

**Review of the Contribution of the Scottish Science Centres
Network to Formal and Informal Science Education**

Report of Follow-Through Visits by HM Inspectorate of Education - June 2009

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1. Background to the review and follow-through visits

1.1 In 2006, the Scottish Executive's Enterprise, Transport and Lifelong Learning Department (SEETLLD) asked HM Inspectorate of Education (HMIE) to carry out a review of the four Scottish science centres - Glasgow Science Centre (GSC), Our Dynamic Earth (ODE) in Edinburgh, Satrosphere Science Centre in Aberdeen, and Sensation Science Centre in Dundee. HMIE carried out the review between September and November 2006 and published a report of their findings in June 2007. The report identified the strengths, weaknesses and areas for improvement at each centre. It also made a number of more generic recommendations for the Scottish Science Centres Network (SSCN) and the Scottish Executive, now the Scottish Government (SG).

1.2 Each science centre was asked to prepare an action plan indicating how it would address the main areas for improvement identified in the report and to share their plans with HMIE and the Scottish Executive's Office of the Chief Scientific Adviser for Scotland (OCSA), which took over funding of the science centres from SEETLLD in August 2006. The SSCN was similarly asked to prepare and submit an action plan indicating how the centres would address the main recommendations identified in the report. HM Inspectors visited each centre, and met with the SSCN, on two occasions in 2008 to gauge the progress being made with their action plans.

1.3 In June 2009, HM Inspectors carried out follow-through visits to the four centres and also met with the SSCN and representatives of OCSA. During the visits to the science centres, HMIE included a peer reviewer from another science centre on each of the teams. The review team talked with key stakeholders and members of centre staff, including chief executive officers (CEOs) and education managers, examined relevant documentation and centre websites and, where appropriate, observed interaction between staff and visitors.

1.4 This report summarises the findings of the HMIE follow-through visits and notes under each recommendation the nature and extent of improvement which had been achieved.

2. Glasgow Science Centre

Develop a suitable range of resources which can be downloaded from the centre website and which can be used to prepare groups for visits to the centre and to carry out associated follow-up work on return to their school.

Staff at the centre, working with a number of other individuals and groups, had produced a wide range of high quality and innovative online resources, designed to serve a variety of purposes. Some allowed teachers to prepare their classes for visits to GSC; some could be used during a visit to reinforce or extend learning; and some could be used to consolidate and enrich children and young people's learning on return to their schools. Resources, including games, experiments and supporting worksheets were grouped under topic headings and made helpful reference to the new *Curriculum for Excellence* experiences and outcomes in science and other curriculum areas. Many of the resources, which could be readily accessed by

children and young people, were interactive, engaging and enjoyable to use, thus presenting science in a non-threatening manner. Staff continued to work with Learning and Teaching Scotland to develop effective links between the centre's website and Glow, the national intranet for education designed to build capacity across schools, colleges and other educational providers in support of *Curriculum for Excellence*.

Continue to develop and extend the already successful continuous professional development (CPD) programme for pre-school, primary and secondary teachers (including those in training) to take account of how best to develop the *Curriculum for Excellence* principles and purposes in the context of the emerging science curriculum.

In addition to the ongoing CPD for pre-school, primary and secondary teachers, centre staff working with other partners had used additional funding provided by the SG to run three residential courses for around 70 primary teachers from a range of education authorities. These courses which focused on aspects of physical science were designed to inspire and challenge teachers through a combination of presentations and discussion, hands-on experience of science equipment and resources, and outreach support while working with children in their own schools. The courses had proved successful in a range of ways, including improving teachers' planning of science lessons, raising their confidence and competence to discuss concepts with children and colleagues, and increasing their awareness of what children were capable of achieving in science. Participating teachers also felt better prepared to implement *Curriculum for Excellence*, largely because of their improved confidence and understanding. Centre staff had also contributed to a wide range of CPD events, some taking place within the science centre and others at a number of venues across Scotland. In addition, the centre had provided work placement opportunities for significant numbers of primary teachers which had contributed greatly to their professional development.

Identify client groups who do not currently visit the centre and find ways of engaging them.

Using data collected from visitor and non-visitor surveys, staff had worked hard both to identify client groups which did not visit the centre and to seek innovative ways of engaging with them. A number of successful initiatives had been introduced, including the 'Little Explorers' programme for pre-school children and sleepovers in the centre for uniformed and family groups. The transport subsidy provided by the SG had proved beneficial in attracting substantial numbers of school pupils and community groups from more socially, economically and geographically disadvantaged areas to visit the centre. With generous support from a major healthcare company, 'Bodyworks', a new health and wellbeing outreach programme involving live science shows, interactive workshops and exhibits had been made available to audiences of all ages across Scotland. In order to meet the needs of senior school pupils, the centre working in partnership with other agencies had developed interactive high-tech workshops. These allowed the pupils to investigate the production of biofuels and thus develop a better understanding of the economic and social aspects of chemistry. The 'Inside DNA' exhibition, which focused on the relationships between genetics, health and evolution, provided a similar range of

experiences for senior pupils and other adult groups. Other activities designed to attract different interest groups had proved successful in allowing audiences to meet practising scientists and to engage in astronomy.

Further publicise the centre website and its contents.

The centre had increased the profile of its website through improving and enhancing both the content and layout of materials and through incorporating website links on promotional literature and email communications. The appointment of a communications manager had allowed greater scrutiny of promotional activity and had led to the development of a range of initiatives which should improve public awareness of the centre and its website. The website was both well structured and easy to navigate and contained a substantial amount of helpful and interesting information and resources. Those who used the website were encouraged to enrol to receive the eNewsletter which would keep them regularly updated on what was happening at the centre.

Take forward plans to gain a quality standard for science education provision at the centre.

The centre had continued to build on its existing positive culture of evaluation and improvement. Centre staff had been involved in a range of CPD activities, including writing articles and delivering presentations and workshops across the UK and in Europe. This allowed them to exemplify their standards and the measures they used to assure quality. These experiences also helped expose staff to examples of best practice from other centres and organisations which they could then discuss in GSC in order to further improve their programmes and practices. Most significantly, the centre was the first organisation in Scotland to achieve the Learning Outside the Classroom Quality Badge in recognition of the work they did to provide quality, safely-managed educational experiences for young people. This award was part of a UK national scheme designed to recognise centres which provided quality learning experiences outside the classroom and which managed risk effectively.

3. Our Dynamic Earth

Improve the accommodation for educational presentations and workshops.

ODE had sought advice from a range of individuals and groups and had made significant improvements to teaching and learning spaces. In addition to creating a third learning space, they had totally refurbished existing areas to provide a flexible and stimulating environment for visitors with moveable partitions and minimal storage facilities. Sophisticated dimmable and colour changing lighting and integrated sound systems were used to produce an air of anticipation and excitement. Rooms were air conditioned and included electronic whiteboards, data projectors and digital video globes which were used to display a range of global features on a spherical screen. Tables and chairs had been arranged to create maximum space and flexibility thus allowing members of the education team to engage in more interactive forms of learning with their audiences. The centre had also extended educational provision through making better use of the galleries and

events space as additional learning spaces. Staff had collaborated with a number of agencies to develop activities which could be undertaken in the diverse environment around ODE.

Extend formal educational provision through developing effective working relationships with more partners and by better integration of the work of the education team, including outreach, and front-of-house team.

The education team had been expanded and staff were now well qualified to work with visitors of all ages and across most key areas of the science curricula. Staff engaged well with young people and made effective use of the new facilities and available resources to interest and challenge them.

The education manager had worked hard to identify and build productive working relationships with key individuals from a range of organisations, including local authorities, science festivals, universities and the Scottish Schools Equipment Research Centre (SSERC). Improved links with primary and secondary schools had allowed members of the education team to identify schools which they could visit in order to observe best practice in teaching and learning. Staff had established a Teacher Focus Group which met to offer advice about a range of matters including classroom design, website development and future shows and workshops. Schools had been identified where shows could be piloted and pupils had provided helpful feedback about shows they had seen. A number of teachers had benefited from short-term work placements at ODE and had offered useful advice about workshop content as well as creating a range of new resources.

Members of the education team and front-of-house staff now worked better together and the communication role of science gallery staff had been extended to include delivery of enhanced tours and further development of the role of explorer characters in interacting with visitors in the galleries. Front-of-house staff had received training in a range of communication and presentation techniques and education and front-of-house staff had attended joint training events. Better administrative support had been provided at ODE for the outreach officer so that she could devote more time to developing and delivering workshops.

Develop a suitable range of resources which can be downloaded from the centre website and which can be used to prepare groups for visits to the centre and to carry out associated follow up work on return to their school.

The centre now had a good range of appropriate online resources which allowed teachers to better prepare their classes for visits to ODE and which could be used to consolidate and extend children and young people's learning on return to their schools. Such materials were available for the majority of presentations and workshops. They made reference to *Curriculum for Excellence* capacities and outcomes and many provided innovative opportunities for cross-curricular working, involving science and social studies as well as literacy, drama, and art and craft. In addition to pre-and post-visit resources, the website also helpfully included favourite websites and a small bank of images which could be downloaded by teachers for use with their classes. The website also had a section for young people which included regular updates on topical science matters, careers in science and a

science blog with contributions from the science communication team as well as feedback from visitors.

Increase the amount and nature of outreach activities to meet the demand from schools.

A teacher on long-term secondment from East Lothian, and working jointly between ODE and the Scottish Seabird Centre, had significantly extended the numbers of pupils involved in the outreach programme. This included schools from 14 education authorities across Scotland. Working with teachers from a number of schools, she had developed a range of highly experiential and interactive topical workshops for pre-school, primary and early secondary pupils. The workshops related well to *Curriculum for Excellence* outcomes and allowed children and young people to observe and handle specimens, take part in exciting demonstrations and experience high quality audio-visual materials. Children were encouraged to think critically, ask questions and engage in discussion and debate. Working with a range of partners, ODE staff had successfully delivered a pilot project on climate change in a number of primary and secondary schools. As well as raising awareness of the science behind the greenhouse effect, global warming and global cooling, the project had served to involve pupils, teachers, parents, science experts and science communicators in a shared initiative.

Develop and extend CPD provision for primary and secondary teachers, including the provision of joint presentations in collaboration with partners.

Using additional CPD funding provided by the SG, ODE had collaborated with staff from the Scottish Earth Science Education Forum (SESEF) and SSERC to run two two-day residential courses for around 60 primary teachers from a number of education authorities. The courses, which focused on *Curriculum for Excellence* principles and experiences and outcomes, gave teachers opportunities to work in the outdoor environment around ODE in order to gain a better understanding of how glaciation had affected the local landscape. As well as acquiring helpful background knowledge about environmental issues, teachers had practised a range of useful skills which they could pass on to their pupils. Centre staff had also given presentations at a number of CPD events often in collaboration with other providers. In addition, ODE had provided several work placements which allowed teachers to experience a different working environment as well as developing resources and activities which could be used with other pupil and teacher groups. The centre should aim to repeat and extend its CPD provision, particularly for secondary teachers of the sciences and social subjects.

Include *Curriculum for Excellence* principles and purposes more systematically in presentations, CPD and marketing materials.

ODE education and front-of-house staff were familiar with *Curriculum for Excellence* and many had attended a wide range of CPD events about the content and methodology associated with the new curriculum. Some education staff had visited primary schools to observe best practice in learning and teaching at first hand. Presentations, workshops, debates and storytelling events focused on the content of the new curriculum and delivery approaches exemplified the capacities, principles

and purposes of *Curriculum for Excellence*. During workshops, young people were actively engaged in their learning through having opportunities for investigating, group work, discussion and problem solving. Marketing literature, including information on the centre's website, made explicit reference to *Curriculum for Excellence*. Pre- and post-visit materials and other resources included reference to successful learners, confident individuals, responsible citizens and effective contributors as well as relevant experiences and outcomes in different curriculum areas. The CPD events which had been held for primary teachers also focused on the needs of schools in addressing *Curriculum for Excellence*.

Develop effective ways of identifying client groups which don't currently make use of the centre and find ways of including them in the centre provision.

The centre had used a number of approaches to identify client user and non-user groups, including improving and extending their existing database, analysing postcode data and monitoring the use of the centre by community groups. This had proved helpful in targeting marketing materials and in increasing the number of schools visiting ODE, including some which had not visited before. The transport subsidy provided by the SG had also been important in allowing schools in more socially, economically and geographically disadvantaged areas to visit the centre. Staff had also worked hard to improve access for community groups, for example, through awarding community season tickets to disadvantaged youth and senior groups and donating tickets to community groups for fund-raising activities. They had also visited a number of local community groups to ascertain their needs in relation to visits to the centre or by means of suitable outreach.

4. Satrosphere Science Centre

Explore ways of improving external signage and review the partitioning of the exhibition hall.

Satrosphere had taken a number of successful steps to highlight its location in Aberdeen. AA and other road signs, along with a number of billboards, had clearly drawn attention to the centre's exhibitions, particularly for prospective customers entering Aberdeen from the north. The centre had usefully explored possibilities for additional signage on windows. Further options for more prominent and engaging signage on external walls of the building should be considered. It would also be helpful to place advertising boards on the grassed area in front of the centre and to explore the use of additional tables outside the café.

A strong start had been made to improving the layout of the exhibition hall though some partitioning of the 'Walking with Beasts' exhibits and the thematic grouping of other exhibits. The revised layout encouraged users to engage in some exploration and promoted an ethos of interest and expectancy as they progressed through the centre. Centre staff were in the process of exploring imaginative plans for future flexible and portable partitioning of exhibits. There would be value in continuing to find cost-effective ways of doing this.

Extend CPD programmes for teachers to include presentational skills, communication of scientific ideas, promotion of *Curriculum for Excellence* principles and purposes and development of citizenship skills.

The centre had effectively begun to extend CPD programmes for teachers. Satrosphere staff had been involved in presenting successful CPD sessions for primary and secondary teachers from two neighbouring local authorities. In addition to providing effective CPD, these events enabled centre staff to discuss current educational developments and to network with local teachers. With the support of centre staff, Aberdeen University School of Education had organised and run a successful three-day residential course for about 20 primary teachers from a number of education authorities. This used targeted CPD funding provided by the SG. These CPD sessions had been successful in developing primary teachers' skills, enthusiasm and confidence in teaching science. Satrosphere staff had attended a CPD providers' national conference to ensure that the centre's programmes represented current *Curriculum for Excellence* developments. The centre should aim to repeat and extend its CPD provision.

Make use of secondees to revise teacher materials, shows and outreach activities in line with *Curriculum for Excellence*, to give broader application in the primary and secondary sectors.

The new education team, which currently included a secondary biology teacher, had effectively revised the centre's education materials, and introduced new primary and secondary materials, to embody the principles of *Curriculum for Excellence*. This revision had been supported by an educational consultant who worked with the education team to enhance their understanding of learning theories, concept mapping and *Curriculum for Excellence*. In addition, this partnership working had led to the production of a promising new 'Sound' show for primary pupils. The centre should continue to explore the possibility of seconding teachers to further develop provision.

Make further use of the centre to showcase local research and developments in industry and higher education.

Productive links between Satrosphere and Aberdeen University's Public Engagement with Science Coordinator had resulted in a number of very successful events being organised. These gave members of the public insight into current scientific research. These events included the following.

- A Discovery Day held during National Science and Engineering Week when children and families took part in an exciting range of practical science investigations.
- A 'Guess the Image' exhibition which displayed electron microscope images created by cutting edge technology.
- Hosting and contributing to Café Scientifique Aberdeen sessions where members of the public discussed aspects of current research with the scientists involved and with each other.

- A series of lunchtime public lectures during Techfest.

Satrosphere was planning to mount exciting exhibitions on renewable energy and on Great Scottish Minds, as well as presenting further 'Meet the Scientist' events.

Improve teamwork, communication and morale across all staff through further opportunities for them to meet, influence policy, evaluate provision and suggest ideas for improvement.

Satrosphere's new management team, skilfully led and supported by senior staff from Sensation Science Centre, had very effectively improved teamwork, communication and morale among staff. All staff had been involved in setting objectives for the centre and in taking forward improvement. Staff increasingly felt a sense of ownership of the centre's work. They also felt supported and valued, and that their ideas for improvement were welcomed and acted upon. A sense of corporate endeavour had been developed through the following activities.

- The involvement of all staff in morning briefings by the duty manager and end-of-day debriefs where necessary.
- Weekly meetings of the education team to share ideas, plan and review projects, and discuss action needed in the light of comments from feedback forms.
- All education team members taking responsibility as duty managers.
- Involvement of staff in the development of shows, workshops and trails.
- Regular full staff meetings to take views and to discuss progress and any actions required.
- Regular discussions of targets and performance by the whole team and the operations manager.
- Use of a supportive peer review system where staff acted as critical friends for each other.

Prepare a clear statement of aims which embodies the views of staff and partners, and further develop more rigorous and systematic procedures for self-evaluation and continuous improvement.

All members of the Satrosphere team were closely involved in preparing a clear and appropriate set of educational objectives which were embedded in the business plan. The objectives addressed the current challenges faced by the centre whilst suggesting appropriate actions for continuous improvement. The statement of objectives was in constant use as a working document to guide and monitor progress. This operational approach was entirely appropriate in the centre's present situation where it was working hard to address current issues. Steps should now be taken to formulate an over-arching set of strategic aims which clearly indicate Satrosphere's purpose and mission.

A developing culture and ethos of self-evaluation and continuous improvement were clearly evident in the centre's operation. Closer involvement of staff in all aspects of planning and delivery, and ongoing review of aspects of performance at all levels, had led to considerable improvement in the quality of provision. Members of the Satrosphere team worked well together and the recently-introduced appraisal and peer review systems provided staff with support and encouragement as well as challenge. Proformas for schools to provide feedback on shows, visits and outreach sought stakeholders' views on the delivery of skills, knowledge and the *Curriculum for Excellence* capacities. This feedback was carefully analysed and discussed regularly by the team, and necessary adjustments made to the provision.

Review the Board membership to ensure that it is consistent with taking forward the aims and meeting the needs of the next stage in Satrosphere's development.

The Satrosphere Board now has a new Chair and a substantially new membership. The re-formed Board was fully representative of partners with a clear locus in taking the centre forward. Under the forward-looking and innovative leadership of the Chair, members representing local authority officers and councillors, finance, industry and higher education had been proactive in supporting and challenging the centre to develop and extend its provision. Regular Board meetings ensured that budgets and progress with business objectives were kept under continuous review. The Board should continue to work with the Satrosphere management team to ensure that the centre defines its overall purpose and aims, and further develops its capacity for continuous improvement.

5. Dundee Science Centre (Sensation)

Examine ways of extending CPD in pre-school and primary, and providing CPD for secondary, including probationer teachers and those in initial teacher education.

The centre had continued to extend its CPD programme for pre-school and primary teachers. This included a residential CPD programme for about 20 primary teachers, held in conjunction with Aberdeen University School of Education and funded by the Scottish Government. Feedback from teachers, pupils and parents indicated that this event had been very successful. In addition there were clear plans to extend the centre's well-regarded CPD course inputs for Dundee University Bachelor of Education and Postgraduate Diploma in Education students. Sensation was ensuring that it was well placed to deliver high quality CPD through establishing working partnerships with the Association for Science Education, Tayside and Fife Branch, and through senior education staff visiting centres of best practice abroad. This strong foundation for CPD provision should now be repeated and further extended into the secondary sector and for those in initial teacher education.

Increase the range and frequency of outreach programmes in negotiation with stakeholders, focusing on science for citizenship and the use of science to promote *Curriculum for Excellence* principles and purposes.

There had been a substantial increase in the centre's already extensive outreach programme including several new presentations for secondary schools. Outreach activities were varied, imaginative and clearly focused on the development of *Curriculum for Excellence* capacities in children and young people. Examples of effective outreach activities included the following.

- A Crazy Creatures' science and literacy project, based on a book, read by all the pupils involved, which led to a range of stimulating science investigations, along with associated creative writing and talking activities.
- Schools undertaking activities which led to energy efficiency certificates obtained in partnership with local industry and the science centre.
- A range of practical science activities presented by Sensation to young people in a local youth drop-in facility run by Dundee City Council's community learning and development staff.
- Outreach sessions delivered through science festivals and other events in local Council areas and beyond.

Examine further ways of using the centre to showcase current research in higher education.

The centre had used several innovative and successful ways of showcasing current research in education and had effectively engaged the public in learning about, and discussing, cutting edge science. An effective partnership with local higher education institutions including Dundee, Abertay and St Andrew's Universities had resulted in staff and research students presenting their work to the public through a range of events such as the following.

- A series of scientist-led presentations and public discussions on topical subjects including epilepsy, brain awareness and aspects of genetics.
- Hosting and contributing to Café Science events on topics such as detecting tooth disease, vaccines, mother and baby play, and community health.
- The Go4SET project which was an Engineering Development Trust initiative to stimulate the interest of young people in Science, Engineering and Technology. Teams of S2 pupils from local schools worked with a local company mentor on a real-life project based on reducing their school's carbon footprint.

Increase stakeholders' awareness of the centre's provision through publicising the website and class materials available on it, and developing appropriate education authority contacts.

Schools and other stakeholders had become increasingly aware of the centre's provision and its materials available for classes through the improved publicity given to the Sensation website. This had been achieved through such measures as the use of email shots which included the website address, optimising related web searches, providing key information about travel funding and educational provision on the website, and ensuring that the website address was prominent on all of the centre's resources and publications.

Sensation had continued to further develop education authority contacts through enhanced Board membership and through a teacher forum whose members acted as ambassadors for the centre. The centre should continue to extend aspects of strategic partnership with education authorities.

Develop a more systematic and rigorous system of quality assurance which focuses on outcomes and impact for stakeholders.

Procedures used by Sensation to evaluate provision had made a strong start to focusing more clearly on the quality of experience and impact on pupils, teachers and members of the public. Examples included the following.

- Teacher feedback forms now highlighted the contribution of the centre's provision to addressing *Curriculum for Excellence* learning experiences and outcomes.
- Teacher forum members trialled new activities in their schools and provided valuable feedback which was used to refine presentations.
- Centre staff undertook supportive but challenging peer review in which they made and welcomed constructive suggestions for improvement. They also identified learning aims and worked with a 'buddy' to achieve these. There would be value in linking this valuable activity with peer review.
- All workshops and shows were rigorously evaluated using clear and appropriate criteria.
- Clear aims which guided quality assurance activities were included in the centre's business plan.

6. The Scottish Science Centres

Since the four science centres opened, education staff had met on a regular basis to share experiences and to learn from each other. Staff from the four centres had continued to meet over the last two years and this had allowed both the network and individual centres to improve their practices in order to better meet the needs of their various client groups. Some of the network responses to the HMIE recommendations are described below although more detail is supplied under

named science centres where specific points for action were more appropriate to their circumstances.

Continue to work together, both as a network and in cooperation with key partner agencies and individuals, to share exhibits, ideas, presentations, opportunities for staff development, and to learn from best practices both in Scotland and in other science centres across the world.

Whilst there had been little networking among the CEOs of each centre, the education teams had been proactively engaged in a range of valuable joint working. They met regularly to discuss matters of common interest and to support each other, and had shared a number of presentations and exhibits. They organised a very successful and well-attended Scottish Science Communicators' Conference, held at Glasgow Science Centre, both to exchange ideas and best practice from across the UK. Centres had benefited from sharing quality assurance procedures and Satrosphere had successfully improved its provision through sustained support from the other centres, especially Sensation. Members of the education teams had used their experience of visits to science centres in Great Britain, Europe and North America to plan how they might further enhance provision in Scotland.

The education teams had continued to extend their working contacts with key partners including local authorities, higher education institutions, SSERC, industry and other science engagement providers including STEMNET Scotland.

In view of the valuable outcomes of the joint working among education teams there would be considerable benefit in their continuing to work closely in supporting each other through sharing resources, expertise and ideas.

Work together and with key local and national agencies, particularly the Scottish Schools' Equipment Resource Centre (SSERC), to deliver high quality CPD to all teachers of science, including probationers and those in initial teacher education. This should allow teachers to keep up to date with developments in their subjects especially those associated with the delivery of *Curriculum for Excellence*, and to develop their skills in communicating science ideas and concepts, and in motivating young people.

The network had established very effective partnership working with SSERC to host and deliver an extensive and highly-regarded range of CPD activities for both primary and secondary teachers, including probationers and those in initial teacher education. These activities had provided teachers with practical advice and resources to deliver *Curriculum for Excellence* in the sciences, and had provided effective opportunities for networking. The additional targeted CPD funding from the SG had allowed each of the science centres, working in collaboration with a range of key partners, to run highly successful residential courses for around 170 primary teachers across education authorities. These operated on different models, both to draw on the expertise and resources available locally but also to meet the needs of teachers in relation to *Curriculum for Excellence*. The reduction in available science subject expertise in centrally based education authority staff, and in many national bodies, has resulted in the role of science centres in supporting primary and secondary teachers and young people being increasingly important.

Improve links with key personnel in local education authorities in order to gain support from, and influence practices across, all schools in that authority.

The network had made progress in improving working links with personnel in education authorities, particularly at the level of science advisers and teachers. There had been several valuable teacher secondments to develop and improve materials. Whilst some working contacts had been made with education authority heads of service, for example through co-option as Board members, there was a need for the network to establish more contacts at this level.

Develop a suitable range of materials for downloading from centre websites to complement the school curriculum, and to prepare pupils for visits to the centres and to carry out associated follow-up work on their return to school.

As indicated under the comments on individual centres, there was a much improved range of accessible website resources for teachers. The network's initial efforts to determine how these materials might be distributed through Glow should continue to be pursued.

Make more extended use of seconded teachers to revise teacher and pupil materials, the content of shows and outreach provision in line with *Curriculum for Excellence*.

As indicated under the comments on individual centres, an increasing range and duration of teacher placements was being sought and used to revise and develop pupil materials. Some centres used work placements organised through Excellence in Education through Business Links (EEBL) not only to provide CPD for teachers but also to prepare resources for teachers in support of *Curriculum for Excellence*. In one centre, a teacher from an education authority had been seconded for two years to develop resources and provide outreach workshops for pupils. She had identified and was working with a number of 'ambassador schools' in particular education authorities which helped to disseminate information to local schools about the workshops. This is a valuable model for other centres to consider. The use of seconded teachers has proved to be a valuable means of sharing expertise and networking with schools and should continue to be developed.

More systematically identify client groups who do not visit the centres and devise ways of attracting them.

With support from the SG, the network commissioned an online survey of primary and secondary schools across Scotland to gain information directly from schools about the accessibility of the experiences offered by Scottish Science Centres. The survey highlighted a number of key issues including the following.

- There was a higher incidence of 'non-visitation' amongst secondary schools than primary schools.
- Primary schools appear to be able to match visits to the centres more closely with their curriculum than secondary schools.

- Three-quarters of the 'non-visitors' were aware of the centres' aims to support the Scottish curriculum.
- The overall experience of outreach visits to schools was rated very positively and higher than visits to a centre. Outreach activities are considered to be easier to organise and less disruptive for the school.
- The main barriers to visiting are physical and financial with transport costs being identified as the major constraint.

The results of this survey, together with other data collected by individual centres, had provided very helpful information about how best to engage with schools. It also reinforced the need to continue to identify ways of meeting the needs of client groups which currently do not make use of the centres' inreach or outreach opportunities. As *Curriculum for Excellence* is progressively adopted by primary and secondary schools, science centres have an important role to play in supporting the needs of children, young people and their teachers. Centres should continue to improve their systems, both individually and collectively, for gathering, analysing and sharing data about schools and communities.

Make more extensive use of centre facilities to showcase local research and developments in higher education and industry.

The individual centres had all made progress with showcasing local research. In addition, the network had established productive links with Edinburgh Beltane Beacon and with the Dundee/Glasgow initiative to deliver a range of innovative science events. The network had also established effective working links with science communication programmes in Europe through visits to science centres and through representation on Ecsite-UK.

7. The Scottish Executive (now the Scottish Government)

Provide a commitment to funding centres over a more extended period so that they can operate in a more financially-secure environment, engage in longer-term budget planning and take account of the need to secure improved continuity of staffing in education teams.

When the HMIE report was published in June 2007, funding for the four science centres was due to end on 31 March 2008. Scottish Ministers subsequently agreed to introduce a new funding package for the science centres for the period from 2008 to 2011, thus confirming a further three years of funding for the centres. This funding, worth £2.56 million for each of those three financial years, was shared among the centres, and included an element of transport subsidy. This extended period of funding had proved helpful to centres, particularly those which required to enhance their education teams and improve staffing structures and career progression. The SG provided two further sources of funding, both of which helped the centres address specific action points in the HMIE report. In 2007-08, the network and individual centres presented successful bids for around £600,000 which was used, for example, to organise the Scottish Science Communicators'

Conference, establish an education database, run visitor surveys, and support team development and stability. The four centres were also given around £250,000 to provide CPD courses for primary teachers in order to help them address the science content of *Curriculum for Excellence*. This successful project was managed by SSERC and allowed around 170 teachers to benefit from extended support and challenge from science centre staff and a range of outside agencies. The SG should continue to provide funding for the centres over a more extended period so that they can build on the improvements they have made.

Provide further subsidies to cover the cost of school visits and transport to the science centres, including additional funding to target pupils from socially, economically or geographically disadvantaged areas.

As part of the funding package mentioned above, the SG had included a transport subsidy of £126,000 per year for each of the three years 2008-2011. This had proved beneficial to all centres in allowing schools and community groups in socially, economically and geographical disadvantaged areas to benefit from opportunities to engage in first hand experiences of doing science. Results from the recent survey commissioned by the science centres reinforced the value of the transport subsidy and highlighted the fact that 'non-visitor' schools identified transport costs as a major constraint on visits to the science centres. It is important that the SG continues to support this initiative.

Use the Scottish Science Centres Network to provide peer evaluation and support for each centre.

Shortly after the HMIE report was published in June 2007, the culmination of a significant number of management and financial difficulties almost led to the closure of Satrosphere. The SG gave additional funding to allow senior managers from Sensation to carry out a review of the viability of Satrosphere and to provide significant operational and strategic support and advice until the centre was on a more secure footing. Working with the new Chair of the Board at Satrosphere, senior and middle managers at Sensation deserve enormous credit for the way in which they resolved staffing, recruitment and induction issues, and improved the culture, ethos, leadership and financial viability of Satrosphere. Without this level of peer support from the network, it is likely that Satrosphere would have been the second Scottish science centre to close.

The SG has supported centres where they wanted to work together and this has, for example, led to some joint bids for project funding. During the Homecoming campaign in 2009, centres were encouraged to collaborate in submitting a joint bid for funding with each centre leading on particular aspects, according to their strengths and capacity to carry out activities on behalf of the others.

In carrying out the follow-through visits associated with this report, HMIE included a peer reviewer from another science centre on each of the teams. As well as providing a professional development opportunity for the peer reviewers, the intention was to help build openness and capacity for quality assurance across the science centre network.

8. What happens next?

HMIE is confident that:

- centres have responded well in addressing the recommendations made in the HMIE report published in June 2007;
- funding provided by the Scottish Government has been used successfully to effect improvements in educational provision in line with the HMIE recommendations;
- centres have played a key role in promoting *Curriculum for Excellence* through their resources, teaching and learning approaches and CPD; and
- staff in all centres have responded positively to a developing culture of self-evaluation and improvement, evident in all aspects of their work.

Where HMI have identified the need for ongoing development work under particular recommendations, individual centres and the network should continue to make progress in taking forward improvements in aspects of their provision.

HMIE will continue to monitor, challenge and support the science centres, individually or collectively, through providing professional evaluation and advice as deemed appropriate by the Scottish Government.

HOW CAN YOU CONTACT US?

If you would like a printed copy of this report

This report has been produced as a web-only publication and is available on our website at www.hmie.gov.uk

This supports the sustainability of natural resources and the Scottish Government's Greener Scotland agenda. Copies of the report can be printed for individual use. Please contact the Business Management and Communications Team (BMCT) if you wish to enquire about our arrangements for translated text or copies of this report in other formats.

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If you wish to comment about this review

Should you wish to comment on any aspect of this review you should write in the first instance to Frank Crawford, HMCI, at HM Inspectorate of Education, Second Floor, Denholm House, Almondvale Business Park, Almondvale Way, Livingston EH54 6GA. A copy of the HMIE Feedback and Complaints Procedure leaflet is available from this office by telephoning 01506 600258 or from our website at www.hmie.gov.uk.

If you are not satisfied with the action we have taken at the end of our complaints procedure, you can raise your complaint with the Scottish Public Services Ombudsman (SPSO). The SPSO is fully independent and has powers to investigate complaints about Government departments and agencies. You should write to SPSO, Freepost EH641, Edinburgh EH3 0BR. You can also telephone 0800 377 7330 (fax 0800 377 7331) or e-mail: ask@spsso.org.uk. More information about the Ombudsman's office can be obtained from the website: www.spsso.org.uk.

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