Embracing outdoor learning

Scotland's "rich urban and rural environments" present enormous potential for delivering the Curriculum for Excellence in a meaningful way to engage young people in their learning, as outlined in Education Scotland's key document "Curriculum for excellence through outdoor learning" [1].

Laura Campbell, Biology teacher.

A wealth of research highlights the benefits of outdoor learning, from supporting young people's attainment, health and wellbeing, wider achievements and personal development [2]. Education Scotland's 2022 evaluation of "Structural barriers to STEM engagement" [3], carried out by Ekosgen, reports that learners "want their learning experience rooted in the real world" with an emphasis on Learning for Sustainability, climate education and outdoor learning. Meanwhile, the 2022 OECD PISA report "Are students ready to take on environmental challenges?" [4] states that while approximately half of students are "environmentally enthusiastic", there is a curriculum-agency gap where being aware of the issues does not necessarily translate into meaningful action. The opening line of this report states, "Never before have the stakes been so high for the role of science education in shaping how people interact with the environment". Embracing the outdoors as part of our learning and teaching practice is a fantastic way to respond to these findings and embed Learning for Sustainability, an entitlement for all learners and recognised within the GTCS Professional Standards and HGIOS.

Teacher Insight – Laura Campbell

Laura Campbell, a Teacher of Biology/Science, completed her probation year at Brae's High School in Falkirk and, during this time attended SSERC's Science Probationer Residential course as a delegate. Throughout the course, Laura spoke passionately about outdoor learning:

> "We talk so much about Play Pedagogy in Primary and Early Years. But it stops in S1. Why? Learners behave differently outdoors – they play again and there is more freedom."

As a Biology/Science teacher, Laura had delivered many of her own lessons outdoors and shared some of her favourite outdoor learning activities in Biology (Figure 1).

When learning outdoors, Laura noted changes in behaviour and attitudes among learners; they relaxed and those who were

>>

Other topics

often unmotivated and disengaged started to participate more and enjoy the lesson. Learner voice (Figure 2) reinforced the positive correlation between outdoor learning and a sense of wellbeing [2].

Laura conducted a practitioner enquiry, during her probation year, on outdoor learning. She planned and delivered a whole-school outdoor learning day for the S1 cohort, with subject-specialists across the school adapting a "indoor" lesson for the outdoors. Measures were put in place to ensure the event was inclusive and could continue regardless of the weather on the day. Figure 3 summarises the variety of outdoor learning activities offered.

Laura has since taken up a full-time, permanent post at Rossie Young People's Trust, where she delivers the Forest School programme. This Scandinavian approach to learning highlights the importance of young people having regular contact with the outdoors providing opportunities to develop skills and knowledge through experiential learning in a woodland environment.
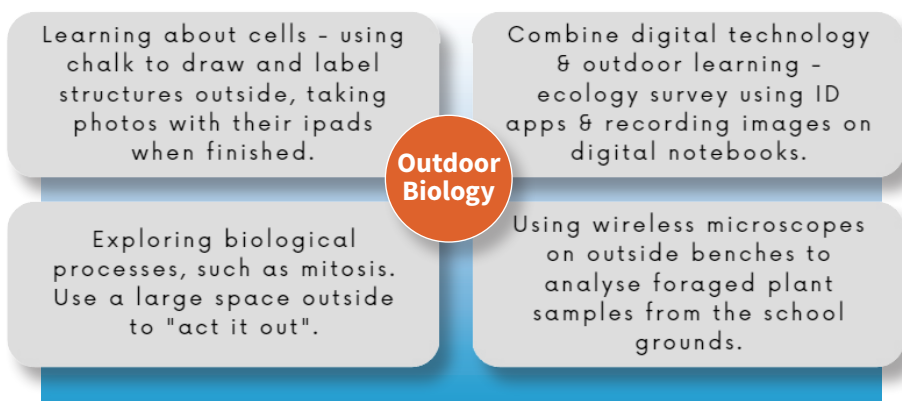

Figure 1 - Laura Campbell shares some of her favourite outdoor learning activities.

Six themes emerge from research of the positive impacts of Forest School on young people: confidence, social skills, language and communication, motivation and concentration, and knowledge and understanding [5].

Laura describes Forest School as "a holistic approach to education and aims to be child-led, allowing young people to develop their confidence and self-esteem whilst exploring an alternative environment". Young people can develop their practical skills such as working with tools and woodcraft but also their transferable skills such as communication and teamwork. At Rossie, the team deliver the Forest and Outdoor Learning Award, which allows young people to explore creative and practical activities in the forest, including den building, candle making and pizza making; the young people have even designed and built their own pizza oven (Figure 4 shows some of these learning activities).

The young people at Rossie are currently involved in risk assessing, designing and building a treehouse treehouse with a swing and a rooftop garden.

Laura remarked "What's really nice about Forest School is that young people find it relaxing and enjoyable but there are also so many links to the Curriculum for Excellence, particularly to Science." Rossie are in the process of leading the building of the first secure Forest School site in the UK, which will allow young people in secure accommodation to access a Forest School education. >>

Figure 2 - Learner voice – Outdoor Learning.

Science delivered a climate change workshop to understand the greenhouse effect.

Maths & Physics co-delivered a lesson on momentum and scientific enquiry.

Geography and Humanities delivered a session called "Sustainability Superheroes" to design a future-proof school.

Whole-school outdoor learning

Music & Drama worked together to build natural musical instruments and put on a show at the end of the day.

The PE department held a lesson on Yoga in the school playing fields.

The History department held "Battle Royale" with their re-enactment of the Battle of Falkirk.
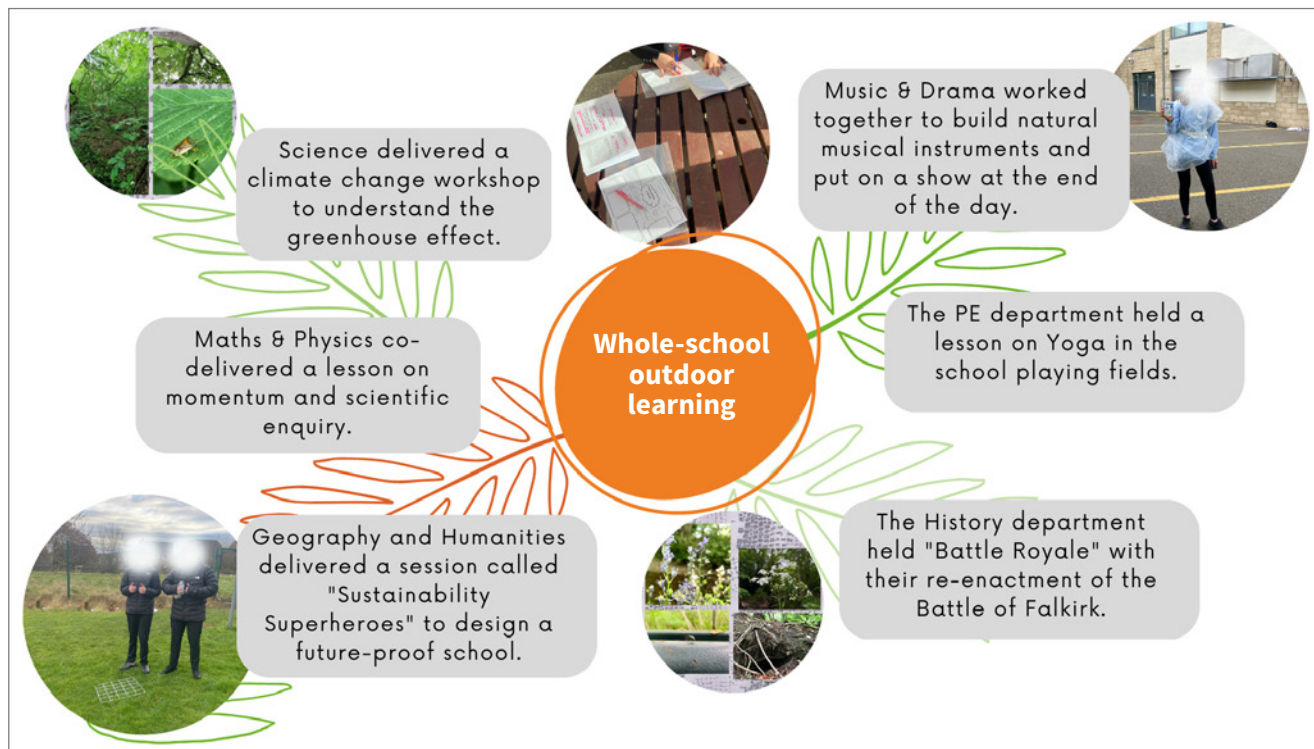
Figure 3 - Sessions delivered outdoors during a Brae's High School Outdoor Learning event in 2022.

SSERC Biology Professional Learning

As we move forward as a team at SSERC, we are committed to supporting teachers and technicians with professional learning opportunities that embed outdoor learning and Learning for Sustainability. Our "Techniques for Senior Phase Biology" course in March and the Summer School programme have been reinvigorated to boost these learning activities. In May 2024, we aim to launch our first ecology-focused programme.

SSERC Biology Resources to support Outdoor Learning

A range of materials can be found on the Biology resources page of the SSERC website, including:
- A health and safety guidance document for fieldwork/ecology.
- Explore our World – 3 comprehensive practical activities for outside.

Outdoor & Woodland Learning Scotland offers a range of downloadable resources via their website.

Learning at Rossie Forest School

Figure 4 - Learning at Rossie Forest School.

References
[1] Education Scotland (2010), Curriculum for Excellence through Outdoor Learning, Education Scotland, ISBN 978-184399-180-9.
[2] Education Scotland, Outdoor Learning: Practical guidance, ideas and support for teachers and practitioners in Scotland, Education Scotland.
[3] Staiano, S., Weaver, R., Whitcomb, R. (2002), The Structural Barriers to STEM Engagement – Final Report for Education Scotland", Ekosgen. Available at https://education.gov.scot/media/co2dniov/ekosgen-structural-barriers-to-stem-engagement-year-3-report-nov-2022_.pdf.
[4] OECD (2022), Are Students Ready to Take on Environmental Challenges?, PISA, OECD Publishing, Paris, available at https://doi.org/10.1787/8abe655c-en.
[5] O'Brien, L. (2007), Forest School and its impact on young people: Case studies in Britain, Urban Forestry & Urban Greening, 6:4, 249-265.

Python, pandas
and physics pendulums

As is often the case, a coincidence of events, over a period of time, proved to be a stimulus to develop a new activity. The core of this article is about damped simple harmonic oscillation at Advanced Higher Physics but it is multidisciplinary in nature, incorporating elements of maths, computer science and data science.

The 'last straw' was an email containing a short, elegant piece of Python code whose output was a beautiful, simple, colour, Hertzsprung-Russell diagram. Python warranted further study.

A convenient reason proved to be the data collected from a simple pendulum experiment. A smart phone, running Pasco's free Sparkvue data logging software, was used as the pendulum bob recording the phone's y-axis accelerometer readings. The data is easy to collect and display but it was hoped that the activity could be extended to include an estimate of the 'damping factor' of the simple harmonic motion.

So why bother?
Firstly, the decay envelope in a simple harmonic motion gives us an insight into the exponential function and viscous damping.

Secondly it allows real-life, messy, big data to be easily collected and used to demonstrate how an AH Physics activity could be used to 'signpost' or give an insight into data science. Data science is becoming increasingly important in modern society. In the code we have used Python and Pandas in a Jupyter notebook through the Anaconda distribution to read a csv file into Python, replace an Excel table with a dataframe, analyse and reform the data and reuse sections of code. Many of these activities are components of the SQA SCQF level 8 unit Programming for Data J4YB35. Other SQA NPA data science units exist at levels 4, 5 and 6.

"The Anaconda Distribution for Students and Academics allows learners to quickly get started with a no-cost, easy-to-use Python package and environment manager for educational and research use". More details of the Anaconda package can be found here.

"Jupyter Notebook is a free, open-source web application for creating and sharing computational documents". More details about Jupyter can be found here.

"Pandas is a fast, powerful, flexible and easy to use open source data analysis and manipulation tool, built on top of the Python programming language". Documentation for Pandas can be found here.

The full version of this article (which contains all the code used and a brief explanation of each block of code) and all the associated notebook and csv files are available for download from here.

At maximum displacement all the energy in the SHM system is potential energy. Any loss of energy from the system must lead to a reduction of peak amplitude.

Analysis of this data (about 500 rows and five columns) involved identifying the peaks and troughs of the waveform and had previously been carried out in Excel (see Figure 1). It should be noted that the data collected was real, that is to say it was imperfect and messy.

Whilst this was successful it required several 'manual' processes. Either filtering, copying to a new sheet or
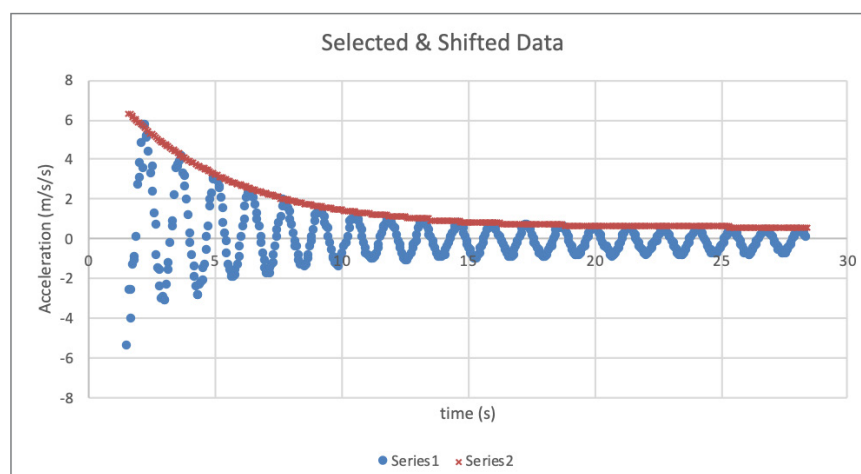
»

Figure 1 - Result of Excel pendulum data analysis.

shifting data by a value obtained from visual inspection. A brief description of the steps taken are shown below. The spreadsheet cell equations are included in the full downloadable, version.

In this example we assume that you have collected data in columns A, B & C in a sheet called 'in'. We will assume that column B contains the 'x' axis data and column C contains 'y 'axis data (column A contains a date/time group).
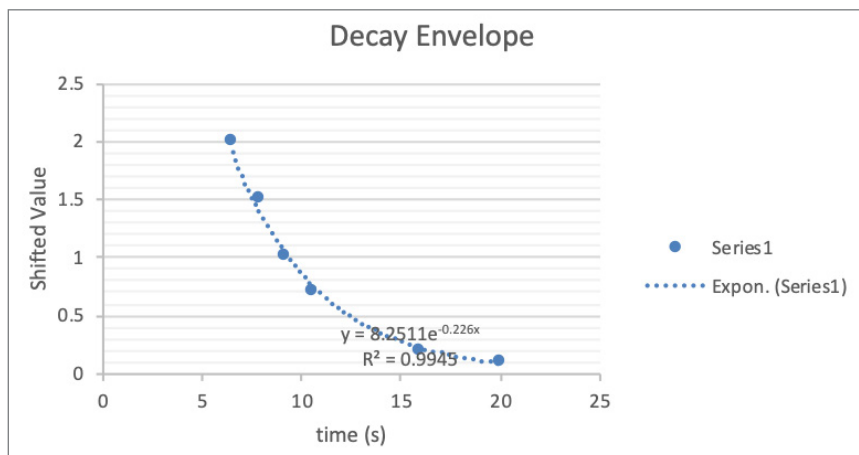

Figure 2 - Excel exponential fit to the data points after completion of step 11 below.

Step 1
'Top & Tail' your data.

Step 2
Calculate the difference between successive data points.

Step 3
Flag all 'turning points' i.e. where the peaks and troughs lie.

Step 4
Copy the flagged data and 'blank' the unflagged data.

Step 5
Copy and paste the flagged data to a new sheet.

Step 6
Copy the VALUES of columns A & B into columns C & D.

Step 7
Filter the contents of sheet1 i.e. deselect 'blanks' in col A leaving only those points 'flagged'.

Step 8
Move the filtered data to a third sheet.

Step 9
Shift the data until the upper envelope is just above the x axis.

Step 10
Flag all positive values.

Step 11
Filter on this Flag and plot this filtered dataset and find the best exponential curve fit (see Figure 2).

Excel gave a best fit exponential curve of y = 8.2511 e-0.226x. A decay constant of -0.226.

Plotting the line with this equation (which is asymptotic to the x-axis) but shifted vertically to lie on the envelope of the original data resulted in Figure 1.

Could we do better and automate most of the process in Python? (Very much a first, novice attempt.)
In this article we use Jupyter notebook to run Python. For brevity in this abridged version, the code and the commentary on the code is not shown. Please download the full article for a full listing and commentary.
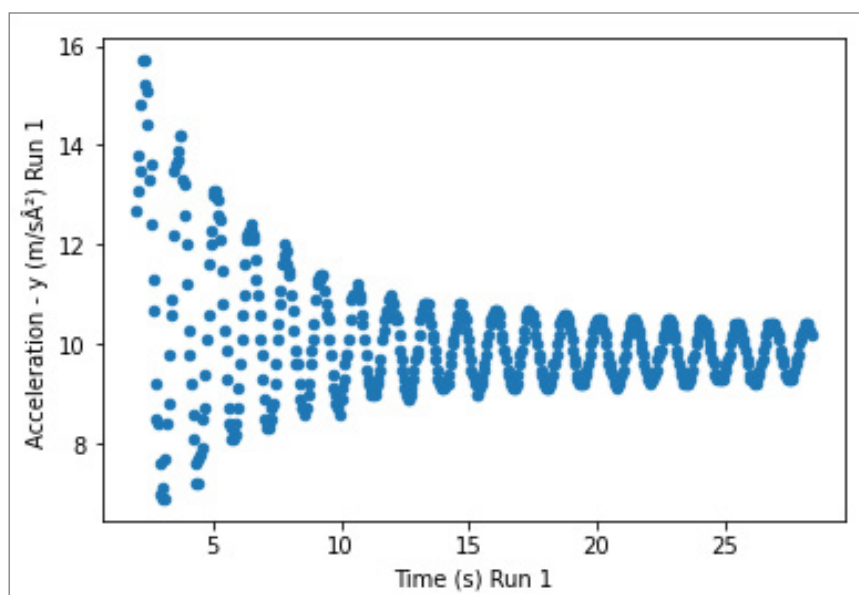
A plot of the raw data looks like in Figure 3.   »

Figure 3 - Raw data plot.

```
[-3.76541561 -0.19490793  9.40862694]
[0.34746838 0.02416033 0.06121143]
```
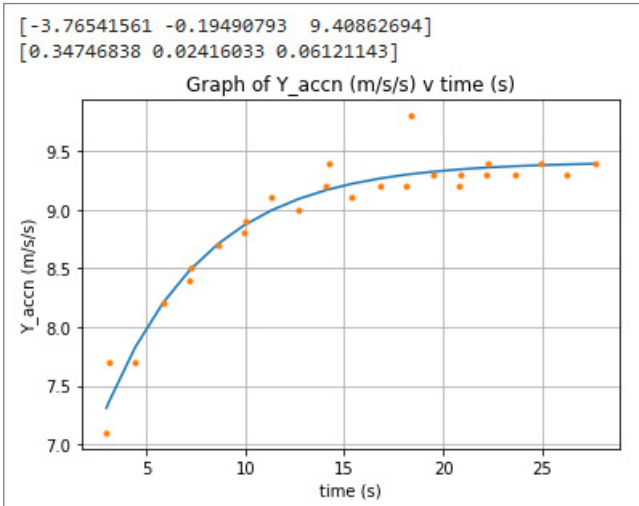
Figure 4 - The troughs identified, plotted and an exponential curve fitted.


```
[ 5.82833333 -0.1758791  10.30523931]
[0.61305499 0.03334055 0.19337377]
```
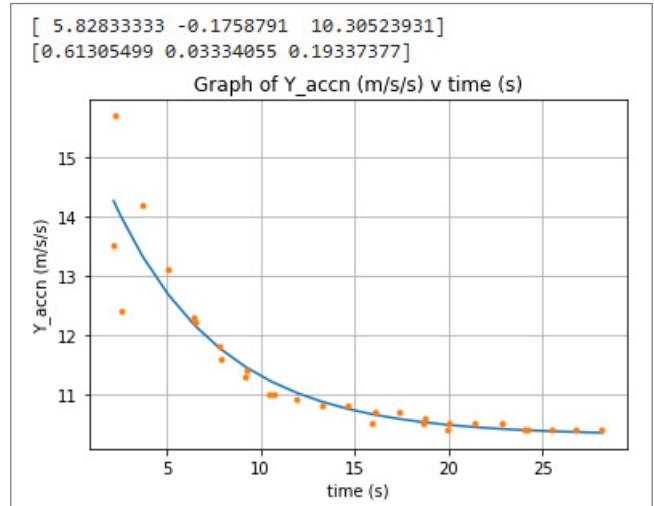
Figure 5 - The peaks identified, plotted and an exponential curve fitted.

Using the Python code we identify the peaks and troughs and fit them to an exponential function and derive the constants (Figures 4 and 5).

The two envelope equations plotted alongside the original data is shown in Figure 6 below.

Can we recreate the original waveform from what we have learned about it?

Using the equation

$$y = a\,Cos(\omega t + \emptyset)e^{-\frac{b}{2m}t} + c$$

for damped simple harmonic motion where (for a mechanical spring system).

$$\omega = \sqrt{\omega_0{}^2 - \left(\frac{b}{2m}\right)^2}$$ and the natural

frequency, $\omega_0 = \sqrt{\frac{k}{m}}$

Y = y-axis value at time t, a = the oscillation amplitude, t = the time in seconds, b = coefficient of viscous damping, m = mass, Ø = phase angle and c = the vertical offset from the x-axis.

Setting Ø = 0, neglecting the second term in the equation for ω (as it is very small compared to $\omega_0{}^2$) and assuming a symmetrical waveform can we create a facsimile of the original data?

The constants a and b/2m can be obtained from the curve fit algorithm. From the data in the graph we first calculate

$$\omega_0 = \frac{2\Pi}{T}$$

To obtain T we take the mode value of the time interval between the turning points ln(18). This gives us the period of the waveform.

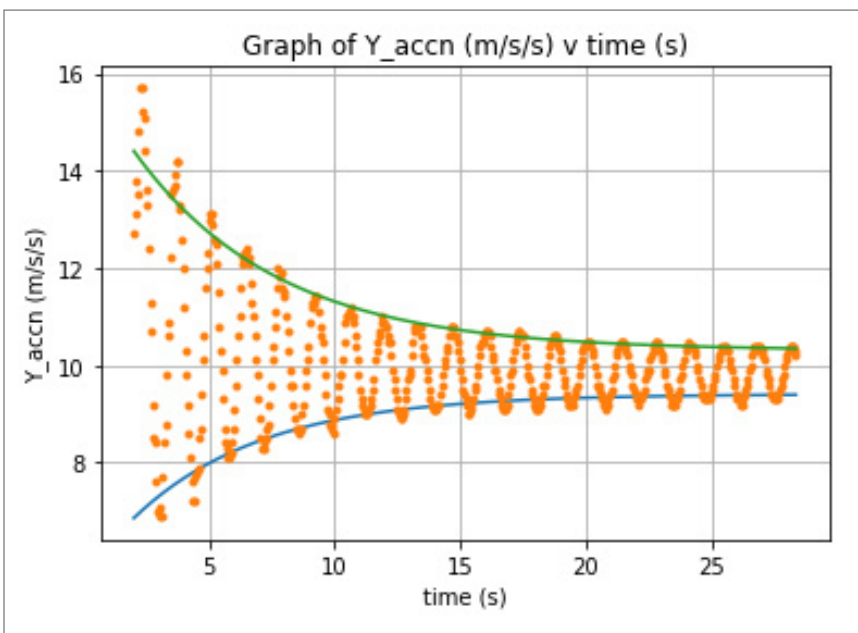Figures 7 and 8 on the next page show the recreated data and the exponential envelope lines of best fit. $\gg$

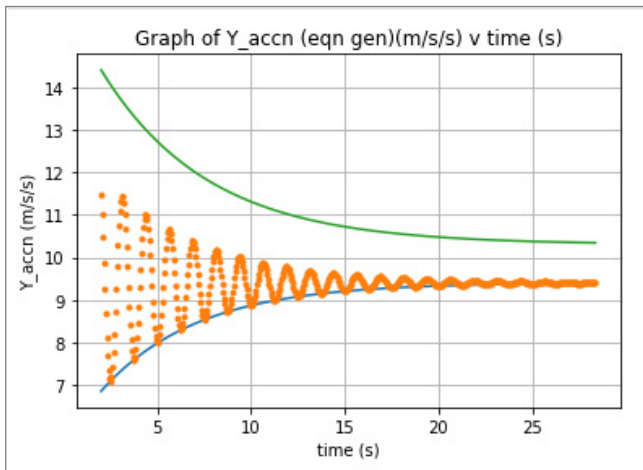**Figure 6** - The original data plotted with the two exponential lines of best envelope fit.

Figure 7 - Waveform recreated based on data to fit the lower envelope.
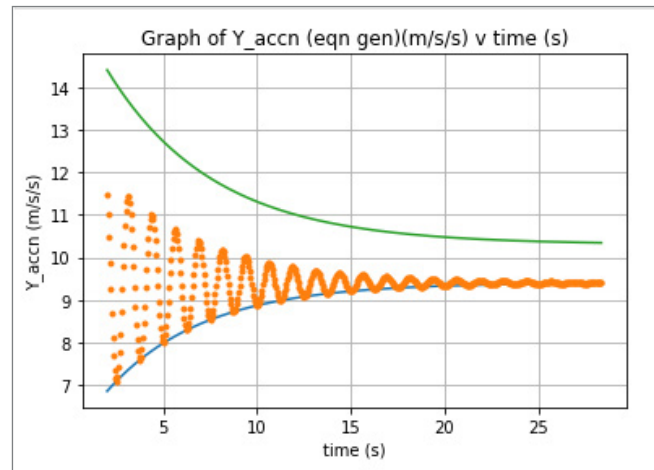

Figure 8 - Waveform recreated based on data to fit the upper envelope.

Will the process work with other data?

We set up a Pasco smart cart connected to a spring, on a slope. We collected and exported the data to a spreadsheet and read the spreadsheet into the above program.

By simply changing the name of the spreadsheet to be read, the name of the sheet to be written, which columns to discard and changing the column title references we obtained the following final output shown in Figure 9.

The numbers above represent the constants of the exponential line fitting the upper and lower curves respectively. Below each of the three constants is the python calculated standard error in each of the constants.

Thank you to Catalina Dobas, laser service engineer and python outreach ambassador at Photonic Solutions Ltd for verifying the code and formatting it in a professional, modular, function-based way.

Please click here for her program. ≪


```
[ 0.20755863 -0.12262707  0.19238129]
[0.00587035 0.01585511 0.00935865]

[-0.19666541 -0.10223541  0.23789431]
[0.00654466 0.01229129 0.00937175]
```
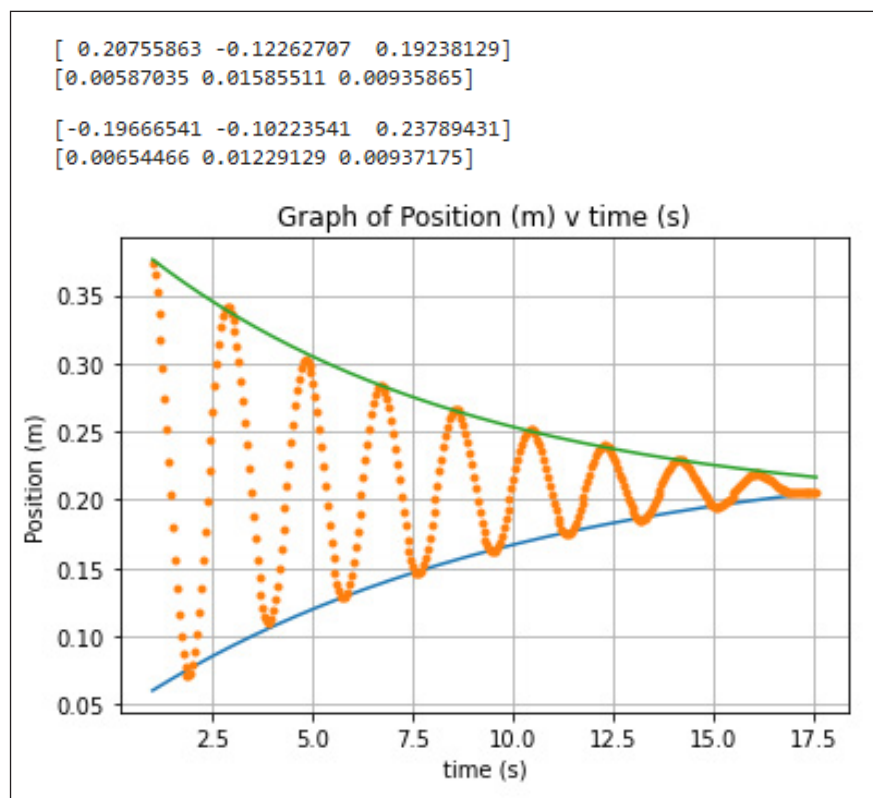
Figure 9 - Waveform recreated based on data to fit the upper envelope.

SSERC professional learning courses

We offer professional learning (PL) courses and events for teachers in both primary and secondary settings, school technicians, and other educators. Many of our PL offers are financially supported via ENTHUSE funding from STEM Learning or from the Scottish Government. Such funding for our courses helps towards covering course costs and allows us to provide delegates with resources to support learning and teaching back in their schools.

Courses available for online booking include:

COURSE NAME	RESIDENTIAL?	DATES	CLOSING DATE	SECTOR
*Safety in Microbiology for Schools	Face-to-face	25-27 April 2023	3 March 23	Secondary Technicians**
Using R in the STEM Classroom	Face-to-face	4 May 2023	17 March 23	Secondary Biology
*Welding Skills	Face-to-face	9-10 May 2023	17 March 23	Secondary Technology***
Safe Use of Fixed Workshop Machinery	Face-to-face	16-17 May 2023	21 April 23	Secondary Technicians**
*Welding Skills	Face-to-face	23-24 May 2023	31 March 23	Secondary Technology***
*Physics Teachers Summer School	Face-to-face	24-27 May 2023	21 April 23	Secondary Physics
Introductory Physics	Face-to-face	31 May – 1 June 23	28 April 23	Secondary Technicians
*Wood Turning	Face-to-face	5-6 June 2023	5 May 23	Secondary Technology***
*Chemistry Summer School	Face-to-face	15-16 June 2023	12 May 23	Secondary Chemistry
*Wood Turning	Face-to-face	12-13 June 2023	12 May 23	Secondary Technology***
*Biology Summer School	Face-to-face	20-22 June 2023	26 May 23	Secondary Biology***
*Wood Turning	Face-to-face	19-20 June 2023	26 May 23	Secondary Technology***

*   This course attracts ENTHUSE funding which offsets the course fee.
**   May also be suitable for secondary teachers.
*** May also be suitable for secondary technician.

Please check our website pages at https://www.sserc.org.uk/professional-learning/calendar/ for the most up-to-date details on our professional learning calendar.

Readying learners
for a data-driven world

Why are data skills important?

Data skills are to the 21st Century what reading and writing were to the 20th. The digital technology revolution has put data at the core of many things, from personal privacy and public health, to running organisations and tackling the climate crisis.

As the coronavirus pandemic has so vividly shown us, a basic level of data literacy is critical for every citizen, even those who don't regularly work with data as part of their job. But as every industry becomes increasingly digitised and data-driven, from health care to agriculture, engineering, marketing, hospitality, sport, and even the arts, data skills are becoming more important than ever across the range of possible careers.

In Scotland alone, there are lots of companies using data in incredible ways to solve some of the world's most pressing problems. A few examples are: IGS, an Edinburgh-based company using sensor data to develop smart systems for vertical farming, with the aim of tackling food shortage and climate change (Figure 1); Space Intelligence, who use satellite imaging data to work out the best places to plant carbon-capturing forests; and Skyrora Design, a literal rocket science company that carefully monitors

Figure 1 - IGS are an Edinburgh-based company that uses sensor data to monitor and develop smart systems for vertical farming, with the aim of tackling food shortages and climate change.

data on the positions of satellites and space debris in order to safely launch their rockets into space.

The rapidly increasing demand for people with data skills in the workforce means that Scotland (and the whole UK) now faces a significant data skills gap. For this reason, it is imperative that learners are introduced to data skills in school.

What is data literacy and how can schools teach it in BGE?

Data literacy is the ability to ask questions, collect, analyse, interpret, and communicate stories about data (Figure 2). An enquiry based

framework called PPDAC (Problem, Plan, Data, Analysis, Conclusion) is used to help structure learning. In choosing a problem to solve, it's helpful for learners to pursue something that is meaningful and motivating to them.

You might assume that teaching data skills would most naturally sit in the context of numeracy, but teachers are very likely already teaching aspects of data literacy in other subjects, such as maths, social sciences, geography, modern studies, environmental science, >>

Figure 2 -Telling stories with data. (Image source: @kdnuggets)
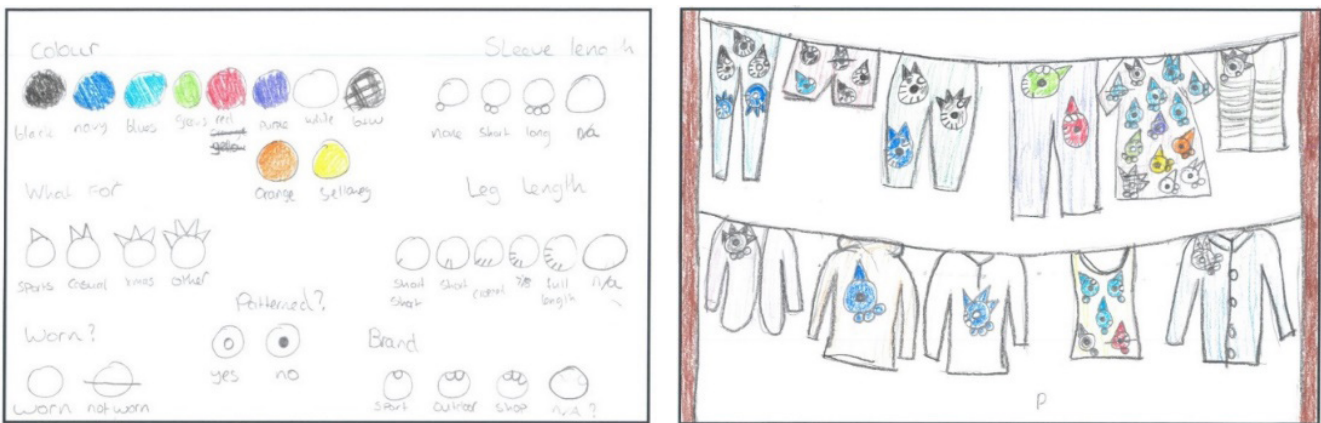
Figure 3 - An interdisciplinary activity that brings together art and personal data in a beautiful and gentle way. This resource can be freely downloaded from https://dataschools.education/resource/dear-data-6-lessons/.

physical and life sciences, and computing science. Moreover, the opportunity to *apply* data skills exists in almost every subject in the Scottish curriculum. For example, learners in Physical Education could analyse their step counts and activity levels and work out where they're most stationary or active in school. In Music, learners could create compositions using data sonification with http://musicalgorithms.org/3.2/, where different sounds or notes are played with different values of a dataset. Or in Geography, the Census

data could be studied to learn more about your neighbourhood using datashine.org.uk, or find out how many accidents have happened on the roads outside your school using crashmap.co.uk.

The Data Education in Schools team have developed a range of free, high-quality, engaging interdisciplinary resources that support teachers to help enhance (or recognise) their data literacy teaching in the context of the curriculum. This growing library of teaching resources and

professional learning videos is searchable by theme, level and area, and can be found at https://dataschools.education/data-education-resources/ (see Figure 3).

The NPA Data Science

For senior Secondary learners, there now exists a new National Progression Award in Data Science (Levels 4, 5, 6), which is possibly the world's first data science qualification designed specifically for school learners! See Figure 4.

A National Progression Award is designed to provide learners with the knowledge and skills needed to progress to further learning or employment. NPAs focus on specific areas such as cyber security, computer programming and data science. NPAs are nationally recognised qualifications that deliver real-world skills. At Level 4 (National 4) the qualification will take 80 hours to deliver. At Level 5 (National 5) and Level 6 (Higher) the qualification will take 120 hours to deliver. »
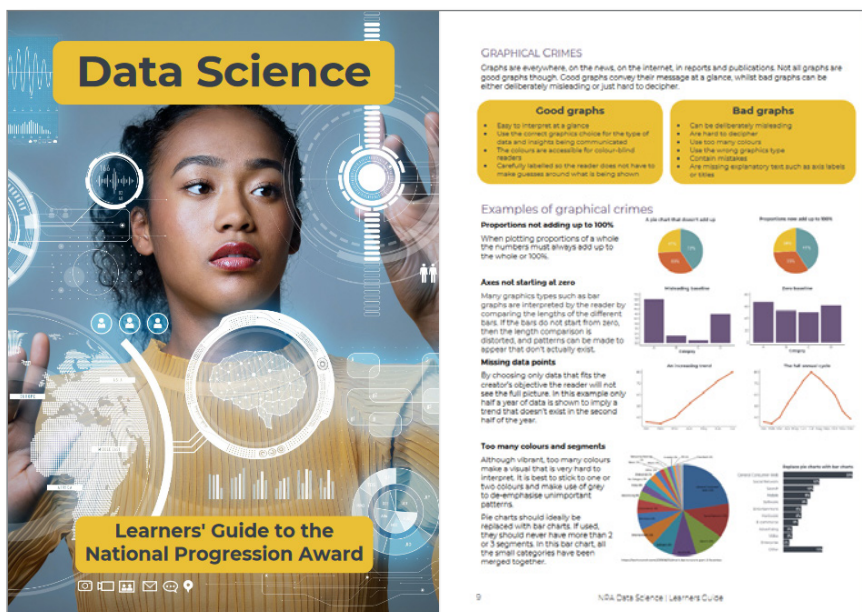

Figure 4 -Excerpts from the Learners' Guide to the NPA Data Science.

The qualification covers data literacy, data citizenship, data ethics, data analysis, statistics, and, optionally, computer programming. Learners will find out what data science is used for, the principles behind it, and gain practical skills in analysing large datasets. They will be able to apply these skills in their personal lives, at university and in employment.

The qualification is designed to be accessible to every learner, and teachable by every teacher. A range of support materials are available for teachers and learners. There's a Learner's Guide, which covers the contents of most of the qualification, and an Educator's Guide to help teachers prepare for and deliver the qualification. Both can be found at https://dataschools. education/about-data-literacy/ npa-data-science/. There's also a range of lessons and assessments available for most of the units within the qualification (http://learn-data. science/).

If you would like further support to engage with data science in your classroom, Data Education in Schools are offering a number of professional learning courses in 2023. They will also be running a free four-day course with dates across

February through May, on teaching data science in the secondary classroom, including the NPA Data Science. In partnership with SSERC, they are offering a one-day course data science in the secondary classroom (**8th June 2023**), check the SSERC website for further details.

About Data Education in Schools
Data Education in Schools is developing an interdisciplinary data education curriculum for Scotland and a set of engaging real world data science teaching materials for primary and secondary school teachers. The team brings together academics, qualified teachers and STEM professionals with expertise from industry and local government.

The Data Education in Schools project is part of the Edinburgh and South East Scotland City Region Deal Skills Programme, funded by the Scottish Government.

If you would like more information, or a free poster for your classroom highlighting examples of data careers spanning a range of sectors, send an email to dataschools@ed.ac.uk. <<

Data Education in Schools

www.dataschools.education
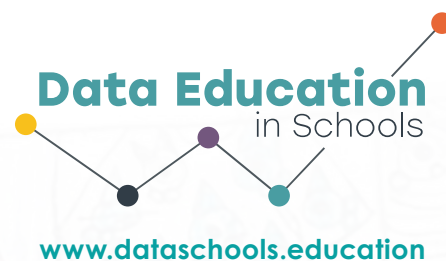
Technology professional learning

Here at SSERC technology we have developed several hands-on practical courses to assist technology teachers, technicians, and other support staff to develop and enhance their engineering, woodworking, and Computer Aided Design (CAD)/Computer Aided Manufacture (CAM) skills.

These courses have been developed in a modular fashion that allows focus on specific core areas and develop key practical skills. These skills will prove useful in the successful delivery of metalworking/woodworking craft activities, design activities and teaching aspects of SQA based courses such as National qualifications.

An outline of these courses is given below. However, it should be noted that the offering is continually growing and further are planned. If any further information on any of courses is required, then please do not hesitate to contact the Technology team at duncan.lamb@sserc.scot.

Engineering bench skills
Engineering bench skills is a 2-day course which involves using a range of basic metalwork hand tools and equipment. It is ideally suited to individuals with limited metal working experience or those wishing to refresh their knowledge.

The course is delivered through participating in a range of practical tasks to build confidence and skill

Bench skills.

level. At least one project and a range of demonstration pieces be completed with all practical work being fully supported by demonstrations and presentations to cover theory of correct tool selection, use and care.

What's covered at a glance
- Work with a range of basic metalwork hand tools.
- Preparing and properly marking out metal.
- Cutting metal using the most appropriate method.
- Shaping and finish metal.
- Setting up and performing drilling operations safely.
- Develop skills and knowledge of safe working practices.

Fabrication skills
Fabrication skills allows technicians and teachers to gain confidence and skills in using equipment such as folding machines, guillotines, and spot welders. At least one finished project and a range of demonstration pieces will be completed which will develop skills in marking out, cutting, shaping, and forming sheet metal artefacts in a safe manner. Practical work will be supported by demonstrations and presentations covering the theory of correct tool selection, use and care.

What is covered at a glance
- Work with a range of basic sheet metalwork hand tools.
- Preparing and properly marking out sheet metal.
- Cutting sheet metal using guillotine and notcher equipment.
- Forming sheet metal using benders and rollers into various shapes.
- Setting up and performing spot welding operations safely.
- Develop skills and knowledge of safe working practices.   >>

Fabrication skills.
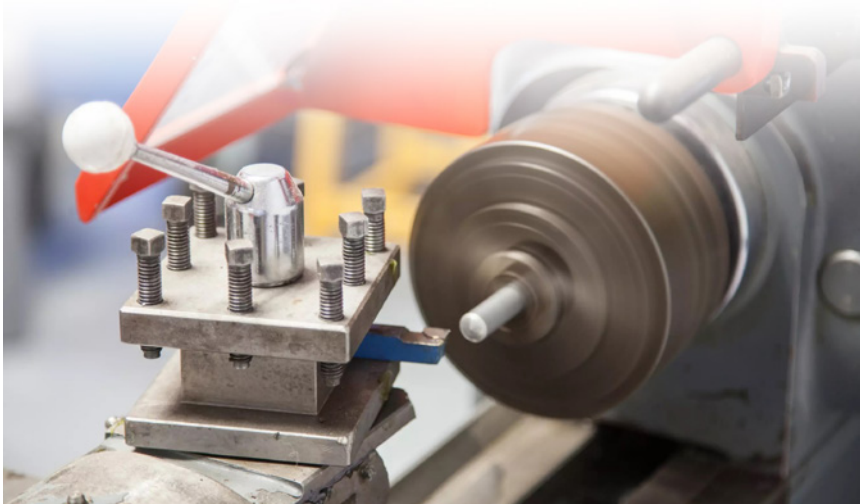
Centre lathe turning.

Centre lathe turning

This course aims to develop your knowledge and understanding of the functions, machining operations and safe use of centre lathes. This course will allow teaching and support staff to implement lathe turning projects successfully and safely into the curriculum and/or deliver SQA based coursework.

This is a two-day course which will take place in an engineering workshop environment and will involve setting up and using several types of tooling to perform facing, taper, parallel, knurling, threading, drilling, and parting processes.

All aspects of machine parts, functions and safe use will be covered. Practical work will be supported by demonstrations from professionals and key presentations will cover the theory and safety aspects.

One-to-one guidance when performing machining operation will also be provided.

What is covered at a glance
- Safety precautions for the safe operation of the centre lathe.
- How to set tools and prepare the centre lathe for safe use.
- How to operate the centre lathe to carry out the following basic functions safely – facing off, parallel turning, taper turning, drilling, threading, turning between centre's, parting, knurling, boring
- Understanding tool grinding angles and cutting speeds.
- Understanding work holding methods.

Hot & cold metal forming

The hot & cold metal forming two-day course looks at how to safely set up equipment used in forging processes. It will also develop knowledge of various cold metal forming techniques, Personal Protective Equipment requirements and specific educational Health & Safety regulations regarding forges.

A full 2 days are spent in our workshop using the forge, associated equipment and the "Metalcraft" range of tooling. Many forging techniques will be covered and at least two projects will be completed with several practice pieces also being produced.
What is covered at a glance
- Risks and hazards associated with forging and using cold rolling equipment.
- Appropriate PPE (Personal Protective Equipment) for forging.
- A range of forging techniques to produce metal-based artefacts.
- Use cold rolling formers/benders.
- Develop skills and knowledge of safe working practices.

Welding skills

This two-day course will involve learning how to safely set up and use MIG, Arc and spot-welding equipment and their associated tools. It will also develop knowledge of various welding techniques, PPE requirements and specific educational Health & Safety regulations.

No prior experience of welding is required, and each participant will spend 2 full days in our workshop using the welding equipment to complete a range of basic welding tasks. Using various welding >>

Hot & cold metal forming.

Welding skills.

techniques and joining methods. All practical work is supported by demonstrations and one-to-one tutoring.

What is covered at a glance
- Dangers of fumes, gases, and radiation when welding.
- Correct PPE for welding.
- Use welding equipment safely
- Setting up arc/MIG welding machines correctly.
- Commonly used welding joints i.e., T, Butt, and Lap joints.
- Safety implications of poor weld quality.
- Testing of completed welds.
- Develop skills and knowledge of safe working practices.

Woodturning

Our two-day woodturning course aims to develop your knowledge and understanding of the functions, machining operations and safe use of woodturning machines. It involves using several different turning tools to practice and hone wood turning techniques. All aspects of machine parts, functions, work holding methods and safe use are covered. Practical work will be supported by demonstrations from professionals and key presentations will cover the theory and safety aspects.

One-to-one guidance when performing turning operations is also provided and each participant will produce a variety of small, finished projects.

What is covered at a glance
- Component parts and functions of woodturning lathes.
- Work with a range of basic woodturning tools.
- Prepare and set up material in the lathe for turning between centres.
- Prepare and setup material in the lathe for faceplate turning.
- Shaping and finishing material.
- Develop skills and knowledge of safe working practices.

Woodturning.
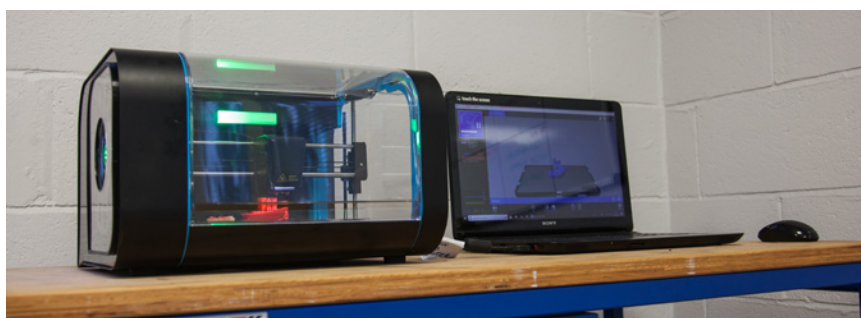
Technology makerspace.

Technology makerspace

Our technology makerspace course has been developed specifically for technology teachers and technicians who wish to learn and develop skills in the following areas; laser cutting, 3D Printing, sublimation printing and vinyl cutting. These skills are essential for anyone wishing to introduce some of these newer technologies into the classroom.

Two days are spent looking at how to set up and use laser cutters, 3D printers, vinyl cutters and sublimation printing equipment. It will also look at ways in which this equipment could be used within the classroom and specific educational Health & Safety regulations.

No prior experience is necessary with any of the outlined equipment and each participant will produce several personalised projects at each using basic software, setting up the equipment and looking at how to maintain them for efficient use. All practical work is supported by demonstrations, group work and one-to-one tutoring.

What is covered at a glance
- Laser cutters, 3D printers, Sublimation printers and vinyl cutters.
- Risks and hazards associated with such equipment.
- Types of software used and how to set up equipment for cutting/printing.
- Calibrating and maintaining equipment

Technology probationers residential

This is a two-day residential course based at SSERC HQ to support probationer teachers in Technology to deliver safe, high quality, hands-on practical STEM learning in the workshop. There is coverage across a range of technology curriculum organisers allowing individuals to develop their skills in and out of their subject specialism. >>

The programme offers an excellent way of keeping up to date with developments in your subject area. The residential aspect of the course offers a great networking and peer engagement aspect for delegates, creating opportunities to build new working relationships with other probationer teachers across the range of schools and local authorities in Scotland.

The course is aligned to the GTCS Standards for Full Registration and the National Model for Professional Learning.

What is covered at a glance
- A range of basic skills in woodworking, metalworking, machining processes and 'new' technologies such as 3D printing and laser cutting.
- Health and safety and relevant safety measures within the technology workshop.
- A variety of teaching strategies to promote learning in technology including demonstrations, exploration of new concepts, skills, materials, and the use of real-life applications to design, problem solve and create.
- Network with fellow professionals and explore mechanisms for ongoing support.

Technology probationers residential.
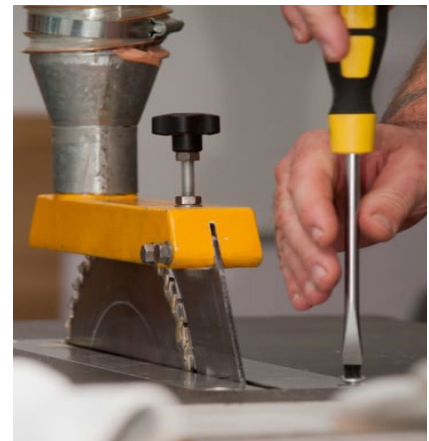
Safe use of fixed workshop machinery.

- Understand the range of opportunities within the wider STEM engagement portfolio which SSERC offers.
- Evaluate their own professional learning and its impact on learners.

Safe use of fixed workshop machinery (2 SCQF points, Level 5)

Safe use of fixed workshop machinery is a two-day SCQF credit and levelled course that looks to develop safe use practices on bandsaws, circular saws, and planer thicknessers. It also covers procedures for carrying out associated tasks such as blade changing and the inspection and cleaning of dust extraction systems. The course is suitable for individuals who have completed a craft apprenticeship or have previous training/experience in using the equipment.

As outlined by the HSE (Health and Safety Executive), training should be refreshed every 3 to 5 years. As such a one-day refresher course is available to those who have attended the SSERC two-day course previously within this period.

What is covered at a glance
- Safe working practices of bandsaws, circular saws, and planer thicknessers.
- Blade changing procedures.

Maintenance of fixed workshop machinery and tools.

- Important of dust extraction.
- Correct PPE to use.
- Hazards and risks associated with each machine.
- Brief outline of PUWER (Provision and Use of Work Equipment Regulations).

Maintenance of fixed workshop machinery and tools (3 SCQF points, Level 6)

This is a three-day SCQF credit and levelled course designed to develop knowledge and skills in the safe methods of implementing a maintenance programme for hand tools, power tools, fixed machines, dust extraction and emergency stop systems. It looks at a complete range of technology related machinery and how to perform and record preventative maintenance checks. This course is usually only suitable for individuals who have previous experience in using/maintaining a range of wood and metalworking machinery.

What is covered at a glance
- How to implement a maintenance programme for hand tools and machinery in technical department workshops.
- Outline of PUWER regulations.
- Blade changing, abrasive belts and other common tool changing procedures.

<<

SSERC Technicians courses
https://www.sserc.org.uk/professional-learning/technicians-pl/
https://www.sserc.org.uk/professional-learning/secondary-clpl/technology-clpl/

Leading the way in STEM

The current academic year has seen the launch of our Leadership in STEM Education professional learning course for both early years & primary and secondary cohorts. This course represents a significant addition to our list of professional learning offers for educators in Scotland, and the pilot year is proving to be a success.

This course is designed to offer a unique personal and professional development journey for our delegates and aims to offer something different from other leadership courses that are currently available. A particular USP is that whilst many aspiring Principal Teachers or Faculty Heads work with us, it's not just designed for them. Some of our delegates want to build their knowledge, skills and professional abilities to develop experience as leaders of STEM in their respective centres. Promotion? Perhaps one day, but their main focus is to continue to be highly effective practitioners and leaders of STEM learning in their centre.

The six-unit course is a blend of online, face-to-face and independent research and study. Spanning around 160 hours, the course covers a broad range of professional learning topics. Aligned to the GTCS standards for career-long professional learning and middle leadership means the content and learning is set at SCQF Level 11.

Some of the activities involved in this course are listed below.

The delivery team at SSERC doesn't just support our delegates; each of them has the commitment from their Headteacher and In-school Coach to ensure they are given the time and opportunity to complete a range of research and leadership tasks back at their centre. Furthermore, the course is designed to bring as many external partners and agencies together as possible, all working together with SSERC to put the practitioner at the centre, encouraging them to see themself as the learner, with input from:

- GTCS
- Education Scotland
- Skills Development Scotland
- Strathclyde and Stirling Universities
- Experts and consultants in leadership and management strategies
- Organisations that support STEM education

Some of the six-unit course activities...

- ☑ Developing academic writing skills and engaging with publications at Masters Level.
- ☑ Exploring key current educational policies in STEM and measuring their impact.
- ☑ Carrying out self-evaluation and improvement activities in their centre.
- ☑ Developing and understanding management and leadership skills, theory and practice.
- ☑ Analysing their own leadership skills and potential through the views of themselves and others.
- ☑ Investigating the range of STEM engagement opportunities that exist in Scotland and how they can impact and enhance the learner journey.
- ☑ Completing a professional enquiry on a key area relevant to their setting.

>>

Leadership in STEM Education course

"Our Leadership in STEM Education course is the latest in a series of professional learning opportunities supporting the education community in Scotland.

It means we have professional learning offerings to support (STEM) teachers at all stages of their education career, all recognised by the GTCS as supporting professional development."

Alastair MacGregor, CEO – SSERC

"The Leadership in STEM course has really helped me to gain confidence in taking on leadership tasks and roles within the school. The connections and discussions we have are inspiring and have shaped my thinking of how I would like a department to look and work when I move into a promoted post."

Mark Melrose – Ross High School

"The course has been extremely beneficial and has enhanced my knowledge of all areas of leadership. It has provided insight from experts in different areas, allowed valuable time to discuss with like-minded colleagues, and provided challenge to enhance my skills and knowledge."

Jodie McGeehan – St Andrew's RC Secondary

"This Leadership course has been a fantastic opportunity to network with staff from across Scotland. It has also allowed an opportunity to consider my school's implementation of the STEM agenda. Through visiting speakers, online engagement, and group work with peers, I feel I have been given a great platform to improve my leadership skills and have gained invaluable advice."

Kyle Henderson – Dunblane High School

"This course is invaluable for any practitioners interested in leading STEM activities and providing further STEM opportunities in their centre. From exploring the National priorities in STEM to gaining valuable insight into your own leadership qualities, the content is well thought out and relevant, with delivery from excellent external speakers.

As an experienced Principal Teacher, I have benefitted enormously from all aspects of this course and would highly recommend this to anyone, no matter where they are on their Leadership journey."

Amanda McVicar – Douglas Academy

Next steps

SSERC is working with GTCS to gain Professional Accreditation for this course, meaning that delegates who complete the course can be considered with the accomplished expertise they deserve. It is our hope that this course will continue to offer transformational learning for educators across Scotland in the early years, primary and secondary settings and whilst we will reflect on any changes and improvements we can make, with the valued feedback from our inaugural cohort, we will be ready to recruit for year two very soon.

Interested?

If you would like to know more about our Leadership in STEM Education course or are considering applying for a place for 2023/2024, please visit: https://www.sserc.org.uk/professional-learning/secondary-clpl/leadership-in-stem/

Professional Learning gtc SCOTLAND 2021-2026 AWARDED ORGANISATION