated with teachers' experiences of the SSERC delivered CPD. Table 5 summarises responses to both in terms of the percentage of teachers indicating *complete agreement* with each of the statements.

Simple examination of table 5 (see opposite page) reveals that participants in SSERC sponsored CPD were often several times more likely than those experiencing other locally delivered Science CPD to indicate complete agreement with each statement.

2.10 FUTURE CPD PRIORITIES

Teachers and technicians were asked a number of questions about their future Science CPD priorities and their preferred mode of delivery.

Teachers' future CPD priorities

Not surprisingly, teachers' professional development priorities reflected their stage of involvement. Table 6 records the percentage of primary and secondary teachers who indicated high priority to their professional development in various curricular areas.

Table 6 - Teachers indicating high priority for their professional development by stage

Curricular Area	Primary staff	Secondary staff
CfE Early to level 2	87% (N=37)	9% (N=46)
CfE Levels 3 and 4	21% (N=24)	68% (N=75)
National 4/National 5	-	93% (N=81)
Higher/Advanced Higher	-	87% (N=79)

Requested focus of teachers' CPD

Demand for future CPD appeared high amongst teachers. When asked to rate a list of foci for their CPD priorities over the next three to five years a majority of teachers indicated all but one of the statements as *high priority*. Two thirds (66%) of teachers rated both *subject updating* and *practical work for classroom use* as *high priority* while 64% rated ideas for investigations as *high priority*. Although only 18% of teachers rated *health and safety* as *high priority* a majority (57%) still saw this as *medium priority*. (See annotated teacher questionnaire Q20 Appendix 1A for further detail.)

Although the numbers were small, there was some evidence to suggest that *subject updating* and *support for case studies/researching units* were higher priority among secondary class teachers than their primary colleagues. This is to be expected

Table 5 – Comparison of satisfaction with SSERC and other science CPD

The CPD event(s) which I attended ...	SSERC CPD % Completely agree	Other science CPD % Completely agree
Was conducted in a professional manner	99	30
Comprised presentations of a high standard	90	17
Gave access to quality support materials	95	18
Encouraged networking with other delegates	88	18
Increased my knowledge of my science area	64	22
Increased my knowledge of other science areas	56	12
Was relevant to my science teaching	89	23
Increased my understanding of a Curriculum for Excellence	59	12
Provided support for my leadership development	35	7
Provided a number of useful ideas for teaching	87	17
Encouraged me to try new ideas	86	15
Increased my awareness of sources of support for teaching science	68	12
Highlighted the importance of science education for pupils	61	15
Left me with a desire to attend similar CPD events	80	12
Underlined the importance of CPD for my professional development	66	14

as case studies/researching units form part of the new Highers in the sciences. On the other hand, primary class teachers were more likely than their secondary colleagues to identify *topical science* as *high priority*.

A key theme to emerge from teachers' questionnaire comments and from the focus groups concerned the need for on-going CPD that would continue to help them implement CfE (particularly practical approaches) and Advanced Higher Science courses.

I think with the new Highers and Advanced Highers there will be CPD needs in terms of sort of updating subject knowledge. All these qualifications are going to be updated and a lot of teachers left university a good number of years ago, so new knowledge updating.

Secondary teacher leadership course participant

Other common responses regarding CPD from teachers included:

- Secondary teachers becoming increasingly concerned about changes to assessment procedures, leaving them to devise assessment schemes for some exams.
- Primary school teachers having particular CPD needs i.e.: lacking confidence to cover 'an enormous science curriculum'.
- Secondary teachers in general science courses teaching a subject that they are not trained to teach.

Teachers' preferred mode of CPD delivery

Teachers overwhelmingly indicated a high preference for CPD which was *Face-to-face* (92%), and *Experiential* (89%). Only 6% and 5% of teachers respectively recorded *eLearning* and *Distance Learning* as high preference.

Residential CPD events were relatively popular with two thirds of teachers (65%) indicating a high preference for *short residential with a follow-up* and 59% indicating *short residential only*. These figures

may in part reflect the high levels of satisfaction among teachers who had previously taken part in such events and who had also completed our questionnaire.

Teachers' preferred timing of CPD events

When it came to event timing teachers most commonly indicated their preference for *weekday* (48% high preference) over *twilight* (16% high preference) and *Saturday/Sunday events* (16% high preference).

Teachers' views on the feasibility of different CPD modes

When asked about the feasibility of the different modes and timing of delivery teachers were again unequivocal, noting *Face-to-face* (69%) and *Experiential learning* (66%) as *high feasibility*. While *eLearning* and *Distance learning* were not the preferred modes of delivery for teachers (see previous section) they were at least acknowledged by more teachers as feasible. Fifty-three percent and 50% respectively noted *eLearning* and *Distance learning* as *high feasibility*. Although residentials were more popular than *eLearning* or *Distance learning* in terms of the mode of delivery teachers were less likely to regard them as *feasible*. Just under half (45%) of teachers regarded either *short residential* or *short residential with follow-up* as highly feasible. Interestingly lower percentages of teachers regarded *twilight* (43%), *Saturday/Sunday* (38%) or *weekday* (36%) timings as *highly feasible*.

Technicians' further CPD priorities

Technicians presented a similar picture to that of teachers in relation to the mode of CPD events, timing, and feasibility.

Requested focus of technicians' CPD

Technicians' questionnaire comments, identified a wide range of CPD requirements, including subject-specific courses, as well as those which focused on keeping up-to-date with changes in technology, ICT and health and safety. Technicians also wanted better geographical access to CPD. Events which promoted communication between teachers and technicians were also suggested in order to help promote more effective, systematic science education in schools.

Technicians' preferred mode of delivery

Technicians were asked about their preferred mode of CPD delivery and the feasibility of these modes. In general their responses reflected those

of teachers, demonstrating a high preference for *Face-to-face* events (83%) and *Experiential learning* (90%) and much less enthusiasm for *eLearning* (15% high preference) and *Distance learning* (9% high preference). *Short residentials* - both with (27%) and without (31%) follow-up were less popular among technicians than among teachers and probably reflects the lack of experience of such events among technicians.

Technicians' preferred timing of CPD events

In a similar picture to that exhibited by teachers - but with much stronger differences, technicians overwhelmingly indicated their preference for weekday event (83% high preference) over twilight (4% high preference) and Saturday/Sunday events (1% high preference).

Technicians' views on the feasibility of different CPD modes

As with teachers, technicians were most likely to note *Face-to-face* (74%) and *Experiential* (74%) modes as *high feasibility*. Similarly, although *eLearning* and *Distance learning* were not the preferred modes of delivery among technicians they were acknowledged as feasible by more of them. Forty-nine percent noted *eLearning* and 40% noted *Distance learning* as *high feasibility*. Two thirds of technicians (66%) suggested weekday events as *high feasibility* with much lower percentages noting *twilight* (10%) or *Saturday/Sunday events* as *high feasibility*.

Qualitative insights on valued and effective modes of CPD

The main CPD formats or modes of delivery adopted by SSERC and covered by the evaluation were two-part residential (which included a gap task), summer school and single day workshops. During Phase 2, SSERC piloted another approach which involved delivering CPD to a science teaching staff in their own school.

There was consensus among participants that residential SSERC events and summer schools were an extremely effective way of experiencing new ideas and, at the same time, allowing them to share ideas with others from across Scotland. The two-part courses with a gap task encouraged participants to try ideas in their own schools, in their own time, and then meet back with colleagues to reflect and evaluate their practice. Typical comments from participants about this approach included:

You can't possibly do the activities we've been doing any other way. Because of the nature of the subject we teach it's practical based, so you have to get hands on, get in there into the lab and do practical work for the subject based activities, but also like today you couldn't sit round and counsel each other... I felt, great I'm going to find out what's happening all over the rest of Scotland. I thought that was an important part of coming on this particular one.

I think you've had a chance to then follow up and meet those people that you met last time round to actually see what's happened to them. It wouldn't really be the same by emailing. They might say "I'll email you and find out how you got on" but everybody is so busy that unless you actually have set time for it then it's not really going to matter.

Unless you have a length of time where you're taken out of your normal environment and work with people you have a wee bit of social time with them as well you then get much more out of the following days of the course as you get to know people that bit better. It doesn't happen online so easily.

We spoke as well about the job being very lonely. You're really out on your own or to speak to someone who does the same job as you, so this is ideal to share experience... Even if you've got principal teachers and faculty heads in your own school, but it's not science faculty head, their experiences are different.

Teacher focus group participants

In summary, participants regarded the residential, 'intensive' experience as the 'core' or 'Gold standard' format. They suggested that this approach should be continued but accepted that it could be reinforced and supplemented by other methods. As these secondary teacher focus group participants suggested:

I don't think it's [the residential] the only way, but it is the best way. I think in combination with other techniques then that would be fine, but I don't think it should be removed and perhaps it should be the primary focus maybe that you get this and then you get another two days and then you can go online contact with people.

I think the residential is kind of like the complete gold standard. I think you could possibly if that is not at all possible you could maybe combine a number of days and intersperse them with some tasks that you come

back, but I think you couldn't get rid of getting people together face-to-face and working together completely.

I wouldn't have got the same thing from that as just seeing people's electronic version of their talk. It's not the same as actually having them in front of you and being able to ask them the question "How do you do that?" There is no replacement for it.

The gap-task format was seen as an effective device to develop teachers' reflective practice and encourage innovation while providing peer support.

There's a responsibility on you to actually do something... There's something that you need to do at the end of it and you need to be accountable for that and the fact that people are still willing to put their neck on the line so to speak shows how valuable they think the course is because if they didn't they wouldn't be doing their GAP task, they wouldn't be getting involved to the extent that everybody here has done... You build up that kind of relationship that allows you to have the accountability that knowing that you're safe to discuss what you've done with other people... that you're going to get reasonable feedback or approval.

Leadership focus group participants

Participants also highlighted the importance of these types of CPD in terms of accessing advice particularly given their concerns over the diminishing availability of Local Authority advice and CPD for science.

In the past there has been some sort of support structure if you like through the Authorities or even thinking about SQA and people like that and that seems to be getting worn away and more and more we are feeling a bit alone and a bit isolated and we do need a forum and a place where we can discuss things.

There also seems to be less emphasis on even Authorities working together, so at least when you're meeting up with people from different Authorities and you're finding out that everyone is in the same boat then you don't feel that you're so isolated either.

Teacher focus group participants

Participants also commented on the need for sufficient time and cover to allow teachers to attend residential CPD events, particularly if these

took place during the school day. They regarded the ongoing availability of cover and its cost as an increasing problem if they were to access this type of CPD.

Some teachers' comments highlighted the potential of on-line modes and virtual learning environments, suggesting that these could play a useful role in CPD delivery and disseminating ideas and resources. However, they were generally regarded as a supplement and not a replacement for practical 'hands-on' CPD opportunities.

Externally delivered, school-based CPD

During 2010 SSERC delivered Science CPD to a whole science department in a large secondary school. The evaluation also addressed this development and a researcher observed the CPD day and distributed evaluation questionnaires. Participants in this school-based CPD suggested that there were more advantages than disadvantages accruing from this approach. The only significant disadvantage was felt to be the lack of opportunity to share and discuss practice with colleagues from other schools.

School-based CPD was felt to: encourage team building and sharing practice, support discussion around the incorporation of ideas, and, promote the momentum for change. Moreover, it was also seen to save on travelling time and expenses and was regarded as less disruptive to other commitments in school. However, others also pointed out that having the CPD based in the school could mean that the daily life of the school was more likely to intrude on participants' CPD experiences.

School based CPD, arguably presented an opportunity to achieve rapid 'critical mass' in the promotion of pedagogic and curricular change than might be achieved through the more traditional CPD event involving one or two representatives from a larger number of schools. Having CPD take place in familiar surroundings and among colleagues also resulted in a more relaxed atmosphere and saved on the time often devoted to introductions and icebreaking activities. It was highlighted by SSERC personnel, however, that school based CPD, could be very resource-intensive for the provider and that an alternative would be for a school science department to attend SSERC for CPD.

2.11 BARRIERS TO PROFESSIONAL DEVELOPMENT

Survey and focus group participants expressed their views regarding barriers to professional development. Over the course of the two-year evaluation the most commonly cited barrier to professional development opportunities concerned the limited funding available at school and Local Authority level to cover the costs associated with CPD. Competing professional responsibilities also featured as a potential barrier but was much less of an issue compared to funding. Phase 2 responses strongly emphasised the increasing impact of reduced funding on teachers' ability to access CPD.

It's the time and letting staff... they can't get the staff, they can get nobody to cover classes when you go out to CPD because their budget is so constrained; it's really, really bad.

Secondary science teacher focus group participant

Strategic informants also regarded the issue of funding for CPD as crucial.

We need high quality CPD, and yet that's the one thing that's been cut because it's an easy cut. I know certainly the centre within our own budgets CPD has more than halved... so therefore you're saying to teachers on one hand that you need trained and on the courses that we have here they're excellent courses and cheap at the price and you get money back, but at the end of the day if you're a head teacher sitting in a school saying "I've got to cover this for three days at £200 a day, £600 against a shrinking budget" these are major concerns for schools throughout the country.

...they have difficulty funding CPD at the time when we're saying ... essentially CPD is essential to deliver what we're trying to deliver, to deliver change, so we're giving one message which teachers are hearing loud and clear and then we're delivering another message [and] they're saying "well you want us to do it, but you're not giving us the time or the money or the space or whatever" and that's a major frustration and that's a hurdle, that's a challenge, a Scottish challenge, but it's a challenge that we need to meet.

Headteacher and university representatives

Teachers recognised that providing CPD courses at twilight and weekends (for example, the current two-part residential courses require participants to attend on two Saturdays) could address the issue of finding cover to some extent. However, they also reported that family commitments meant that attending CPD out of school hours was not always feasible.

Teachers' comments often acknowledged that their Local Authorities faced financial challenges which meant they had to make choices regarding which CPD initiatives to support. Some were reported to be using funds to support basic awareness raising of Curriculum for Excellence rather than supporting more experienced teachers to take practice forward and build local/cluster capacity.

Most of the in-service ends up you being talked at and a PowerPoint and it's like "Can we not just have the time? What is the point in giving us an extra Curriculum for Excellence day to sit there and listen to someone talk to us about Curriculum for Excellence when the most valuable thing we could be doing with that time is actually getting on with it and developing stuff?"

Leadership group participant

Teachers thought that any funding provided to Local Authorities for science CPD would have to be ring-fenced and protected; otherwise they believed that it would be used for other purposes.

Technicians reported similar concerns to their teacher colleagues. They saw the main barrier to accessing CPD as school and Local Authority managers' reticence to draw on limited funds to pay for CPD. Where there was only one technician in a school there were also difficulties in finding an appropriate time to attend CPD courses.

In the present financial situation I feel that many of these [CPD] courses for technicians will disappear which is totally unsatisfactory. These are excellent sources of learning and also give great networking activities.

Technician

There were exceptions, some technicians believed their Local Authority was very committed to CPD in science for technicians and had developed local facilities and used Modern Apprenticeships to sustain a supply of new technicians and promote their skills. These individuals were also encouraged to participate in SSERC CPD to support their development.

Finally, teachers and technicians who lived and worked in remote areas, as one person said "anywhere north of Dundee", noted that the distance from CPD venues could create difficulties in accessing courses.

3

Insights from the research observations of SSERC CPD events

Over the course of the research, members of the research team continued to observe examples of different types of SSERC CPD events/courses. These included; subject specific, leadership and expert groups, probationer teachers and student tasters.

The observations provided insights on the CPD approaches and content, as well as an opportunity to discuss the CPD and related issues with participants. This helped the research team to further gauge levels of satisfaction and to explore participants' intentions to implement what they had learned. The researchers were also able to discuss the design of the training with course leaders and presenters. This 'sensitising' information was particularly valuable during the analysis of the qualitative data.

As with Phase 1 observations, the researchers found that participants across all of the CPD events were enthusiastic and engaged with the sessions. Again there was much praise for the relevant content of sessions, methods used to deliver the content and the quality of presenters, particularly their ability to understand the needs of participants. Participants stressed that the resources provided would be readily incorporated into their lessons and shared with colleagues in their schools.

There was an excellent professional yet friendly rapport between CPD leaders and the participants. This supportive environment and the carefully chosen venues helped to foster motivation and networking. Where used, the gap-tasks continued to provide opportunities to try and test innovative approaches and reflect on these with colleagues and to refine and share ideas.

Conclusion and recommendations

4.1 CONCLUSION

The findings of the second and final phase of the evaluation are similar to Phase 1 in that there is an extremely high level of satisfaction with SSERC CPD across teachers in all levels, sectors and subjects. Technicians were equally satisfied with their CPD experiences. Moreover, the CPD is reported by all groups of participants to have impacted on practice. Phase 2 has also provided evidence that SSERC CPD is impacting beyond participants' own practice. The relevance of the SSERC CPD to Curriculum for Excellence is acting as a driver in this process. Furthermore, Local Authorities and school management appear to recognise the quality of SSERC CPD and its relevance to the wider curriculum, encourage staff to attend courses and also support the dissemination of the CPD among colleagues.

The CPD has also facilitated access to valuable resources that were subsequently used in participants' schools. Almost all teachers reported that they had introduced or tried new materials and resources following the SSERC CPD. Phase 1 and 2 surveys also reveal that the majority report trying new methods of teaching as a result of their SSERC CPD.

Participants reported the positive impact of CPD on: student learning and performance; teacher-student rapport; staff confidence; enthusiasm and expectations regarding implementation of Curriculum for Excellence (CfE); career prospects.

SSERC courses are seen as unique in their capacity to provide relevant, high quality CPD that addresses the need of teachers charged with implementing CfE as well as providing additional pedagogical and resource support. The quality of presenters and CPD leaders in their delivery of CPD and on-going support for practitioners has been consistently praised. Presenters are seen as aware of the practical, curricular and policy context that teachers work within and courses are carefully designed to reflect target groups' needs. Indeed, the willingness of staff to respond to enquiries from teachers and technicians long after their participation on the courses is a key factor in sustaining the impact of their professional learning and development.

There is limited availability of science-specific CPD at local level. Where it does exist, most local and indeed much nationally available science is reported to fall far short of the CPD available from SSERC. Compared to other science CPD, that provided by SSERC was regarded as more relevant to teachers' needs, was delivered by experts and provided useful resources.

Teachers identified a need for on-going CPD that would continue to help them implement CfE (particularly practical approaches) deliver Advanced Higher Science courses and meet the challenge of changes in assessment for some courses.

Technicians identified a wide range of CPD requirements, including subject-specific courses, as well as those which focused on technology, ICT and health and safety. They also sought greater geographical access across Scotland to CPD and suggested a need for CPD that promoted communication between teachers and technicians in order to provide more effective, systematic science education in schools.

Phase 1 of the evaluation revealed that PGDE students were also extremely positive about their SSERC CPD. Like teachers, they found the CPD inspirational, as well as promoting new ideas for teaching in the classroom. The impact of CPD on students was reported in terms of improvements in confidence, enthusiasm and expectations regarding implementation of *Curriculum for Excellence (CfE)*, career prospects.

Perhaps, the only negative note to emerge from this evaluation has been the concern over the availability of funding at school and Local Authority level to support CPD. SSERC CPD participants and other stakeholders stressed that CPD opportunities for teachers and technicians were being constrained by financial restrictions. This issue and the challenge of meeting the demand among teachers and technicians for science-specific CPD will require creative approaches by SSERC, their partner organisations and government.

The consistently high levels of reported impact of the programme on practitioners' work across schools reveals that what started as an innovative national CPD programme for teachers and technicians has now become integral to the CPD 'landscape' of STEM education in Scotland. The high demand from practitioners for SSERC CPD reflects this and underscores the reputation of the programme, the quality of SSERC staff, and the organisation's other activities.

4.2 RECOMMENDATIONS

The evidence presented in this report clearly suggests that the CPD programme provided by SSERC is of very high standard, delivered by a highly skilled and enthusiastic team who have a firm grasp of the nature of science teaching and education in Scotland. The SSERC CPD programme has had an impact on teachers' skills, confidence and motivation to teach science. It has had a similar impact on the skills and motivation of PGDE students and technical support staff. Moreover, the evidence also suggests that the majority of SSERC CPD participants have adapted their practice in light of their CPD experience. It is also clear that SSERC CPD has reached beyond those who have participated in its CPD. Large numbers of participants indicated disseminating the messages, lessons and materials from their CPD to colleagues in their school and in some cases to colleagues in other schools. These findings are consistent over the duration of the programme.

The evaluation has identified a number of recommendations and issues for consideration concerning the future development of SSERC's CPD for teachers and technicians. These relate to curriculum development and developing policies for teacher education and professional learning and development.

Investing in quality CPD for science teachers and technicians

- Faced with a wealth of evidence indicating the value of SSERC CPD, its ability to meet the needs of those teaching and supporting science education in Scotland and the evidence suggesting a sustained impact on classroom practice we would strongly recommend continued investment in similar SSERC CPD programmes. This view is shared by The Royal

Society in their recommendation number 5 (Royal Society 2011 P61) and the Donaldson Report emphasises the value of SSERC (Donaldson 2011 pp74).

- Indeed, a common theme arising from CPD participants and many of the strategic key informants was that the drive from Government on the need for promoting science and for creating a scientifically literate society should be reflected in funding for measures that support effective science education. Science education is about strategic planning for the nation. Professional science CPD needs to be strategic, teachers should expect a programme that supports and invests in them throughout their career.
- An expansion of SSERC would be a cost-effective way to support this drive. This should include continued and increased funding for SSERC to expand appropriate staffing and resources to work with partners to plan and implement three or five year programmes of national CPD.

Creatively addressing the demand for SSERC CPD

The above comments have to be set in the context of the continued financial austerity faced by Local Authorities. The research has also shown that there is a great demand for SSERC CPD and support and that teachers see the content and quality of other local and national sources of CPD as less able to meet their needs. The funding provided for the SSERC CPD programme has built up teacher and technicians' expectations. The question is how to continue this?

- Given the current capacity of SSERC, it is difficult to see how it can meet the demand for science education CPD. It is important, therefore, that SSERC, its partner agencies, Local Authorities, other associated bodies and government explore ways to enhance these partnerships and develop their provision and services to address the demand in a way that allows the quality and impact of the work to be maintained.
- SSERC already has an extensive network of active partners that advise on and help design and deliver their CPD programmes, including Scottish Technicians Advisory Group (STAG) and Technician Training Partnerships. The association with STAG has seen the successful provision

of SQA rated courses for technicians. Over the period 2010-2011, SSERC has also been working with members of the Scottish Science Advisory Group (SSAG) with a view to exploring how Local Authorities might best capitalise on the professional development provided through SSERC and its partners.

- Participant and key stakeholders' comments suggested that SSERC take on a national co-ordination and leadership role regarding CPD delivery. This might be achieved through working in partnership with universities, FE colleges, Local Authorities, professional bodies and industry to design and quality assure CPD that is delivered across Scotland by SSERC trained/approved providers.
- While providers such as universities and colleges might provide outreach CPD to local schools, stakeholders stress that there are issues of ensuring relevance of content to address school's needs, co-ordination across departments/faculties etc. within universities to develop and deliver quality CPD and sustaining periodic delivery.
- Some stakeholders suggested focusing CPD developments on school clusters with SSERC trained local teachers and technicians acting as CPD 'champions' to help co-ordinate and promote CPD. Indeed, a number of Local Authority Training Partnerships have already been established for technician training. Working within school clusters with principal teachers in science and involving technicians, SSERC could build capacity at learning community level. SSERC could also provide quality assurance and moderation and encourage cross-sector working. The emerging teacher learning communities could act as a scaffold for such developments. This will also develop leadership and ownership and empower teachers to take forward their CPD with support from SSERC.
- An important caveat for SSERC developing as a facilitator among other CPD 'agents' and providers concerns the fact that although SSERC has been involved in 'training the trainer' initiatives before, it values never being more than one step removed from the training. This is regarded by SSERC and some other strategic stakeholders as an important factor in maintaining the quality of the CPD programmes that the organisation is involved with.

- There is also recognition that support from Local Authority and school managers to facilitate access to science CPD is crucial to any development seeking to promote CPD for teachers and technicians. As a Local Authority shared service SSERC is well-placed to move this agenda forwards.

CPD approaches and formats needed to meet science teachers and technicians' needs

The evaluation has suggested that face-to-face experiential CPD, particularly the residential two-day and two-part approaches can impact strongly on teacher and technicians' practice. Looking to the future, these and other formats appear necessary to meet the needs of practitioners. Again, SSERC and partner organisations need to maintain their on-going development of programmes and explore what mix of CPD approaches are required and, importantly, are feasible. This could involve a repertoire of CPD models and content including:

- A continuation of:
 - the very successful experiential, face-to-face, two-part residential courses that include an action learning component. This allows participants to try new ideas and reflect with peers and CPD leaders. This type of CPD is often regarded as relatively expensive but its cost needs to be set against its potential for improving the science education experiences of pupils in Scottish schools.
 - School-based CPD delivery by SSERC personnel to whole departments and cross-curriculum groups has shown distinct benefits for staff and offers another potential approach in SSERC's repertoire.
 - Non-residential half or whole day focused events that enable staff to address key topics and skills require only limited teacher cover and represent a reduced cost approach for schools.
- Development of on-line and electronic CPD provision to supplement, but not replace face-to-face CPD, supported by SSERC staff via phone and email. SSERC is already piloting an initiative along these lines.

The focus and content of science education CPD to address the needs of teachers and technicians

Teachers and technicians have highlighted a particular need for CPD content that focuses on particular topics in order to meet the challenges of providing effective science education within the context of Curriculum for Excellence.

- Teachers' responses to the survey highlighted the need for on-going CPD that would continue to help them implement CfE (particularly practical approaches), the new national qualifications including delivering Advanced Higher Science courses and to meet the challenge of changes in assessment for some courses.
- There is a need for further development of CPD courses that seek to promote leadership across all levels of staff and not just promoted staff. The SSERC leadership courses were highly valued by participants who reported a sustained impact on their ability to manage and lead. Given that the Donaldson Report highlights the need to build leadership capacity across the teacher population.

Much of the CPD which has been offered in recent years has been generic in nature. Despite strong evidence about specific needs for deeper subject understanding and a desire for reinvigoration of subject expertise, subject-specific and sector-specific provision has been much less prominent. The strong uptake of high quality training given by bodies such as SSERC in science or SCILT in modern languages is indicative of a wider need. Immediate priorities might be the teaching of modern languages in primary schools, science, aspects of mathematics and Gaelic.

(Donaldson 2011 Recommendation 41. pp99)

Many of the successful elements of the SSERC leadership courses could be tailored to benefit a wider teacher audience.

- There is a need to support those science teachers who have to teach a science subject that they are not trained to teach.

- Technicians have identified a wide range of CPD requirements, including subject-specific courses, as well as those which focused on technology, ICT and health and safety.
- Technicians also want more access across Scotland to CPD as well as CPD that promotes communication between teachers and technicians in order to provide more effective, systematic science education in schools.
- Primary school teachers have particular CPD needs particularly that focus on building confidence to cover 'an enormous science curriculum' and understand the science concepts behind the experiences and outcomes.
- PGDE students most commonly highlighted the need for periodic support to implement CfE, to build their confidence to do this, and to provide guidance on relevant resources. PGDE students identified specific themes for CPD as: delivering Higher and Advanced Higher courses, effective teaching methods and practical approaches that engaged with pupils.

Providing accreditation for science CPD

- SSERC should continue to explore ways to increase the range of accredited CPD it offers from its suite of courses. This is particularly relevant to those courses that include an action learning and action research component. These courses, including those with a focus on leadership, have shown that participants reflecting on their practice, with input from peers, improve their classroom practice and are also likely to have an impact across their schools.

Such accreditation would help practitioners to evidence their professional learning and development over the course of their career and promote systematic development of their skills. Partnership with other providers such as universities working with learning communities might offer opportunities to enhance the delivery and scope of CPD available.

The need for research on the longer-term impact of science education CPD

- Understanding what works in terms of improving engagement and attainment in science education is important given that international studies such as PISA [8] (OECD 2010) reveal that the UK is ranked 11th across other OECD countries in terms of pupil attainment on science.
- There is clear evidence of the positive impact of SSERC CPD on teachers' practice, their confidence to deliver science education and provide examples of greater pupil engagement. However, a longitudinal study of the impact of SSERC CPD on pupils could begin to examine the potential for such CPD to, for example, increase the number of pupils taking science at secondary level, improve science attainment and increase ultimately the numbers of Scottish students going onto STEM programmes in higher education. Such a study may initially appear costly however the potential implications of such research may well prove to be monies well spent if it contributes to renewed interest and investment in science.

[8] OECD (2010) PISA 2009 Results: Executive Summary What Students Know and Can Do: Student Performance in Reading, Mathematics and Science. <http://www.pisa.oecd.org/dataoecd/54/12/46643496.pdf>

NOTE

This Questionnaire is Based on 125 responses. Due to the effects of rounding percentage totals may not always add exactly to 100.

SECTION 1 - ABOUT YOU**1) Are you ...? (N=125)**

Male 26% Female 74%

2) Age group ...? (N=125)

21-25 4%	26-30 13%	31-35 18%	36-40 14%
41-45 14%	46-50 16%	51-55 13%	56-60 8%

3) Do you work ...? (N=125)

Full-time 90% Part-time 10%

4) Is your school ...? Please tick all that apply. (N=125)

Pre-school	-	Primary	30%	Secondary	66%
Independent	2%	FE College	-	Special	1%

5) What is your role within the school? (N=123) Are you:

Headteacher	2%	DHT/AHT	4%	Faculty head	10%
Principal teacher	18%	Class teacher	65%	Other	2%

6) What specialist science subject do you teach? (N=124)

Biology	20%
Chemistry	23%
Physics	19%
Not a specialist science teacher	30%
Teach more than 1 subject	8%

7) For how many years have you been a teacher? (N=125)

I am a probationer	1%
I am fully qualified and have been teaching for up to 5 years	25%
I have been teaching for between 6 to 15 years	38%
I have been teaching for 16 or more years	37%

SECTION 2 - INVOLVEMENT IN AND EVALUATION OF SSERC SPONSORED CPD

- 8) Please indicate from the following list of CPD events those that you have taken part in and the number of times you have attended such training since August 2005? Tick all that apply.

Format of CPD	Attended	No. of events
PGDE residential / Scottish Universities Science School (SUSS) (N=19)	19	(17 x1) and (2X2)
PGDE workshop other than residential / SUSS (N=2)	2	(1x1) and (1x2)
Summer school (residential) (N=19)	19	(16x1) and (3x2)
Two part residential (with gap task) (N=101)	101	(95x1) and (6x2)
Single day workshops (other than as part of a PGDE course) (N=33)	33	(19x1), (6x2) and (8x3+)
Leadership courses (for curricular leaders/heads of faculty) (N=21)	21	(13x1), (5x2) and (3x3+)
Other SSERC sponsored CPD (since August 2005) (N=22) <i>Please specify below</i>	22	(18x1), (2x2) and (2x3+)

9) Please indicate the extent to which each of the factors below influenced your decision to take part in SSERC sponsored CPD? Tick one box on each line.

Reasons for undertaking SSERC CPD	Big influence	Some influence	Little influence	No influence	Not applicable
Reputation of SSERC CPD (N=121)	60%	28%	7%	5%	-
Encouraged by my line manager/local authority (N=108)	25%	34%	16%	25%	-
Encouraged by my colleagues (N=114)	18%	34%	12%	36%	-
To develop my knowledge of science in general (N=120)	61%	28%	8%	3%	-
To develop my knowledge of a specific science subject (N=112)	50%	26%	16%	8%	-
To improve my teaching skills (N=117)	73%	24%	2%	2%	-
To increase my understanding of Curriculum for Excellence (N=119)	63%	23%	9%	3%	3%
To help implement Curriculum for Excellence (N=118)	69%	25%	3%	1%	3%
To network with colleagues (N=117)	28%	50%	18%	4%	-
To improve my leadership skills (N=110)	28%	18%	23%	31%	-
To improve my career prospects (N=113)	21%	18%	25%	36%	-
General interest (N=118)	42%	46%	4%	9%	-
Taking advantage of an opportunity (N=117)	41%	46%	7%	6%	-
Other reason Please specify below (N=10)	6	-	-	4	-

e.g. as part of a PGDE programme

10) Thinking back to your involvement with SSERC CPD, please indicate the extent to which you agree with the following statements. Tick one box on each line.

The CPD event(s) which I attended ...	Completely agree	Mostly agree	Mostly disagree	Completely disagree	Not applicable
Was conducted in a professional manner (N=125)	99%	1%	-	-	-
Comprised presentations of a high standard (N=125)	90%	10%	-	-	-
Gave access to quality support materials (N=125)	95%	4%	1%	-	-
Encouraged networking with other delegates (N=125)	88%	10%	2%	1%	-
Increased my knowledge of my science area (N=123)	64%	25%	2%	1%	8%
Increased my knowledge of other science areas (N=120)	56%	26%	4%	1%	13%
Was relevant to my science teaching (N=125)	89%	10%	1%	-	-
Increased my understanding of <i>Curriculum for Excellence</i> (N=123)	59%	29%	4%	2%	7%
Provided support for my leadership development (N=121)	35%	21%	10%	1%	34%
Provided a number of useful ideas for teaching (N=124)	87%	13%	-	-	-
Encouraged me to try new ideas (N=125)	86%	13%	-	1%	-
Increased my awareness of sources of support for teaching science (N=123)	68%	30%	2%	1%	-
Highlighted the importance of science education for pupils (N=123)	61%	29%	5%	-	6%
Left me with a desire to attend similar CPD events (N=124)	80%	20%	-	-	-
Underlined the importance of CPD for my professional development (N=125)	66%	29%	3%	2%	-

11) How would you summarise the overall impact of SSERC CPD on your teaching or professional practice?

103 responses

SECTION 3 – IMPACT OF SSERC SPONSORED CPD

12) Below are a number of statements about the impact of SSERC CPD. Please indicate the extent to which you agree with each statement? Tick one box on each line.

Following involvement in the SSERC CPD ...	Strongly agree	Agree	Disagree	Strongly disagree	No change
My enthusiasm for teaching science has increased (N=124)	52%	41%	2%	-	4%
My confidence for teaching science has increased (N=121)	48%	40%	3%	-	9%
I have introduced new resources/- materials to my teaching (N=125)	73%	27%	-	-	-
I am more able to implement <i>Curriculum for Excellence</i> (N=123)	47%	39%	5%	2%	7%
I have a wider network of colleagues (N=123)	31%	48%	8%	1%	12%
I actively participate in a network of colleagues (N=123)	14%	31%	28%	2%	26%
I have taken a significant role in science developments at departmental level (N=121)	42%	41%	5%	-	12%
I have taken a significant role in science developments at school level (N=121)	39%	37%	12%	-	12%
I have taken a significant role in science developments at local authority level (N=121)	13%	17%	34%	6%	30%
I have made contributions to science developments at a national level (N=120)	12%	12%	32%	15%	30%
I am a better teacher of science (N=123)	37%	55%	2%	1%	5%
I am more positive about my career prospects (N=121)	22%	22%	13%	2%	41%
I have a better relationship with pupils (N=122)	21%	30%	7%	1%	43%
Pupils are more positive about science (N=121)	36%	50%	1%	-	13%
Pupil achievement in science has improved (N=119)	27%	52%	3%	-	18%
I have a better understanding of what SSERC offers (N=123)	60%	37%	-	-	2%

13) Have you introduced or attempted to introduce anything from the SSERC CPD to your teaching or practice? Tick all that apply (N=124).

No, I have made no changes to my practice	2%
Yes, I have introduced or tried new materials/resources	93%
Yes, I have introduced or tried new methods of teaching	63%

- 14) We are particularly interested in what staff have implemented following SSERC CPD. Please give examples of things you have introduced to your practice from the CPD and summarise what you see as its main impact.

118 responses

Are these developments sustainable? Please say why/why not?

*To what extent have these developments impacted on colleagues in your department/school?
Please give detail.*

*To what extent have these developments impacted on colleagues in other schools?
Please give detail.*

NOTE

If you have been on a residential course (excluding leadership courses) which incorporated a gap task please answer questions 15 and 16 otherwise go to Section 4.

15) Was the residential course...? (N=125)

Primary	24%	Chemistry	15%
Science	13%	Physics	9%
Biology	13%	No residential course	22%
More than 1 course	4%		

16) Some SSERC sponsored CPD provides participants with resources/materials to help support developments. Please list the resources you received and how they were subsequently used.

SERC supplied resources and materials (please list in this column)	Not yet used	Not yet used but plan to do so	Used in own class	Used by colleagues from your school	Used in other ways (please indicate below)
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	See Appendix 1b for Q16 findings				
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In what other ways have you used the SSERC materials/resources?

SECTION 4 - LOCALLY DELIVERED SCIENCE CPD

17) Have you taken part in any Science CPD NOT involving SSERC? Tick one box. (N=125)

Yes 48% No 52%

18) Thinking back to your involvement with this locally based Science CPD, please indicate the extent to which you agree with the following statements? Tick one box on each line.

The CPD event(s) which I attended ...	Completely agree	Mostly agree	Mostly disagree	Completely disagree	Not applicable
Was conducted in a professional manner (N=60)	30%	68%	2%	-	-
Comprised presentations of a high standard (N=59)	17%	64%	19%	-	-
Gave access to quality support materials (N=60)	18%	33%	38%	10%	-
Encouraged networking with other delegates (N=60)	18%	53%	22%	7%	-
Increased my knowledge of my science area (N=60)	22%	48%	22%	5%	3%
Increased my knowledge of other science areas (N=60)	12%	42%	27%	5%	15%
Was relevant to my science teaching (N=60)	23%	62%	13%	2%	-
Increased my understanding of a <i>Curriculum for Excellence</i> (N=60)	12%	33%	32%	7%	17%
Provided support for my leadership development (N=60)	7%	13%	25%	5%	50%
Provided a number of useful ideas for teaching (N=60)	17%	57%	23%	3%	-
Encouraged me to try new ideas (N=60)	15%	60%	20%	5%	-
Increased my awareness of sources of support for teaching science (N=60)	12%	45%	37%	7%	-
Highlighted the importance of science education for pupils (N=60)	15%	48%	25%	8%	3%
Left me with a desire to attend similar CPD events (N=59)	12%	44%	31%	14%	-
Underlined the importance of CPD for my professional development (N=59)	15%	58%	19%	8%	-

SECTION 5 - FURTHER CPD

SSERC is looking to the future and wants to ensure that its programmes of professional development continue to meet the needs of science teachers and technicians. To help shape this future programme we are gathering information about the teaching profession's CPD requirements in science.

Please try to think about your professional development needs in Science over the next 3-5 year period in the light of curricular developments including National 4, National 5, Higher and Advanced Higher.

19) Please rate the importance of these to your professional development. Tick one box on each line.

Curriculum area	High priority	Medium priority	Low priority	Not applicable
CfE Early --> Level 2 (N=87)	45%	10%	23%	22%
CfE Levels 3 and 4 (N=103)	55%	23%	13%	9%
National 4 / National 5 (N=106)	71%	7%	4%	19%
Higher / Advanced Higher (N=104)	66%	9%	3%	22%

20) In the context of science where do you see your priorities in terms of the nature of professional development over the next 3-5 years? Tick one box on each line.

Focus of professional development	High priority	Medium priority	Low priority	Not applicable
Subject updating (N=116)	66%	22%	10%	2%
Teaching and learning approaches (N=117)	58%	35%	7%	-
Practical work for classroom use (N=119)	66%	33%	2%	-
Health & Safety (N=115)	18%	57%	24%	1%
Ideas for investigations (N=115)	64%	33%	4%	-
Topical science (N=119)	61%	35%	5%	-
Support for Case Studies / Researching Units (Higher) (N=111)	60%	13%	6%	22%

Please use this space to indicate any other professional development priorities

13 responses

21) We are keen to explore how useful you would find different modes of professional development. For the purposes of this question we identify a number of different types of CPD including:

- *Face-to-face*: This would involve attendance at an event where the CPD provider is present and where you work collaboratively with other colleagues (this could be on or off site).
- *Experiential*: This would include practical hands-on activities which involve participants.
- *Distance Learning*: This could include independent study, study at a remote location involving dialogue with a provider which might be interactive e.g. through video conferencing, Glow Meets etc.
- *eLearning*: This might include professional development activities delivered through a variety of ICT platforms including web-based learning, Glow etc.

Please indicate your preference for each of the different modes of delivery.

Tick one box on each line.

Mode of professional development	High preference	Medium preference	Low preference
Face-to-face (N=121)	92%	8%	-
Experiential (N=122)	89%	10%	1%
Distance learning (N=117)	5%	30%	65%
eLearning (N=120)	6%	35%	59%
Twilight (N=118)	16%	52%	32%
Weekday (N=120)	48%	40%	12%
Saturday / Sunday (N=120)	16%	54%	30%
Short residential (N=118)	59%	41%	1%
Short residential with follow-up (N=121)	65%	32%	3%
Extended residential (>3 day) (N=119)	23%	38%	40%

22) How feasible would it be for you to attend/make use of the various modes of professional development identified in Question 21? Tick one box on each line.

Mode of professional development	High feasibility	Medium feasibility	Low feasibility
Face-to-face (N=120)	69%	30%	1%
Experiential (N=119)	66%	33%	2%
Distance learning (N=119)	50%	35%	16%
eLearning (N=119)	53%	29%	19%
Twilight (N=117)	43%	32%	26%
Weekday (N=119)	36%	41%	23%
Saturday / Sunday (N=120)	38%	43%	20%
Short residential (N=119)	45%	49%	6%
Short residential with follow-up (N=121)	45%	46%	10%
Extended residential (>3 day) (N=118)	24%	25%	52%

23) What specific barriers do you experience which will reduce access to professional development opportunities?

107 responses

SECTION 6 - FINAL COMMENTS

24) Use this space to make any other relevant comments.

73 responses

Appendix 1b - Teachers' use of SSERC CPD resources

6

2010 TEACHER SURVEY - Q16 SSERC RESOURCES RECEIVED AND SUBSEQUENT USE

Table 1 - Detail of resource use for Biology

Curricular area/topic	In what ways have resources been used?						
Biology	Used in more than one way	Used by school colleagues	Used in own class	Used in other way	Not yet used (plan to do so)	Not yet used	Total
DNA / inheritance	8	4	5	1	2	1	21
Photosynthesis	8	2	1	1	3	1	16
Microbiology / biotechnology	2	1	1	-	1	-	5
Bacterial transformation	-	-	1	-	2	-	3
Investigation starters	2	-	-	1	-	-	3
Biodiversity	-	-	1	-	1	-	2
Total	20	7	9	3	9	2	50

Table 2 - Detail of resource use for Chemistry

Curricular area/topic	In what ways have resources been used?						
Chemistry	Used in more than one way	Used by school colleagues	Used in own class	Used in other way	Not yet used (plan to do so)	Not yet used	Total
Alternative energies / technologies	16	4	7	1	1	1	30
Apparatus / equipment	4	1	3	-	2	-	10
Toiletries chemistry	2	1	3	1	2	-	9
Electrolyte chemistry	3	1	1	-	2	-	7
Reaction rates	3	-	-	-	-	-	3
Forensic	-	1	-	-	2	-	3
pH	2	-	-	-	-	-	2
Total	30	8	14	2	9	1	64

Table 3 - Detail of resource use for Physics

Curricular area/topic	In what ways have resources been used?						Total
	Used in more than one way	Used by school colleagues	Used in own class	Used in other way	Not yet used (plan to do so)	Not yet used	
Physics							
Smart / novel materials	2	-	4	-	2	2	10
It shouldn't happen to a webcam	-	-	2	-	3	-	5
Optoelectronics	5	-	-	-	-	-	5
Seismology	2	-	-	-	-	-	2
Gas Laws	1	-	-	-	-	-	1
Non-ionising radiation	1	-	-	-	-	-	1
Motion analysis	-	-	1	-	-	-	1
Total	11	-	7	-	5	2	25

Table 4 - Detail of resource use for Primary

Curricular area/topic	In what ways have resources been used?						Total
	Used in more than one way	Used by school colleagues	Used in own class	Used in other way	Not yet used (plan to do so)	Not yet used	
Primary							
Formative assessment / teaching approaches	14	-	3	-	1	-	18
Observation skills	9	1	7	-	1	-	18
Electricity	3	4	5	-	-	-	12
Heat transfer	3	-	8	1	-	-	12
Plant biology	3	-	6	-	1	-	10
Geology	1	1	-	-	-	-	2
Inheritance	-	-	-	-	1	-	1
Total	33	6	29	1	4	-	73

Table 5 - Detail of resource use General

Curricular area/topic	In what ways have resources been used?						Total
	Used in more than one way	Used by school colleagues	Used in own class	Used in other way	Not yet used (plan to do so)	Not yet used	
Photography / video editing	28	5	18	-	3	-	54
Electronic / paper resources	14	3	10	-	1	-	28
UV radiation	10	1	3	-	4	-	18
Discussion activities/formative assessment	8	2	6	-	1	-	17
Various	1	-	-	-	-	1	2
Total	61	11	37	-	9	1	119

NOTE

This Questionnaire is Based on 80 responses. Due to the effects of rounding percentage totals may not always add exactly to 100.

SECTION 1 - ABOUT YOU**1) Are you ...? (N=80)**

Male 40% Female 60%

2) Age group ...? (N=80)

16-20	1%	21-25	5%	26-30	6%	31-35	14%	36-40	10%
41-45	8%	46-50	25%	51-55	19%	56-60	8%	61-65	5%

3) Do you work ...? (N=80)

Full-time 74% Part-time/jobshare 18% Term time 9%

4) Is your school? Please tick all that apply. (N=80)

Pre-school	-	Primary	-	Secondary	89%
Independent	-	FE College	1%	Special	-
Other (please state) _____ 10% _____					

5) What is your job title? (N=80)

Assistant technician 2% Technician 68% Senior technician 18%

Other (please state) _____ 9% _____

6) Does your role involve ? Tick all that apply. (N=79)

Support for science in the school	80%
Support for science in other schools	13%
Support for IT/ICT in the school	27%
Support for IT/ICT in other schools	3%
Support for other subjects in the school	Please specify _____ 51% _____
Support for other subjects in other schools	Please specify _____ 5% _____

7) For how many years have you been a school technician? (N=77)

I have been a school technician for up to 5 years	49%
I have been a school technician for between 6 to 15 years	26%
I have been a school technician for 16 or more years	25%

SECTION 2 - INVOLVEMENT IN AND EVALUATION OF SSERC SPONSORED CPD

- 8) Please indicate from the following list of CPD events those that you have taken part in since 2005? Tick all that apply. (N=80)

CPD	Attended
Technician Consultative conference 2005	11%
Technician Consultative Conference 2006	11%
Technician Conference 2008	11%
Technician Conference 2009	13%
Microbiology for Schools	44%
Safe use of fixed workshop machinery	34%
Electrical safety and portable appliance testing	25%
Managing health and safety for senior technicians	4%
Introductory chemistry	13%
Chemical handling	20%
Introductory physics	34%
Video Editing	6%
Other SSERC sponsored CPD (since 2005): <i>Please specify below</i>	28%

9) Please indicate the extent to which each of the factors below influenced your decision to take part in SSERC sponsored CPD? Tick one box on each line.

Reasons for undertaking SSERC CPD	Big influence	Some influence	Little influence	No influence
Reputation of SSERC CPD (N=73)	45%	37%	10%	8%
Encouraged by my line manager/local authority (N=75)	49%	27%	9%	15%
Encouraged by my colleagues (N=71)	11%	35%	30%	24%
To develop my knowledge of science in general (N=73)	58%	30%	8%	4%
To develop my knowledge of a specific science and/or technology area (N=74)	73%	19%	5%	3%
To improve my technical skills (N=74)	72%	20%	5%	2%
To network with colleagues (N=69)	10%	42%	30%	17%
To increase my qualifications (N=73)	30%	38%	18%	14%
To improve my career prospects (N=74)	28%	24%	26%	22%
General interest (N=71)	34%	54%	7%	6%
Taking advantage of an opportunity (N=72)	42%	40%	11%	7%
Other reason: (N=7)	6	-	-	1

10) Thinking back to your involvement with SSERC CPD, please indicate the extent to which you agree with the following statements? Tick one box on each line.

The CPD event(s) which I attended ...	Completely agree	Mostly agree	Mostly disagree	Completely disagree	Not applicable
Was conducted in a professional manner (N=80)	85%	13%	3%	-	-
Comprised presentations of a high standard (N=80)	74%	23%	3%	1%	-
Gave access to quality support materials (N=80)	56%	40%	3%	1%	-
Encouraged networking with other delegates (N=80)	39%	51%	8%	3%	-
Increased my knowledge of my science and/or technology area (N=80)	61%	33%	5%	1%	-
Increased my knowledge of other science and/or technology areas (N=79)	49%	25%	23%	3%	-
Was relevant to my job	80%	18%	3%	-	-
Helped me support implementation of <i>Curriculum for Excellence</i> (N=80)	13%	29%	16%	4%	39%
Provided a number of useful ideas (N=80)	41%	44%	15%	-	-
Encouraged me to try new ideas (N=80)	39%	43%	14%	5%	-
Increased my awareness of sources of support for my job (N=79)	44%	42%	11%	3%	-
Increased my ability to support science and/or technology education for pupils (N=80)	49%	39%	9%	4%	-
Left me with a desire to attend similar CPD events (N=80)	56%	34%	10%	-	-
Underlined the importance of CPD for my professional development (N=80)	55%	35%	9%	1%	-

11) How would you summarise your overall experience of SSERC sponsored CPD?

71 responses

SECTION 3 - IMPACT OF SSERC SPONSORED CPD ON YOU

12) Below are a number of statements about the impact of SSERC CPD. Please indicate the extent to which you agree with each statement? Tick one box on each line.

Following involvement in the SSERC CPD ...	Strongly agree	Agree	Disagree	Strongly disagree	No change	Not applicable
My enthusiasm for my job has increased (N=80)	23%	51%	10%	1%	15%	-
My confidence in my working abilities has increased (N=80)	38%	54%	5%	-	4%	-
I have introduced new science and/or technology activities to my school (N=80)	6%	40%	13%	1%	25%	15%
I have a better understanding of what is needed to support implementation of Curriculum for Excellence (N=80)	1%	29%	14%	3%	8%	46%
I have a wider network of colleagues (N=80)	10%	53%	8%	1%	26%	3%
I actively participate in a network of colleagues (N=80)	6%	26%	31%	4%	30%	3%
I have taken a significant role in science and/or technology developments at departmental level (N=78)	10%	26%	18%	5%	26%	15%
I have more contact with technicians in other schools (N=80)	3%	39%	21%	3%	31%	4%
I am a more competent technician (N=80)	35%	54%	1%	3%	6%	1%
I have a better understanding of how to support science and/or technology teaching (N=80)	19%	45%	9%	-	24%	4%
I am more positive about my career prospects (N=80)	15%	33%	19%	5%	26%	3%
I have a better relationship with pupils (N=80)	5%	18%	11%	-	39%	28%
Pupils are more positive about science (N=79)	3%	14%	10%	1%	20%	52%
I have a better understanding of what SSERC offers (N=80)	23%	65%	6%	-	6%	-

13) Have you introduced or attempted to introduce anything from the SSERC CPD to your work?

Tick all that apply. (N=78)

No, I have made no changes in my work. 47%

Yes, I have made or attempted to make some changes in my work. 53%

14) We are particularly interested in what staff have implemented following SSERC CPD.

Please give examples of anything you have introduced/used from the CPD and summarise what you see as its main impact.

Examples of anything you have introduced as a result of the SSERC CPD:

41 responses

Are the changes you have made sustainable? Please say why/why not?

To what extent have these changes had an impact on teachers and technicians in your department/school? Please give detail:

SECTION 4 - FURTHER CPD

We are keen to explore how useful you would find different modes of professional development. For the purposes of this question we identify a number of different types of CPD including:

- *Face-to-face*: This would involve attendance at an event where the CPD provider is present and where you work collaboratively with other colleagues (this could be on or off site).
- *Experiential*: This would include practical hands-on activities which involve participants.
- *Distance Learning*: This could include independent study, study at a remote location involving dialogue with a provider which might be interactive e.g. through video conferencing, Glow Meets etc.
- *eLearning*: This might include professional development activities delivered through a variety of ICT platforms including web-based learning, Glow etc.

15) Please indicate your preference for each of the different modes of delivery.

Tick one box on each line.

Mode of professional development	High preference	Medium preference	Low preference
Face-to-face (N=78)	83%	17%	-
Experiential (N=77)	90%	10%	-
Distance learning (N=78)	9%	46%	45%
eLearning (N=78)	15%	49%	36%
Twilight (N=77)	4%	26%	70%
Weekday (N=78)	83%	13%	4%
Saturday / Sunday (N=77)	1%	12%	87%
Short residential (N=78)	31%	49%	21%
Short residential with follow-up (N=78)	27%	49%	24%
Extended residential (>3 day) (N=78)	15%	28%	56%

16) How feasible would it be for you to attend/make use of the various modes of professional development identified in Question 15? Tick one box on each line.

Mode of professional development	High feasibility	Medium feasibility	Low feasibility
Face-to-face (N=76)	74%	24%	3%
Experiential (N=76)	74%	20%	7%
Distance learning (N=76)	40%	41%	20%
eLearning (N=76)	49%	38%	13%
Twilight (N=73)	10%	29%	62%
Weekday (N=74)	66%	28%	5%
Saturday / Sunday (N=76)	8%	16%	76%
Short residential (N=77)	34%	48%	18%
Short residential with follow-up (N=77)	29%	51%	21%
Extended residential (>3 day) (N=77)	17%	31%	52%

17) What specific barriers do you experience which will reduce access to professional development opportunities?

61 responses

SECTION 5 - FINAL COMMENTS

18) Use this space to make any other relevant comments.

33 responses



School of Education, University of Glasgow, 11 Eldon Street, Glasgow G3 6NH

Publisher: **SSERC** (Scottish Schools Education Research Centre), 2 Pitreavie Court, South Pitreavie Business Park, Dunfermline KY11 8UB
Telephone 01383 626 070, fax 01383 842 793, e-mail sts@sserc.org.uk.

SSERC is a Company Limited by Guarantee (Scottish Company No. SC131509) and a registered educational charity (Scottish Charity No. SCO17884) Registered Office – 5th Floor, Quartermile Two, 2 Lister Square, Edinburgh EH3 9GL.

© **University of Glasgow SCRE Centre and SSERC 2011**, ISBN 978-0-9531776-5-3. Report written by Kevin Lowden, Stuart Hall, Prof Vic Lally and Dr Rebecca Mancy SCRE Centre at the University of Glasgow, www.gla.ac.uk/faculties/education/
The right of Kevin Lowden, Stuart Hall, Prof Vic Lally and Dr Rebecca Mancy to be identified as authors of this work has been identified in accordance with the Copyright, Designs and Patents Act 1988.

The authors gratefully acknowledge the cooperation and information received from all involved in the research.