

‘STEM-ulating’ Youth Workers

A collaboration with the Prince's Trust

February 2016

Version 2

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“STEM leads to an enquiring mind... this training has inspired me. I'm questioning things, I'm enthused and I'm desperate to deliver some sessions myself!”
The Prince's Trust Youth Worker,
after attending STEM training

“I don't really like science to be honest, but I love experiments!”
Girl aged 11

The value of STEM

Science, technology, engineering and maths (STEM) are enabling. They enable people to make sense of the world around them, they enable people to make informed decisions, and they enable people to pursue a wealth of exciting and fruitful career opportunities.

Science should be something that young people firstly appreciate and enjoy, and then use to build knowledge and skills that may empower their futures – whether by aiding decision making about health and technology or by acting as the foundation for their training and employment.

We believe that all young people should have the opportunity to enjoy science in a way that is relevant to them.

Yet we recognise that many young people, and especially those from relatively low socioeconomic (disadvantaged) backgrounds, can find STEM subjects challenging and unengaging at school. But there are myriad opportunities to engage with STEM, and engaging with STEM outside school

can support personal and social development, as well as building confidence in these subjects in school.

Traditionally youth workers tend to use sports, the arts and outdoor activities to engage with disadvantaged young people and the youth sector has developed broad expertise in these areas. However, youth workers often lack the confidence to deliver STEM subjects.

We want to empower and enable youth workers to include STEM activities within their programmes, thereby engaging and enthusing these young people with STEM.

The youth sector does not need to do this alone. The science engagement community has a wealth of expertise in engaging young people with STEM. Working in partnership will be invaluable in supporting a sustained change to benefit young people. We are keen to encourage and facilitate collaboration between the sectors.



Collaboration

“The Wellcome-funded STEM training has had a significant impact on our staff, enhancing not only the Fairbridge programme, but supporting Trust-wide understanding of the relevance and importance of STEM skills and opportunities for our young people.”

Martina Milburn, Chief Executive of The Prince’s Trust

Our 2014 study, ‘Experiments in Engagement’¹, identified ten steps to maximise the success of engaging young people from disadvantaged backgrounds with informal science activities. Key learnings included the importance of working locally, building long-term relationships and communicating through trusted channels. These goals would be best accomplished by collaborating with an organisation already working with this audience. We could interest and empower the staff to deliver hands-on STEM activities and introduce them to experts in informal science learning.

A training programme for The Prince’s Trust

The Prince’s Trust has a mission to *help disadvantaged young people in the UK to change their lives and get into work, education, training or volunteering*. Given its recent work with STEM, including their partnerships with Will.i.am and Samsung, The Prince’s Trust was an ideal first partner.

We identified their ‘Fairbridge programme’ as where we could have most impact. Fairbridge is delivered in-house by Prince’s Trust staff and enables young people aged 13 – 25, who are unemployed or struggling at school, to transform their lives.

Drawing on the expertise of science communicators from At-Bristol, Centre for Life, Glasgow Science Centre and the Natural History Museum, we developed a two-day training programme to upskill Fairbridge staff from across the country. This was delivered to four cohorts at the National STEM Learning Centre in York during the summer of 2015.

“This training is a fantastic opportunity for our staff, assisting them in delivering our strategy of equipping our young people with the right skills for the future, especially in STEM.”

Laurice Harris, Senior Head of Learning and Development at The Prince’s Trust

After the training

An online forum was created to provide ongoing support for participants, who also received introductions to science communication experts more local to their centres around the country. The training culminated on 14 December 2015 with a STEM Celebration and Science Fair. The event allowed the participants to showcase the STEM activities they had already undertaken (examples in Appendix A) and to explore future collaborations and opportunities. They also receive ongoing support through an online forum.



The Prince’s Trust staff learning about pop rockets

¹ Wellcome Trust. Experiments in Engagement. London: Wellcome Trust; 2014 bit.ly/1sVJjTO [accessed 10 February 2016].

Training, celebrating and a science fair

“This training was the BEST!” Course participant

Day 1

Time	Activity
10.00	Registration
10.15	Introduction and welcome
10.30	Icebreaker <i>Chain reaction – team construction of a ‘Heath-Robinson’ machine</i>
11.30	The what and why of STEM <i>Discussion around the value of STEM activities for young people</i>
12.00	Break
12.15	Introducing simple STEM activities <i>Hands-on activities: Microwave demos, Tealight activities, Bird feeders and Cornflour goo.</i>
13.30	Lunch
14.00	Introducing simple STEM activities (cont.)
15.15	Reflections on existing STEM content <i>Discussing how STEM can deliver Personal Social Development goals and how much STEM already exists within the programme</i>
16.00	Break
16.15	Energiser 1: <i>Pop rockets</i>
16.30	Personal story <i>Sharing stories of the difference it has made for some young people</i>
17.00	Reflection on the day’s activities

Day 2

Time	Activity
08.45	Warm-up activity: <i>Houdini’s handcuffs</i>
09.00	Adding STEM to existing activities <i>Sharing ideas for how small changes can reframe current activities to increase their STEM content</i>
09.45	Inquiry-led STEM activities <i>Hands-on investigative activities: Microwave mug cakes, Egg drop challenge, Scribble robots and Seeds – learning from objects, not about objects</i>
11.00	Break
11.15	Inquiry-led STEM activities (cont.)
12.30	Lunch
13.15	Energiser 2: <i>Fun things to do with straws</i>
13.30	Softly acknowledging STEM <i>Exploring different ways to incorporate STEM</i>
14.00	Break
14.15	Energiser 3: <i>Invisibility demo</i>
14.45	Planning your own session <i>Collaborative opportunity to develop session plans in consultation with the science communication experts.</i>
16.15	Final thoughts

Science beyond the classroom

“STEM enables young people to critically analyse and question the world around them, which are essential transferrable skills.” Course participant

Day 3

Time	Activity
10.30	Registration
11.00	Welcome and icebreaker <i>Team construction of a lollypop stick catapult</i>
11.30	Discussion session <i>Discussion with experts and peers to share the highs and lows of STEM delivery, troubleshoot problems and develop new ideas</i>
12.25	Energiser 1: <i>Icing sugar blow</i>
12.30	Lunch – <i>networking opportunity</i>
13.30	Energiser 2: <i>Air-pressure rocket and Destination Space</i>
13.35	Opportunities and Initiatives <i>Citizen Science CREST Awards & British Science Week The Crunch</i>
14.45	Energiser 3: <i>Co-ordination and the brain</i>
15.00	Break
15.15	Reflections and planning <i>Opportunity for centre teams to consult the experts, develop new ideas for their STEM pledge</i>
16.00	Plenary <i>Centres share STEM pledges</i>
16.30	Free time <i>Opportunity to relax before the Science Fair</i>
17.00	Science Fair <i>STEM activity posters from each centre (examples in Appendix A), science busking activities, speeches and Science Fair Awards.</i>



The Prince's Trust staff practice the icing sugar blow

“Like a lot of young people, I didn't like science at school so it's nice to do fun activities and show young people that science can be fun.”

Course participant

“Having the delivery staff motivated and excited about STEM has had a positive knock-on effect to our young people. STEM has become an integral part of our delivery programme.”

The Prince's Trust Fairbridge Manager

Impact of the training

“Really excited to see my team implementing things they learned earlier this week on a session on Wednesday!” The Prince’s Trust Fairbridge Manager

Feedback from Days 1 and 2

We surveyed all 84 Fairbridge staff who attended Days 1 and 2 and 53 responded. It was very encouraging to see how the value they placed on STEM increased after attending the training. 68 percent considered it Very Important or Quite Important before the training, this increased to 98 percent after the training (Figure 1).

Similarly, their confidence in their ability to run STEM activities increased, with more than 95 percent feeling ‘Quite Confident’ or ‘Very Confident’ about running STEM activities after the training compared to 43 percent before the training (Figure 2).

We are also pleased that 100 percent of respondents said they were ‘Quite Likely’ or ‘Very Likely’ to add STEM to existing activities and 86 percent said they would develop entirely new STEM activities (Figure 3).

Reciprocal learning for the experts

We also surveyed the nine informal science learning experts involved in the training and seven responded. They provided some interesting insights to their experiences of running the course and what they had learned from The Prince’s Trust staff.

“An appreciation of a youth worker's day to day job, and the challenges of incorporating science communication into it.”
Course leader

“It has reaffirmed my thoughts that trusted relationships are very important in engaging young people.”
Course leader

“The importance of using others with the necessary skills and not putting that responsibility on yourself. Basically, that a collaborative approach is what would be best for the young people.”
Course leader

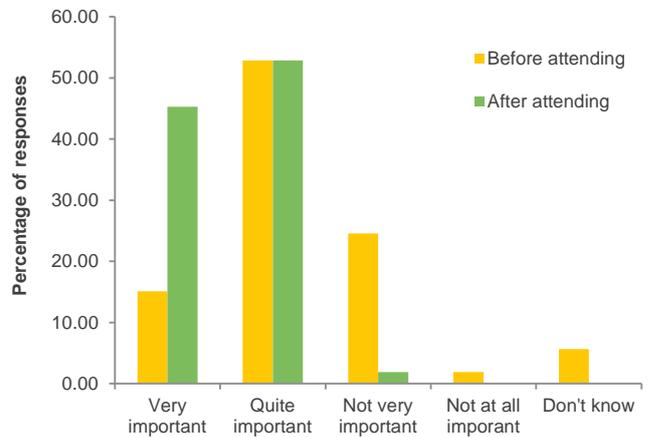


Figure 1: Participants’ responses to the question “How important, if at all, do you think it is to provide STEM in your Fairbridge activities and skills development for young people?”

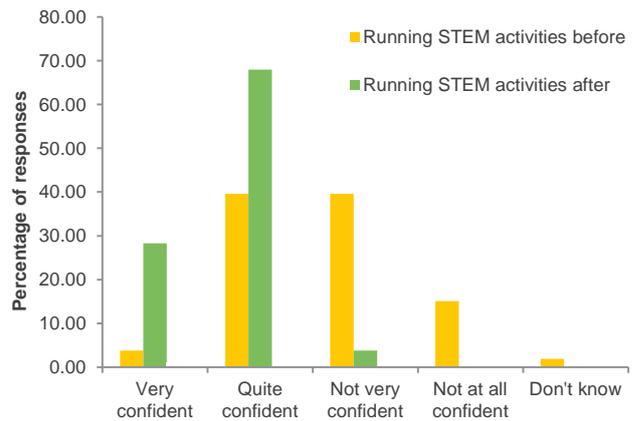


Figure 2: Participants’ responses to the question “How confident, if at all, do you feel about running STEM activities for Fairbridge participants?”

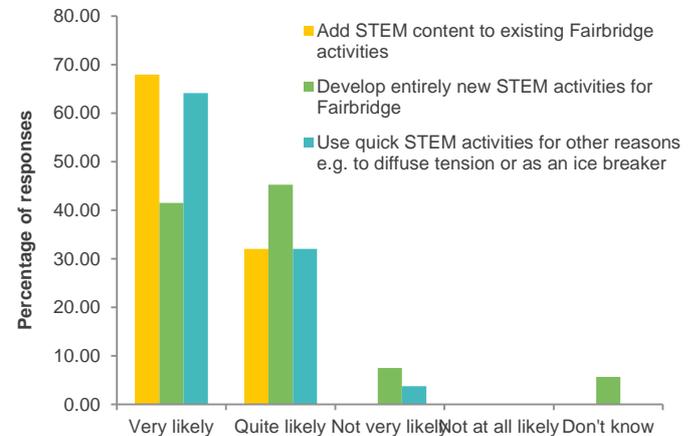


Figure 3: Participants’ responses to the question “Having been on training, how likely are you to use STEM activities in the following ways?”

Science beyond the classroom

Feedback from Day 3

The third day of training was a ‘STEM-ulating’ day for everyone involved. The Prince’s Trust staff were excited to share best practice and lesson learned from the diverse range of STEM activities they had delivered since Phase 1.

“I enjoyed discussing the projects that we have all been involved with and how successful they’ve been”

Course participant

We surveyed all 75 attendees. 42 responded of whom 32 had also attended Days 1 and 2 in the summer. It was encouraging that 100 percent of the respondents reported at least one or more STEM activities from Days 1 and 2 have been used in their centre (Figure 4).

It was also very positive to hear how the amount of STEM activities within Fairbridge has increased significantly across the country with 98 percent of the respondents describing the amount of STEM as ‘Greatly Increased’ or ‘Increased’ in their centre (Figure 5).

The participants clearly value the benefits and opportunities STEM can offer their young people. 98 percent of respondents ‘Agreed’ or ‘Strongly Agreed’ with the statement “STEM activities are important for the benefits/opportunities they offer to young people” (Figure 6).

They were also asked “What do you think young people may gain, if anything, by taking part in STEM activities as part of the Fairbridge programme?”

“STEM gives us new tools to build self-esteem and help young people move forward.”

Course participant

“A regained confidence that may have been lost around ‘science’, seeing science as a practical application rather than just knowledge-based may change their mind about career or course options.”

Course participant

“They will be able to develop skills which otherwise would have been difficult to develop as part of the programme.”

Course participant

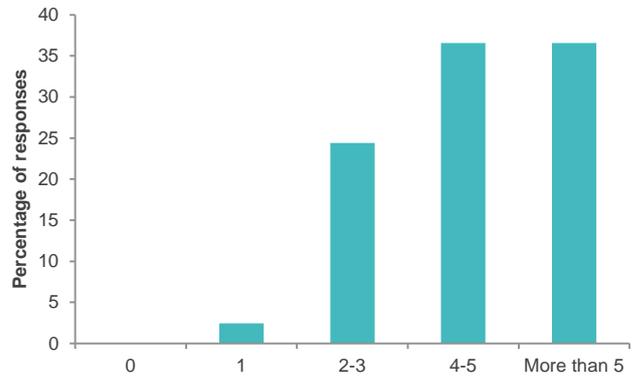


Figure 4: Participants’ responses to the question “How many STEM activities from Days 1 and 2 have been used in your centre?”

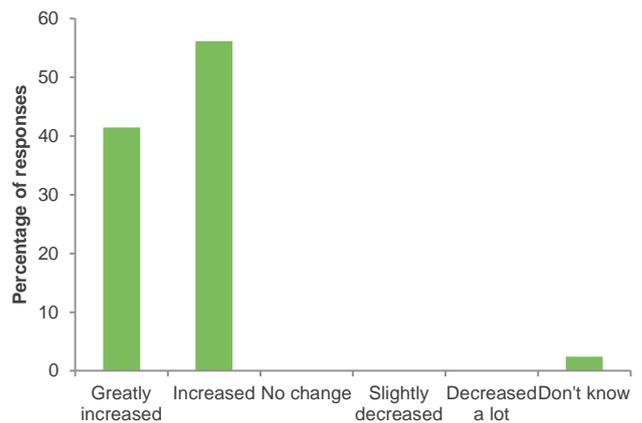


Figure 5: Participants’ responses to the question “How has the number of STEM activities at your centre changed since the training on Days 1 and 2?”

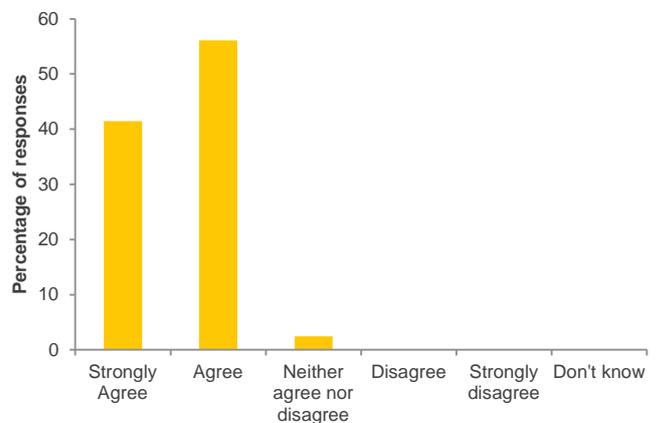


Figure 6: Participants’ responses when asked how much they agree or disagree with the statement “STEM activities are important for the benefits/opportunities they offer to young people”

Next steps – get involved!

“Young people may gain an interest that they never realised they had.” Course participant

Please get in touch if you are interested in collaborating as we are currently exploring potential partnerships and want to meet new organisations working in this area.

We are offering more training for youth workers, facilitating cross-sector relationships and ensuring sufficient support and resources are available for new projects.

For more information or to discuss a potential collaboration please contact:

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Staff from The Prince's Trust comparing the overlap of STEM content with Personal and Social Development content for different activities.

Appendix A: Examples of STEM sessions run by Fairbridge staff

The STEM Celebration and Science Fair provided an opportunity for all 17 Fairbridge teams attending to showcase the STEM activities they had been running since the initial training.

Each centre was asked to provide details for a poster that was displayed during the training facilitating the exchange of ideas and best practice between centres. The posters were also incorporated into the Science Fair in the evening to showcase the range of STEM activities to a broader audience.

This appendix includes four examples of STEM sessions developed and delivered by the Fairbridge staff. A larger selection of sessions can be downloaded from bit.ly/1PNdMwA.



The Prince's Trust staff member at the Science Fair explaining their 'Seriously Scientific!' STEM collaboration with the Manchester Science Fair and the Museum of Science and Industry.

Tracing the Tees

Middlesbrough Fairbridge Team

Objectives

1. A six day course (including two night residential) to explore the River Tees and gain a better understanding of the state of the environment.
2. Participate in rebuilding fishing platforms at Preston Farm Nature Reserve, walk along the lower Tees and visit Bowlees Nature Reserve
3. Complete water quality surveys, bug surveys and a bat survey with Tees Valley Wildlife Trust

Throughout the course the group carried out a number of OPAL (Open Air Laboratory) surveys to identify, quantify and highlight environmentally deprived areas. This included carrying out a bat survey and water quality surveys in two parts of the River Tees to identify differences in water quality and the species that live there.

The bug survey tied this all together by assessing how the invertebrate populations were faring in habitats close to the river. The young people carried out their bug surveys in three different habitats and learnt why certain species lived in particular habitats and why some might prefer wetter areas than grassy areas.

The group helped build fishing platforms, which focus anglers on one section of the riverbank, thus reducing disturbance of the whole riverbank. We also discussed the damaging effects of invasive species such as Giant Hogweed and Himalayan Balsam on local nature reserves.

Successes and lessons learned

We found that this was a really engaging project. All of the young people gained the John Muir Award Discovery Level and were given the opportunity to showcase their art work and a short film we produced of the project at a celebration event.

Our surveys showed that the section of the River Tees closer to the source was more species rich than at Preston Farm. We discussed why each part of the river differed, and pollution and industry were the most popular answers. All this helps Tees Valley Wildlife Trust gain a bigger picture of the state of the environment.



Young people on The Prince's Trust Fairbridge programme working alongside staff from Tees Valley Wildlife Trust

Seriously Scientific! North Manchester Fairbridge Team

Objectives

1. To link in with Manchester Science Festival 2015 events and our local Science Centre/Museum
2. To engage both age groups in STEM through the use of fun and innovative activities
3. To further develop personal/social/life skills already promoted at Fairbridge

To link in with the Festival we planned a full week of STEM related sessions. Under 16's were invited in to solve a murder mystery in the centre, introducing them to the principles of Forensic Science which many of them have watched on TV shows like CSI.

Over 16's were invited in for a Halloween-themed session about Zombies, which included a "Zombie Breakout" task, similar to the many "Escape Room" facilities which are appearing across the country and are increasing in popularity. This required them to use maths and problem-solving amongst other skills to avoid being "infected" by our zombies, to find items required for a Zombie Apocalypse Survival Kit, and to escape the building in an allocated time frame.

Both age groups also had a day out at the Manchester Museum of Science and Industry which had a range of special events and activities running throughout the week.

Successes and lessons learned

The sessions were well received with both age groups fully engaged and enjoying their visits to the museum where they could try various hands-on activities which always works well with our young people. We hope to plan more visits to MOSI and other local museums on our programme soon.

Following this week, the "non-classroom/school" and fun approach to delivering STEM content is something which we will continue to use as this appears to be a medium through which we can better engage the types of young people referred to our programme yet still promote STEM topics, skills and careers.



Under 16s investigating fingerprints as part of their introduction to Forensic Science.

ARUP Engineering Challenge Liverpool Fairbridge Team

Objectives

- a. Explore aspects of STEM relating to structural engineering
- b. Plan and communicate ideas to peers
- c. Review lessons learned and identify links with life situations

The young people were introduced to ARUP services before enjoying a presentation from an ARUP engineer exploring the role of engineering within building. This was followed by a discussion where they could explore the topic further before using their learning to attempt the tower challenge.

The goal was to create a tower built from spaghetti and marshmallows. To make a successful tower, the young people needed to explore the weaknesses and strengths of different shapes as well as the varying properties of the different building materials. The engineers were on hand to discuss the importance of foundations and the impact of the different weights and strengths of the materials on the tower.

Afterwards the young people were able to review the activity and discuss whether they had followed their initial design ideas or adapted the plan as they went along and learnt more about the materials.

Successes and lessons learned

The session was a success and all the young people enjoyed the practical aspects of the task. It was also interesting for them to hear the career paths of the different engineers. However we might restrict the number of personal stories next time in favour of more time explaining current routes into engineering.

Having the engineers present challenged the young people to think more deeply about aspects like the foundations, which they hadn't fully considered. ARUP also offered a two week placement for any suitable and interested young people in the future.



Young people from Fairbridge building their spaghetti and marshmallow tower

(Un)natural Disasters Kennington Fairbridge Team

Objectives

- Individual research & mini-presentation
- Group discussion – consider human impacts & interventions
- Hands-on Science – simulate a natural disaster in pairs

Staff talked about earthquakes as an example of a natural disaster including where they are common, recent examples e.g. Nepal, Japan, whether anyone in group had experienced a real one or the earthquake simulator at Natural History Museum. Introduced relationship between natural disasters & humans – we cannot prevent natural disasters but can plan & prepare for them (risk mitigation).

Each young person named a natural disaster then researched their natural disaster on tablets and made notes – what, how/why/when, effects, example, planning/mitigation & video clip.

Young people informally presented their natural disaster to group, followed by questions and group discussion about the human impacts and interventions relating to natural disasters. They created unnatural volcano, oil spill & tsunami in pairs, then showcased their experiment to group.

Successes and lessons learned

From the start, the group were very open to discussion so we set them the task of each researching a natural disaster. We helped the young people make notes and asked if they felt comfortable talking through their natural disaster & video clip to the group. We were impressed that each young person managed to give a mini-presentation.

In pairs the young people simulated a natural disaster, independently following instructions & experimenting. We provided the young people with materials that we had found around the centre using other STEM activity resources e.g. film canisters. This worked well apart from our attempt at recycled homemade tsunami gravel – we will buy fish tank gravel next time.



Young people from Fairbridge demonstrating their unnatural volcano

