

# **Dundee Science Centre Science Learning Institute**

An innovative collaboration between  
Dundee Science Centre,  
University of Dundee School of Education, Social Work  
and Community Education,  
and Dundee College

**Report 2010-11**



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## **Executive summary**

Dundee Science Centre Science Learning Institute was established in 2010, and launched by the Cabinet Secretary for Education and Lifelong Learning.

In its first year, this innovative collaboration between Dundee Science Centre, the University of Dundee and Dundee College has facilitated relevant, inspiring and useful learning and professional development experiences for a total of 371 students and professionals including teachers, trainee teachers, research scientists, undergraduates, and further education students.

Continuing professional development courses for teachers have provided support for the profession, closely tailored to embody the values of Curriculum for Excellence. Through joint programming, the wide range of courses was created and delivered by both the science centre team and educationalists and researchers of the University of Dundee School of Education, Social Work and Community Education. Ranging from microbiology to the physics of sound, and including pedagogical support for inquiry-based learning, thinking skills and use of handheld technology, the series of courses has explored methodologies, science topics, cross-curricular learning, and current educational research.

Support for scientists and other professions has included the three-month Create and Inspire science communication experience for research scientists, a short introductory science communication course attended by undergraduate scientists, and a science communication module delivered as part of Dundee College's Access to Forensics and Access to Biomedical Science courses.

Sharing the ethos of the science centre, all courses and experiences have core values of inspiration, enjoyment and challenge, and welcome delegates to the centre as professionals and colleagues.

Evaluation shows significant impact on delegates, with extensive evidence of motivation, enjoyment, confidence and implementation of new practices in the classroom or other workplace. Many delegates express a desire to share their learning with colleagues (and several cite specific examples of doing so), suggesting an impact beyond just those who attend the course. In several cases delegates claim a desire to embark on new projects and learning experiences, including one enrolling on a formal university module, and one even pursuing a change in career.

This report outlines the achievements of the Science Learning Institute in its first year. Significantly, this report is testament to the vision, leadership and commitment of the partners in creating this innovative collaboration for the benefit of learners and professionals across the region.

## Introduction

Dundee Science Centre's Science Learning Institute was established in 2010, shortly after the science centre's tenth anniversary.

Reflecting the maturity of the science centre, the Science Learning Institute formation formally established a centre of collaboration and leadership, to support integrated working for the benefit of science learners across the community.

Following ten years of science centre development and research, the Science Learning Institute concept evolved due to inspiration from the world's best science centres and museums, and in order to meet the needs of the Tayside and Scottish community:

- inspired by experience of the Institute for Inquiry and Teacher Institute at Exploratorium, San Francisco: a museum renowned worldwide as a centre for excellence in science inquiry
- a mission to support Curriculum for Excellence not just through programming for pupils, but through practical support for teachers and trainee teachers
- the Research Excellence Framework for universities, and the need for science communication training for scientists, and facilitated public engagement opportunities
- the need for enhanced 'soft skills' and science communication content in further education and undergraduate courses
- the development of a range of partnerships and programmes based in the science centre, and the evolution of the science centre as a hub for partnership working in science
- a vision of a culture of engagement with science, through the integration of services by education, 'informal' learning, further education, and higher education

The Science Learning Institute was formed through formal partnership between Dundee Science Centre, the University of Dundee School of Education, Social Work and Community Education, and Dundee College, taking the form of shared resources, coordinated programming, and collaborative development.

The partnership of the Institute is reflected in the collaborative nature and ethos of many of the courses and experiences offered, with the majority of courses open to all professions, seeing teachers, students and researchers working together.

## Partners and Supporters

The Science Learning Institute is a collaborative initiative, and its work is made possible through the enthusiasm and commitment of the collaborating partners,

- University of Dundee School of Education, Social Work and Community Education
- Dundee College
- Dundee Science Centre

We are also grateful to supporting funders who have enabled Science Learning Institute courses to take place:

- The Mathew Trust, for supporting continuing learning and training for all
- Dundee City Council, for supporting CPD for Dundee teachers
- Perth and Kinross Council, for supporting CPD for Perth and Kinross teachers

In addition, related projects have been kindly supported by the Outreach and Public Engagement Network North East Scotland, Scottish Government and the Society for Applied Microbiology.



## Programme of Science Learning Institute courses and experiences, 2010-11

### Twilight and half-day courses

*Time for Nano*, 13th November 2010

Delivered by Dundee Science Centre Science Learning Team

*Introduction to Science Communication*, 18th November 2010

Delivered by Dundee Science Centre Science Learning Team

*Healthy Body Bits*, 25th November 2010

Delivered by Dundee Science Centre Science Learning Team

*The Physics of Sound*, 19th January 2011

Delivered by Neil Taylor, University of Dundee

*Curiosity and Creativity: Science, Art and Writing*, 26th January 2011

Delivered by Dundee Science Centre Science Learning Team

*Facilitating Topical Discussions*, 27th January 2011

Delivered by Dundee Science Centre Science Learning Team

*Developing Thinking in Mathematics and Science*, 2nd February 2011

Delivered by Dr Sheila Henderson, University of Dundee

*Science: some of the 'Tricky' Bits*, 16th February 2011

Delivered by Neil Taylor, University of Dundee

*Making best use of Hand-held Communication Devices*, 23rd February 2011

Delivered by Sharon Tonner, University of Dundee

*Fingerprint Identification*, 24th February 2011

Delivered by Dundee Science Centre Science Learning Team

*Classic Kitchen Science*, 5th March 2011

Delivered by Dundee Science Centre Science Learning Team

*Early Explorers Showcase*, 10th March 2011

Delivered by Dundee Science Centre Science Learning Team

*Microbiology for the Primary Classroom*, 22nd March 2011

Delivered by Dundee Science Centre Science Learning Team



*"I attended several of the twilight Science CPD sessions and found them extremely useful. They gave me an overview of a topic that I had limited understanding of, they provided practical ideas for the classroom (many of which we did ourselves, so that we experienced the activities first) and also a range of resources and websites to explore at a later stage.*

*The sessions made me think and question ideas, rather than just provide answers or ready formulated plans. The Science teaching on the PGDE course is very limited, so it has been fantastic to be able to access further CPD from such an informed and specialised source. During my forthcoming years of teaching, I intend to continue to attend the CPD sessions and draw on the wider resources of the centre".*

**PGDE student**

*Biodiversity for Primary Science and Literacy*, 27th April 2011  
Delivered by Dundee Science Centre Science Learning Team

*Interactive Games and Teambuilding*, 28th April 2011  
Delivered by Dundee Science Centre Science Learning Team

*Our Solar System*, 9th May 2011  
Delivered by Dundee Science Centre Science Learning Team

*How to Run a Science Investigation*, 17th May 2011  
Delivered by Dundee Science Centre Science Learning Team

*Curiosity and Creativity: Science, Art and Writing*, 26th May 2011  
Delivered by Dundee Science Centre Science Learning Team

*"The event on a Saturday afternoon was most enjoyable, mixing with colleagues from primary and secondary sectors in a relaxing atmosphere. The presentation was informative and we were all encouraged to investigate the materials and to make mini presentations describing how we might use the material in our classes. It is amazing what a wide range of ideas come from a small group. Best of all - free kit to take back to school!!!"*

**Secondary school teacher**

**A year-long science communication module** as part of the Access to Forensics and Access to Biomedical Science courses at Dundee College  
Jointly delivered by Dundee College and Dundee Science Centre Science Learning Team

**Create and Inspire:** a three-month public engagement professional development experience for research scientists, November 2010 – February 2011  
Delivered by Dundee Science Centre Science Learning Team

**A two-part input into the BEd course**, focusing on how teachers can utilise the science centre as an integrated resource

**Scientists on Tour**, a project which incorporated science communication training for research scientists, outreach visits to secondary schools, and provision of curriculum support materials for teachers

The science centre has also facilitated the following training and professional development experiences:

- two Teacher in Residence placements
- five undergraduate science communication placements in conjunction with the University of St Andrews
- an S6 Baccalaureate placement in conjunction with Abertay University

*"The course improved my presentation skills and confidence in front of a classroom of children. Furthermore, I now can hold a crowds' attention better by using the techniques I learned and I am better at conveying ideas to people who do not have prior knowledge of a subject. These skills will be useful in any profession not just teaching science".*

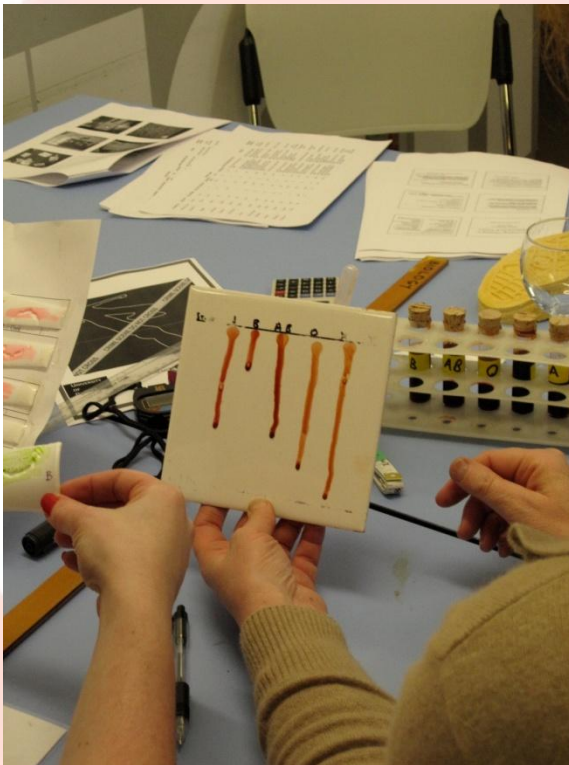
**Undergraduate science student**

## Audience

These courses and experiences were attended by 371 delegates, in the following numbers:

- 212 primary school teachers (including 87 reached via CPD outreach)
- 2 teachers specifically of early years
- 20 secondary school teachers
- 13 trainee teachers
- 28 research scientists
- 2 science centre staff
- one youth group worker
- seven undergraduate science students
- one S6 student
- 25 Dundee College Access students
- 60 first year BEd students

Note: for single date courses, these figures relate to the number of delegate places, rather than individuals, due to a significant number of loyal repeat attendees. For multiple-input courses and experiences, participants are counted only once.



*"I have attended several CPD sessions at DSC this session and have been extremely impressed at the standard and variety of opportunities available. They have embraced CfE and have incorporated cross curricular themes throughout. I found the sessions very relevant to what I was trying to achieve back in the classroom and gave me inspiration and enthusiasm for teaching science in addition to building confidence... Finally the workshops have provided the opportunity to network with teachers from other councils which in itself is a very important part of teacher CPD and I have made links with staff from Dundee University which has led me to start a 'Developing Mathematical Thinking' Masters module in September. I look forward to seeing the programme of workshops for next session".*

**Primary teacher**

## **Evaluation**

A learning experience should be evaluated according to its impact on learners, especially in impact on practice.

## **Methodology**

All courses were evaluated through hard copy feedback forms completed by delegates immediately after the course, to assess initial reactions and experience of the course itself. These forms consisted of Likert scale questions to assess impressions of enjoyability, usefulness, inspiration and motivation, and open text questions covering the most useful aspects of the course, areas for improvement, impact on professional practice and any intention to use the course content.

On-the-day feedback questionnaires were completed by the vast majority of delegates.

An online survey sent to all delegates in June 2011 aimed to gauge actual impact experienced following the courses, using multiple choice and open text questions to assess impacts felt up to nine months after attendance at a Science Learning Institute course. Multiple choice questions covered both attitudinal and practical implementation impacts, and open text questions invited participants to detail all types of impact felt. All questions gave the response option of 'No impact'.

33 participants responded to the online impact survey (approximately 9% of the total audience). This represented 13 primary teachers, six secondary teachers, four trainee teachers, seven research scientists, four science students, one nursery teacher, and one science centre employee.

A selection of delegates also provided testimonials to give a deeper insight into their experience.

## **Impact**

On-the-day feedback shows a very high level of enjoyment and inspiration, alongside intention to implement ideas and a sense of usefulness of the course. This is reflected in the online impact survey.

Amongst teacher and trainee teacher delegates, the most common outcome (from over half of respondents) is that delegates have carried out new activities in the classroom. This is closely followed by having learned new activities which they have not yet carried out, and just under half of delegates cite an increase in confidence in their own topic knowledge, and a similar number cite 'new or renewed enthusiasm' for science or a specific science topic. Just under

half of respondents had actually loaned a topic loan box from Dundee Science Centre, therefore carrying out new projects or activities with pupils.

Amongst non-teacher respondents, most felt they had gained confidence in science communication or other skills. Some claim that they have gained skills that they have now used in practice, and some say that they have actually implemented science communication and education activities due to their Science Learning Institute experience.

No respondents chose the option, 'I did not get anything out of [the course/experience]'.

### **Impact on the individual as a professional**

Considering impact on themselves as professionals, respondents often cite new ideas and confidence, many suggesting that this is a real area of need:

*"I think the courses keep you fresh with ideas and renew enthusiasm for teaching science and build confidence for those who lack it by providing activities and ideas".*

*"More confident about teaching some aspects of science and gave me lots of new ideas".*

*"The sessions attended sparked my interest in science based topics".*

A significant number of participants also discuss how their experience has incited analytical, reflective practice, to stimulate ongoing learning:

*"I think more about explaining what I do."*

*"It made me consider how to communicate science to school children and teaching as a possible future career".*

*"I now think more about how best to communicate with people I meet through work (e.g. colleagues or university students I meet through running experiments). The course has taught me the importance of explaining my research in a more accessible way, and the importance of making science fun so that people can actually get some enjoyment out of participating in scientific research".*

An input into the BEd first year course had a very significant and important impact on students' views of science. Students cited a benefit in acquiring new knowledge about what science centres can offer them as practitioners, suggesting an increase in professional knowledge. However, the most significant message received from students was that 'science can be fun', with many referring to a realisation that science learning and teaching can be 'fun', 'important', 'creative' and 'exciting'. This would appear to be a very valuable attitude and realisation at this stage in teacher training.

Feedback from PGDE students who attended courses as delegates shows that they particularly value having additional support, beyond what is available through their formal studies.

*“I have found these sessions very useful and hope they continue to be offered and funded in the future that others might benefit, and that I might continue to keep my knowledge and skills up to date”.*

### **Impact on professional practice**

Half of respondents cite specific practical action they have taken following their course or experience. Many teachers refer to new practical science activities carried out in class, and even new experiences and knowledge generated by using colleagues or even pupils as ‘multipliers’.

*“Have done some of the activities in Science club; gave Nanotechnology as the topic for the IB group project which produced some brilliant videos. The winning three will be entered into the [Time for Nano national] competition”.*

*“I regularly run experiments as part of my research, and during the debriefing process I now try to explain the nature of my research in more accessible way, so that it is more fun”.*

*“Used blood typing experiment in class as an example of fair test. Used loan box (Fingerprinting) in class”.*

*“Sixth year pupils familiarised themselves with the nano kit and then delivered a lunchtime CPD session to teachers in the Science department, introducing them to the kit and discussing the theory and carrying out demonstrations”.*

*“Forensic Science and Crime Scene investigation scene. Home made lava lamps”.*

Some respondents additionally felt such a significant impact that it sparked an interest in further formal study and even change of career.

*“Signed up for Maths module at Dundee Uni after maths thinking course, delivered inset to colleagues about investigations and plan to do ice balloons with class next session. Kept in contact with people I have met on courses, shared some of the interactive games with colleagues”.*

*“I have applied to change my career and move into science communication by going back to University to study a Masters course in animation for one year. After which time I want to make animations for science, one audience being school kids”.*

## Enjoyment and inspiration

The Science Learning Institute aims to share the ethos of the science centre – enjoyment, inspiration, and curiosity – through its courses and experiences. Dundee Science Centre welcomed Curriculum for Excellence, particularly its recognition of enjoyment and inspiration as valuable aspects of the learning experience. As such, we also aim to give delegates an experience that is enjoyable and inspiring, and value these qualities as vital and complementary to practical utility.

On-the-day feedback shows a very high level of enjoyment. Based on a Likert scale of 1 to 8 (in which 1 is lowest, and 8 is highest), enjoyment consistently scores highly, with the lowest mean score for a course being 7.23. Indeed, many courses gained the highest score of 8 from all delegates. Inspiration scores only slightly less highly, with the lowest mean course score at 5.92, and all other course scores averaging over 6.

*“Have really enjoyed visiting Dundee Science Centre and will use it again in the future. Have also told colleagues and friends about it”.*

*“The DSC staff were brilliant. They were friendly, enthusiastic and helpful at every session”.*

*“The event on a Saturday afternoon was most enjoyable, mixing with colleagues from primary and secondary sectors in a relaxing atmosphere”.*

*“Fantastic workshops, really practical and gave confidence to teach”.*



Evaluation of each individual course and experience is detailed at the end of this report.

## **Vision for 2011-12 and beyond**

The Science Learning Institute represents the concept of inter-organisational and inter-professional collaboration, based in the science centre. We aim to expand the partnership and programming where possible, to provide benefit for learners and professionals. The following developments are planned for 2011-12:

- an expanded programme of CPD courses, featuring extended inputs by the University of Dundee School of Education, Social Work and Community Education
- inclusion of a new partner – the Scottish Schools Equipment Resource Centre (SSERC) – in order to offer SSERC programming to a wider Tayside audience
- delivery of a pilot ‘researcher residency’ scheme in conjunction with Revealing Research at the University of Dundee
- development of the ‘Germ Wars’ project to generate content for a microbiology and ‘unseen science’ Curriculum for Excellence context on Education Scotland’s *STEM Central* website
- addition of practical science communication training to Dundee College science courses
- delivery of the STEM Ambassadors programme across the region as STEMNET contractor for North East Scotland
- provision of the STEM schools advisory service across North East Scotland

Over 2010-11, Dundee Science Centre Science Learning Institute has gained great recognition for its work, including plaudits from the Cabinet Secretary for Education and Lifelong Learning and CEO of the Wellcome Trust, for its innovation and integration with science and education.

In 2011-12 and beyond, Dundee Science Centre seeks to continue to innovate and integrate, for the ultimate benefit of science learners across Tayside and Scotland.

## **Evaluation of individual courses**

The following is based on the content of immediate feedback in on-the-day delegate questionnaires, except where stated otherwise.

### **Time for Nano**, 13th November 2010

Part of the European 'Time for Nano' project, this course gave teachers (and two science communicators) the materials and knowledge to deliver nanotechnology activities. The session included a talk by a local research scientist working on this area, which was very well received by delegates. Feedback shows that delegates valued most highly the opportunity to 'try out' the Nano Kit materials with peers, and also the talk by a nanotechnology specialist. Subsequent feedback shows that delegates made use of the kit and activities, including one school in which the S6 pupils were challenged to actually deliver a nanotechnology CPD session to teachers.

In addition to providing the CPD session and Nano Kit, teachers were asked to encourage and challenge pupils to use their new nanotechnology knowledge to create a short video on the subject. Subsequently, a local school that had been involved in the course won the UK-wide Time for Nano video competition.

### **Introduction to Science Communication**, 18th November 2010

Those new to science communication benefited from this course by learning and practising a range of science engagement techniques utilised by the science centre Science Learning Team. Feedback shows the course was very enjoyable and useful, with delegates expressing they had, 'learnt a lot about communication techniques and had fun too'. Particularly useful was the range of information covered, the opportunity to practise their own science communication skills, and the opportunity to discuss how different ideas can be conveyed to different ages. Delegates claimed the course was highly inspirational - one delegate reported they would take back the ideas to the youth groups they lead, and another commented, 'It will help me with presenting information (not just science) to people with little knowledge of it'. All delegates felt they would recommend this course to others.

### **Healthy Body Bits**, 25th November 2010

This session focused on introducing and engaging delegates with the Healthy Body Bits loan box, and familiarisation with workshops and resources available from the science centre. Through a range of activities, including those resources contained in the loan box, delegates learned new ways to teach about the body and keeping it healthy to children. Ideas were shared between delegates during the session, with feedback suggesting that delegates appreciated the opportunity to share new ideas with peers. Feedback on the day indicated that many would be taking these new ideas back to the classroom, with a number of delegates later borrowing the loan box.

### **The Physics of Sound**, 19th January 2011

Consisting of various practical activities to engage learners across Early, First and Second level sound topics, this session was very well received by teachers, who particularly commented on how useful and practical the session was. Teachers were particularly impressed by the

information provided, and practical support with activities which could be transferred directly to the classroom. One respondent commented that the session, 'Allowed me to visualise how I would apply this to my own practice', and another said, 'I have set up a science lab in my home corner and will be using some of the information and experiments in the near future to engage and inspire my little scientists'. Teachers also felt that the session helped deepen their own understanding of the topic.

**Curiosity and Creativity: Science, Art and Writing**, 26th January and 26th May 2011

Focusing on techniques for integrating science, art and writing, this session included ways to link science with literacy, poetry, and other expressive arts. Due to demand, the session was run twice. Feedback shows that delegates most valued the 'ideas' that they felt they could take back and implement in the classroom. Some delegates referred to plans to share ideas with colleagues and implement activities in the classroom, and a significant number referred to increased confidence in approaching science topics, and linking science with arts and literacy.

**Facilitating Topical Discussions**, 27th January 2011

This session covered generic tools for starting and facilitating topical discussion in the classroom, specifically support Curriculum for Excellence Topical Science Experiences and Outcomes. Feedback on the day shows a high level of enjoyment and inspiration and sense of the usefulness of the tools and materials. Additionally, later feedback provides evidence that materials were used in the classroom and found effective.

**Developing Thinking in Mathematics and Science**, 2nd February 2011

Sharing current research in inquiry for the classroom, this session received excellent feedback from delegates. Most significantly, teachers referred to an intention to change their pedagogical approaches, saying that the message they would take away from the session was, 'To try and move away from a resource led maths base to more inspirational active learning techniques', and, 'Move maths and science learning into relational learning'. Delegates appeared very impressed by the current research, and in the on-the-day feedback forms, two delegates specifically said they planned to get involved with the project. Teachers found the course useful, referred to both pedagogy learned, and also activities they could practically use in class. Moreover, teachers left the session feeling that, 'Maths is anything but boring', and 'Maths can be exciting!'

**Science: Some of the 'Tricky' Bits**, 16th February 2011

This course explored a single second Curriculum for Excellence experience and outcome, which contains potentially 'tricky' topics of magnetism, electrostatics and gravitational forces. Delegates particularly appreciated the practical support: the opportunity to try out activities experimenting and discussing with peers. Feedback shows that the session appeared to very effectively break down fears, as delegates realised, 'You don't have to get too technical. Simple is best', and, 'That you can use simple experiments to explain things that are relevant to the children's lives'. This support appeared to give delegates increased confidence and the motivation to implement new practices, as teachers claimed, 'I plan to use ideas for activities with my class and will approach with increased confidence and knowledge!', and, 'Had started

teaching this outcome but tonight's CPD has helped me to take my teaching on further and pull the work together i.e. comparing the forces and their application'.

**Making best use of Hand-held Communication Devices**, 23rd February 2011

This session again gave delegates insight into current research in this field. Feedback was overwhelmingly excellent, with the most significant impact being a sense of inspiration and excitement about this new technology. Feedback included 'It was all fantastic', 'Loved every minute of the session', and, 'We could all learn to use an iPhone and the activities were inspirational'. Delegates appeared to feel they had gained very valuable insight into cutting-edge research in new pedagogies, feeling it was, 'The way forward for ICT and learning', and would 'Re-energise my ICT practice', and several cited a desire to work more with the researcher involved. Delegates included not only teachers but also another hand-held technologies researcher, who claimed, 'It'll influence my research', showing that the course also had been beneficial to interprofessional research.

Following this course, the University of Dundee and science centre partners collaborated to facilitate further research in using these devices in the science centre context.

**Fingerprint Identification**, 24th February 2011

This course included a talk by a local specialist from the Scottish Police Services Authority, as well as an opportunity to learn about fingerprinting and its role in identification, and activity materials available to loan from the science centre. Delegates particularly valued the talk by the specialist, especially the insight into the career path into forensic science, and felt that it gave them the ability to share this with pupils. Delegates also valued the opportunity to practise the fingerprinting techniques, and many said that they planned to use the activities in resources in the classroom.

**Classic Kitchen Science**, 5th March 2011

Aimed at not just teachers but also those running children's activities and clubs informally, this course covered 'classic' hands-on science activities and demonstrations utilising everyday materials and ingredients. Delegates overwhelmingly enjoyed the session and the opportunity to practise practical activities. All respondents cited an intention to use or share their new knowledge, including one who planned to 'Have a science week', and one who planned to 'Work collaboratively with colleagues to use activities seen and carried out today in class at future dates. Has provided much motivation'. Delegates most significantly valued the 'new ideas' for hands-on activities, and some also felt that the course had improved their own knowledge of the science behind the activities.

**Early Explorers Showcase**, 10th March 2011

This session showcased the Early Explorers early years programme at the science centre, giving insight to enable teachers to use the experience most effectively. All delegates felt the course was very useful, particularly citing the knowledge of available resources and 'new ideas' they could try or adapt for the classroom. Some comments also referred to the 'Open/welcoming ethos of centres and the range of resources/workshops', and an impression that, 'Science is fun and enjoyable. CPD is fun!'.

**Microbiology for the Primary Classroom**, 22nd March 2011

This course outlined resources available from the science centre, and activities to make microbiology accessible for primary pupils. Whilst few feedback forms were received, comments show that delegates found the content useful and helpful, gained knowledge and confidence, and felt that they could explore the topic in the classroom.

**Biodiversity for Primary Science and Literacy**, 27th April 2011

This session covered familiarisation with the science centre 'Genes in a Bottle' DNA extraction workshop and science and literacy resources in a loan kit available to schools, including factual reading books, outdoor activities, and topics including basic genetics. All delegates said that they intended to implement ideas in the classroom, and appreciated the activities, ideas and methods shared. Mainly respondents felt that the impact on their professional practice was an increase in confidence and ideas for implementation in the classroom.

**Interactive Games and Teambuilding**, 28th April 2011

This session covered interactive games that could be used to build teamwork, collaboration and confidence in the classroom. Feedback shows that delegates valued the 'new ideas', the chance to play some of the games, and opportunity to discuss with peers. Delegates were also very likely to say that they would follow up the course by using the games in the classroom.

**Our Solar System**, 9th May 2011

This course provided familiarisation with the science centre's Solar System topic show and resources available for loan. Delegates found it most useful to explore the resources and find out how activities could be implemented in the classroom, including 'How to tackle some of the more tricky aspects of the solar system i.e. phases of the moon'. Many also stated a desire to use the resources and activities in future. An additional benefit appears to be the topic knowledge gained by delegates through attending, suggesting that the course was also valuable in improving teachers' own science knowledge and understanding.

**How to run a Science Investigation in the Primary Classroom**, 17th May 2011

This course provided an introduction to the inquiry process, with tools and methods for creating opportunities for pupil-led investigation through first-hand experience. Feedback shows that the intended learning aims of the course – about pupil-led questioning, first-hand experience, and true open-ended investigation – were appreciated by delegates, with teachers saying that the message they would take away from the course included, 'To allow children ownership', 'Letting children make more decisions about where to take the learning', and 'Starting with questions so they have ownership', and 'Less control will still work!'. All delegates planned to implement techniques, and several stated an intention to share with colleagues (one specifying that they would do so formally at the next in-service training day). Delegates found the techniques useful and usable – 'I liked the raising questions part about how to introduce an idea to pupils and let them choose' – and feedback also suggested that they felt more confidence to integrate science investigation into learning and teaching plans.

### **Create and Inspire**, November 2010 – February 2011

This three-month public engagement professional development experience for research scientists included: science communication training; support and mentoring from science centre staff; a public engagement practice session; and delivery of public engagement in the science centre at 'Science in the City' meet-the-science days. Evaluation shows delegates found the course to be highly enjoyable, useful and inspirational, with feedback including, 'The workshop was a brilliant experience. I should thank you and your colleagues for delivering such an informative and yet entertaining workshop'. The level of confidence and skills of the delegates to create and deliver a public engagement activity increased following the project, with comments including, 'I have more of an idea of how to engage with people of different backgrounds. I feel more confident', 'It helped me to think about different methods of engagement, and to meet others', and, 'It gave me the opportunity to take my exhibit out on-location with real participants. It made me aware of several improvements I could make which I hadn't thought of'. Scientists found it rewarding when members of the public engaged with their research and the activities they had developed, and were keen to follow up this experience by taking part in further public engagement opportunities. The enthusiasm of participants to do more similar activity suggests that the course inspires positivity about public engagement, supporting the development of ambassadors for public engagement: one participant responded that, 'Public engagement is not as scary as it looks and is fun'.

### **Scientists on Tour**

This project provided research scientists with science communication training and the experience of secondary school outreach, in which S2 pupils took part in hands-on workshops and had the opportunity to talk to scientists about their careers and research. Schools taking part in the project received science centre-developed teacher resource kits providing information on how to start and run topical science discussions in the classroom, and how to give pupils confidence to contribute. Teachers taking part in the project were also given the opportunity to attend the 'Facilitating Topical Discussions' CPD course, adding further value to the project. Feedback from scientists included: 'Fun and thought provoking - staff were brilliant'; 'Learnt a lot about communication techniques and had fun too!'; 'Lots of help as to how to engage children and make learning fun'; 'It has been useful as it has given me ideas of how to communicate new ideas to an audience unfamiliar to science. I have become aware of some of my weaknesses in demonstrating and now can try and improve in these areas'. Scientists commented that they felt more confident in visiting schools and speaking to pupils. Two scientists had previously participated one of the 2009-2010 Create and Inspire course.

Teachers welcomed the resource packs and all planned to use the techniques in the classroom. Feedback included, 'Many of the ideas were simple to organise, inexpensive and fun which make them ideal for use in schools', and, 'This pack provision will give us suitable ideas and increase our knowledge and comfort of working within this field'.

### **Dundee College course**

Dundee Science Centre's team provided weekly input into the Access to Forensics and Access to Biomedical Science courses at Dundee College. Access students are required to gain a qualification in communication, equivalent to a Higher grade course, however, previous

feedback has proven that the students work better in a contextualised environment. Therefore, the collaboration aimed to deliver an engaging communication course which is based in science. Aims included: to develop confidence to communicate science using writing and presentation skills, improve effective listening skills, and also develop confidence with debate and discussion. This year saw an increase in engagement, especially with debate and discussion, with the science centre team delivering a Play Decide debate. Most significant outcomes appear to be students' confidence to discuss topical science, and student comments including, 'Debate can be fun!', 'That was much better than I expected', and 'I feel more confident to discuss my ideas in future'.

### **BEd first year course inputs**

Dundee Science Centre's contribution to the BEd course consisted of two inputs: a visit to the science centre to experience the same format as a school group visit, and a subsequent session on contextualising the visit and avoiding misconceptions. Feedback shows that students felt the experience was very useful, particularly the visit to the science centre and new understanding of what resources the centre offers them as practitioners. Some also referred to their own knowledge acquisition of the scientific topic of the Solar System (the science centre show they had experienced). The most overwhelming impression received and articulated by students, however, was attitudinal - that 'science is fun': an outcome not to be underestimated in its importance. Many students also articulated a motivation to find out more about the topic and the science centre resources available to teachers.

### **Science Learning Institute outreach day, Fife**

Delivered in a Fife primary school, this event saw the science centre team delivering four sessions for a cluster group of primary school teachers. Feedback shows a very high level of enjoyment, usefulness and motivation arising from the event, with many teachers referring to activities they planned to implement in the classroom. Very noticeable in the feedback was a sense of enjoyment and inspiration and appreciation of the 'enthusiasm' of the presenters. Comments included, 'Great inspiration to all staff to take forward Curriculum for Excellence', and, 'The whole morning was very motivating'.

### **Germ Wars project CPD**

This session was part of a three-month project for ten primary schools across Dundee. The course initiated the project, and was subsequently complemented by provision of books, other resources, outreach visits, and a class visit to the science centre. Feedback on the day showed that a number of teachers felt nervous about the topic and the project ahead, though most felt that the session has given them increased confidence and ability to work on the project, citing 'Enthusiasm to get started', 'More confident now I have seen some of the resources', and 'Much more confident and enthusiastic'. Many looked forward to carrying out the project with pupils. The fact that teachers felt hesitant and nervous about the project, however, shows that need for such projects.

After the project, evaluation forms were sent out to all teachers, asking for feedback not only from teachers, but also pupils. Initial feedback shows that teachers and pupils both enjoyed the project very much. Teachers commented that the project actively engaged them with

microbiology, being at an appropriate level and a new area for pupils. Many teachers commented that they felt much more confident about teaching microbiology (a subject previously avoided) and would borrow the Microbiology resources in future and delve further into the subject. Additionally, one teacher asked their class to vote on their favourite topic of the year, with *Germ Wars* being an outright winner.

### **Baccalaureate and undergraduate student placements**

In conjunction with Abertay University and Dundee City Council, one student from Grove Academy, Dundee, carried out their interdisciplinary project (on the accuracy of soil analysis in forensic investigations) with support from the science centre team. The team facilitated contact with local forensic scientists as well as providing general project mentoring. Feedback shows an increase in confidence through working in the science centre team. The science centre also provided support other Baccalaureate students who required a public forum in which to carry out public questionnaires.

Five undergraduate students from the University of St Andrews were placed at Dundee Science Centre as part of their 'Communication and Teaching in Science' fourth year module. Students were provided with science communication training and an introduction to Curriculum for Excellence; they shadowed and assisted in science centre curriculum-linked school workshops, and were given mentoring for their 'special projects', which were student-led projects ranging from the creation and delivery of school workshops to the development of teacher resources. Students presented their activities to school pupils and teachers towards the end of the placement, using the knowledge and skills they had gained during the three month placement. The success of the projects is demonstrated by the fact that two of the students were invited to deliver their activities within local schools, after teachers were so impressed with their workshop content and delivery at the science centre. Another student has also since delivered their workshop to a second class at the science centre due to their success during the placement.

## **Participant testimonials**

*“The course improved my presentation skills and confidence in front of a classroom of children. Furthermore, I now can hold a crowds' attention better by using the techniques I learned and I am better at conveying ideas to people who do not have prior knowledge of a subject. These skills will be useful in any profession not just teaching science”.*

### **Undergraduate science student**

*“I attended several of the twilight Science CPD sessions and found them extremely useful. They gave me an overview of a topic that I had limited understanding of, they provided practical ideas for the classroom (many of which we did ourselves, so that we experienced the activities first) and also a range of resources and websites to explore at a later stage.*

*The sessions made me think and question ideas, rather than just provide answers or ready formulated plans. The sessions also introduced me to the wider opportunities available such as the loan boxes (which I have already used), outreach visits as well as visits to the centre. The Science teaching on the PGDE course is very limited, so it has been fantastic to be able to access further CPD from such an informed and specialised source. During my forthcoming years of teaching, I intend to continue to attend the CPD sessions and draw on the wider resources of the centre”.*

### **PGDE student**

*“As a PGDE student the inputs we receive at University only cover the fundamental basics of each subject area. Therefore, attending the CPD opportunities afforded by Dundee Science Centre has enable me to take part in more in-depth learning into a subject that appears to be undervalued. The individual topics covered provided scientific background which supports teaching in the classroom in a more informed manner. More than this, though, the CPD has increased my confidence to deliver quality science lessons in these topic areas in the primary classroom, in a way that the limited time on a PGDE course does not allow for.*

*I have found these sessions very useful and hope they continue to be offered and funded in the future that others might benefit, and that I might continue to keep my knowledge and skills up to date”.*

### **PGDE student**

*“I have attended several CPD sessions at DSC this session and have been extremely impressed at the standard and variety of opportunities available. They have embraced CfE and have incorporated cross curricular themes throughout. I found the sessions very relevant to what I was trying to achieve back in the classroom and gave me inspiration and enthusiasm for teaching science in addition to building confidence. I value good quality CPD where I can readily use new concepts learned and I feel this is what DSC provided.*

*Back in school I have shared some of the experiences and lesson ideas during inset opportunities with colleagues and have used ideas within my own practice as well as encouraging others to attend DSC for CPD due to the high standard. I was particularly inspired with the Science, Art and Writing concept and encouraged my colleagues to participate in a whole school SAW theme where each class did their own SAW display linked to ongoing topics*

*and the project was concluded with an open afternoon for parents in which pupils were able to show off their work. It was very successful and a similar whole school project is planned for the coming session.*

*Finally the workshops have provided the opportunity to network with teachers from other councils which in itself is a very important part of teacher CPD and I have made links with staff from Dundee University which has led me to start a 'Developing Mathematical Thinking' masters module in September. I look forward to seeing the programme of workshops for next session".*

**Primary teacher**

*"The ideas from the course were brought to the attention of Science colleagues at a Science DM. Teachers have used these ideas such as "tops and pants", and the "physical continuum" activities successfully in lessons to help increase pupil motivation, and generate discussion. It has also improved pupils' critical thinking and evaluation skills. These ideas will be incorporated into the new CFE courses, as well as teachers trialling them in existing classes such as the smoking part of Healthy Bodies in Int 1 Biology".*

**Secondary teacher**

*"The event on a Saturday afternoon was most enjoyable, mixing with colleagues from primary and secondary sectors in a relaxing atmosphere. The presentation was informative and we were all encouraged to investigate the materials and to make mini presentations describing how we might use the material in our classes. It is amazing what a wide range of ideas come from a small group. Best of all - free kit to take back to school!!!"*

**Secondary school teacher**

Reports on other Dundee Science Centre initiatives are also available on request and online:

- Dundee Science Centre annual report 2009-10
- Fife Science Festival 2011
- Dundee Science Festival 2010
- Dundee Science Centre HMIE report 2009
- Dundee Science Centre annual report 2008-9
- Dundee Science Centre annual report 2007-8
- Dundee Science Centre annual report 2006-7
- Dundee Science Centre HMIE report 2006
- Dundee Science Centre annual report 2005-6

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