STEM Education Support Officer

Higher Education and Industry links
# Contents

Executive summary .......................................................... Pages 4/5  
Introduction to the role .................................................... Pages 6/7  
Activities undertaken ....................................................... Pages 7-21  
Example STEM engagement ............................................. Pages 21 -31  
Future Development work ............................................... Pages 31-33  
Appendix A – Background role information ....................... Pages 34-37  
Appendix B – STEM organisations mentioned in report ......... Page 38  
Appendix C – STEM map concept ..................................... Page 39  
Appendix D – STEM@ information ................................... Pages 40-44  
Appendix E – Advanced Higher Physics support (as of 2013) .... Page 45-47  
References ........................................................................ Page 48
Executive summary

Main actions undertaken in post

- Initiated survey of higher education support for school via Deans Education group, due to be completed again in 2015 using new online editable format
- Set up of Biology teacher mailing list progressing to the first Society of Biology teacher network in Scotland
- Held event for 11 research institutes and Biology teachers at the Moredun research institute to encourage awareness of CfE needs and share existing resources
- Supported Wellcome trust application for Biology data sets resource by Dr Cathy Southworth
- Overseen the set up of University STEM@ e-mail accounts and shared with teaching community (ongoing)
- Mapping and sharing of Scottish Education officer (QIO) information with wider STEM community including STEMNET, SCDI Young Engineers and Science clubs, Universities, Research institutes, Deans of Science and Engineering, Professional bodies etc
- Supported the work of STEMEX IDL ((Interdisciplinary Learning) group and PLC (Professional Learning Communities)
- Held ‘Engaging with Scottish school to support STEM’ event to raise awareness of sustainable STEM engagement and allow organisations and like-minded individuals to share ideas
- Demonstrated cross-university support by arranging supply of Dry Ice in 2 more Scottish Universities to support Elementary Cloud Chamber project at the University of Glasgow
- Proposed STEM map initiative to support communication structure amongst STEM fields in Scotland
Future development work for consideration

- STEM Local authority wide career events targeted at age 10-13 year olds based on Kings College ASPIRES data and with great involvement of Parents and family capital
- Work with Higher Education, research and industry (as well as others such as SDS and SSERC) to provide targeted support for supporting the introduction of lab skills courses and engineering science in more schools
- Continue to map STEM engagement activity and find a suitable way to record this information, include organisations such as Science centres, STEM clubs and professional bodies in the remit
- Hold an annual ‘Engaging with Schools event to coincide with above and ensure there is an incentive for organisations to share what they are doing and to attend
- Support the development of new teacher networks by providing funding for teacher network initiatives/projects as well as enhanced links and raised awareness of such networks amongst Higher Education, research institutes and industry.
Introduction to role including background reports

The STEM Education Support Officer role was supported by a governing body with representation from the following organisations –

- Education Scotland
- Deans of Science and Engineering
- SSERC (Scottish Schools Education Research Centre)
- Industry Bodies (SELEX Es, SASOL and CBI Scotland)

The major aims of the post were to -

- To map, evaluate and help co-ordinate current schools engagement with Higher Education and Industry
- To map, evaluate and help co-ordinate existing STEM Continuing Professional Development (CPD) activity offered by Higher Education and Industry
- To map and stimulate the use of learning support materials
- To contribute to the development of Interdisciplinary approaches to enhance the learning experience

Please refer to Appendix A for the statements from the SEEAG and SSAC reports that outline the intention (and requirement) of the STEM Education Support Officer role prior to its establishment.

The purpose of this role has never been to develop something new in an already complex STEM Education landscape but to support ongoing activities and maximise their benefit to teaching and learning. In the process of attempting to map out activities that already exist it has been possible to highlight opportunities to plug gaps in the STEM support structure and host events and activities that brought like-minded organisations together.
As well as my reports during the project the information below will help to detail some of the activities undertaken in this post.

**Activities undertaken**

Supported by the Scottish Universities Deans of Science and Engineering Education Group I undertook a survey of current school engagement activity that has taken place to support teaching and learning in Scottish schools and shared this information with the wider STEM community and quality improvement officers. This process had been initiated by the then secretary Alan Roach and the response varied by university but gave me a suitable amount of information allowing me to build up a network of contacts in Scottish universities as well as a broader understanding of university process and rationale for engaging with schools. Given that this was conducted at the start of the role in 2013, the data may be out of date and so I have decided to initiate a new survey of information which is due to be completed in early 2015 and will be sustained by the Deans of Science and Engineering Education Group, most likely on the Deans of Science and Engineering website. An example of what this information will look like can be found here –

https://docs.google.com/spreadsheets/d/1PMC9UjF23yBEwvnNKFswnUBiOShTw2sPSoo_pue7zd8/edit#gid=1017918951

The variety of approaches to engagement are detailed in this report, it should be noted that without further long term evaluation it is difficult to be definitive about the impact of the approaches rather than to comment that those mentioned are highly regarded by both university and schools involved. Future consideration should be given to research into school engagement in general to look at the long term impact on teaching, learning and career pathways. Short term evaluation on its own cannot be used to establish success when working with teachers and pupils.

To ensure that this information can be kept up to date more readily, I have agreed with the Deans of Science and Engineering Education Group to trial an online editable
spreadsheet method (see web link above) that will allow each university to input their outreach and therefore make comparisons across institutions. An unexpected outcome of gathering this information at the start of the role is that different STEM departments within universities are not fully aware of existing projects, as well as like for like department from other universities. Awareness of what the wider Higher Education (HE) community are doing is a strength that I would encourage to be built on as it prevents duplication of effort and increasing opportunities for collaborative projects reaching a wider School audience.

A July 2013 Wellcome Trust report into STEM public engagementi in school engagement reminds us that a ‘2008 report for DIUS, Coyne and Goodfellowii examined universities’ links with schools in STEM subjects.1 Their report outlines the wide range of quality activities that are undertaken by universities, but it also highlights the fragmented way in which such activities take place.’ This is still the case and will require a Scotland-wide agreed initiative and funding to make a sustainable change. Note that the work that does take place is often well received by schools that are fortunate enough to take part and have a good connection with the university and so this previous comment is not a criticism of the endeavours that some individuals and departments are making in order to have a sustainable working relationship with local schools.

**Moredun research day leading to WELLCOME application**

On the 24th of February 2014, I worked with SSERC and Moredun Research Institute to bring together 19 researchers from 11 of Scotland’s research institutes to have discussions with 13 biology teachers regarding development needs for the new CfE Biology and Human Biology Higher.

The event was designed to build on background development needs information collated from Education Scotland/SQA Hampden teacher meetings, Biology teachers surveyiii (S
Bryce 2014) and SSERC Biology Development Officer experience. The event had the following key objectives:

- For researchers to share, collate and discuss current activities that Scottish Research Institutes (and individuals) are doing to support school education (3-18). Including websites, outreach activities, public engagement etc.
- Create links between teachers and research institutes with the aim to set a date for a follow up development day to construct materials that will support the new qualifications.
- Coordinating educational resources and prioritising some key curriculum target areas for future development that will bring some tangible short term outputs.

Following the event, Dr Cathy Southworth from the Centre for Regenerative medicine prepared a large funding bid put forward to the Wellcome Trust to gather data sets and case studies from the multiple research organisations and make this more accessible to schools and widely available. The grant would also have provided an extensive set of CPD opportunities for Biology teachers as well as resources for National 5 assessment. Teachers from the Moredun event became partners in the application and I acted as a project champion for the grant application. The application was successful to the final stage interview in London and received letters of support from both the Society of Biology and Moredun Research Institute but was unfortunately unsuccessful at this final stage as the Wellcome Trust felt that this type of activity could be state funded and felt that the CPD delivery was possibly ambitious.

A surprising outcome of the event was the clear benefit to the research institutes’ knowledge of the new curriculum as well as the opportunity to learn about what support biology teachers require. I am sure that there will be many outcomes from this that are not measurable such as improved resource development that has an increased awareness of teachers and learners needs. The teachers were surprised at the amount of existing...
support materials available but recognise the need for someone to collate and share this information, possibly mapping this to the CfE Biology curriculum.

**STEM Map exemplar idea**

Early on in the role it became apparent that communication amongst different networks was a development need in Scottish STEM education, there was often repetition and overlap in the type of activities taking place. It was also clear from meeting local authorities that some schools were more successful than others at gaining industry support and more could be done to coordinate this. Higher Education and Industry often weren’t sure where to start when setting up a new activity to support schools and weren’t always making the most of local authority education officer experience.

The map below gives an example of the idea I had to have a point of contact for each local authority as well as a STEM® (see next section of report) email address for each HE. I had also began speaking with STEMNET (STEM ambassador programme), SCDI YESC (Young Engineers and Science Clubs), SDS (Skills Development Scotland) to investigate how all could possibly work together to host and maintain such a database of contacts, and perhaps put more information on the map such as YESC club info, apprenticeship opportunities, available STEM ambassadors.

Momentum for the idea did not continue as much as I would have hoped due to concerns with maintaining the data, as well as possible negotiations with local authorities to encourage them to maintain their contact info. I still however see this as a useful idea and with sufficient backing by organisations above and the Scottish Government, could be taken forward. See Appendix C for more Map information.
STEM@

An idea first proposed at the Deans of Science and Engineering Education group after it was made clear that often schools, local authorities and other organisations that support schools are not often aware of who to contact in a university.

11 Scottish universities now have a STEM@ e-mail address and this has been shared with local authority quality improvement officers, skills development Scotland, teachers directly via the teacher networks and also posted on the Education Scotland STEM bulletin. The original document can be found at the following web link.

To support teachers wanting to use this document I decided to add in university department (STEM only) information. The Deans of Science and Engineering Education Group will keep this up to date going forward and are considering hosting on their website. Appendix D shows the document that has been circulated to teachers.
Society of Biology Teacher Network (Scotland) and SYNAPSE (Biology teacher mailing list and shared resources)

Having looked forward at the new STEM curriculum it was clear that Biology would face the greatest of changes. So in September 2013 I arranged to meet with Biology teachers in Renfrewshire during part of their subject development meetings. The teachers at that meeting were very clear that they felt isolated and highlighted a feeling of under representation compared with that of their colleagues in Physics and Chemistry. After collating the needs of these teachers, attending the Education Scotland Hampden events, meeting with the IOP teacher network, meeting with the Society of Biology and Scottish Life science association, I decided to set up a trial Biology teacher mailing list. The mailing list is based on the same set up used by John Watson of Campbeltown Grammar school who set up the chemistry teacher mailing list called STRONTIUM, and uses a free Google groups platform. The idea is inspired by the Institute of Physics mailing list called SPUTNIK which is widely used by physics teachers and seen as an invaluable resource amongst Physics teaching community and the IOP Teacher Network Scotland. The biology teacher mailing list is called SYNAPSE and to date (Jan 2015) has over 740 Biology Education professionals signed up who are mainly teachers but with some HE, research and colleges also taking part in the discussions. I have been actively encouraging HE, research and industry to engage with this network to improve communication between the sectors. This free platform works in conjunction with the teachers existing e-mail account (this is the key to its success) and can be used for whatever teachers require, including to share ideas, questions about curriculum content or assessment etc as well as providing a voice for biology teachers’ opinion and on occasion, express concern at developments in the education system. The rate of growth of this network is a great success for Scottish Biology teachers as the representation highlights a will in Scotland for professional dialogue outwith their own School as well as a willingness to share resource.
Following on from the above mailing list and shared resources online support. Successful negotiations with the Society of Biology and SSERC have led to the development of the first Society of Biology Teacher Network (Scotland), which will use SYNAPSE as a tool but who’s main purpose will be to support the development of biology teachers in Scotland by have great links with the wider life sciences sector and to ensure teachers in their area are aware of the career opportunities and skills required in the life science sector (something that industry have highlighted via the recent SDS skills investment plan’).

The network will be managed by the Society of Biology with a working group to support the 4 Teacher network coordinators that will be in post following interview.

In January 2015 Stuart Farmer from STEMEC will bring together the professional learning communities and networks together for a meeting at SSERC, to share best practise and to discuss what more can be done to support teachers via such networks. It also provides an opportunity for all to learn from the different approaches to professional learning communities in Scotland

**Interdisciplinary learning work and STEMEC**

As the remit in my role was similar to that of the STEMEC IDL subgroup I supported this group by giving advice on IDL and meeting with 2 schools (St Ninians and Belmont Academy) regarding how they structure (or plan to) their IDL within their school curriculum. Both schools have similar approaches in that they allocate time outwith normal discipline timetable structure for pupils to do IDL project work. The projects are developed by teachers in multiple departments and teachers take the lessons on rotation to ensure the projects have the integrity you would expect from being taught in a single discipline. Belmont Academy is at the initial planning stage of having a ‘STEM’ IDL slot in their timetable for all S3 pupils to attend. They plan to use existing projects normally associated with STEM clubs as well as their own projects developed in house, and use the STEM club as an overflow for enthusiastic groups of pupils. This is a great idea, and one which I have shared with both STEMNET and SCDI. If this became more common then
there would be increased opportunities for HE and Industry to bring their experience of IDL into schools along with exciting contexts for IDL projects. Education Scotland have produced numerous documentation on IDL as part of the implementation of CfE, since IDL is one of the four contexts for learning in CfE. To support STEMEC research I collated this information by extracting the relevant text on IDL from Education Scotland reports and collated this into one document. Feedback from meetings with local authorities and teachers at various events was relayed back to STEMEC to support Colin Graham in the formulation of his ‘Pillars and Lintels’ reportvi on IDL.

As well as the I have taken a keen interest in the development of IDL projects. One such project is the development of a device that turns a smartphone into a microscope using a lens extracted from a laser pen. Working with technicians at SSERC, SELEX Es and ST Microelectronics the design for the device was perfected and cost decreased so that it could be a sustainable school STEM IDL project. After speaking with both organisations it was agreed that they could fund a trial run for the project in a school of their choice. Glenrothes High school was chosen and I met with the heads of department and some teachers in both CDT and Science.
The school decided to take on the project as an S1 IDL activity whereby all of the S1 cohort would design, build and use the microscope to complete a project in Science. There were many hurdles to jump before this went ahead. The timetable in the school meant that each practical S1 Science class did not attend the same S1 CDT class so the pupils could not do the project in each subject at the same time. This meant that the CDT department started the project and then passed the equipment over to Science once complete. This also meant that the idea of the pupils investigating how lenses and microscopes work and using this to design their own had to be put to one side and the project is now a multidisciplinary form of IDL, however it is a starting point for IDL in the school and therefore a step in the right direction, and the school do intend to reconsider a challenge/project based approach in future years. There were also negotiations that had to take place between the lead teacher for the project and teachers from other STEM departments to gain support for taking the project in place of other work, however this was down to the project itself (a concern that it was too much for pupils to do in CDT) and a fear of the unknown with taking on a new project with no prior CPD. Any objections
were overcome by offering increased support with preparing the materials in the first year to save CDT technicians additional work in preparing the materials for the pupils. This work was taken on by SSERC technicians and SELEX Es. Due to end in spring, the lead teacher (Mr Robin Wallace) has since informed me that due to the excitement amongst the pupils for this project other departments are now getting on board and are looking to use the device with the pupils in their own contexts – Art and Design are taking pictures using the microscopes and doing an interpretation of the images in to a work of art, Home Economics are considering investigating textiles using them, and English are considering using the images to develop an imaginative essay on the microscopic world. The school is now looking to fund this project themselves next year as it has been viewed as a success so far.

Figure 3 - Image of a pupil's build so far in CDT

The above process has demonstrated to me that IDL project/challenge based work is challenging to do within the curriculum and consideration of curriculum structures in the BGE phase of CFE would have to be given in order for this type of IDL to take place. The BOCSH Group\textsuperscript{vii} (Building our Curriculum Self Help Group), consisting of a group of headteachers and school senior management across a number of schools is due to release
a paper on IDL in which it contains a variety of approaches to IDL, consideration will hopefully be given to the difficulty in different approaches to IDL.

All IDL projects have been shared with the development team at SSERC and are being used in SSERC CPD programmes.

Working with SSERC I delivered IDL practical CPD to Physics teachers during a Physics residential CPD (Oct 2013). Encouraging teachers to consider working with technical departments to develop an enterprise project designing, making and selling titanium jewellery/key fobs. The project was designed so that each department could do their part of the project independently with a lead department pulling the project together. A teacher who trialled the project fed back to me that although the practical work was carried out as expected she found it easier to move the pupils around other departments during her own class time. So she spent time with her class in ICT, Technical and Science in order for them to complete the project. She noted that the pupils had increased motivation compared with normal class work, but that it did take an increased amount of time and effort on her part. However she would be taking it forward in future. Comment feedback from the teachers that attended the CPD is below –

- ‘Takes time to organise and develop contexts into coursework’
- ‘Already have something similar (IDL activity) so no real need to add an additional context’
- ‘I’m unsure as to how receptive my colleagues would be at this point due to course development and evaluations’
- ‘School has IDL built in’
- ‘Need time to develop with other subject areas. Resourcing at a time our budgets are being cut’
- ‘Need other departments to participate’
- ‘The principles of IDL already appear in my class teaching. School implementation does not lend itself to this approach’
- ‘Time issues’
- ‘Time’
- ‘More useful for primary school teaching’
After hearing feedback from the teacher who took forward this idea, it is clear that during any IDL project such as above there has to be a strong focus on maintaining discipline rigour so that although it is ‘fun’, the pupils still learn from the techniques etc they are using and are aware of this.

In September 2014 I worked with SSERC and the Ellen MacArtur Foundation to deliver an IDL workshop as part of their 1 day CPD event for 20 teachers. The projects used during this day were the same as the two above but being demonstrated to in the main technology teachers. 73% of teachers stated that they were ‘very likely’ and the rest ‘likely’ to take the IDL projects forward. Many during the day indicated that funding and time could be an issue but if the project was exciting enough then these challenges could be overcome.
ASTROBIOLOGY CPD – University of Edinburgh is an example of an multidisciplinary approach to CPD provided by Higher Education, with both physics and biology teachers in attendance who are encouraged to develop multidi[...]

Society of Biology annual teachers meeting 2014

Invited by the Society of Biology, I delivered a presentation on IDL and Biology teacher networking to over 80 Biology teachers called ‘Don’t forget, there is an ‘I’ in collaboration’.

The abstract for my presentation was –

‘According to an old Oxford Dictionary the definition of ’collaboration’ is the ’action of working with someone to produce something’. I say ‘old’ dictionary because, like the dictionary, there is nothing new in collaboration. However, at a time of substantial change in our education system and in the absence of earlier support structures, there is a need to improve the way biology teachers work together to develop and share high quality resources in order to enhance teaching and learning.

For a number of years, physics teachers have had access to Sputnik, an email network which allows teachers across Scotland to communicate with each other in order to share resources and ideas. This presentation will investigate the potential benefits of expanding an existing biology teacher network and shared resource drive called SYNAPSE. Such a network has the potential (i) to improve collaborative working both within and across education authorities, (ii) to support inter-disciplinary learning and teaching and (iii) to facilitate better links between schools, industry, research and higher education.’

However much of the presentation focussed on the opportunities for Biology centred IDL and how the cutting edge of the life sciences sector was an output of excellent interdisciplinary work.

Engage with STEM event (Feb 2015)

Still to be held, the purpose of this event is to provide an opportunity to showcase different approaches to engaging with Schools. Higher Education, Colleges, Industry and
Research institutes have been invited as well as teacher networks and professional bodies. The theme behind the event will be sustainability of projects and the impact on teaching and learning by encouraging attendees to consider how this can be achieved when working with Schools. The programme consists of break-out sessions involving 7 different approaches to engaging with Schools and 3 speakers (Developing Scotland’s young workforce, Kings College ASPIRES research and School STEM needs). With an expected attendance of over 150, it is proving to be a popular event.

If successful, Education Scotland are giving consideration to repeating the event in different areas of the country on a regular basis.

Showcasing the great work that goes on provides an opportunity to reflect and share best practice in this area of STEM education, and provides an opportunity for Education Scotland to highlight how they would like to see organisations working with schools in a sustainable way that supports teaching and learning.

Outcomes that cannot be measured

Inevitably there are outcomes from this role whereby impact cannot be easily measured. Listed below are some examples of this –

- Writing a piece for the SDS website detailing how Industry can engage with schools
- Impact of Biology teacher discussions due to SYNAPSE
- All outcomes from Moredun Researchers Day
- Impact of gathering Local Authority contact info and sharing this with STEM organisations and Higher Education
- Impact of delivering talks to teachers and senior management regarding STEM opportunities in a number of local authorities
• Raising awareness of existing work in the STEM community and making links between people and organisations e.g. making Primary Engineer aware of Scottish CDT teachers facebook page and SUPA aware of glow meets CPD for teachers.

Examples of engagement activities with Scottish Schools

THE ELEMENTARY CLOUD CHAMBER PROJECT – Support with practical element of new Higher Physics curriculum

The ‘Elementary’ cloud chamber project (http://cernandscotland.tumblr.com/CloudChamber) is a partnership between the University of Glasgow Particle Physics group, Real Science and Glasgow Science Festival. The project consists of an innovative kit that allows pupils to build cloud chambers for a very low cost, however the kit needed solid CO₂ (dry ice) to operate, something that many schools do not have access to. So in August last year (2013) we brought together University Physics departments to share ideas on working with School Physics departments and it was agreed by some of the Universities present that they could supply dry ice to schools so that the cloud chamber project can be taken up by a larger number of schools. Both the University of St Andrews and the University of Edinburgh agreed to supply dry ice after a Safe Handling Document was developed (supported by SSERC) and a format for collecting the dry ice approved by each institution. The University of Glasgow Particle Physics group are currently working to find a host for the cloud chamber kits so that this project can be completed and therefore more schools will have a practical element to the new particle physics section of the CfE Higher course. This example demonstrates the need for collaboration between Universities to ensure that great projects such as this one developed by Aidan Robson and the team at University of Glasgow Particle Physics Group reach a wider audience. This project in particular is very well thought of by teachers and learners as it is relevant to the
curriculum, can be delivered in one lesson, and enhances an area of the curriculum that may have lacked practical work. Working collaboratively like this across universities to benefit more schools is excellent; however this can only happen if each university is aware of the projects in other institutions. Subject-based teacher networks can go some way to ensuring this is the case, and this was discussed earlier in my report.

**UNDERGRADUATE PLACEMENT – Using students in HE/College as ambassadors for young people in Schools, whilst enhancing the School curriculum**

The University of Edinburgh run an integral, optional course for final year students in several different degree streams in the School of GeoSciences (e.g. meteorology, geology, ecology, environmental science, geophysics, geology/physical geography, environmental geoscience). As such it is supported and funded by the university. It is currently offered as a 200 hour course and is an integral final year course for students taking the new MA Education with Earth Sciences course.

This course option is very popular with the undergraduates as it is quite different than anything else they encounter as undergraduates because it involves working with (mostly) external clients (e.g. teachers, visitor centre/museum education managers etc). The university is currently looking to expand this programme to other departments and therefore will expand the number of schools that they work with. The success of this approach has been the ‘client’ approach when working with schools, the undergraduates are tasked with working with the school to establish a suitable project. Projects have ranged from weather stations to bee colonies.

The students all submit a ‘reflective diary’ (50% of assessment) describing their project development and management, a technical report and a ‘product’ (50%). All submissions and feedback from the participating schools supports their overall grading. The university now has over 8 years experience of developing this programme.
Specific departments in the University of St Andrews, University of Dundee, University of Glasgow, Glasgow Caledonian University and Heriot-Watt University also deliver undergraduate placement programmes supported by the ‘Undergraduate Ambassadors Scheme’ (http://www.uas.ac.uk/participants_u.htm).

SCDI, UNIVERSITY OF STRATHCLYDE, WEIR GROUP 3D PRINTER – partnership with STEM Industry and HE to provide an opportunity to enhance school curriculum with state of the art technology and CPD for teachers.

In a recent Learned Societies group report into funding of practical equipment in Scottish Schools, 80% of teachers were dissatisfied with funding levels for practical work. It is no surprise therefore, that projects like the 3D printer project are taken up very quickly by STEM teachers, however the sustainability of these projects depends on a commitment to funding in the long term. The particular strength of this approach was the link to a practical STEM challenge for the pupils to try and then an opportunity to celebrate the work of the pupils at an annual SCDI YESC celebration event as well as the CPD that is provided for teachers to support them with taking the 3D printer into the classroom. Too often resources are given out to schools without suitable training, which is not the case for this particular project and most free practical resources provided by SCDI YESC.

BRIDGE TO EMPLOYMENT – Industry engagement activity designed to eventually lead to employment for some participants

The programme was initially funded by Johnson and Johnson and is now locally funded by LifeScan Scotland. Schools are given a specification for the type of S4 pupil LifeScan would expect to attend the course, and has potential to do the full 3 year programme. This is to be a pupil who is interested in STEM but possibly not achieving their potential, but also pupils who have chosen STEM subjects and have potential to do well.
In 2013/14 the intake of pupils is from 11 schools who have provided 10 pupils each. It is expected that during the 3 year programme the total number of pupils will drop to 80/85. This is due to a natural decline, as some pupils will change their mind about the scheme and entrance into the second year of the programme requires the pupils to put forward an application with a CV.

Year 1 (110 pupils)

- Team Build day
- Tour of LifeScan and careers talks from employees
- 8 STEMINARs consisting of 1.5 hour after school work (with practical) supported by STEM ambassadors
- Two tours to UHI facilities
- Watching a live operation as it takes place in America and a chance to talk to the surgeons
- A1 Poster project and competition followed up by a judging night supported by local community
- Graduation Night
- Employability workshop ran by HR team to support pupils with a CV and Employment Skills

Year two (approx 85 pupils)

- 2 Day team build activity
- British Safety Council qualification course
- Health and Safety awareness skills course
- Project linked with STEM ambassador
- Innovations day with product design ad proposal made to business

Year 3 (approx 50 pupils)

- (Int 2) Standard Leadership qualification supported with a project that develops the Bridge to Employment programme for future participants
LifeScan describe the project as a ‘talent pipeline’ for them. They have established a very good relationship with their local schools and have seen an increased awareness for their apprenticeship programme. So much so, that they are no longer having to externally advertise for apprenticeships. The benefit to the employees is also crucial as many of them enjoy working with the pupils and there is an increased job satisfaction.

Other partners in this scheme include -

- Inverness UHI – Partners that support with tours/ venues and some year 2 educational activities
- Highlands and Islands Enterprise – STEM ambassadors, Run STEMINARS, Mentoring help for pupils
- Highlands council – Maxine Garson (Ed Dept) provides a liaison for Schools with the business

Due to the success of the project and the wider benefits to the local community LifeScan and the Highlands and Islands council are increasing the number of industries involved. This will allow a greater number of pupils to benefit from the scheme every year, as currently there is no room for LifeScan to expand the project in-house.

ENGINEERING CONTEXTS AND CHALLENGES – University of Highlands and Islands, Highland Council and local Industry supporting the implementation of new Engineering Science qualification

The aim of this project is for pupils to develop an understanding about the different branches of engineering as part of their Engineering Science course. The basic structure for this project is that pupils will be informed of an impending visit by an engineer and have to research the different types of engineering. Pupils then create a set of questions to ask the visitor/s about their job and what it entails and the engineer will also do a
presentation about their job role. Lastly a project/challenge based task is set for the pupils to reflect the work that the engineer does.

In 2013/14 this project was carried out with Charleston, Inverness Royal Academy, Millburn and is expanding in 2014/15 to more schools. In total there are 84 Schools in Scotland that are taking on the new Engineering Science qualification (Nat 5 level, correct as of Nov 2014, data from SQA). This project is a great example of a direct benefit to pupils and school as it supports delivery of the course, improves career ambitions and awareness in young people.

REGENERATE! STEM CELL RESEARCH outreach programme- Teacher CPD for cutting edge research

The ‘Hope beyond Hype – Scottish Stem cell stories’ workshops provide a range of CPD and pupil activities for teachers to use. This project is another good example of support tailored for schools to suit the need of the curriculum and an area of the CfE curriculum that is new to many Biology teachers. As mentioned later, support of this kind is invaluable to teachers trying to implement a new curriculum topic.

IOP/SUPA EDUCATION SCOTLAND GLOW MEETS – Online CPD

Online CPD is an efficient way to reach out to large numbers of teachers as well as those in rural areas. This CPD supported by SSERC (who have a dedicated GLOW studio for presenters) was arranged as a partnership between the IOP/SUPA and Education Scotland. Although not to be used to replace face to face CPD as a whole, online CPD is a quick and relatively easy way to update teacher’s subject knowledge on new areas of the curriculum. With the changes being made to the curriculum ever more readily in future (with regards to content) this type of CPD will be extremely valuable.
This programme was developed by Alistair Wilson of the University of Strathclyde, initially working with Springburn Academy in Glasgow, to support and encourage young learners who do not have family or friends who have attended university and are in an area of multiple deprivation. The fundamental success of the programme is the one-to-one mentoring programme giving pupils advice on what Universities are looking for in applicants and also subject specific advice. The programme is funded by Glasgow City Council Education Services and works closely with senior management within the schools involved.

STEMNET ‘SPEED DATING’ CAREERS FORMAT, improving careers awareness and motivation amongst young people

STEMNET are now regularly working with schools to arrange for ambassadors to take part in career ‘speed dating’ with entire year groups or select classes of pupils. The format is that the ambassadors from HE, Research, College or Industry will sit prepared to
answer questions and the pupils move round the room to find out about each persons career and what it is they do etc.

The benefit of this approach is that it is more personal for the pupil and forces them to approach all people in the hall or room without stereotyping or having prior prejudices to that particular career path. Currently there is no such evidence that I know of that determines if this approach is more beneficial, it would be good to do further research to determine the impact of career pathways that pupils choose as a result of different career information approaches.

STEMNET also offer advice to schools wanting to start up clubs or run events that promote STEM. A recent STEM bulletin produced by Global Science details the grants available to Schools to help run such events or to fund resources.


**HERIOT-WATT AH SUPPORT (PHYSICS), support with practical investigation and coursework**

Many University Physics departments offer support for delivery of the AH projects, including Aberdeen, Dundee, Glasgow, St Andrews, Strathclyde and the West of Scotland. As well as this the University offer workshops for coursework which are mentioned in Appendix E – This document was circulated to teachers following a day for University Physics department representatives to meet at SSERC to learn about the new Higher and Advanced Higher courses so that they can consider adapting their support for schools.

The Heriot-Watt Advanced Higher support is supported by the Institute of Physics and is very structured and is a regular dependable feature for teachers in the central east of Scotland. The university offers an online booking calendar system, free technical support during the labs and teacher support packs as well as less detailed pupil support packs.
Pupils are expected to complete 1 practical to complement their investigation and should come prepared to use the equipment available at the University.

The reason I mention Advanced Higher support in this report is that with local authority budgets being stretched the Advanced Higher classes are become increasingly larger due to class mergers with schools sharing the responsibility. This leads to additional pressure for teachers to support pupils to complete the practical work for their investigation. As well as the advantage of providing more good quality apparatus for pupils to use, the support from universities provides an enhanced opportunity for independent study and gives pupils an opportunity to experience lab work out with school. With a new CfE Advanced Higher course soon to be underway in schools I can only see the need for this support to increase but also see it as an opportunity for universities to attract pupils and enhance links with local teachers.

LOCKERBIE ACADEMY – Physics and Road Safety

Jennie Hargreaves from Lockerbie academy took advantage of a Royal Society partnership grant to partner with a local police officer to teach pupils about road safety in the context of the Physics crash investigation. Such grants open doors to allow teachers (and HE/Industry) with particular passions to create exciting and innovative contexts for STEM pupils to learn from. Jennie herself described the process by saying that ‘I can’t say that there isn’t work involved in preparing the grant application or completing the research but the experience is amazing. I have learned so much and the students have been thoroughly fired up by the scientific process’

PRIMARY ENGINEER – Programmes of CPD and support to encourage more STEM activity in participating primary schools

The Primary Engineer programme was set up in 2005 as a not-for-profit company with the aim to encourage children from a very young age to become the engineers of the future. The programme now extends through both primary and secondary education.
The founding aims of the programme were to –

- Develop projects which map to the curriculum and offer teachers alternative topics that explore the wider world of engineering.
- Expand the mechanisms by which engineers can engage with schools, teachers and students in a mutually productive and informative manner.
- Become a national voice for engineering in primary schools, highlighting the achievements of primary children, teachers and engineers.
- Address the skills pipeline from the foundations of the education system.

Recently Skills Development Scotland named Primary Engineer as a key partner in their ‘Engineering Strategic Engineering Plan’ and have committed funding to map the Primary Engineer programme to the masters level for teachers. To date they are working with 12 Local Authorities in Scotland and over 275 Schools, with the majority linked to an Engineering company for further support.

On the 21st of July 2014 the Institution of Primary Engineers and Institution of Secondary Engineers programme were launched. Susan Scurlock, founder and chief executive comments that-

‘the Institution of Primary Engineers and The Institution of Secondary Engineers are new programmes they have been designed with two things in mind - to enable schools to coordinate, plan, record and evaluate their pupil’s engagement with STEM and to encourage and support the engineers of the future.

Each school will have an Institution committee comprised of teachers, engineers and pupils; together they will plan the STEM activities giving engineers a role within the school and the opportunity for teachers to work with professionals from the engineering world.’
Having seen the activities produced with the teachers and the impact on pupils interest for STEM, it is a good quality and exciting set of programmes for schools to be involved with, especially as a cluster of schools as part of the improved transition to secondary STEM education. The annual Scottish Engineering Special leaders award developed by Primary Engineer encourages pupils to be creative and has also grown rapidly since it began and is now open to Secondary schools.

**Future development work**

- Once established if the methodology of career ‘speed dating’ encourages greater interest in young people towards STEM careers, work with STEMNET and local authorities to set up local authority wide career days that target available progression routes in their area. As the STEMNET career ‘speed dating’ events grow, the demand from Schools will outweigh what can be provided. Consideration could be given to work with STEMNET (and perhaps SDS) to provide local authority wide career days (possibly on rotation around schools) with an emphasis on local employment and further/higher education opportunities. Consideration should be given to family capital with STEM careers as pupils with no Family STEM background are less likely to choose this career path. Target age group should be younger at age 10-13.

- To seek support from HE, research and industry to support the delivery of lab skills courses in schools as well as implementing other courses such as engineering sciences in more schools. This would involve providing new equipment for schools, access to expertise for teachers and possibly industry/researcher visits. As there is a demand for more flexible progression routes in schools, the sciences and STEM subjects will have to offer more options for those pupils that are not progressing to Higher (SCQF level 7) level within School in the STEM subjects.
This should in turn lead to increased opportunities to engage with College based courses with relevant industry experience.

- Mapping of STEM activity and continue to work to find a location where this information is located and a process for keeping this information up to date. Although this is now progressing, continued development of this work would lead to better awareness amongst teachers and local authorities. It has been challenging to find a way to ensure that I know about what individuals and organisations are doing to support schools, much of this information has come indirectly via word of mouth or via contact through the governing body that supports the role and funders. Thought could be given to an incentivised approach to finding out about what Industry, HE and Research are doing to support schools, perhaps with reward for effective school engagement activities in a variety of categories. This however would need to be sustainable and supported long term as would take several years to become a recognised part of the STEM landscape. The new STEM award for teachers at the Scottish Education awards could perhaps be supplemented by a new STEM School engagement award for Industry and HE.

- It would be beneficial to carry out a detailed evaluation of the impact of interdisciplinary learning (IDL) on teaching and learning in Scottish schools. Also further research on how schools are implementing IDL logistically and what Education Scotland are looking for when examining best practice in IDL would be valuable. This could coincide with the development of new IDL projects for schools to use in the BGE phase based on industrial and topical contexts, building on the work done in this role, that of STEMEC and in partnership with the work of Education Scotland’s STEMCentral. Targeted support for IDL should be offered to schools identified as needing to develop in this area of CfE implementation, with financial support where necessary. Senior phase IDL should be considered also but greater partnership and discussion with SQA and schools would be required.
before a plan could be implemented. A programme of practical CPD for IDL would need to be set up in order for this outcome to be delivered.

- Continued development of an annual engaging with schools event for HE and others to demonstrate what type of support is beneficial to schools and encourage more support for schools in the future. This could also coincide with a celebration of Schools engagement in Scotland as proposed earlier, which would in turn encourage more Industry/HE/Research and college representation at the event. The event should be held in partnership with key STEM organisations and should move geographically annually rather than being associated with a single venue.

- Teacher networks in Scotland are a very useful resource. Consisting of large groups of like-minded (same subject), subject teachers who each have their own unique experience to share. This has been one of the great successes of CfE that isn’t mentioned enough, in that, teachers have had to implement a new curriculum with limited funding and have come together online and in person to ensure that workload is shared more effectively and often than ever before. Some teachers may have a vast understanding of GLOW resources, others the National STEM learning centre etc. Giving teachers an opportunity to communicate quickly should be a priority. Currently there are a variety of networks, some being supported more than others by either professional bodies or grants. I would encourage these networks to be supported further and to remain independent (managed and led by teachers), learner and teacher centred at all times.

Acknowledgements
Thank you to the Governing Body that have supported me in this role – and to Paul Beaumont who acted as my line manager. And for the time that many others have taken to give guidance and ensure that the role remained independent.
'STEM CPD provision in Scotland requires some level of overall direction and co-ordination within the new decentralised system that is evolving through current educational reform, at least to the extent of establishing strategic priorities, ensuring quality and breadth of provision, and delivering some level of common and widely available experience and understanding.'

'To achieve these aims, the SSAC has worked with the Deans of Science and Engineering in Scotland, Scottish Government, SSERC, STEM-Ed Scotland, CBI Scotland and SEMTA to address this co-ordination challenge. They strongly recommend the creation of Industry/Academia Schools Liaison Co-ordinator for Sciences posts, whose role they propose should be:

- To act as central co-ordinators for science-related schools activities, including CPD for science teachers and schools science engagement activity, which provide support for science teachers and schools as they implement new science courses under the CfE.
- To act as a central liaison to facilitate good practice engagement between schools, universities and industry to widen pupil experience and teaching in support of the new CfE.

Funding is being made available to implement this plan.'

'Whilst welcoming this initiative in principle, SEEAG has some comments and constructive proposals regarding the location (hosting), duration, tasks and scope of the co-ordinator post(s) if the required impact is to be
achieved:

The specified range of tasks involves mapping, evaluating and co-ordinating current activities, developing and disseminating a range of exemplar materials using a variety of resources for use by teachers, creating interdisciplinary linkages across the life, physical and engineering sciences. The varied practical experience of SEEAG members leads the group to consider this range of tasks to be over-ambitious relative to the funded time available, and some prioritisation is likely to be necessary. For instance, while exemplification is an important deliverable, it is in itself very time consuming and requires particular subject expertise. The tasks of the co-ordinator should be carefully prioritised on realistically attainable goals.

To function effectively, the co-ordinators need to develop a strategic overview of a wide range of CPD and science engagement activities and organisations across Scotland, to be recognised and included yet remain independent. Whilst the co-ordinators might be based in a key stakeholder organisation engaged in CPD development and delivery in order to function effectively, the location should be chosen with particular care to ensure the capacity to operate independently of any one organisation and engage widely. Unless the appointee(s) have broad and deep knowledge of the complex CPD and science engagement landscape, they will take a period of months to become sufficiently familiar with this complex landscape to make an impact. Yet this landscape is constantly evolving and is poorly mapped. The work will require ongoing and long-term engagement.’

‘The co-ordinators should not duplicate but rather empower and enhance the work of existing providers and organisations also working to achieve better coordination of their STEM support work. The establishment of effective working
partnerships will itself help to achieve shared goals more effectively.
In order to maximise impact and ensure independence and impartiality, it
would make sense for the co-ordinators to work and liaise with a support
group of providers and stakeholders, with broad representation from industry,
higher education and a range of support organisation across CPD and schools
engagement, especially including SSERC, local authorities, relevant
professional associations, and CPD providers.’

**SSAC, Enhancing Support for Schools through collaboration report**

‘**Recommendation 1**: SSAC consider that it is essential to capture and map the
breadth of existing schools’ engagement with industry, professional institutions,
learned societies and academia with a view to developing good practice
guidance (including guidance on the evaluation of the impact of the activities) and
examples – as well as co-ordinating and publicising opportunities.’

‘**Recommendation 4**: SSAC consider that there should be a greater role for industry and
academia in developing and contributing to science-specific CPD for science teachers.’
‘54. After much discussion, and with the support of organisations such as the Deans of
Science and Engineering in Scotland Group, Scottish Government, SSERC, STEM-ED
Scotland, CBI Scotland and SEMTA, SSAC consider that one solution to the problems
identified above would be to create one or more Industry/Academic Schools Liaison Co-
ordinator for Science posts. The individuals would work to draw together existing
activity, map it effectively and translate it into good practice examples that could be
disseminated to schools across Scotland.’
'55. In addition, it provides the opportunity to draw together and directly implement many of the recommendations highlighted throughout this report. SSAC has identified that a particular focus (through Recommendations 1, 2, 4 and 6) would be required for the liaison activity between schools and external partners (industry, academia and others) and the provision and availability of science-related CPD in Scotland. This could be achieved directly through the creation of the co-ordinator post. There may be an option for creating two posts which could be split according to scientific discipline (e.g. one covering the life sciences and one covering the physical and engineering sciences and mathematics).'

‘Recommendation 10: SSAC strongly recommend the creation of one or more Industry/Academic Schools Liaison Co-ordinator for Sciences posts.’
Appendix B – Some of the STEM organisations and groups that support STEM Education mentioned in this report

ASE – Association for Science education
RSC – Royal Society of Chemistry
EDT – Engineering development trust
IOP – Institute of Physics, recent talks and primary activity
SOB – Society of Biology
STEMEC – STEM Education Committee
SCDI – Scottish Council for Development and Industry
STEMNET – STEM ambassador programme and STEM clubs UK
SSERC – Scottish Schools Education Research Centre,
ICE – Institute of Civil Engineers
IET – Institute for Engineering and Technology
IMECHE – Institute of Mechanical Engineers
TTA – Technology teachers association
CASS – Computing at School Scotland
RSE – Royal Society of Edinburgh
SSAC – Scottish Science Advisory Council
SSAG – Scottish Science Advisory Group
SGeneralMicro – Society for General Microbiology
Deans of Science and Engineering Education group
British Science Association (CREST) - TechFestSETPoint
Education Scotland
SUPA – Scottish Universities Physics alliance
OPITO – Oil and Gas Skills development organisation
SDS – Skills development Scotland
Appendix C – STEM Map

Map allows you to ‘layer’ information, this view shows main buildings for HE/FE in Scotland.

Figure 7 - STEM Map Powerpoint presentation _ right click then click show to play.
Appendix D – STEM@ info

University STEM departments - Brief overview

Please refer to annual prospectus and University websites as it cannot be guaranteed that this information is entirely up to date but it does give a brief overview - last edited 25/11/2014

Master kept at https://docs.google.com/document/d/1Wq-EaXb-X30TUkT5v1Ok7bm-Il-38zXqF4NsLj1qeg/edit

This document and subsequent e-mail addresses are for STEM teachers and local authority education departments.

University of Aberdeen
STEM@aberdeen.ac.uk
http://www.abdn.ac.uk/study/courses/undergraduate/

(Arranged as Colleges and schools with colleges)

College of Life Sciences and medicine
School of Biological Sciences; Medical; Medicine and Dentistry; Psychology, Rowett Institute of Nutrition and Health

College of Physical Sciences
Schools of Engineering; Geosciences; Natural and Computing Sciences

University of Abertay
STEM@abertay.ac.uk
http://www.abertay.ac.uk/courses/prospectus/download/

(Arranged as Schools then divisions within Schools)

School of Arts, Media and Computer Games
Game Design; Games Tech; Sound Production; Visual Communication and Computer Arts

School of Science, Engineering and Technology
Civil Engineering; Computing; Environmental; Food; Forensics

University of Dundee
STEM@dundee.ac.uk
http://www.dundee.ac.uk/study/prospectus/

College of Art, Science and Engineering
Centre for Anatomy and Human Identification, School of Computing; School of Engineering; Physics and Mathematics

College of Life Sciences
School of research; learning and teaching
College of Arts and Social Sciences  
School of the Environment

College of Medicine, Dentistry and Nursing  
School of Medicine; Dentistry; Nursing and midwifery

University of Edinburgh  
STEM@ed.ac.uk  
http://www.ed.ac.uk/studying/undergraduate/pdf-download

College of Humanities and Social Science  
School of economics and Moray house

College of Medicine and Veterinary medicine  
School of Biomedical Sciences; Clinical Sciences; Molecular; genetic and population health sciences; Royal (Dick) School of Veterinary Sciences

College of Science and Engineering  
Schools of Biological Sciences; Chemistry; Engineering; Geosciences; Informatics; Mathematics; Physics and Astronomy

Glasgow Caledonian University  
STEM@gcu.ac.uk  
http://www.gcu.ac.uk/coursesearchnonjs/view/

(Arranged as Schools and departments within them)

School of Engineering and Built Environment  
Department of Construction and Surveying; Engineering; Computing; Communications and interactive systems

School of Health and Life Sciences  
Nursing and Community Health; Life Sciences

University of Glasgow  
STEM@glasgow.ac.uk  
http://www.gla.ac.uk/prospectuses/undergraduate/

(Arranged as Colleges and schools with colleges)

College of Medical, Veterinary and Life Sciences  
School of Life Sciences; Medicine and Veterinary medicine

College of Science and Engineering  
School of Chemistry; Computing Science; Engineering; Geographical and Earth Sciences; Mathematics and Statistics; Physics and Astronomy; Psychology.
Heriot-Watt University
STEM@hw.ac.uk
http://www.undergraduate.hw.ac.uk/

(Arranged as Schools)

School of Energy, Geoscience, Infrastructure and Society
Architectural Engineering; Civil Engineering; Construction Management and surveying; Urban studies.

School of Engineering and Physical Sciences
Chemistry; Chemical Engineering; Electrical Electronic and Computer Engineering

School of Life Sciences
Psychology; Biological Sciences; Brewing and Distilling; Food Science; Marine Science

School of Mathematical and Computer Sciences
Actuarial Mathematics and Statistics; Computing Science; Mathematics

Institute of Petroleum Engineering - post grad research

University of the Highlands and Islands
STEM@uhi.ac.uk
http://www.uhi.ac.uk/en/studying-at-uhi/prospectus

Faculty of Science, Health and Engineering
Engineering; Energy and Technology; Sustainable, environment and rural resource management; Applied life studies

University of Stirling
(http://www.stir.ac.uk/contact/)
http://www.stir.ac.uk/undergraduate-study/course-information/prospectus/

(Arranged as Schools)

School of Natural Sciences
Aquaculture; Biological and Environmental Sciences; Computing Science and Mathematics; Psychology.

School of Health Sciences
Adult Nursing; Mental Health Nursing; Midwifery; and Health Professionals and Paramedical Practice

Queen Margaret University
(http://www.qmu.ac.uk/the_university/contact_us.htm)
School of Health Sciences
Diabetics; Nutrition and Biological Sciences; Nursing; Physiotherapy; Radiography; Speech and Hearing Sciences.

Edinburgh Napier University
(STEM @ due to be ready soon)
http://www.napier.ac.uk/contact-us/prospectus/Pages/Prospectus.aspx

Faculty of Engineering, Computing and Creative Industries
School of Arts and Creative industries; School of Computing; School of Engineering and Built Environment

Faculty of Health, Life and Social Sciences
School of Life; Sport and Social Sciences; School of Nursing; Midwifery and Social Care

Robert Gordon University Aberdeen

Faculty of Design and Technology
Scott Sutherland School of Architecture and the Built Environment; School of Engineering; School of Computing science and digital media.

Faculty of Health and Social Care
School of Health Sciences; School of Nursing and Midwifery; School of Pharmacy and Life Sciences.

University of St Andrews
STEM@st-andrews.ac.uk
http://www.st-andrews.ac.uk/study/ug/prospectus/

STEM Academic Schools consist of -
School of Biology; Chemistry; Computer Science; Geography and Geosciences; Mathematics and Statistics; Medicine; Physics and Astronomy; Psychology and Neuroscience

University of Strathclyde
STEM@strath.ac.uk
http://www.strath.ac.uk/prospectus/
(Arranged as departments within Faculties)

**Faculty of Engineering**
Department of Architecture; Biomedical Engineering; Chemical and Process engineering; Civil and Environmental Engineering; Design, manufacture and Engineering Management; Electronic and Electrical Engineering; Mechanical and Aerospace Engineering; Naval Architecture; Ocean and Marine Engineering

**Faculty of Science**
Department of Pure and Applied Chemistry; Computer and Information Sciences; Mathematics and Statistics; Physics, Institute of Pharmacy and Biomedical Sciences, Institute of Photonics.

**Faculty of Humanities and Social Sciences**
Psychology

---

**University of the West of Scotland**
[http://www.uws.ac.uk/contacts/#.VC6gXk1OUos](http://www.uws.ac.uk/contacts/#.VC6gXk1OUos)
[http://www.uws.ac.uk/study-at-uws/undergraduate/](http://www.uws.ac.uk/study-at-uws/undergraduate/)

**School of Engineering and Computing**
Aircraft Engineering; Chemical Engineering; Civil Engineering; Computing; Computing animation and games development; Web and mobile development; Engineering Management; Mechanical Engineering; Motorsport design engineering; Music technology; Physics; Physics with Nuclear Technology; Product design and Development

**School of Science**
Biological Sciences; Environmental and Waste management; Chemical Sciences; Earth Sciences; Mathematics and statistics; Sport, health and exercise.

**School of Health, Nursing and Midwifery**
Nursing; Mental Health Nursing; Midwifery
Appendix E – Advanced Higher Physics support (written late 2013)

Aberdeen

Aberdeen currently runs two workshops for schools to support Advanced Higher. Practical Optics workshop is held in September and a Wave Particle Duality workshop being held in November.

Contact: tbc

Dundee

A rotational motion workshop, relating to an LO3 experiment, is run in the 1st week of September and some 120-160 students attend one of the 7 or 8 sessions offered during the week. The majority of attendees come from schools in Fife, Dundee or Angus (with fewer from Perth & Kinross).

In terms of AH investigation support no formal laboratory sessions are offered although ad-hoc requests are received and, wherever possible, accommodated. There has been a noticeable increase in requests in recent years with some ‘regular’ schools availing themselves of the facilities. In general visiting pupils are supported by a member of the academic staff.

In terms of wider outreach activities the department is involved in the supporting careers events, delivery of research talks and in the Tayside Universities and Schools Liaison Group (TUSLIP) Day of Physics held in September. Generally some 100-150 students attend the Day of Physics which comprises lectures, workshops and careers sessions.

Contact: d.mcgloin@dundee.ac.uk (David McGloin)

Glasgow

The Department provides a helpline/email system which offers:

- advice on possible experiments to develop or complete an investigation
- advice on the treatment of uncertainties
- possible help to understand “unexpected” results or to identify systematic errors
- access for school pupils to investigation enhancement experiments available in the university.

From October to March 30 enhancement experiments are offered in a small ‘AH Investigations Lab’. Teachers are able to access a list of available experiments. Pupils are generally not issued with a guide to the experiment before a visit but are asked to do some research on the experimental procedure. Pupils are issued with a guide to the experiment an AH Checklist. Each pupil is fully supervised throughout their visit either by a tutor or one of a group of postgraduate students. After the visit pupils have access to the Helpline facility. Most visiting pupils are from the west of Scotland but some have come from Edinburgh, Dundee, the Borders and Shetland. The past 3 years have seen ca. 120, 60 and 70 pupils attend (performing some 150, 110 and 120 experiments).

Additional support for schools is offered through a number of routes including:
• visits to schools to help motivate pupils at the start of their investigation work and to assist them and their teachers in planning their investigations. Such visit may include:
  o PowerPoint presentation on all aspects of the investigation
  o providing inexperienced schools with an Investigation Planner
  o issuing pupils with an Individual Planner and advising them on in-school and possible university experiments
  o helping staff to identify equipment within the school that could be useful in investigations
• Master-classes
• A range of resources for AH (although they are to be updated)
• Ambassador programmes (undergraduate and postgraduate)
• ‘Lab-in-a-lorry’
• School visit days

Contact: peter.law@glasgow.ac.uk (Peter Law)

Heriot-Watt
http://www.eps.hw.ac.uk/teaching/physics-schools-laboratory.htm

AH investigation support offered by Heriot-Watt is principally in the form of making a series of set experiments available to students who come to the university. Typically equipment/laboratory is used every Tuesday/Thursday from mid-October to mid-March although in 2013 the facilities are only available until; end December. Demand has risen from 8 schools (29 students) in 2008 to 25 schools (213 students) in 2012.

Each student visits on one occasion and during that time is able to complete one or two experiments. A handbook is available for teachers although some schools are much less organised than others. The majority of attending schools are from the Edinburgh, West Lothian, Falkirk and Borders authorities.

Teachers are contacted by a variety of routes including the annual Stirling Meeting and a web-based calendar. A demonstrator, funded by the university, is available to support students with the equipment but not interpretation of results; teachers must be in attendance alongside their students.

In addition to AH investigation support the department offers school talks, laboratory-based workshops and weekend Master Classes.

Contact: d.beddard@hw.ac.uk (Dawn Beddard)

St Andrews

The department is involved the Tayside Universities and Schools Liaison Group (TUSLIP) Day of Physics held in September.

Support for AH investigations is primarily in response to requests. The majority of students involved are from Fife but students from across Scotland attend. Schools lectures are
available on request. The department is involved in a number of outreach initiatives including “Seeing Life through a New Light” - a science engagement programme based on the applications of light in medicine and biology which was established with funding from EPSRC.

The university is employing someone whose brief is to work closely in supporting physics and / or computer science in rural / remote areas. The undergraduate ambassador scheme is particularly successful with a number undergraduate students spending time in schools (predominantly secondary) supporting teachers.

Contact: pasc@st-andrews.ac.uk, Dr Paul Cruickshank

Strathclyde

AH investigation support offered by Strathclyde is mainly centered on the west of Scotland with some 100-200 students reached each year. The department responds to both pupil and school requests and staff/technical support is provided.

In addition to investigation support AH Days are run in the final of the autumn term and the first week of the spring term. AH Days offer talks on research linked to the AH curriculum, careers information, simple experiments linked to AH learning outcomes. The department is actively involved in TechFest and responds to requests for school-based talks all over Scotland. There are departmental Open Days (advertised centrally and through the website) and Science on the Streets is offered as part of the Glasgow Science Festival.

Contact: study@phys.strath.ac.uk Nigel Langford

West of Scotland

In terms of AH investigation support this is offered on ad-hoc basis. Generally between 2 and 10 pupils attend each year. Schools from both state and independent sectors avail themselves of the service.

No formal list of available experiments is provided – requests are dealt with on a case-by-case basis. Students are encouraged to look through the date before they leave and most follow this advice.

Teacher support days are offered jointly by UWS/Strathclyde and UWS has been offered as a venue for the IOP Touring Lecture.

Contact:tbc
1 http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtp053221.pdf
2 The Department for Innovation, Universities and Skills is now the Department for Business, Innovation and Skills (BIS).
3 https://drive.google.com/file/d/0B33B2yGHN4RTWWlQTXUwakZxWDg/view?usp=sharing
4 https://docs.google.com/document/d/1Wg-EaXb-X30TUKT5y10k7bm-ll-382XgF4NsLJ1jgeg/edit
5 http://www.skillsdevelopmentscotland.co.uk/media/1114815/life_sciences_sip_april14.pdf
6 http://www.scotland.gov.uk/Topics/Education/Schools/curriculum/ACE/Science/STEMEC/STEMECPapers
7 https://bocsh2011.wikispaces.com/
8 http://www.astrobiology.ac.uk/teaching/astrobiology-summer-academy/
9 http://www.strath.ac.uk/media/faculties/engineering/annabel/final_Insight_issue_4.pdf
10 http://www.skillsdevelopmentscotland.co.uk/resources/skills-investment-plans/
12 http://www.lifescan-scotland.co.uk/community/bte/
13 http://www.crm.ed.ac.uk/public/teachers
14 http://www.eurostemcell.org/regenerate-bringing-cutting-edge-science-schools-around-scotland
15 http://www.strath.ac.uk/humanities/schoolofeducation/glasgowintergenerationalmentoringnetwork/
16 http://your-initiatives.safety-mobility-for-all.com/school-story/road-crash-investigator
17 https://royalsociety.org/education/partnership/
18 http://www.primaryengineer.com/