Explore Your Universe

Phase 3

Final Reports from the 14 Science Centres

March 31st 2018

UK Association for Science and Discovery Centres

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Executive summary

Explore Your Universe is a successful national STEM programme which brings together some of the most fascinating, cutting-edge science in the country with the talents and infrastructure of the nation's largest network of dedicated science engagement organisations.

The vision of the programme is to inspire a new sense of excitement amongst young people around the physical sciences by sharing the amazing stories and technologies of STFC. To achieve this, the Explore Your Universe team has created an exceptional set of hands-on activities, experiments, school's workshops, public shows, meet-the-expert sessions, a website, a full training programme and handbook, and a variety of other resources to share the inspirational science of STFC.

Phases 1 and 2 engaged 341,714 children and adults at 23 locations across the UK with cutting-edge physics and engineering. Phase 3, upon which we are now reporting increased the value-for-money, sustainability and legacy of the Explore Your Universe Programme, by extending the reach into disadvantaged and underserved schools and communities to engage those who are remote from STEM. This latest phase reached 39,273 children and adults, largely from underserved communities in 14 regions of the UK and across England, Wales, Scotland and Northern Ireland. The Phase 3 partners have considerably exceeded their combined original target of reaching 15,000 people.

There are three reports for Explore Your Universe Phase 3:

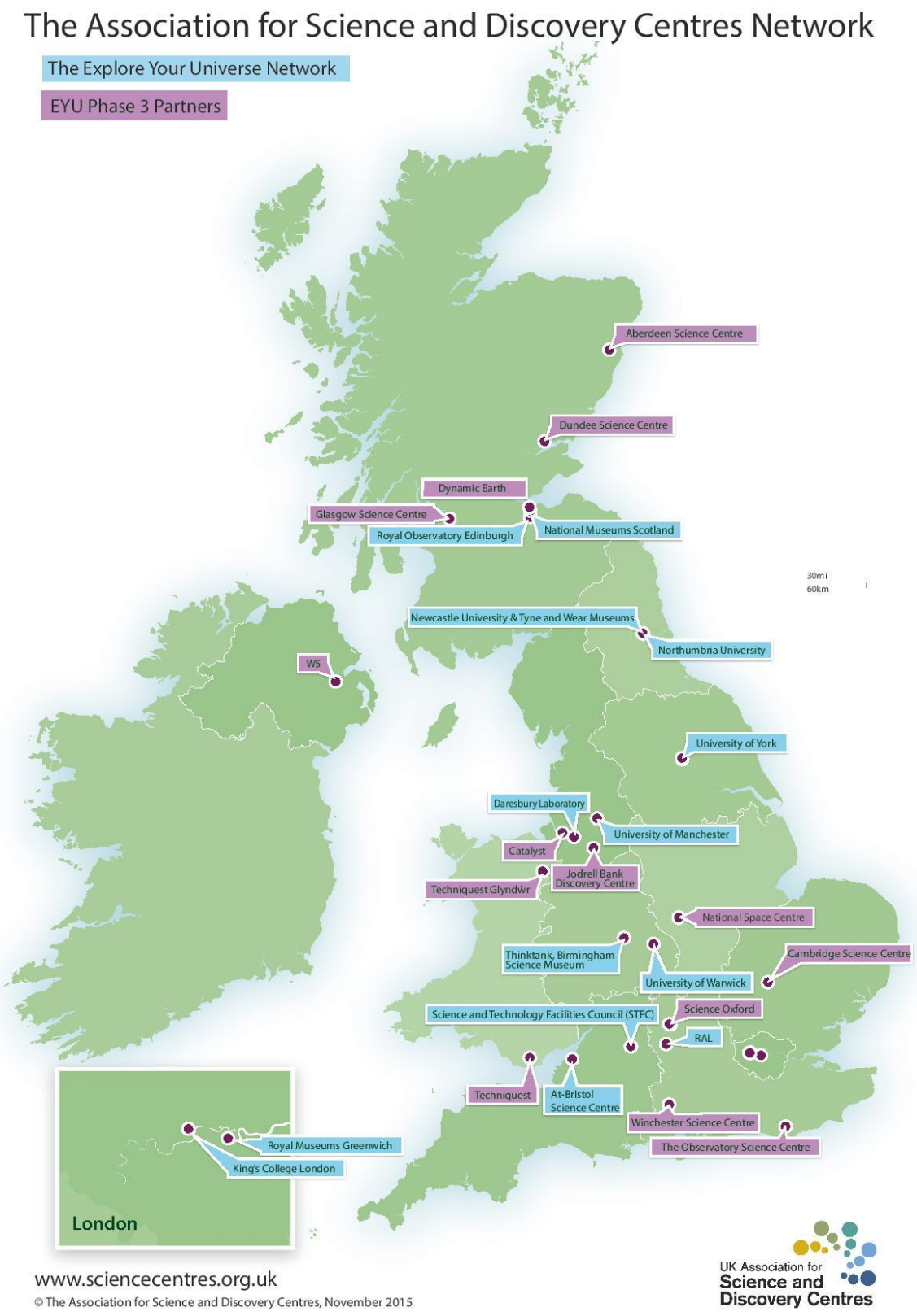
1. The Main Report from ASDC to STFC summarising all areas of the programme, including the Science Centre's delivery and the evaluation.
2. The full academic evaluation report, including data.
3. This report, collating the highlights of the final reports from each of the Phase 3 Centres.

This report details the variety of programmes each Science Centre undertook to reach widely. It includes detail of their programmes, the numbers they reached and in which communities, their evaluation, quotes from participants, case studies and the numbers reached. The variety of activities and events was wide and included community events, outreach to rural and underserved schools, teacher CPD for schools in underserved areas, activities and workshops at a prison, bursary schemes for schools to cover coaches and other costs to visit a Centre for high-end physics workshops, and careers events involving local and national employers.

This report covers Explore Your Universe activities at the following 14 selected Science Centres:

1. Aberdeen Science Centre
2. Cambridge Science Centre
3. Catalyst Science Discovery Centre
4. Dundee Science Centre
5. Dynamic Earth
6. Glasgow Science Centre
7. Jodrell Bank Discovery Centre
8. National Space Centre
9. Science Oxford
10. Techniquest
11. Techniquest Glyndŵr
12. The Observatory Science Centre
13. W5
14. Winchester Science Centre

Explore Your Universe Phase 1, 2 and 3 Partner Map



Aberdeen Science Centre

Report summary

Aberdeen Science Centre's (ASC) vision is to inspire, educate and enthuse people of all ages, backgrounds and abilities in Science, Technology, Engineering and Maths. As such, ASC engages a wide-ranging audience including schools, family and community groups, three to five-year-old little explorers, Primary and Secondary school groups, disengaged young adults and teens to adult audiences and retired people. ASC receives Scottish Government Funding annually to engage with disadvantaged and underserved schools and communities, including those in rural areas. However, in terms of schools, this funding currently only covers school inreach meaning that it is focused mainly in Aberdeen City and Aberdeenshire. ASC are currently working to expand their reach to schools and communities beyond these areas.

Moray is an area situated between Aberdeenshire and The Highlands. It is mostly rural, with the larger cities of Aberdeen and Inverness a large distance away. This remoteness, local knowledge and work with partners in the area has shown that schools in Moray are unserved in terms of opportunities to engage with informal STEM Learning. For this reason, ASC chose to apply for Phase 3 EYU funding for outreach engagement in the area.

During this project ASC engaged with every S1/2 group in Moray. Of the eight Secondary schools in Moray all but two are classed as rural by the Scottish Government's Urban-Rural classification, with those not classed as rural still 68 miles by road (a two-hour trip by car) from the Science Centre. Two Primary schools engaged with in this outreach are rural, and one is classified as deprived, being in a top 20% Scottish Index of Multiple Deprivation (SIMD) area. This project has allowed Aberdeen Science Centre to engage with pupils in these schools that would have otherwise not engage with Explore Your Universe or possibly, any informal STEM Learning.

For Secondary schools, ASC delivered a one hour Explore Your Universe Show, taking pupils on a journey from the very small to the very large. Starting with atoms, we introduced what they are and also subatomic particles including electrons. We then moved on to the very large and how we investigate beyond our world. The one-hour Primary school show followed a similar format however, concepts were explained at a slower pace and reinforced depending on the ability of the class.

In total ASC engaged with 1063 Secondary school pupils and 568 Primary school pupils during this outreach project.

The project provided the opportunity to train staff and revisit EYU for our inreach pupils. ASC adapted the show to fit a 'Science on the Spot' style session where we deliver a 30-minute demo to visiting schools. This allowed the show to be delivered to nearly every Second Level school pupil who visited in October and November 2017. It is planned to revisit the EYU 'Science on the Spot' in the future and to add/remove demos so that ASC can continue to engage school pupils in exciting UK led science, as well as using the show to engage public visitors in the future.

Introduction

ASC engages wide-ranging audiences including school, family and community groups, three to five-year-old little explorers, primary and secondary school pupils, disengaged young teens and adults, and the retired. ASC receives Scottish Government Funding to engage with disadvantaged and underserved schools and communities; currently this reach is mainly in Aberdeen City and Aberdeenshire. However, ASC are working to expand their reach to schools and communities out of these areas including in Moray, Angus and The Highlands.

Local knowledge and work with partners, including the Primary Science Development Officer for Moray, Developing the Young Workforce (DYW), Moray Council and Moray College, shows that many schools and communities in Moray are underserved and remote from STEM activities. This is due to their geographical location and their distance from the closest large cities, Inverness and Aberdeen. Due to the distance to Aberdeen City, it is challenging for school groups to visit ASC for a one-day trip and return for the end of the school day. As the only Science Centre in North Scotland, ASC is ideally placed to serve this area and the EYU programme gave the prefect opportunity to achieve this ambition.

Delivering the EYU project to schools in Moray through outreach allowed ASC to expand the reach of the EYU project and made STEM engagement a reality for this group of pupils who have very little or no exposure to STEM within the normal classroom offering.

Also, as part of this project, but not funded by the project, was the development of a 'Science on the Spot' version of the EYU show. This allowed ASC to offer an EYU experience to most Second Level pupils visiting the Centre. This version of the show can now be used to complement school visits and engage with the public.

Programmes delivered

An Outreach Programme for Explore Your Universe curriculum-linked workshops

This funding allowed engagement with every S1/2 pupil in Moray which ASC had not previously engaged with. Of the eight Secondary schools in Moray, all but two are classed as rural by the Scottish Government's Urban-Rural classification. The two that are not classified as rural are Elgin Academy and Elgin High, both of which are classified as "Other Urban Area – population of between 10,000 and 124,999" (Elgin has a population of 23,128). However, Elgin is 68 miles from Aberdeen with a journey time of roughly two hours by car. This means that although not classed as rural these schools do not have ready access to any Science Centre due to their geographic location. Two primary schools engaged with in this outreach programme are rural, classified as "Remote Small Towns" and one is classified as deprived, being in a top 20% Scottish Index of Multiple Deprivation (SIMD). This project enabled ASC to engage with pupils in these schools who would not have otherwise engaged with Explore Your Universe or informal STEM Learning.

ASC's STEM Communicators and Coordinators are all trained in the delivery of the EYU show, with key delivery staff attending the EYU Phase 3 Training Academy and one visiting CERN. ASC's STEM Coordinator, who attended the Phase 3 Training Academy and visited CERN, delivered the show to the Secondary schools and provided further training for the staff member who delivered the show to Primary schools. The STEM Learning team worked together to ensure the show was aimed appropriately for the Primary school audience. Together this utilised ASC staff's strengths and experience in development and delivery for school audiences.

ASC delivered a one hour Explore Your Universe Show to Secondary school pupils. The show opened with an introduction to STFC and projects they are involved with including the James Webb telescope, the European Extremely Large Telescope, the Central Laser Facility and the Daresbury Particle Accelerator Facility. The show then took pupils on a journey from the very small to the very large. Starting with atoms, they were introduced to what they are and also subatomic particles including electrons. Using the Van de Graaff generator (specifically two demos: creating sparks and floating pie tins), electrons and electricity were explored with pupils. The concept of particle accelerators was introduced and their real-world applications such as at CERN and Daresbury. This included their role in answering the fundamental questions about the universe. This was followed up with demonstrations using the plasma ball and fluorescent tube to reinforce the concepts of atoms, electrons, electricity and particle accelerators.

The show then explored the 'very large' and how we investigate beyond our world. The advantages and disadvantages of ground-based telescopes such as the European Extremely Large Telescope were discussed, and the Hubble Space Telescope was introduced as we explained its mission, achievements and ultimate retirement. This led on to the James Webb Space Telescope and the STFC's involvement in its design and construction. Visible light was explored using diffraction glasses before moving on to the infrared technology of the James Webb Telescope. To help explain infrared technology, various demos with the infrared camera were used.

For the one-hour Primary school show a similar format was used but concepts were explained at a slower pace and reinforced when required depending on the ability of the class. Plasma ball, diffraction glasses and infrared camera demos were used as above. The meteorite sample was used to explain how scientists use these objects to investigate the materials that make up the solar system and our own planet.

In total ASC engaged with 1063 Secondary school pupils and 568 Primary school pupils during this outreach project.

Audience specific engagement

Your programme of activities will have led to engagements with many types of audiences. Please tell us how you successfully engaged with each of the following (A-E):

A. Inspiring family audiences

Approximate number of family audiences engaged: 18,944

Over the course of the outreach project ASC was visited by two traveling STFC roadshows – "Incredible Power of Light" and "Seeing the Universe in all its Light" exhibitions. While these were present in the Centre, ASC developed and delivered a family show to complement the content of each. Parts of the show were therefore focused on STFC research such as the James Webb Telescope. These shows were all delivered in the Centre to audiences between 20 and 60 individuals. ASC's shows and workshops are always included in the entry price, with no additional costs. This meant that the shows were available to all visitors. At ASC, there are always STEM Communicators on the exhibition floor and whilst the traveling exhibitions were at ASC, they were trained to facilitate and explain the exhibitions – further engaging our public visitors with STFC research.

B. Gender reach

All school groups who were visited as part of the funded EYU outreach are estimated to be 50:50 male/female. None of the schools are gender specific and no groups or classes were divided by gender.

C. Additional Explore Your Universe Activities (not grant-aided)

Throughout the time of the project, ASC delivered an EYU show to most school groups who visited the Centre that were working at Second Level (roughly KS2 equivalent). For this, ASC adapted the show to fit a 'Science on the Spot' style session. This style involves using a narrative to tie demonstrations together while keeping it informal (e.g. no presentation slides and delivered in a way that does not require a particular room or set up). Using the thermal camera, plasma ball and meteorite demos, ASC explained the science behind them in an informal and interactive way similar to the show but with flexibility to spend more or less time on each demo depending on the class's ability. This allowed the show to be delivered to nearly every school pupil (working at Second Level – note this can include younger pupils) who visited in October and November 2017. It is planned to revisit the EYU 'Science on the Spot' in the future and to add/remove demos to ensure ASC can continue to engage school pupils in exciting UK led science.

D. Developing new relationships

Moray was identified as an area that had limited opportunity to engage with STEM activities. Due to the geographical location of Moray to Aberdeen City it is challenging for these groups to visit the Science Centre in a one-day trip and return by the end of the school day. The EYU funding allowed ASC to visit this area, which would not have been possible before. Delivering the EYU project to schools in Moray through outreach allowed ASC to make STEM engagement a reality for this group of pupils who have very little or no exposure to STEM outside of the normal classroom offering.

As ASC progresses with its 'Lifetime With Science' redevelopment scheme, there are plans to engage more hard to reach communities through a new outreach programme. Engagement with the Moray schools through the EYU programme has 'broken the ice' with these schools. We now have an established relationship with staff, management and pupils at these schools, paving the way for further engagement in the future. Senior Management at the schools visited all expressed an interest in developing closer links and beginning an annual outreach programme.

Following the EYU Training Academy in Edinburgh, staff that had attended expressed an awareness of how much value events like this had. It was identified that staff across all Science Centres had much to gain from working on shared projects such as EYU. There was a real benefit to spending time in the same room together openly discussing experiences, successes, failures, delivery strategies and training plans for the project. During the course of a wide-ranging discussion between staff from several Scottish organisations over dinner, a decision was made to look at organising a 'Scottish Science Centre Meet-up'. The group's first meeting took place at Glasgow Science Centre, with a second meeting taking place in Edinburgh in January 2018. Although the group is still finding its feet, the following aims were initially proposed:

- To share best practice and experiences where Centres have overlapping projects.
- To discuss effective planning, coordination, training and delivery strategies across many similar projects.

- Develop closer ties with an aim to potentially work together on future projects.
- Highlight areas of potential collaboration.

The group is keen to ensure that the attendees were all of a similar position to a Science Centre Coordinator, rather than senior management in order to keep the conversation focussed on shared issues such as development, delivery and training. Going forward the group plans to meet quarterly and sees a real benefit in the new relationship.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Outreach to all Moray Secondary Schools (eight schools, all S1/2 year groups)	18	40-70	~950
Outreach to Moray Primary Schools	12	20-30	~360
School inreach	*8*	*25-30*	*~200*
Incredible Power of Light Exhibit (STFC roadshow)			*~10,750*
Overall TOTAL number of participants: 1,310 (as part of funding), *additional 10,950*			

Final delivery numbers

Final delivery numbers as of 20th January 2018			
Contracted Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Outreach to all Moray Secondary Schools (eight schools, all S1/2 year groups)	18	40-70	1,063
Outreach to Moray Primary Schools	11	40-70	568
School inreach (entered as Bursary for feedback but not using funding)	53	10-33	1,257
Incredible Power of Light Exhibit (STFC roadshow)			12,216
Seeing the Universe in all its light (STFC roadshow)			6,728
Overall TOTAL number of participants: 1,631 (as part of funding), *additional 18,944*			

Of the sessions you ran, how many of these were with target schools / groups?

All pupils engaged with as part of the funded project were our target audience. These were new schools who ASC had not previously engaged with in the case of Secondary schools and those ASC had had very little engagement with in the case of Primary Schools.

Meeting your Explore Your Universe contracted deliverables

ASC exceeded the contracted delivery targets. The success of the project in terms of delivery targets came from working with partners in the target area and also taking the time to contact schools and teachers to explain why ASC wanted to work with them. Additionally, ASC ensured all planning was complete well ahead of time i.e. planning journey times, set up times, making sure staff knew how each school's day ran and this ensured that there were no issues during the delivery.

Marketing, press and social media engagement

As this project aimed to engage schools in an outreach project we did not utilise social media and other marketing tools were not required. All communication was directly with the school staff.

Explore Your Universe legacy

ASC will continue to use EYU shows and equipment in various capacities. The full EYU show is part of the year-round school programme and ASC will use the developed "Science on the Spot" version of the show at various points throughout the year. For example, it ties very nicely to other topics such as electricity and so will be used to complement shows and workshops on this topic.

ASC has developed a relationship with Secondary schools in Moray. This relationship will continue as ASC expands its reach further North with upcoming projects and funding. The upcoming projects and funding will ensure that ASC have the capacity to continue to engage with these rural schools. These were the schools where ASC had impact as they have very little opportunity to engage with STEM in an informal way. These schools benefit significantly from ASC being able to bring inspiring and relevant STEM activities to their setting. The family show will be used throughout January and February 2018 and has been updated using what has been learnt over the course of this project.

Your best case study

Our coordinator delivering the Secondary school programme was approached by several members of staff before/during delivery, often during turn-around between shows and while setting or clearing up. The staff were incredibly curious about the equipment being brought in and generally about ASC as we have not visited these schools before. The staff had different experiences with science ranging from active science teachers to administration staff for whom 'science was not for them'. The key piece of equipment that stood out was the Van De Graaff generator because staff would often recognise this equipment from when they were at school. What was particularly encouraging was that this key piece of equipment had obviously, at some point during their education, excited and inspired them enough to make a lifelong impression.

To take the knowledge that one exciting piece of equipment can inspire an interest in STEM into a show for young people, is incredibly exciting. While it is too soon to know what the long-term impact of this show is, the thought that the show might have made a lifelong impression on the pupils was a very rewarding moment.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
120	0	120	0	0	0	0

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
112	1063	160	0	9	0	0

ASC fell slightly below the contracted deliverable for Primary school outreach which was discussed with ASDC. The feedback forms were very complicated and long for Primary school children. Knowing this from the start of the project, ASC ensured that where possible time was planned to help pupils with the forms, i.e. explaining the questions. With two classes time was short and therefore feedback forms were not collected. All schools were asked to email forms to ASC after the show but as of yet, none have been received.

Quotes from families, teachers and schoolchildren

Some comments on twitter from Head Teachers:

- "Our S1 [are] developing their enquiry skills, thanks to Aberdeen Science Centre @AberdeenSci." (@speysiderector)
- "A big thank you to Aberdeen Science Centre @AberdeenSci for their work with S2 on technologies in physics and space." (@ElginAcadmeyHT)
- "S1 STEM @aberdeensci delivered many fascinating scientific experiments. An insightful and hugely enjoyable afternoon! @TheMorayCouncil" (@ElginHighHT)

Included images can be used in future publications.

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

The response from staff who have worked on this project has been very positive. It has enabled staff to develop and gain confidence in the field of physics, all the way from atoms to astrophysics (and everything in-between). It has proven very popular with audiences which in turn makes it a fun show to deliver. The staff have also enjoyed working with high quality, advanced equipment. Staff who attended the training academy gained a great deal from this and then fed the information to colleagues. The flexibility of the show and equipment has also been important to staff as this has allowed us to deliver 'EYU' to a wide audience across diverse formats.

'I have absolutely loved delivering the EYU programme. I think the engagement level amongst participants has been the highest for any show I have delivered. The excitement in the groups when they see themselves for the first time through the lens of an infrared camera is a particular highlight for me. Working with a group of schools for the first time was particularly exciting and I can't wait to work with them again in the future.' Thomas Wild - STEM Learning Coordinator

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

One of the key aims of ASC's show was to make participants aware of STFC and the amazing areas of science that they are involved in. ASC also aimed to inspire our audience with some of the most exciting and diverse areas of science in the country. As our show centred on the work being undertaken by STFC, staff gained a great deal of experience explaining this and discussing their

importance. The CERN visit and Edinburgh Training Academy inspired the staff who attended and gave them a first-hand chance to see some of the work STFC is involved with. Those members of staff brought that knowledge back to the Centre and delivered training sessions for delivery staff helping to improve their knowledge.

How many staff members took part in Explore Your Universe phase 3?

Five members of staff were trained specifically to deliver the Phase 3 Primary/Secondary outreach elements of the programme. Future staff will be trained as we make use of the EYU show/equipment in other formats including public shows in the future.

Please give a reason for your answer:

It was a good place to find up-to-date information on STFC projects. However, the website does contain a huge amount of information with updates from STFC multiple times daily. Unfortunately, pulling out the key pieces of information from this website was time consuming. If the 'Experiments at home' section were updated regularly, then coordinators at ASC would make more use of this as a resource.

STFC Outcomes

By engaging with young people who have very little opportunity to engage with STEM outside of school (due to their geographical location), ASC hoped to inspire young people to think more about STEM careers. We feel that the EYU show, with its STFC UK Science focus is ideal for this, not only by inspiring and exciting young people in STEM, but also by showing the amazing science that is happening in the UK that they could be part of. Although ASC have not received the analysed data from the feedback collected for ASDC, it was noted that many pupils showed that they were inspired and excited by the show and this was backed up by teacher's comments during delivery, expressing their happiness with seeing the pupils engaged in STEM. As well as the young people who ASC engaged with, the project also allowed the development of staff who were trained to deliver the show and a chance for them to explore STFC science.

Dundee Science Centre

Report summary

Dundee Science Centre has brought STFC science to many local audiences through its earlier work in the Explore Your Universe project, and through the legacy of Phase 1 as an embedded part of the workshop programme. Phase 3 has now allowed DSC to bring these inspiring activities to even more people in deprived and remote areas, with one event as part of Dundee Science Festival run in a community centre in a deprived area of Dundee, and five secondary school outreaches across our local area. In total, these events engaged 1,564 people to share the amazing stories of STFC's research and the importance of the science to all of us.

Introduction

For Phase 3 of Explore Your Universe, Dundee Science Centre (DSC) ran a programme of school assembly outreaches in deprived and remote secondary schools, and a community-based family drop-in event as part of Dundee Science Festival 2017.

Phase 3 allowed DSC to extend its successful work with the EYU activities and themes to more disadvantaged audiences including schools and families who were not currently engaging with the science centre or with science in general.

Programmes delivered

3. An Outreach Programme for Explore Your Universe school and community workshops

The school outreaches included 45-minute assembly demo-shows on the fundamental science behind STFC's research, and applications in both everyday life and 'cutting edge' research. Topics covered included atoms, particle accelerators, light, lasers, fibre optics, infrared and astronomy. Funded outreaches were chosen as the best way to engage hard-to-reach secondary schools, because of the struggles to get many secondary schools to take a class off-timetable for an external visit. Promotion for these outreach events was targeted at schools in deprived and remote areas.

Five schools were visited, with two or three shows run at each. The shows engaged a total of 1,439 pupils from S1 to S4, and 68 teachers. All of the shows were delivered by two members of DSC's STEM Learning Team. The shows combined EYU demonstrations with others from Destination Space (like the whoosh bottle as an exothermic reaction to view in infrared, for a flash-bang end to the show) and some of DSC's Medical Technology demonstrations (with keyhole surgery and photodynamic therapy for cancer as example every day and 'cutting edge' applications of fibre optics and lasers).

The family drop-in event was held in Menzieshill Community Centre in a deprived are of Dundee, as part of Dundee Science Festival 2017. This evening event was titled '*Out of this World!*' and attracted 125 people including local families and an after-school club. Four staff from DSC along with external partner deliverers (and an inflatable planetarium) ran a range of different activities themed around space and astrophysics. The EYU equipment and activities were used to demonstrate spectroscopy, the uses of infrared and the electromagnetic spectrum. These were delivered within a community-based venue and focused on engaging 'hard-to-reach' families that otherwise may not have had the

opportunity to engage with physics or science in general. As a result of this, the activities were delivered in a way that was accessible to this audience.

Audience specific engagement

A. Inspiring family audiences

Approximately 85 people from a family audience were engaged at the community event (with the remainder being after-school club pupils).

Local families were engaged through this Dundee Science Festival event which aimed specifically to reach families living in the surrounding area. Having worked in this area before with this community centre, the DSC team were able to tailor their approach and the activities they brought along to suit this audience. The infrared camera was particularly popular (including the bin-bag 'nebula' demonstration, linking to JWST) as parents could use it to work together with children to look at each other with infrared.

B. Engaging communities and under-represented groups

Approximate 125 people from hard-to-reach community audiences were engaged at the Dundee Science Festival community event. It was held in an area of high deprivation, so all of the families/groups/individuals who attended fall within this grouping. It was held out-with Dundee Science Centre to ensure that local people would be able to access it more easily, instead running in their local community centre. The venue also aimed to alleviate other barriers to engagement from local communities and under-represented groups such as confidence, finance, etc. by holding it somewhere that made them feel comfortable and was recognisable. The event was also free-of-charge.

C. Gender reach

All events run during this project had an even gender split. All events also were delivered by an even mix of male and female staff, to avoid any perceived bias and to encourage wider engagement.

D. Additional Explore Your Universe Activities (not grant-aided)

During Phase 2, Dundee Science Centre also ran its '*Electromagnetic Spectrum*' secondary school workshop (of EYU activities) three times for a total of 55 secondary pupils and 13 teachers. Other EYU activities such as the Van de Graaff generator were used on many public outreaches, and the meteorites are used nearly every day at Dundee Science Centre to engage some visitors!

E. Developing new relationships

The external partners brought in for the community event were all existing partnerships. The project did allow DSC to improve its links with other science centres through the CERN visit and the training academy in Edinburgh. The training academy in particular helped to inspire closer links between the Scottish science centres, especially at officer level, as the officers have continued to meet up since then to share experience and training.

Your Contracted Explore Your Universe Deliverables

Original contracted deliverables			
Contracted Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Dundee Science Festival – Science Adventure day	1	120	120
Secondary school outreach sessions: Outreaches tailored to each school, with varying costs: e.g. 5 half-days of workshops in Fife/Angus/Perth schools or 4 full-days of workshops in Dundee schools (300-480 pupils); or school assemblies could reach up to 1,200 pupils.	3 full-days – 5 half-days	60 (half-day of workshops) – 200 (assembly)	300–480 (workshops) or 600–1,200 (assemblies)
Overall TOTAL number of participants: 420 – 1,320			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Dundee Science Festival – Science Adventure day	1	125	125
Secondary school outreach sessions: Outreaches tailored to each school, with varying costs: 4 half-days of assemblies in Fife/Angus/Perth schools and 1 half-day of assemblies in a Dundee school	5	212-400	1,439
Overall TOTAL number of participants: 1,564			

Of the sessions you ran, how many of these were with target schools / groups?

The target audience for the school events was secondary schools in deprived or rural areas. As described below, in order to get enough bookings, it was necessary to relax the criteria Dundee Science Centre set on the Scottish Index of Multiple Deprivation (SIMD) and the Scottish Government's Urban-Rural scale (UR). Of the five school events, four were top 35% SIMD or UR 6 (very rural), and one was UR 3 (small town). The community event also reached its target audience group.

Meeting your Explore Your Universe contracted deliverables

The target audience for the school events was secondary schools in deprived or rural areas. The STEM Learning Team promoted its programme to all the schools in the four nearby Local Authorities (Dundee, Fife, Angus and Perth & Kinross) who met a threshold of being top 25% SIMD or UR 5-6 (rural or very rural). Unfortunately, due to the limited number of schools (and clearly, other factors within the schools) the team did not get enough schools booking. In agreement with ASDC, Dundee

Science Centre relaxed the programme criteria to include top 35% SIMD and UR 3-6 (small towns to very rural areas), and managed to secure bookings to meet the targets.

Marketing, press and social media engagement

The '*Out of this World!*' community event involved the use of tailored marketing aimed specifically at reaching local audiences. Based upon consultation with community centre managers in previous events DSC has found that it is more effective to use methods like specific community centre posters to promote the event to the local audience. This was delivered as part of the wider marketing strategy of Dundee Science Festival 2017 which promoted all events including the EYU event.

The school events were promoted to qualifying schools by email and phone calls. The STEM Learning Team often finds it difficult to get its message past school administrators to the right teachers. Personal communication with known teachers is always much more successful, but that is not normally possible when trying to engage new schools. Local authority Quality Improvement Officers / Education Support Officers can be useful to help spread the word. A combination of these methods allowed the team to secure the bookings needed for this project.

Explore Your Universe legacy

EYU equipment will be utilised and adopted as part of DSC's core public outreach/engagement packages and activities like the Van de Graaff generator and meteorites have already been used extensively throughout the wider community engagement programme.

Since Phase 1, DSC has continued to offer an '*Electromagnetic Spectrum*' workshop for secondary schools, developed from the EYU resources and including many of the original STFC research links. Various activities from the Materials EYU kit have been featured in school Chemistry workshops, and the meteorites are a regular feature of school space workshops.

Most of the schools who saw the Phase 3 outreach assemblies qualify for a transport subsidy from the Scottish Government to visit DSC, so will be invited to bring a class to the centre for a workshop, to help build a stronger relationship and keep them engaged. Dundee Science Centre will also continue to work with the Menzieshill Community Centre to further engage that community.

Your best case study

Running secondary school EYU events as outreaches allowed DSC to engage more schools that otherwise would not have engaged with the project due to logistical issues with bringing a secondary class out of school. Running assembly demo-shows also allowed the project to reach higher numbers of pupils, especially with repeat sessions in each school. The EYU demonstrations and content about STFC's science were easy to adapt to this demo-show format. Other demonstrations were also included, such as the hydrogen balloon and whoosh bottle from the Destination Space project, illustrating the most common element in the universe and an exothermic reaction for the infrared camera respectively; and using keyhole surgery and photodynamic cancer treatment as relatable example applications of fibre-optics and lasers. This combination of demonstrations and format allowed DSC to provide a dramatic, engaging demo-show, with a variety of everyday and 'cutting edge' research applications to explain the fundamental science behind STFC's work, and bring it to the widest possible audience of secondary pupils from disadvantaged areas to inspire them about science.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)					
Outreach		**Inreach**		**School and Career Events Teacher Questionnaire**	**Other (please specify)**
Primary	Secondary	Primary	Secondary		
	210				

Final online evaluation data input as of December 8th 2017*					
Outreach		**Inreach**		**School and Career Events Teacher Questionnaire**	**Other (please specify)**
Primary	Secondary	Primary	Secondary		
	530			6	

* as agreed by the ASDC project manager. The contracted target of 210 was met by December 1st, with the evaluation data from later events all input by December 8th.

Dundee Science Centre was unable to take any photographs during the outreach activities, but some teachers did take pictures. The above images could be used in reports as they were published openly online by the school and do not feature any identifiable pupils.

How Explore Your Universe worked for your centre

How did you and your colleagues feel about Explore Your Universe?

"The EYU project has provided DSC with great equipment, and the content is well received by audiences".

"Thermal imaging camera is a very unique way of getting young people and families to think about space in relation to the new JWST. It is also very interactive".

Explore Your Universe "demonstrates the link from particle physics right up through to astrophysics through use of kit such as spectroscopes".

"The project was well managed, and the feedback process was well set-up - the forms were okay, and the online system worked quite well".

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

The Explore Your Universe project has allowed Dundee Science Centre's team to become much more aware of and engaged with STFC's science, from the part-time science communicators to other managers. The team is now very confident delivering activities and sharing stories on these topics, and looking forward to including more activities in future shows on projects like JWST.

How many staff members took part in Explore Your Universe phase 3?

14 members of staff were trained on EYU activities during Phase 3:

- Seven staff who delivered the school and community events
- Six additional part-time Science Communicators received training in the run-up to Dundee Science Festival
- One additional officer attended the training academy and helped deliver schools '*Electromagnetic Spectrum*' workshops

STFC Outcomes

Activities like the infrared camera and Van de Graaff generator were used to inspire family audiences who would not otherwise engage with science. By making the science dramatic and fun to play with, these EYU activities allowed the families to engage with the DSC team, find out about STFC's science, and hopefully improve the way they see science and its relevance for their lives.

For the school's workshops, Dundee Science Centre chose to focus on the background science to build on the pupils' existing knowledge with the project's dramatic demonstrations. By presenting both relatable everyday applications and 'cutting edge' STFC research applications, the shows aimed to increase how much the pupils valued science and to inspire them for future learning.

Dynamic Earth

Report summary

Dynamic Earth – the UK's only Science Centre dedicated to Earth and Environmental Sciences – is an educational charity with the mission of engaging and inspiring audiences of all ages and backgrounds with the science of planet Earth. Through the galleries of our permanent exhibition and portfolio of professional learning services for schools, public and harder-to reach groups, we engage audiences with the science of everything on, in and around our planet and welcome around 240,000 visitors each year. Since 2012, Dynamic Earth has been a delivery partner of the Explore Your Universe programme to inspire a sense of excitement amongst young people around the physical sciences by sharing the amazing stories and technologies of the Science and Technologies Facilities Council. Through a range of activity targeting different audience strands – including school workshops for primary and secondary school students, experience-based children's club workshops, temporary exhibitions and family learning experiences as an element of our public programme - Dynamic Earth has taken full advantage of the opportunities presented by the EYU programme to engage, inspire and excite audiences of all ages and backgrounds with the physical sciences and stories of STFC.

The EYU programme continues to complement and enhance our Learning Programme for primary and secondary school pupils; Dynamic Earth continues to run EYU workshops developed from the early phases of the programme to primary school audiences, and makes use of EYU kit in our secondary school space workshop programme. Beyond our school learning programme, our learning team have enjoyed integrating EYU content into other programme strands, for example, activities for community audiences focussing on radiation beyond the visible, or activities exploring thermal insulation using infrared technology in our children's science club, family learning and outreach programmes. Indeed, one of the strongest elements of legacy from the EYU programme for Dynamic Earth is the integration of the programme kit into new learning experiences for our audiences; something we would not have been able to do without the support of the programme. Our team have found the quality of experience provided to audiences by EYU kit so high that over the duration of the programme we have invested in additional kit to develop and extend the provision of physical science learning. As well as running workshops and developing family learning experiences using EYU kit, Dynamic Earth welcomed the LHC travelling exhibit in the summer of 2015 and developed a suite of complementary learning experiences for visitors giving them the opportunity to engage with some of the latest discoveries in particle physics.

For EYU Phase 3, Dynamic Earth co-ordinated a two day careers showcase for different audience strands including families, community groups and school audiences in September 2017. Providing the showcase across two different days (one weekend and one weekday) allowed the event to target both family audiences, and thus build family science capital through showcase engagement, as well as support the needs of learners at different stages of their school careers. This included students making transitions to studying science at high school level as well as students choosing their post age 14 subjects for study at examination and or further/higher education level. Across the two-day showcase, we delivered more than 1,100 face to face engagements between visitors and scientists (including Physicists and Engineers), with >20 different research groups and organisations exhibiting at the showcase. More than 50 representatives from academia and industry staffed the showcase for visitors, and 65% of exhibitors were women employed in science and industry. Dynamic Earth took

steps to ensure the event specifically targeted under-represented or harder to reach audiences in STEM through specific targeting to our community group audiences and golden-ticket schools.

Introduction

The EYU Phase 3 programme mission of 'increasing the value-for-money, sustainability and legacy of the Explore Your Universe Programme, further extending the reach into disadvantaged and underserved schools and communities to engage those who are remote from STEM (including geographically) whilst inspiring a sense of excitement around the physical science with young people and families, through sharing the amazing stories and technologies of STFC'. To deliver this, Dynamic Earth organised a two day careers showcase event to target three different under-represented audience segments; school pupils and their teachers in schools with a high classification on the Scottish Indices of Multiple Deprivation/schools classified as remote, community group audiences who experience multiple barriers to participate in STEM, and family audiences who may be prevented from visiting Dynamic Earth due to financial barriers. Targeted marketing to our golden ticket schools, community group network contacts and also in local community outlets ensured that the event was readily promoted to harder-to-reach audiences.

EUY Phase 3 funding enabled us to offer the 'Inspiring Young Scientists Showcase' free of charge to all audience segments, and provide maximum subsidy assistance for travel arrangements for schools to help facilitate their visit to the Centre.

Our research into audience segmentation and who visits the Centre revels that the event successfully engaged with underrepresented groups who would otherwise be unlikely to access the Centre. Postcode data obtained on the day of the showcase revealed that 22.5% of visitors came from communities in the top 25% on the Scottish IOMD, with 12.5% of visitors coming from communities in the top 5%. Additionally, on the showcase public access day, a number of families attended the showcase specifically referencing targeted marketing to our staff from community based initiatives including the Edinburgh Young Carers Project, and the Granton Youth Project. Targeted marketing to schools with a high index of multiple deprivation and high proportion of pupils receiving free school meals meant that the showcase reached 307 pupils from an area of multiple deprivation in the top 25% (or greater) on the SIOMD. Two schools who accessed the showcase were more than an hours' drive away from a research Centre of excellence or their local Science Centre.

The showcase took place in September 2017, and brought together more than twenty different organisations and research teams from industry and academia from all over Scotland. Together we engaged audiences in exciting, hands-on ways with topical and current research from a diverse range of STEM areas, including physics and engineering. We welcomed more than 1,100 visitors to the showcase - with a 120% increase on our contracted school engagement number – and over fifty different representatives from academia and industry being available on hand to inspire audiences across the two days of the showcase. The event had a particularly strong cohort of female role models for children, young people and their teachers and families to meet, interact and engage with; with 65% of exhibitors being women working in STEM academia and industry. Qualitative feedback obtained from family visitors, teachers, school pupils and exhibitors reveals that the showcase met and exceeded expectations from all parties. This feedback is particularly heartening as the showcase was a challenging event for us as a Centre to coordinate due to changes in internal staffing and stiff competition from other (free) cultural venues in Edinburgh across the weekend the showcase took place.

Programmes delivered

Inspiring Careers in Physics and Engineering

Dynamic Earth's Inspiring Young Scientist Careers Showcase brought together more than 20 different research teams and organisations to engage diverse audiences in the amazing opportunities that exist through studying STEM and Geography at school and beyond, including opportunities in Physics and Engineering. All of the stands which made up the showcase were staffed by at least one scientist or engineer from the organisation, with more than 40 scientists and science graduates primarily staffing the showcase overall. The research groups and teams represented across the showcase included:

Leonardo: Representatives from the world leading engineering firm were on hand to engage and inspire pupils in airborne and space systems engineering. Representatives joined us on both days from the firms graduate and apprentice programmes with hands-on activities and demonstrations involving infrared cameras.

SEFARI: Representatives from the James Hutton Institute and Moredun, both part of the Scottish Environment, Food, Agriculture, Research Institute network provided families and pupils with opportunities to meet scientists working in environmental research.

Cairn Energy: Representatives from Cairn Energy, including new graduates from Petroleum Engineering, gave visitors the opportunities to experience footage and get hands on with kit used in energy production.

EDF Energy: The team from EDF Energy gave pupils and families the opportunity to explore power stations in virtual reality, experiment with circuit building using littleBits kits and explore career opportunities for graduates and apprentices in Scottish based renewable energy plants.

Changeworks Recycling: Changeworks recycling promoted career and study opportunities in sustainability, and gave pupils and families the opportunity to make their own smoothie using kinetic energy from cycling on a bicycle.

ESRI: ESRI are the one of the biggest suppliers of GIS software worldwide. Their team gave families, pupils and teachers the opportunity to try out their software for themselves within the context of mapping worldwide deforestation.

SWECO: SWECO are an engineering, design and consultancy firm focussing on innovative solutions to environmental challenges. Their team were on hand to inspire audiences in engineering challenges and provide examples of engineering projects their organisation had worked on throughout the UK.

The University of Edinburgh: Staff and students from the School of GeoSciences engaged audiences in volcanology and oceanography through hands-on activities and demonstrations, and signposted career and study opportunities in Earth and Environmental Sciences.

Heriot Watt University: Research Teams from Heriot Watt University provided 'Countdown' style mathematical challenges for visitors, engaging them with introductory concepts in theoretical physics, provided opportunities to experience life on-board a research cruise in virtual reality and explore the role of microbes in cleaning up worldwide oil spills at sea.

Royal Scottish Geographical Society: RSGS representation was provided by the Institute of Geography and the Lived Environment from the University of Edinburgh; this stall focussed on the role and opportunities of Geography to inspire us and solve global environmental challenges with effects near and far from home.

UK Students for the Exploration and Development of Space: Representatives from the UKSEDS network, currently studying for qualifications in physics and space science in Scotland and elsewhere throughout the UK, inspired audiences in the opportunities within the UK space sector and the wonders of space through exploring the solar system in virtual reality and getting hands on with real rockets.

Skills Development Scotland: Skills Development Scotland are Scotland's national skills development network and professional careers service body. A team of career advisors specialising in STEM qualifications and career pathways were on hand to signpost families and school pupils to useful

STEM careers resources whilst letting them try out various STEM roles using virtual reality.

Royal Navy: Engineering Technician's from the Royal Navy inspired and engaged audiences in how STEM skills are vital across multiple career pathways in the armed forces using interactive experiences exploring the work of ship engines.

The British Geological Survey – The team from BGS in Scotland – including a Marine Geophysicist, a Mechanical Engineer and Web Developer – inspired and engaged audiences in the world-leading work of the BGS in Scotland, with an emphasis on how subsea drills are designed and operated. Audiences had fun experiencing first-hand the various components of a large UAV research drone and experimented with an augmented reality sandbox.

Institute for Mining, Minerals and Materials: The team from IOM3 engaged pupils and families with how a range of different materials help scientists and engineers develop the technology we use in our everyday lives with a range of challenges available for them to take part in to match materials to their uses.

As noted previously, EYU Phase 3 funding meant that Dynamic Earth was able to offer free entry to the showcase for families, community group and school audiences and moreover, was able to cover the transport cost of schools visiting the centre.

Overall the showcase engaged with more than 1,100 people; including 500 school pupils, >60% of which were from schools with an SIOMD index of 25% or greater. Of the 600 family and community group visitors who made up the weekend day of the showcase; 22.5% of visitors came from communities in the top 25% on the Scottish IOMD, with 12.5% of visitors coming from communities in the top 5%.

To extend the longevity of the careers showcase experience for all audience strands and to help reduce 'helicoptering' engagement, Dynamic Earth produced a booklet of 'Career Profiles' for visitors to take away with them following on from the showcase. This resource provided an overview of the careers and pathways into them taken by many of the scientists who staffed the showcase, along with advice they would give to all potential young scientists of the future. More than 20 of our exhibiting scientists contributed to the production of this resource.

Audience specific engagement

A. Inspiring family audiences

Approximate number of family audiences engaged: **600 Family Engagements**

Our Inspiring Young Scientists Showcase was split across a weekend and weekday in September (both a Sunday and a Monday) to provide an event accessible by both family and community group audiences, as well as Primary and Secondary schools. The Showcase was made up of a marketplace style of stalls of activities and experiences staffed by scientists and representatives of organisations from academia and industry. The event was a free experience for families and community audiences as either a destination event at the Centre, or as an experience enhancer included as a component of their day with us in the Centre. Families were free to spend as little or as long as they wished in the showcase area throughout the day. We would estimate that around 50 engagements on the Sunday

of the showcase were facilitated through specialist marketing targeting local community organisations including the Edinburgh Young Carers Project and the Granton Youth Project.

B. Engaging communities and under-represented groups

Approximate number of community/underrepresented audiences engaged: 307 from harder to access schools

Our Inspiring Young Scientists Showcase was split across a weekend and weekday in September (a Sunday and a Monday) to provide an event accessible for both family and community group audiences, as well as Primary and Secondary schools. On the Monday of the event, we provided schools with an hour long time slot to engage with the showcase. For this we had the assistance and facilitation of our Learning Officers. The Showcase was made up of a marketplace style of stalls where activities and experiences were staffed by scientists and representatives of organisations from academia and industry. Access to the showcase was free for school pupils and Dynamic Earth fully subsidised the cost of transport for each school group that attended. Of the 500 school pupils who attended, >60% were from schools with an SIOMD index of 25% or greater.

C. Gender reach

Based on our on-going evaluation of family visitor segmentation, we estimate that our visitors were approximately 50/50 split across the family day of the showcase. The school's day was not attended by any single-sex school; therefore, we anticipate the spilt on the school's day would also be close to 50/50.

D. Additional Explore Your Universe Activities (not grant-aided)

From February to December 2017, Dynamic Earth has delivered Explore Your Universe based workshops called 'Fabulous Forces' to around 536 P3/4 pupils. This is a one-hour workshop delivered by our Learning Team for Primary 3/4 pupils providing them with an introduction to concepts explored within the EYU Programme. Discussion points surround 'What are forces?' and 'What can they do?'. Activities involve pupils experimenting with magnets, experimenting with static electricity and demonstrations involving a Van De Graaff generator.

E. Developing new relationships

Following on from the most recent EYU Training Academy, there has been increased dialogue and communication between development level staff across the Scottish Science Centre network surrounding continuous improvement culture, collaboration opportunities and sharing best practice.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
School Careers Event	1	180	180
Family Careers Event	1	1,000	1,000
Overall TOTAL number of participants: 1,180			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
School Careers Event	1	500	500
Family Careers Event	1	600	600
EYU Based Workshop Bookings	20	Various	536
Overall TOTAL number of participants: 1,636			

Of the sessions you ran, how many of these were with target schools / groups?

Our Phase 3 programme sought to target under represented school groups, families and community audiences. More than 60% of our school groups who attended the showcase were from schools with an SIOMD index of 25% or greater. Postcode data obtained on the families' day of the showcase revealed that 22.5% of visitors came from communities in the top 25% on the Scottish IOMD, with 12.5% of visitors coming from communities in the top 5%.

Meeting your Explore Your Universe contracted deliverables

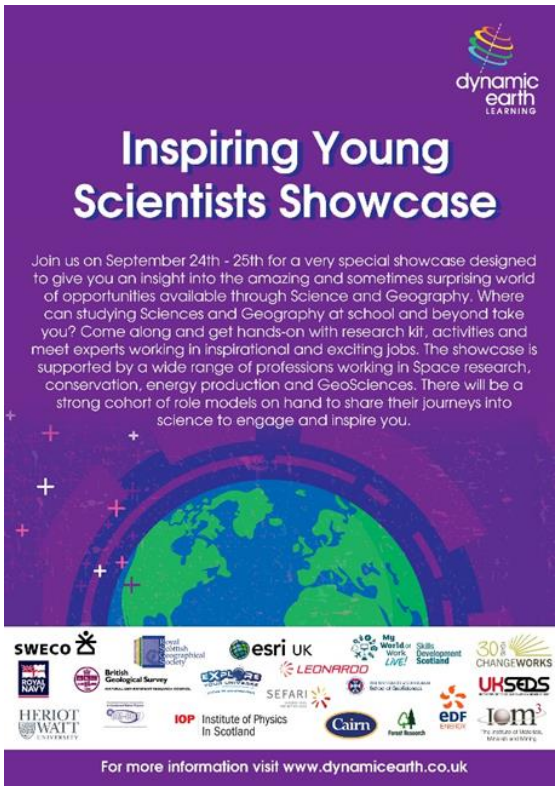
Overall, the careers showcase was well attended by family and harder to reach audiences. One of the biggest successes of the showcase was that it was the most well attended careers showcase we have run as a Centre for school pupils, which allowed us to exceed the schools target for the programme. One of the significant challenges we faced attracting more families to the event was that the weekend day of the showcase fell on the same day as Doors Open Weekend in Edinburgh. This meant that there was stiff competition across the city from other free cultural activity providers. We would not organise future events of this kind as part of Doors Open Weekend. With the added addition of >500 school workshop engagements across the EUY Phase 3 delivery period - something we were unable to predict as our school learning programme is 'on-demand' and led by the needs of schools - we have exceeded our EYU Phase 3 delivery target.

Dynamic Earth Learning Brochure 2017/18 – Showcase Coverage

Dynamic Earth Teacher e-Newsletter: Showcase Coverage

Dynamic Earth provided targeted marketing to different audience strands to deliver a successful careers showcase. The event was marketed to our partner golden ticket schools through targeted email invitations to head teachers, telephone invitations from our Group Bookings Agents and to wider schools within our network through school e-newsletters. The Careers Showcase made possible with funding from EYU also provided a dedicated tab and two page spread in our printed schools Learning Programme distributed to every school in Scotland.

We utilized the skills of our Community Learning and Development, and Science Engagement Officers to advertise the showcase to community audiences through face to face interaction, telephone and personalised email invitations to contacts within our community network. Additionally, our Marketing team put together a poster which was distributed to a range of contacts within our community network for advertising in their local Centres and for distribution to interested families.



Dynamic Earth Inspiring Young Scientists Poster/Flyer for Community Groups

Marketing, press and social media engagement

Our Marketing and Communications Team took steps to ensure the event was marketed well:

- The showcase had a dedicated page on the Dynamic Earth website and was cross linked from the Schools, Family Learning and Community pages to ensure ease of access.
- Two e-newsletters were distributed to our family contacts database with more than 7,000 members advertising the showcase.
- Multiple e-newsletters were distributed to our school's contacts database with more than 12,000 members advertising the showcase.
- The Careers Showcase received a dedicated two-page marketing spread in our 2017-18 Learning Programme sent to every school in Scotland.
- Our Group Bookings Agents, Science Engagement Officer and Community Learning and Development Officer provided personalised invitations to under-represented audiences either through face to face, email or telephone communication.
- Posters and flyers were distributed to local community projects to encourage attendance from harder to reach audiences.
- The Showcase was promoted by representatives from the Dynamic Earth Board of Trustees at relevant events they attended
- The event was widely promoted on Dynamic Earth's Social Media accounts by Dynamic Earth and contributing exhibitors including Twitter (@OurDynamicEarth and @Learn at Dynamic – with a combined following of > 8,500 people), Facebook (with nearly 14,00 page likes) and Instagram (>1,350 followers). Additionally, our PR agency provided blog coverage.

Explore Your Universe legacy

As explored elsewhere in this report, Dynamic Earth continues to make use of EYU provided kit in a variety of our learning programmes for schools, community groups and family audiences and this is one of the strongest elements of legacy of the programme for us as a Centre. We continue to offer EYU workshops as a component of our on-demand school learning programme for schools who would like to book these experiences. Our Learning Team continues to benefit from CPD opportunities provided by the programme in the form of Training Academies and best practice discussion conference calls.

Your best case study

For Phase 3 of the Explore Your Universe Programme, Dynamic Earth organised a two-day Inspiring Young Scientists Showcase which targeted family, community group and school audiences. Targeted marketing from across different strands of our team meant that a high proportion of visitors who came to the showcase were from harder to reach backgrounds; more than 60% of school pupils who attended came from schools with an Scottish IOMD within the top 20% or higher, and 22.5% of family visitors came from communities in the top 25% on the Scottish IOMD, with 12.5% of visitors coming from communities in the top 5%.

The showcase event brought together more than 20 different organisations and research teams working in STEM industry and research to Dynamic Earth in the form of marketplace stalls for visitors to engage with freely, and I asked her face to face interactions, hands-on activities and demonstrations. More than 50 representatives from STEM research and industry staffed the showcase – with a vast majority of representatives being scientists (including engineers). Around 65% of the exhibitors at the showcase were women working in STEM research and industry. Across both days of the event, more than 1,100 visitors engaged with the showcase and met a real scientists or engineer. To provide an element of longevity to the showcase and prevent helicoptering style engagement, Dynamic Earth put together a booklet of 'Career Profiles' for visitors to take away with them following the showcase. These provided profiles on the background and 'STEM journey' of 20 of the scientists who exhibited at the event, and aimed to act as a resource of guidance and inspiration for young scientists of the future.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
					210	

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
					127	

*or as agreed by the ASDC project manager.

If you did not meet your contracted targets, please tell us what you did to try to reach these numbers

Dynamic Earth had robust measures in place across both days of our careers showcase to capture as much guest feedback as possible from all audience strands; including capturing quotations from visitors who attended on both days of the event and completing the EYU Phase 3 Evaluation Forms.

Feedback points were set-up to encourage visitors to complete written evaluation forms on the public day of the careers showcase throughout the exhibition area. We do not have staff resource to encourage visitors to fill these out as a permanent feature of the day, and uptake of this opportunity from visitors was low. All schools were given the opportunity to complete written evaluation forms as part of their visit to the Centre in evaluation spaces we specifically set up for them. However, completing evaluation forms ate into the time schools got to spend in the showcase itself and therefore many teachers opted not to do this. We were unable to get schools to have 'extra' time to complete these due to limited space capacity in the building, as well as limited times school groups were able to spend with us. Any school who did not opt into completing feedback on site were provided with a SAE to complete and return their evaluation forms to us at a later date. Even with chasing up, only two schools followed through with this.

Given that our evaluation target of 210 evaluations across the two-days our EYU Phase 3 programme was running was the same target as Centres who had been running activity from February 2017+, we feel that our evaluation efforts overall were a success.

Quotation Evidence Gathered

- "What you're doing here is fantastic…the kids are like WOW!" (Parent)
- "It's great to have this on as part of our visit today, my daughter has really enjoyed it and I think it's so important to let her see women are doing exciting things in science" (Parent)
- "There's so many different organisations here, really good event" (Parent)
- "I liked talking to the marine scientist because I found out that microbes can help clean up oil spills and I think that's cool" (Child)
- "I think that things like this are great. Nothing like the science we did at school" (Adult)
- "I think if you can capture kids' imaginations then they're hooked" (Adult)
- "It's great to see use of technology…the kids love it!" (Adult)
- "Great to meet real scientists" (Child)
- "Fabulous opportunity" (Adult)
- "Good to hear 'real stories' about how people got into their jobs. Inspiring!" (Adult)
- "Great to meet such a diverse audience at one event" (Exhibitor)

- "It was great to see parents make a genuine attempt to understand and encourage their children, as many will simply dismiss physics as 'too hard'" (Exhibitor)
- "This event was so well organised and gave us a great opportunity to practice public speaking and outreach skills" (Exhibitor)
- "We got to inspire and show them (teachers) that simple experiments and exercises can explain effectively big scientific concepts" (Exhibitor)
- "It was great to meet young people interested in the engineering industry" (Exhibitor)
- "It was great to talk to so many enthusiastic school kids and also meeting teachers and parents (this was particularly useful)" (Exhibitor)
- "Anything that encourages children into STEM careers is worth supporting. So many of the Royal Navy's Career pathways rely on STEM interest and qualifications." (Exhibitor)
- "It was great to give children an insight into the work and opportunities in civil engineering" (Exhibitor)
- "Children taking an interest in our industry; taking away fun facts and ideas for careers which span far more than engineering e.g. Geology and GeoSciences [was the most worthwhile part of the event for me]" (Exhibitor)

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

The learning team have enjoyed the opportunity for another Careers event as Dynamic Earth. Engaging with young people to inspire curiosity, show off the people at the heart of research and impress the value of science is relished especially when we can do it in such a vibrant hands-on way. Offering a chance to experience this surrounded by their families is something special and supported by EYU Phase 3.

As Learning Officers we continue to utilise EYU kit and it pervades other areas of public and school's engagement. Knowledge transfer between staff is helped by staff attending several EYU training courses over the years. The EYU inspired workshop garners reactions of awe and wonder when young people explore magnets, electricity and the Van der Graaff generator. This is one of the best workshops for getting these reactions.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

ASDC programmes such as Explore Your Universe provide a platform for Science Centres to work towards the same goal, compare and share ideas and increase awareness of the network of ASDC and STFC facilities. We are able to bring this knowledge into our workshops whilst we explore a wide array of topics including space and technology. Discovering that this is happening in the UK in inspiring for staff, young people and anyone we engage with.

How many staff members took part in Explore Your Universe phase 3?

The Learning team (seven people) coordinated and facilitated the young people on the day of the school's careers event, whilst the Visitor Services staff facilitated the families' careers day. The school's day was structured to ensure each group had time and space to explore the marketplace and Learning Officers facilitated these interactions. Our Bookings Officers (two people) were central to coordinating the scheduling and preparation of the school groups and were required to understand the event and its context as EYU phase 3.

We continue to use the EYU kit for public engagement so many Visitor Services staff have been trained to use equipment like the Van der Graaff generator and infrared camera.

STFC Outcomes

The EYU programme has been brilliant to be a part of and has provided a platform to inspire the next generation of scientists and researchers. With the suite of activities, we have been able to run workshops, shows, meet the expert events and careers days for young people visiting Dynamic Earth. The feedback and evaluation we have received, not just in Phase 3 has indicated that we have changed minds, initiated curious questions as well as make science fun again!

For EYU phase 3 Dynamic Earth delivered a two-day careers showcase which allowed school pupils and families to visit and meet over 20 organisations from STEM industry, education and career. We know from the feedback that meeting scientists behind the research was a great way to learn that this was happening in the UK and in some cases on our doorstep. This is vital for STFC science, technology and research news to be valued by the public.

The frequency of female role models among the scientists and researchers was encouraging for young females transitioning through school and onto careers, with over 65% of exhibitors being female. In discussions with female participants seeing females in these positions provide an alternative to the gender stereotypes in science.

Our research into audience segmentation and who visits the Centre revels that the event successfully engaged with underrepresented groups who would otherwise be unlikely to access the Centre. Postcode data obtained on the families' day of the showcase revealed that 22.5% of visitors came from communities in the top 25% on the Scottish IOMD, with 12.5% of visitors coming from communities in the top 5%. Creating opportunities for family learning experiences is vital to bringing science into the home and encouraging supportive environments away from school as well as having fun together. The school's showcase reached 307 pupils from an area of multiple deprivation in the top 25% (or greater) on the SIOMD. We know from speaking with teachers that these opportunities are not available without financial support.

Workshops within our formal learning programme continue to use EYU equipment. The service is used by over 24,000 pupils each year and is an important resource for teachers expanding the knowledge, understanding and skills of their pupils.

Winchester Science Centre and Planetarium

Report Summary

The Explore Your Universe phase 3 programme has provided a suite of resources and skills which have dramatically improved the ability of Winchester Science Centre staff to discuss advanced physics-based concepts with wide audiences via a number of formats. The programme vision of 'increasing the value-for-money, sustainability and legacy of the Explore Your Universe Programme' has been achieved by embedding demonstrations and concepts in the core public and schools offering, reaching a combined (minimum) 1,350 members of the public and students beyond the contracted deliverables. This has taken the form of high profile live science shows based on electricity and smaller scale busking activities throughout the Centre as well as using the equipment provided in all relevant schools' offerings.

The reach of the programme has been further extended via free outreach visits to 1,375 students and 43 teachers, 71% of which come from schools with high proportions of students from 'disadvantaged and underserved communities'.

This programme has not been without adversity, with major changes to the project team at a critical time providing a risk to its successful delivery. That challenge has been turned into a learning opportunity for the Centre to refine its project management, how it interacts with its audiences and has given staff greater understanding of the difficulties faced by 'Category 1' schools and therefore strengthened the Centres ability to reach out and support these organisations.

Winchester Science Centre has successfully delivered all of its contracted deliverables, engaging with 1,375 students (1,200 contracted) via outreach and collecting 237 completed evaluation forms (210 contracted). The legacy of Explore Your Universe (EYU) phase 3 will live on in the skills, demonstrations, relationships with schools and the inspiration it has provided for the upcoming Astronomy zone to be hosted at the Centre.

Introduction

Following the success of EYU phase 1 at Winchester Science Centre (WSC, 14,988 active participants with EYU content) and the continuation of the project team (Alex Boxley, AB, as Project Officer and Dr Jenny Shipway, JS, as Project Manager), it seemed that phase 3 would be a success. However, as described in the interim report (J. Shipway, 26th July 2017) the project quickly found challenges in both the lead presenter (AB) and then the project manager (JS) leaving during the delivery timescale. Oversight of the project was taken on by Dr Ben Littlefield (BL) from the beginning of September 2017 and a new physics specialist lead presenter, Phillip Lemon (PL) took on delivery.

At this point the show had been redeveloped and resourced with support from AB and four out of ten targeted schools had returned a positive, but unconfirmed response to receiving outreach. Hampshire Inspection and Advisory Service had agreed to support the project and the show had been added to the general schools offering after internal piloting.

Post change in project team the four positive responses were successfully converted into confirmed visits via support from the STEM NOW team leading to EYU content being delivered via outreach to 1,375 KS3 students, 71 % coming from a 'Category 1' school (schools identified as having low attainment and a high proportion of Pupil Premium students, and/or fewer than the national average students continuing with STEM subjects post-16). A further 250 KS3 students were engaged

via in-house delivery during the project period and took part in both in-house and project-related evaluation for comparison. Multiple attempts were made via the project team, STEM NOW (Winchester Science Centres STEM Ambassador contract holder) and the Hampshire Inspection and Advisory Service to arrange further visits in the delivery period (September – November 2017) but these attempts were unsuccessful with the short notice being the most commonly cited reason for rejection.

EYU phase 3 enabled the renovation and revitalisation of the resource originally provided for phase 1 and through changes in the project team, led to the training of three further members of staff in the delivery of EYU and STFC related content. Phillip Lemon in particular should be mentioned as he led the further refinement of the show in response to teacher, pupil and peer feedback and the techniques he developed have now been passed on across the Education team and EYU based learning is now apparent across Winchester Science Centre's school and public offering.

Feedback for the show, both as outreach and in-house has generally been good to excellent with students commenting that they found the activities 'enjoyable and inspiring' (year 8 student, Winton Community Academy) and teachers complimenting the 'enthusiastic staff, very well delivered, engaging' (Teacher, Testwood Sports College), and the fact that activities 'showed pupils that science is interesting' (Teacher, Cantell School).

Winchester Science Centre has successfully achieved its core agreed deliverables of 1,200 engaged students (1,375 actually reached) with a further 250 students reached who would not have been engaged without the renovation of resources and training provided to staff through the project. The skills, knowledge and enthusiasm for the project has not been lost despite a change in project team and because of phase 3 and the resources provided as part of the project, EYU will remain part of the Centre's core offering for at least the next year. The equipment and skills developed as part of the project will have a lasting legacy in the form of both holiday programmes and other workshops delivered by the Centre.

Programmes delivered

An Outreach Programme for Explore Your Universe curriculum-linked workshops

The core aspect of EYU phase 3 at Winchester Science Centre was the delivery of a free outreach programme of content, initially intended to be small scale shows/workshops and optional teacher CPD. In the original agreement this was to include ten separate visits to ten targeted schools engaging with approximately 120 students per visit in class groups of 30-40 per activity. Schools were to be targeted using STEM Learning 'Priority Schools' criteria (schools identified as having low attainment and a high proportion of Pupil Premium students, and/or fewer students than expected continuing with STEM subjects post-16) and contacted via multiple teacher contacts provided by STEM NOW and strengthened by the support of the Hampshire Inspection and Advisory Service.

The inflexibility of school timetables, especially during the short project delivery timescale, was underestimated by the original project team and although ten schools had been identified and contacted via multiple avenues before the interim report (26th July), only four positive responses were received. These four were converted into confirmed visits but a secondary unexpected challenge was encountered, three of the four schools were priority schools which meant they experienced substantial pressures on their time and inflexibility in their teaching timetables. This made the originally intended small group (under 40) workshops re-developed by AB no-longer

suitable and PL substantially modified the show to be able to effectively work with much larger audiences of 150+ students at a time. It is likely that without the contacts and relationships already in existence between STEM NOW and the schools, the rate of success would have been even lower.

At each of the four schools visited as part of the outreach programme teachers opted to convert their year group's science lessons into a whole year assembly to ensure the greatest value of time and money. Each session was 45 to 60 minutes and focused on the electromagnetic spectrum as the main thread linking demonstrations together. The change in scale of audience did limit which demonstrations would be appropriate with the Van de Graaff generator, discharge tubes, IR camera and plasma ball being the main demonstrations used from the EYU suite. These were supplemented with a microwave/chocolate demonstration to demonstrate the wavelength of microwave radiation, diffraction grating glasses to look at the spectra of light emitted and audience based glow stick demonstrations highlighting frequency and wavelength. PL also brought a wealth of pedagogical experience to the show and introduced physics thought experiments such as the 'Fly striking a moving train' and the true nature of colour. The larger audiences increased the reach of the programme, allowing the project targets to be hit with fewer visits.

Due to the format, each year group was only engaged with once with the age split being roughly 31% year 7, 31% year 8 and 38% year 9 students. Three of the four schools visited (Mountbatten, Cantell and Winton Community Academy) had their entire KS3 cohort receive EYU sessions. 71 % of the students receiving outreach were from schools in the top 25 % of the indices of multiple deprivation and none of the schools engaged with had received EYU content prior to their visits.

Since the funding was initially to cover ten visits, Winchester Science Centre will honour the remaining six visits and will offer them to priority schools during 2018 as free, fully funded visits.

Audience specific engagement

A. Inspiring family audiences

EYU equipment and expertise was used as part of a celebration of electricity at Winchester Science Centre for May half term. The repaired Van de Graaff and plasma ball formed essential parts of a wider 30-minute live show called 'High Voltage' designed to communicate the concept of electricity, it's historical context and the future of wireless charging. Specific audience numbers were not counted for these shows but 44 shows were delivered in total with a rough estimate of between 25 and 150 attendees per show. In total between 1,100 and 6,600 family audiences would have engaged with EYU resources and related concepts.

B. Engaging communities and under-represented groups

A key part of the original proposal was working with schools that had been targeted on the basis that they had high numbers of students on receipt of free school meals (FSM) and low post-16 uptake of STEM subjects. Four schools ultimately received visits, three of which fulfilled the above criteria:

Cantell School has a higher than average number of students in receipt of FSM (21.4 %) and the proportion of students from minority ethnic groups is 'significantly' above the national average for secondary schools (Ofsted 2017). It is in a POLAR quintile 5 region which gives a false impression of progression to higher education institutions, this is likely due to its proximity to the University of Southampton.

Winton Community Academy has a higher than average number of students in receipt of FSM (21.1 %) and is in a POLAR quintile 3 region, an area with moderate participation with higher education institutions

Woodlands Community College has a higher than average number of students in receipt of FSM (28.1 %) and is in a POLAR quintile 1 region, an area with the lowest participation with higher education institutions.

In total 71 % of the students engaged as part of EYU phase 3 were from targeted schools and approximately 16.9 % of all students were in receipt of free school meals.

C. Gender reach

All four schools engaged with the programme were mixed, however data gathered from Ofsted suggests that each school was slightly male dominated with the approximate % of female identifying students being 44.6 %.

Additional Explore Your Universe Activities

Additional delivery numbers as of January 20th 2018			
Additional Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
26th of May to 5th June 2017 – Electricity show for May half term, four shows/day	44	~ 25 – 150	~ 1,100 - 6,600
25th September 2017 EYU Inreach – TASIS	1	35	35
13th October 2017 EYU Inreach – Meoncross	1	40	40
2nd November 2017 EYU Inreach – Testwood Sports College	4	35	140
13th Novemnber 2017 EYU Inreach – Horndean Technology College	1	35	35
Overall TOTAL EXTRA number of participants: 250 school students and 1,100 – 6,600 members of the public			

Contracted Explore Your Universe Deliverables

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Outreach events in secondary schools to deliver EYU show	10	90 – 200	1,200 – 2,000
Overall TOTAL number of participants: 1,200 – 2,000			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Outreach visit – Mountbatten School	1	400	400
Outreach visit – Cantell School	1	540	540
Outreach visit - Winton Community Academy	1	335	335
Outreach visit – Woodlands Community College	1	100	100
Overall TOTAL number of participants: 1,375 school students			

Of the sessions run, how many of these were with target schools/groups

Three of the four funded visits were with targeted schools which equates to 71 % of the total number of students engaged with the funded component of the project. All four schools were new to EYU and had not received outreach from the Centre before.

Meeting the Explore Your Universe contracted deliverables

Despite adversity, Winchester Science Centre has exceeded its contracted deliverables for phase 3 of Explore Your Universe with 1,375 KS3 students directly engaging with STFC and EYU content as part of the project, and a further 250 KS3 students and approximately 1,100 – 6,600 members of the public engaging with EYU content or resources who wouldn't have without the funding provided by the ASDC. The Centre has slightly missed the evaluation target of 210 evaluation forms, receiving only 170 from target schools. To supplement this, we collected a further 67 student evaluation forms from in-house EYU delivery during the project period that would not have happened without the phase 3 funding.

The fulfilment of the project has faced several major challenges, ranging from a change in the project team at a critical phase to the inherent barriers in engaging with the schools targeted as part of the project. Initially the project presented as a success with AB being able to renovate the equipment and train PL and Vanessa Holt (VH) in the delivery of the 45 minute EYU show. This training and repair of equipment allowed the transfer of the skills to the highly successful 'High Voltage' May half term show. The original project team had some success contacting and getting positive (but unconfirmed) responses from four of the ten targeted schools via the relationship between

Winchester Science Centre and STEM NOW. To support conversion, the original project team also set up verbal support for the project from the Hampshire Inspection and Advisory Service.

Both the Project Manager and Project Officer subsequently left the project at a critical time (Summer 2017) and the new Project Manager and Project Officer picked up delivery with four unconfirmed expressions of interest and a refined show, but only three months in which to achieve the contracted deliverables. By taking advantage of the STEM NOW contacts and being as flexible as possible for the school's needs, the project team managed to convert the four expressions of interest into confirmed bookings but despite a campaign of emails and phone calls to the other six targeted schools was unable to arrange visits during the delivery period.

The first delivery at Mountbatten School (28th September 2017), despite being a success, highlighted that the refined show developed by AB was not suitable for the larger audiences, teachers required to work within their timetables. PL spent a substantial amount of time and research modifying the show, focusing on demonstrations that were easy to scale up and hinging the content around the use of the electromagnetic spectrum to explore our universe. This new version was piloted internally with Meoncross School (13th October 2017) before being taken out again to the remaining three target schools as outreach and two more schools as in-reach. The lead presenter also reflected and refined their own skills, being a physics and Primary education specialist, the older audience presented a challenge initially but through initial mentoring by AB, discussion with the wider team, Project Manager, teachers and a rigorous self-refection process he gained confidence and a new area of expertise that he can share with the wider team.

Marketing, press and social media engagement

EYU phase three was advertised in teacher and STEM ambassador newsletters to approximately 3,300 and 2,600 people respectively.

Explore Your Universe legacy

Explore Your Universe phase 3 will continue to have an impact on Winchester Science Centre. All delivery staff are now trained on the key demonstrations that are part of the resources supplied (Van de Graaff, discharge tubes, plasma ball and IR camera) and these demonstrations are widely incorporated into both the core schools and wider public offering and should reach approximately 12,000 people a year. The knowledge and experience gained, both in terms of content and in effective ways to communicate to KS3 audiences has been shared across the team.

The modified EYU show is now a core part of the Centre's KS3 offer and will reach a further estimated 500 students per year. An unintended and positive outcome of the project is its support of the upcoming Astronomy Zone planned for July 2018, the concepts covered in the EYU show are being directly incorporated into the space and specific demonstrations being modified to form interactives and exhibits.

EYU phase 3 has also impacted how the Centre manages projects, all future projects will be managed via a standardised project management framework based on AGILE project management guidelines. Records/documentation related to projects will only be kept in shared (secure) locations with access gated to the project team and a member of the fundraising team to ensure consistency and fulfilment of contracted deliverables. A risk register will be carried out at the beginning of each funding application to identify contingency personnel who will be kept informed about the status of the project, in case of major staff turnover and to avoid any breaks in project related activity.

Case study

Audience driven modification of content

Abstract:

Through phase 1 of Explore Your Universe at Winchester Science Centre the content provided by the ASDC and STFC was refined into a 45-minute small group show designed to work as a complimentary session with the mobile planetarium offering. Successfully winning phase 3 funding allowed the team to further modify the session making it a stand-alone 'workshop in a box' that any member of staff, with sufficient training, could deliver. However, this did not take into account the time pressures faced by targeted KS3 schools and the necessity of much larger audiences, justified by having a lower impact on the teaching timetable within schools. Modifications were made to make the session more dramatic and appropriate for larger audiences and the feedback received improved as a result.

Method:

After the first outreach delivery at Mountbatten School it became apparent that the as-designed show was not suitable for larger audiences, Phillip Lemon led a series of modifications which improved and focused the story being told, reflected in increased confidence of the presenter and positive feedback from schools.

A wavelength proving experiment using chocolate and a microwave was introduced, with students encouraged to 'try this at home', mass audience participation was achieved using a glow stick representation of the visible part of the electromagnetic spectrum and the discharge tubes were improved by introducing diffraction glasses and the concept of spectral analysis. A series of thought experiments were also introduced, encouraging students to predict and discuss the outcome of a fly striking a moving train and the implications for acceleration and the forces involved. A series of discussions on the nature of colour were introduced to foster delight and productive cognitive dissonance and Phill drew from his own personal experience and dissertation to discuss the observations of extra-solar phenomena under different wavelengths of light.

Impact and lessons learnt:

This project highlighted the challenges of closed-room development and the dangers of assuming the scalability of demonstrations. The changes made allowed the scaling up of a show best suited for ~ 40 audience members to reach over 200 at a time. These changes also improved the confidence of the presenter and allowed much more flexibility in working with schools. It is likely that without the changes made, none of the target schools would have been able to benefit from the programme due to the timetable constraints. Future similar projects will be co-developed with the representatives of the recipients to ensure that activity is effective as well as being sustainable.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
	210					

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
	170		67			

Highlighted quotes

- **"**I liked how he made learning fun!" – *Female student, year 7, Testwood School*
- When asked if they will tell their family about the session> "Yes because it was a great experience that needs to be shared" – *Male student, year 7 Testwood School*
- When asked what they liked about the activities> "Engaging presentation, pupils felt involved" – *Teacher, Cantell School*
- When asked what effect the activities may have on student's long term motivation> "Show it can be fun, show it can have real uses" – *Teacher, Cantell School*
- When asked if they will tell their family about the session> "Yes because it inspired me, so it may inspire many others as well" – *Male student, year 7, Cantell School*
- When asked what they liked about the activities> "That it was not really a science boring lesson, it was fun, I liked it. I was intrigued about the colours" – *Male student, Cantell School*
- When asked what they would remember – "With a special camera you can see through a bin bag" – *Female student, year 9, Woodlands Community College*

How Explore Your Universe Worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

The team at Winchester Science Centre overall have been very positive about Explore your Universe, especially the increased understanding and tools available to communicate particle physics. The larger demonstrations have been incorporated as fundamental parts of the team's arsenal and helped members of the team from a non-physics specialist background develop confidence in concepts such as electricity and light. The 'as-intended' EYU content has been less useful due to the constraints of running the programme as outreach in KS3 schools but the modular nature of the demonstrations has allowed the team to reflect and refine the content to be more effective for our target audiences.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

Unfortunately, this aspect of the project was the main casualty of the change in project team as AB was the most involved and aware of current STFC research and its links to the EYU project. The inability of Winchester Science Centre to commit any staff to the training academy was another factor in the reduction of staff knowledge. Overall staff at the Centre generally have less knowledge of STFC research but this is due to staff turnover rather than a direct result of the project. However, research for the upcoming Astronomy Zone is reacquainting the wider team with STFC research.

How many staff members took part in Explore Your Universe phase 3?

Six members of staff took part in Explore Your Universe phase 3:

- Alex Boxley (original lead presenter, left during project period).
- Vanessa Holt (trained on how to deliver show, but left during project period without delivering show).
- Dr Jenny Shipway (original project lead, left during project period).
- Phillip Lemon (lead presenter, delivered all of contracted deliverables and further refined show).
- Liz Mitchell (trained on show delivery but did not deliver show during project period, supported refinement).
- Dr Ben Littlefield (project lead, delivered majority of extra in-house EYU sessions during project period).

Cambridge Science Centre

Report summary

Cambridge Science Centre (CSC) used the skills of their passionate Science Communicators to share Explore Your Universe activities with new audiences via their thriving outreach programme. The CSC outreach programme proved an excellent channel to ensure children who may never have had the chance to engage with Explore Your Universe content could do so. CSC are the only Science Centre in East Anglia offering year-round access to hands-on STEM activities for children in and out of school and therefore were uniquely placed to deliver Explore Your Universe in communities which otherwise would not have the chance to engage with these activities.

In the summer and autumn school terms of 2017 CSC worked with children aged 7 to 12 in targeted communities in the region, e.g. Ely and King's Lynn. Schools in these communities all face specific challenges, for example:

- Ely's schools include many children from isolated rural communities, who otherwise do not have regular access to Science Centre provision.
- King's Lynn was identified in a 2016 Social Mobility Commission report as having particularly poor social mobility. King's Lynn and West Norfolk was the 32nd worst performing local authority out of 324.

Programmes delivered

An Outreach Programme for Explore Your Universe curriculum-linked workshops

CSC delivered an Outreach Programme to audiences that are underserved with STEM activities. CSC engaged new audiences with Explore Your Universe activities through their planned school Roadshows, delivered in the summer and autumn school terms of 2017.

This delivery channel ensured CSC could reach new audiences by:

- Working in targeted communities – working with the GCGP LEP meant that CSC could target their work at those communities where STEM attainment and skills are typically low and with little STEM provision. These are communities that rarely engage with STEM activities and have not yet had the opportunity to participate in Explore Your Universe activities. Towns like King's Lynn require significant journeys to reach Cambridge Science Centre, which provides additional cost barriers.
- Working in schools in communities such as Ely and King's Lynn meant that CSC could reach children from isolated rural communities who cannot normally easily access STEM activities.

CSC delivered their Spectrum Science show and a hands-on activity in schools in each of these communities during their visits in 2017.

CSC made Explore Your Universe activities sustainable by integrating them into their COSMOS outreach activities and school offerings. COSMOS will be delivered in target communities for a minimum of two years and CSC will continue to work with their evaluation partners to assess if they could support a semi-permanent Centre. Where these are established, staff will be trained to deliver

Explore Your Universe activities, e.g. the Spectrum Science show, as part of these facilities' programming.

Inspiring Careers in Physics and Engineering

Whilst CSC does not currently offer careers programmes as such, their Science Communicator team was delighted to deliver a Roadshow event at Peele Community College in Lincolnshire as part of the Explore Your Universe project. This event (funded by LincHigher) was specifically aimed at inspiring young people to take up careers in science and engineering and give them an idea of the wide variety of careers available in the sector.

Audience specific engagement

A. Inspiring family audiences and engaging with communities

Approximate number of family audiences engaged: 7

A total of 970 individuals were engaged with across seven public audience sessions.

These sessions were held at:

- King's Lynn Town Hall (Easter holidays, ten mini-workshops)
- Ely Cathedral (May Half-term, ten mini-workshops)
- Cambourne Science Festival (weekend, village centre venue)
- St Mary's RC Primary School, Lowestoft (summer holidays, six mini-workshops)
- Hauxton Village Primary School (weekend, fete)
- King's Lynn Arts Centre (October half-term, six mini-workshops)
- Cambridge Family Film Festival (half term)

Five of these seven were new audiences with whom Cambridge Science Centre had not previously engaged.

CSC engaged with communities by delivering Roadshow events, for example in Lowestoft (an underserved coastal community) for Kirkley People's Forum in July 2017, and King's Lynn town centre. CSC did not specifically adapt any EYU activities for them, but their 'rainbow bracelet' activity was developed to be something that could be done in any location, would appeal to a wide age range and could be done relatively quickly with large numbers of people, making it suitable for a drop-in community event.

B. Gender reach

The overall gender split across all events (including the 35 groups CSC delivered to in schools) is assessed to have been 50:50 male and female.

28 of the 35 school outreach visit groups were mixed boys and girls groups assessed to be approximately a 50:50 split. A further six groups had a gender bias of no more than 65:35 toward either gender.

One Year 11 group was all boys (n=12).

Additional Explore Your Universe Activities (not grant-aided)

CSC delivered a Roadshow to Ely Cathedral during the May Half-term, comprised of ten mini-workshops. This was based on the Spectrum Science show which is suitable for a large space and a large audience.

Developing new relationships

CSC has developed a new relationship with the LincHigher[1] partnership, which operates alongside Bishop Grosseteste University in Lincoln and aims to increase the uptake in tertiary education in Lincolnshire. This is a new area for CSC which creates opportunities to visit other schools in the area pending suitable funding.

CSC has also developed a relationship with Lowestoft Rising and the Kirkley People's Forum. CSC has worked with them before, but this time the roadshow was at a new school (for CSC) with ten new Primary Schools engaged.

Contracted Explore Your Universe Deliverables

Original contracted deliverables

Contracted Deliverables Type of event or activity	Number of events/activities	Number of participants per event/activity	Total number of participants
Explore Your Universe Roadshow Assembly	10	120	1,200
Explore Your Universe Hands-on Activity	10	30	300
Overall TOTAL number of participants: 1,500			

Final delivery numbers

Final delivery numbers as of January 20th 2018

Contracted Deliverables Type of event or activity	Number of events/activities	Number of participants per event/activity	Total number of participants
Explore Your Universe Roadshow Assembly	13	37 (avg)	475
Explore Your Universe Hands-on Activity	22	24 (avg)	525
Community Outreach	7	139 (avg)	970
Overall TOTAL number of participants: 1,970			

Meeting your Explore Your Universe contracted deliverables

CSC originally intended to deliver to a greater number of students via assemblies. Whilst the average number of students per assembly appears lower than predicted, CSC delivered three more such

[1] https://linchigher.co.uk/

events than originally intended, and supplemented audience reach by delivering a successful community outreach programme.

In total, CSC delivered to 470 more participants than originally intended.

Marketing, press and social media engagement

CSC activities attracted coverage in 16 online articles, seven of which were reported content from the websites of local newspapers.

A selection of Tweets in support of CSC activities:

Explore Your Universe legacy

CSC will continue to offer the activities and show developed, both in the Centre and on outreach. CSC also used the equipment for another set of public activities based on light and colour, and are hoping to incorporate more of the equipment in a new electricity show. CSC have developed new

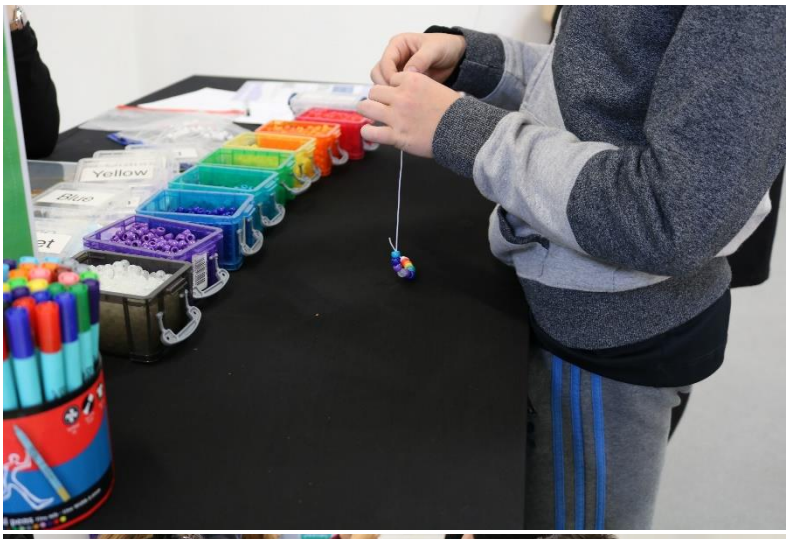
partnerships via this project, and anticipate some schools will continue to visit them in their new centre throughout 2018 and beyond.

Evaluation and Impact of Explore Your Universe programme

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
472				Nil	Nil	3 (PRU)

Quotes and pictures from schools, families and teachers

This selection of quotes and images may be used in future ASDC publications.



What did you like most? RAINBOW BRACELET MAKING.

What did you like most? MAKING BRACELETS

What did you like most? Kids enjoyed doing bracelets

What did you like most? Rainbow, bracelet

What did you like most? Rainbow Bracelet making and presentation

What did you like most? making a Rainbow bracelet

What did you like most? THE RAINBOW BRACELETS.

What did you like most? The Rainbow Activity + Everything.

What did you like most? Space Info, my little girl wants to be astronaut scientist!


Moon
Sun
rayn bow
Venus
bpiny
Mubon
brass
brit


making a rainbow bracelet
discovering gravity
My spinner going up the pipe
discovering how astronauts wee

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

The overall response to Explore Your Universe has been positive due to the many excellent delivery opportunities the project presented. CSC's team of Science Communicators liked the equipment very much and have developed some popular shows and activities as part of this project.

Some colleagues considered the feedback forms a little too long and somewhat time consuming for a smaller organisation to collect and enter.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

Colleagues at CSC are somewhat more aware of STFC's science and technology as a result of the Explore Your Universe project, with time constraints cited as the only reason that a greater familiarity has not yet been achieved.

How many staff members took part in Explore Your Universe phase 3?

A total of 18 core staff members took part in phase 3, consisting of 15 Science Communicators, two Product Developers, and the Research and Evaluation Manager.

Catalyst Science Discovery Centre

Report summary

Catalyst Science Discovery Centre is an interactive Science Centre with a particular focus on the chemical sciences. Their aim is to make science exciting and accessible to people of all ages and inform their audiences about science based industries and their role in our lives. Catalyst is located in the centre of a very deprived area: Halton is ranked 27th in the 2015 Index of Multiple Deprivation. Their aim was to use funding from Phase 3 of Explore Your Universe to give more local children the opportunity to visit the Centre and engage with the exciting science which makes up the EYU workshops.

They hosted a number of events for schools and local community groups which built on the success of, and gave legacy to, previous phases of the EYU project.

Their successful events include five career days for Secondary students, 12 bursary Primary school visits, two well received outreach visits and 21 participating community groups. Opportunities were seized wherever possible to maximise reach and increase audience participation in EYU activity, for example EYU opportunities were added to an annual celebratory day for Beaver groups across the North West, and ten members of staff were given training to effectively deliver the programmes. Targets at Catalyst Science Discovery Centre were exceeded.

Introduction

The Explore Your Universe Phase 3 programme vision was to 'increase the value for-money, sustainability and legacy of the Explore Your Universe Programme, further extending the reach into disadvantaged and underserved schools and communities to engage those who are remote from STEM (including geographically) whilst inspiring a sense of excitement around the physical science with young people and families, through sharing the amazing stories and technologies of STFC.'

Catalyst Science Discovery Centre delivered this vision by:

- Providing bursaries to disadvantaged primary schools in the locality – 12 in total,
- Delivering an EYU Outreach programme to two primary schools in the top 30% of the deprivation scale.
- Hosting five inspirational career days with support from 12 industry partners encouraging young people to consider a career in a STEM industry, plus transport bursaries available for six disadvantaged schools.
- Working with partner organisations including Liverpool John Moores University and STFC at Daresbury Laboratory who shared their exciting work on Big Data, a presentation closely related to the EYU programme.

The funding to Catalyst was well spent and over 3,000 participants engaged with the EYU resources or programme.

Programmes delivered

Bursary Schemes to enable schoolchildren from disadvantaged areas (remote from STEM) to take part in Explore Your Universe curriculum-linked workshops and to visit the science centre (not including travel bursaries)

Catalyst provided bursary schemes for twelve school groups. Three of these groups contacted Catalyst wanting to bring children from their settings. These schools were each identified as either being in the top 25% of the deprivation scale or having complex needs and would therefore have much to gain from EYU opportunities.

The first group were a KS1 class from a special school in Warrington. Pupils in the school have a variety of complex needs and have difficulty accessing science. They visited Catalyst in May and had the opportunity to try out the KS1 EYU show, which uses some of the demonstrations and equipment from the primary EYU show, but focuses on the story of what is in our solar system, exploring the planets moon and sun. The class made star constellation viewers and had a go at launching their own rockets. Feedback from the teacher and pupils, especially about the hands on demonstrations and rocket launching, was really positive. The teacher commented “The Universe workshop was adapted really well for our children.”

The second group Catalyst engaged with was also a special case. They were pupils educated in specialist provision having been excluded from one of the most deprived secondary schools in the area. The group included both KS3 and KS4 pupils who took part in an EYU show and hands on workshop in May. They were extremely positive. Their teacher commented “The students at Horizons do not get the opportunity to use resources that were available through the workshop. They engaged well and really enjoyed it. We do not have a budget for science resources as a behaviour unit; our students would not be able to access these resources at the Centre”.

Pupils commented:

- “The science was full of fun and I learnt a lot”
- “I learnt lots of cool science things”

The third group visited Catalyst in October and had the opportunity to participate in the Explore Your Universe KS2 show held in Catalysts theatre as an additional part of their visit. They were from a local Primary school within the top 25% of the deprivation scale. Activities undertaken in the theatre complimented their visit and gave these 30 disadvantaged year 4 pupils opportunities to further participate in scientific activity.

A further nine bursaries were provided to schools in the locality to give them free access to activities at Catalyst as part of a larger event. As previously mentioned, Catalyst Science Discovery Centre is located in the centre of a very deprived area. In November STFC’s Daresbury Lab, Liverpool John Moores University and Catalyst ran a full week of science events for some of the most deprived pupils in this area. These specific schools were identified in partnership with others including Halton Borough Council. This gave us confidence, knowing that the neediest pupils in the borough were going to be supported. These nine bursaries allowed pupils to visit Catalyst during their science week and participate in two shows- Destination Space and the KS2 EYU show. The funding allowed 396 disadvantaged KS2 pupils to participate in activities within the Science Centre. On the following dates the following school groups made their visit.

- 6th November – All Saints Upton CE Primary School – 30 participants
- 6th November – Widnes Academy West Bank – 28 participants
- 7th November – The Holy Spirit RC Primary School – 49 participants
- 7th November – Castle View Primary School – 49 participants
- 8th November – Bridgewater Park Primary School – 55 participants
- 8th November – Hallwood Park Primary School – 44 participants
- 9th November – Windmill Hill Primary School – 49 participants
- 10th November – Simms Cross Primary School – 40 participants
- 10th November – St Gerards RC Primary School - 52 participants

The feedback was fantastic:

- "I think it's really fun and I would love to do a job like this when I'm older."
- "I think that we are really fortunate to have people to answer our questions that we didn't think of."
- "Everyone got to take part and had an enjoyable time."

All twelve school bursaries were very well received and gave 440 disadvantaged children unique opportunities that they would not have otherwise received.

Travel Bursaries to enable schools from deprived areas, particularly rural areas across Northern Ireland, Scotland and Wales, to take part in an Explore Your Universe curriculum-linked workshop.

Catalyst provided travel bursary schemes for six groups of school children to take part in our Careers events. These schools were – St Chad's, Runcorn; The Grange, Runcorn; South Shore Academy, Blackpool; Litherland High School, Sefton; St John Fisher Catholic College, Newcastle Under Lyme; and Fairfield High, Tameside. All six of these schools met the criteria for our target groups. For more information on the activities they participated in see section 4.

An Outreach Programme for Explore Your Universe curriculum-linked workshops

Catalyst was set the target to meet 300 pupils on outreach visits. Outreach activity isn't something generally offered in the education programme at Catalyst so the opportunity to get out was very welcomed by staff. Two outreach visits were made: on the 24th November 2017 to Oakfield Community School and on the 8th January 2018 to Fairfield Primary school. Catalyst exceeded their target and met 338 pupils in total, 160 boys and 178 girls. Both schools are within the top 30% of the deprivations scale, and Oakfield Community School is in the top 20%.

Catalyst Science Discovery Centre does not have access to a van so used staff transportation. They ensured value for money at both venues by running two shows each school day. Shows were held in school halls to allow larger numbers to engage and staff made use of their centres' PA system so everyone could hear and enjoy the event. School children were introduced to the KS2 EYU show and the show duration ranged from 45 minutes to an hour depending on the hall timetable requirements. All pupils participated, answering questions and trying out the rainbow glasses, and longer shows allowed for more individuals to volunteer.

Inspiring Careers in Physics and Engineering

Catalyst has held two careers events during the course of this funding. The first took place in June and was 'Chemistry at Work Week'. The event was supported by funding from the RSC and therefore free for pupils and teachers. Four EYU transport-funding bursaries made it possible for schools to

attend. Each school that took part received a presentation, using the EYU resources, on the STFC telescopes. This event engaged 352 pupils aged between 11 and 15: 220 females and 132 males. Of these attendees, 121 of the pupils were supported by funding: 60 females and 61 males. Over the week, in addition to the EYU session, Catalyst had representatives from Inovyn, SSE, Cogent Skills, RSClare, United Utilities, Victrex Plc, Banner Chemicals, Croda, Novelis and BASF who all gave presentations with the aim of inspiring pupils to science careers. Catalyst was also supported by a representative from Daresbury Laboratory who delivered a session on Big Data on one of the days and an astronomer from Liverpool John Moores University; the input of these two presenters was particularly closely related to the EYU programme.

Comments from staff who brought their pupils to events included:

- "My students were interested in the range of careers that use science".
- Our favourite session was "the school's observatory, they talked about careers and it was interactive", my students were most interested in "the infra-red camera".
- "Pupils loved the EYU session; they said it was interesting and inspiring".
- The session "will increase motivation and enthusiasm and allow them to think about possible careers".

Their second careers event took place in September. Three schools (two of which fit the criteria for a bursary, being within the top 25% of deprivation) participated in a full day of activity. 100 students from Years 9 and 10 took part in an adapted EYU show, learning about career paths in Astrophysics before an introduction to the various telescopes and a demonstration of the Infra-red camera. They met industry partners representing Solvay and the Office for Nuclear Regulation. 37 male and 63 female students enjoyed the event. Funding helped 70 of these pupils: 47 females and 23 males.

Recruiting schools for the careers events was a challenge. Partly this was due to general difficulties which teachers face when they want to bring their pupils out of school e.g. cover for staff, permission for pupils to miss lessons or events in school. We have also found that a coach bursary of £100 isn't enough to cover coach transport, even for small groups coming from a very local school – this has meant that schools have had to contribute towards coach transport either from the pupils or from their school budget. One of the schools which attended (from Blackpool) had had to secure funding from four separate sources in order to allow them to bring the pupils without the need to seek parental contributions.

Audience specific engagement

A. Inspiring family audiences

Approximate number of family audiences engaged: 470

Family visitors to Catalyst have the opportunity to participate in a Science Show as part of their visit. During this project the science shows on offer over weekends, delivered by Weekend Presenters, were the EYU Family Show running in Spring and Summer 2017 and an adapted show called 'Light fantastic' running from October 2017 to January 2018. Families enjoyed the opportunities to participate and learn about cutting edge science in these shows.

B. Engaging communities and under-represented groups

Approximate number of community audiences engaged: 705

Catalyst Science Discovery Centre runs very successful sleepover events within their venue. Staff at Catalyst identified these as perfect opportunities to engage community groups with the EYU resources. Each group sleeping over were offered a morning workshop and science show. Over the course of this funded project, sleepover groups participated in either the EYU Show or an adapted 'Light Fantastic' show. The new version of light show incorporated many of the EYU resources including the Infra-red camera, the UV lamp, the white light and prism, the plasma ball and the gas spectrum tubes. The community groups sleeping over range from the Girls Brigade to the Beavers, and each community group have very little access or facilities to explore science topics themselves.

C. Gender reach

Catalyst work hard to ensure opportunities are available for all within their Centre, whether that be adapting for special needs, or amending for varying ages. All community groups, family members and school pupils are offered EYU interaction regardless of their gender, age or needs. Experienced presenters are able to adapt shows to ensure suitability for all.

Activity involving EYU presentation	Attendees	Estimated figures by gender	
		Male	Female
Outreach visits away from Catalyst	338	160	178
School visits without bursary to Catalyst (where gender recorded)	686	429	257
Careers events at Catalyst	452	169	283
School visits with bursary	440	223	217
Totals	1,916	981	935

D. Additional Explore Your Universe Activities (not grant-aided)

In addition to the events mentioned above, Catalyst Science Discovery Centre hosted a private event for the Beavers on the 8th October 2017. One hundred and eleven Beaver scouts and forty-three accompanying adults from varying groups across the North West attending a special day- They had four activities on offer- two scientific workshops, a gallery trail and an EYU adapted Light Fantastic Show. The feedback was very positive.

"Everyone had a brilliant time, the leaders were very impressed with the programme you had arranged, very well organised. Please thank your team for the brilliant experiences they gave to the Beavers which were thoroughly enjoyed. Thank you once again for your support, commitment in providing a brilliant day for our beavers." - Val Buckley- ADC Beavers Mid Cheshire

E. Developing new relationships

Catalyst Science Discovery Centre has been operational for thirty years and has built great relationships with many schools. Most of the schools Catalyst engaged with over the course of the EYU phase 3 project had previously visited Catalyst. This project strengthened these existing relationships, showcasing to schools the opportunities on offer and the up-to-date scientific knowledge of the team. This project also gave a new shape to some of these relationships by, for instance, introducing and funding outreach: something that is not part of the current education programme. This meant schools became aware of new opportunities at Catalyst, and Catalyst staff were able to experience the wider reach that outreach might offer.

New relationships were created with the New Horizons Centre for Alternative Provision as part of this project. Their first impressions were excellent: due to the quality of the programme funded by EYU, they have had the opportunity to see how programmes can be adapted for their needs. Catalyst hope they will become regular visitors.

Another new relationship was formed with the Head of Science at Ladybridge High School. The school had visited Catalyst many years ago but the Head of Science hadn't visited in her new role. Attending a careers event at Catalyst introduced the Ladybridge Science team to the range of opportunities available. With ever changing school staff, it is important to appreciate that maintaining relationships is as vital to Catalyst as developing new ones.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Visits by groups of Primary school children to Centre including an EYU primary show and an "I'm a Scientist" Workshop.	12	30	360
Careers event for Secondary schools	6	30	180
Outreach event for Primary school	2	150	300
Uniformed group/school sleepover events (not funded with money from this grant)	(30)	(25)	(750)
School visits including EYU workshops (not funded with money from this grant, based on equivalent period last year)	(43)	(25)	(1,075)
Overall TOTAL number of participants: 840 & (1,825) =2,665			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Visits by groups of Primary school children to Centre including an EYU Primary show and an "I'm a Scientist" Workshop.	12	varying	440
Careers event for Secondary schools	5	90 (average)	452
Outreach event for Primary school	2	160 & 178	338
Uniformed group/school sleepover events (not funded with money from this grant)	(21)	(average 33)	(705)
School visits including EYU workshops (not funded with money from this grant, based on equivalent period last year)	(23)	(average 49)	(1,142)
Overall TOTAL number of participants: 1,230 & (1,847) =3,077			

Of the sessions you ran, how many of these were with target schools / groups?

Target schools were identified as those in the top 25% of the indices of multiple deprivation or geographically remote from STEM and more than an hour's drive away from an EYU Centre.

Out of the 12 events for bursary supported Primary schools, 11 of those schools were within the target audience, and therefore out of the 440 pupils attending 433 pupils were within the target audience and the remaining seven had complex special educational needs.

Both outreach events were delivered in schools which are within the top 30% of the deprivation scale, but only one event was delivered at a school in the top 25%.

Out of the 23 Primary school visits not supported by a bursary, ten met the target audience criteria.

Out of the 15 Secondary schools bringing pupils to a Career Event at Catalyst, eight of those schools were within the top 25% of the deprivation scale, and therefore out of 452 pupils attending 223 pupils were within our target audience.

In other words, out of 52 events (where each school group to a careers event counts separately) 30 of the audiences to Catalyst Science Discovery Centre were from a target group.

Meeting your Explore Your Universe contracted deliverables

The team at Catalyst Science Discovery centre are very pleased with the success of this project.

Catalyst exceeded the majority of the targets set for them as part of this project, although they would have liked to attract a couple more uniformed groups. They expected numbers to be higher in this area, however external events had an impact. During the autumn the new Mersey Gateway Bridge opened up next to Catalyst Science Discovery Centre. Reservations were made by the

Borough Council for the facilities where groups sleep over a number of dates whilst the opening was planned. This hold on booking prevented Catalyst from having full availability.

Other challenges included a change of Education Manager during the project. Effective record keeping and an organised hand over procedure ensured a smooth transition and enabled the new Manager to step in and keep Catalyst on target.

Marketing, press and social media engagement

Explore Your Universe was marketed in a variety of ways at Catalyst. The family events in the summer holidays were advertised on printed posters and distributed to over 200 Tourist Information Centres, Holiday Accommodation Providers, Libraries and Leisure Centres. These public activities were promoted on Catalyst's social media, of which Facebook has over 2,200 followers. The events were further promoted on the Favourite Days Out in Cheshire media channels as Catalyst is part of this consortium. Favourite Days Out Facebook page has 11.5k likes, of which 83% are women, 75% of whom are aged between 25 and 54.

The Explore Your Universe schools workshop was advertised on the new Catalyst website launched in September 2017 and on the annual Education Programme, distributed by post to approximately 5,000 teachers in the North West.

In the Autumn term, Catalyst advertised the Explore Your Universe Outreach show to 51 local Primary schools via email. Catalyst also took part in a project in conjunction with Daresbury Labs an STFC funded organisation and delivered Explore Your Universe Shows to local Primary schools. This project was promoted jointly by Catalyst and STFC. STFC regularly tweeted throughout Space Week and @STFC_Matters has 15,900 followers.

Details about the Explore Your Universe project were included in the Catalyst Annual Newsletter which was distributed widely to Trustees, Patrons, Friends, Sponsors and Schools.

Explore Your Universe legacy

Catalyst will continue to offer EYU opportunities as part of their regular education programme for the foreseeable future. The family show will be delivered a couple of months per year, and will sit within their changing science show offer.

Arrangements have already been made for a Trustee to work with the Education Team alongside a number of Secondary school teachers to identify further opportunities to use the valuable set of EYU resources.

Our Light Fantastic Science Show has been amended to take advantage of the resources available, such as the addition of the infra-red camera and UV light, these changes have greatly enhanced the show and will remain.

Catalyst Science Discovery Centre welcomed the opportunity to run outreach sessions and as a result of this project may look to deliver further outreach activities within schools in the future.

Your best case study

The staff at Catalyst Science Discovery Centre tackled the challenge of finding Primary school audiences creatively. Their aim was to entice twelve Primary classes into the museum to participate in EYU activity. These schools were to be within the top 25% of the deprivation scale. Money was to be awarded covering the costs of workshops but schools had to burden the cost of transportation.

Clare Hampson, Education Manager at Catalyst, and Phil Day, Public Engagement Manager at Daresbury Laboratory (STFC) worked together to create something big, bringing STFC science, including the science from the EYU programme, to schools across Halton. This produced a full week of inspirational science activities for some of the most deprived pupils in the area. Schools taking part were to be selected by a panel including representatives from Halton Borough Council. The aim of the collaboration was to create memorable learning experience for the children, bringing STFC science alive, and maximising the impact.

As part of National Space week's programme there were 129 separate activities, included in those were nine EYU shows and nine Destination Space shows at Catalyst, plus activity from a team at Liverpool John Moores University and STFC Daresbury Laboratory. There was an estimated engagement time of 96 hours.

"This project was all about reaching schools that drew children from the most deprived communities in the borough. We wanted to deliver something that would live long in the memory, encourage children to talk to family and others about space and science, and increase confidence and aspirations in STEM. We hoped that by engaging 'en masse' and intensively with schools in Halton over a week that this might fuel conversations between families across the borough about the week and potentially about science too. Maybe from these conversations some families might become mobilised to seek out other STEM opportunities for their children." Phil Day.

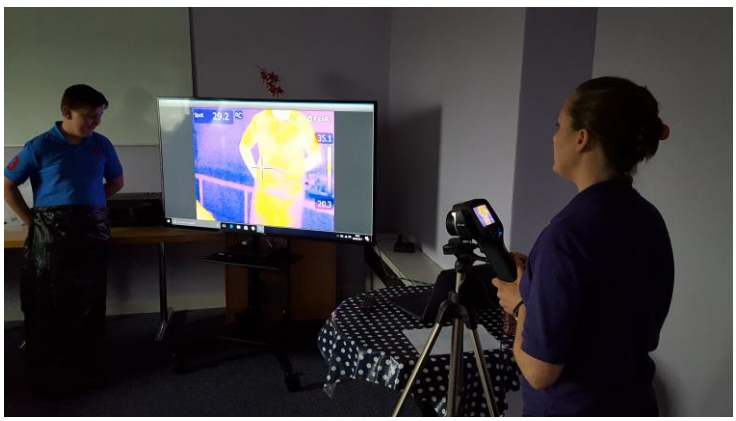
The partnership gave a much bigger weight to the shows at Catalyst. These were part of a larger event and this encouraged sign up from the local schools. A week full of activity gave momentum to the events and the impact was tremendous. This new collaboration was very worthwhile and extremely valuable to Catalyst. Project partners have already started discussions and have ambitions to run something similar next year.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
120	0	90	0	0	0	0

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
210		90				

Quotes from families, teachers and schoolchildren



Quotes have been noted throughout this evaluation report.

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

“I enjoyed delivering the EYU programme at Catalyst Science Discovery Centre. It was great to share with audiences some of the major science projects that are currently being undertaken like the imminent launch of the James Webb Space Telescope, and convey in such informative and simple terms the technological advancements that have, and are being made. The show and the research I have done to prepare for the show, have improved my own understanding in this area of science.” - Lucinda Lewis -Education Manager.

“Giving pupils the opportunity to visit their local Science Discovery Centre to undertake the high quality activities that I know exist with Explore your Universe and Destination Space added a great deal of value to the Space Week. Not only did the workshops provide pupils with a greater depth understanding of space and how UK scientists and engineers are working at the cutting edge to understand more about this inspiring environment; pupils are now more aware of Catalyst as a fantastic venue where they and their family can go to discover more about STEM linked subjects. Their future visits to Catalyst will continue to improve their own science capital and open their eyes to new STEM opportunities in the future.” - Phill Day- Partner in delivering Space Week.

"Explore Your Universe is by far one of the most fun and well received sessions we deliver at Catalyst. It was also one of the first shows I did, and the clear structure, relevant information and "wow" factor made it a joy to deliver. EYU has been one of the key components to my advances in confidence and technique since I have started presenting. There are two main ways I'm aware of that explore your universe is implemented into our programme. Firstly, we deliver an approximately 45 minute EYU show, where we touch upon the Hubble and James Webb space telescope, infrared technology, the VLT, ELT and OWL and atoms and charge, utilising a Van de Graaff generator. Secondly, we utilise the materials as supplements in other sessions, such as a section on smart materials in a plastics workshop, or incorporating the Infrared camera in a light show. I feel confident

to deliver all of the STFC messages and feel like there has been sufficient information and training to do so. It has been a pleasure utilising the STFC's material, and I hope to continue to improve my delivery of it and continue spreading STFC's themes and research." - Patrick Hamilton -Weekend Presenter.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

'Participation in the Explore Your Universe Project has developed my understanding of STFC's science and technology, and has given me an enthusiasm to share some of their other stories. Staff at Catalyst are meeting with Phil Day the Public Engagement Manager at Daresbury Laboratory (STFC) to discuss future collaborations and new ways to share some of their scientific research.'
Lucinda Lewis Education Manager

How many staff members took part in Explore Your Universe phase 3?

Ten members of staff took part in EYU phase 3, two Education Managers, two Education Assistants, and six Weekend Presenters.


EXPLORE
YOUR UNIVERSE
ATOMS TO ASTROPHYSICS

Photographs have permission to use.

STFC Outcomes

Please tell us how the activities and workshops delivered by your Centre have helped to:

- **Inspire people to do something new**

  I would tell my friends and family about these activities because “I feel inspired and they would too.” Girl, Year 4.

  “I could come with my Mum” Boy, Year 6.

  I enjoyed the most “Trying different things that I haven’t done before.” Boy, Year 6

- **Change the way people feel**

  I didn’t know about this research before today. “I thought it was really fun.” Girl Year 4/5

  “I could be a scientist.” Girl, Year 6.

  The thing I liked the most was “That I could see what happens.” Boy, Year 5.

- **Change the way people value science and technology**

  I didn’t know about this research before today. “It is worth learning about.” Girl Year 6.

  I think this research is “Inspiring”. Boy, Year 6.

  I didn’t know about this research before today. “I think it is very important.” Girl, Year 4.

- **Develop or change the skills of participants**

  “I took a lot of knowledge from today.” Girl, Year 6.

- **Change people’s understanding of STFC science, technology and research**

  What do you think of this research? “That is commitment.” Girl, Year 6

  “I think this research is really good.” Boy, Year 6.

Glasgow Science Centre

Report summary

Glasgow Science Centre (GSC) launched "Explore Your Universe" phase 3 in September 2017. We hosted three days of Meet the Expert activity and free entry for school pupils from the most deprived 20% SIMD (Scottish Index of Multiple Deprivation) areas. Over the three days we hosted 7 experts from academia and industry who engaged with 620 pupils from the top 20% on the SIMD.

Introduction

Glasgow Science Centre took part in Phase 1 of Explore Your Universe, having delivered schools workshops such as **Invisible Science** for Primary 5 to Primary 7 pupils and an **Astrophysics Masterclass** for S5 to S6. This also provided us with new knowledge and equipment to run exciting and inspiring activities which became a fixed part of our program.

Phase 3 of Explore Your Universe was delivered in-house by Glasgow Science Centre from 11th to the 13th September 2017 as an inspiring careers event for education audiences. Glasgow Science Centre proposed that we would engage with at least 750 P6 – S1 school pupils through exciting interactions with researchers from local universities and industry.

By offering this event free of charge to schools which fall into the top 20% SIMD we hope to provide opportunities for pupils who may otherwise be unable to visit and also to strengthen relationships with local authorities outside of greater Glasgow.

Programmes delivered

Inspiring Careers in Physics and Engineering

To inspire education audience in the science and stories in the world of Physics and Engineering, GSC delivered exciting and engaging activities in collaboration with local researchers.

The events were advertised through working with local authorities and school contacts to ensure that the event reached the target audiences.

This engagement was split into four strands:

- The opportunity to interact with experts from industry and academia who showcased the outstanding research and innovation they are involved in.
- Engaging with our science communicators who delivered a number of different Science on the Spot activities as per the February 2017 Training Academy. These activities were:
    - The Van De Graaff generator
    - Plasma Balls
    - GSC's MagLev track and its uses in future engineering endeavours
    - Samples of meteorites which we acquired through the Royal Observatory in Edinburgh as part of the STFC Down2Earth loan scheme

- All attendees viewed the **Solar System & Beyond** live presenter show in GSC's full-dome digital planetarium.
- Participating in a drop-in workshop **Engineering with Electronics** which was delivered by the My World of Work! Live team, a STEM careers project who are based within Glasgow Science Centre.

A number of experts from local institutions and organisations that GSC works closely with attended over the course of the three days.

ReallySmallScience is an interdisciplinary research group from Chemical and Process Engineering at the University of Strathclyde. Their aim is to promote scientific research through accessible and fun hands-on activities, ultimately hoping to inspire future generations of scientists and engineers. As part of their time at Explore Your Universe, this team delivered an activity on making your own bouncy balls. This was used as part of a discussion to look at materials science and discuss the research going on at Strathclyde University.

Nicola Jordan of the ***Royal Society for Chemistry*** joined us to deliver an activity which looked at how materials science is playing an important part in the creation of new and novel materials.

QuantIC is the UK Quantum Technology Hub in Quantum Enhanced Imaging, based at the University of Glasgow. Glasgow Science Centre partnered with QuantIC to design and install a new exhibition called **Making the Invisible Visible** in April 2016. This partnership now continues in the form of opportunities to be involved in our Meet the Expert program. Two different researchers took part in Explore Your Universe.

Dr Vincenzo Pusino demonstrated an IndiPix camera prototype to show how we can observe CO_2 by looking at medium wave-infrared light. Dr Matt Edgar demonstrated the use of a single pixel camera which can be used to observe gas leaks. Both researchers used their activities to discuss real life applications, such as using these cameras for inspection of insulation systems, power stations and the like.

Martyn Wells of the UK Astronomy Technology Centre took part to explain the Mid-Infrared Instrument (MIR), a device which is now part of the James Webb Space Telescope. This particular instrument was built in Edinburgh, and so Martyn was able to inspire participants about the ground-breaking, out-of-this world research taking place locally.

Dr Carol Trager-Cowan of the University of Strathclyde ran an activity which allowed the participants to construct their own spectroscope and investigate the hidden rainbows all around them.

Dr Marco Piani of the University of Strathclyde ran an activity called Ask a Quantum Mechanic. This is an activity that we have had join us here at GSC a number of times, and allows participants to discuss a number of different topics in the field of quantum mechanics. Using simple items, such as balloons (to explain the uncertainty principle) and playing cards (entanglement of quantum particles) this activity aims to make individuals comfortable with approaching the subject.

Our Science on the Spot activities were delivered in a fixed place within our Science Mall across the three days. Our Science Communicators interacted with the audience on a drop in basis, with staff encouraging participants to visit this station at some point throughout their visit.

Audience specific engagement

A. Engaging communities and under-represented groups

As part of this project, Glasgow Science Centre had hoped to engage with schools in areas that can be challenging to reach. We had proposed that we would engage with schools in North Ayrshire, Renfrewshire, North Lanarkshire, West Dunbartonshire and Glasgow.

After opening this project up to local authorities and schools in each of these areas, we were successful in obtaining bookings from schools in North Ayrshire, Renfrewshire and Glasgow.

All of the schools we booked to take part in Explore Your Universe were from the top 20% of the Scottish Index of Multiple Deprivation.

B. Gender reach

From the evaluation carried out as part of this project we have estimated that 47% of pupils who visited identify as female, and 53% identify as male.

C. Developing new relationships

As part of the organisation for our Explore Your Universe, GSC engaged with a number of institutions including the University of Glasgow, University of Strathclyde and the Royal Society for Chemistry. This project allowed us to further these existing partnerships, in particular with the QuantIC team at University of Glasgow. We worked closely with Peter Chua who is the Public Engagement and Communications Officer for Quantic who was very excited to be involved in our Explore Your Universe events.

In addition, we worked with Olivia Johnson of STFC who circulated our event to contacts at the Royal Observatory of Edinburgh and the UK Astronomy Technology Centre, leading to what we hope will be an ongoing partnership.

However, we did note that the timing of our event was not ideal for working with some academic contacts. We contacted Erling Reis and Martin Hendry who are the heads of the physics departments at University of Glasgow and University of Strathclyde respectively. Professor Hendry was very interested in being involved in such an event, however due to the September timing many of the researchers in his team were at a conference at CERN in late August. This meant that many were unable to find the time to be prepared for a public engagement event in early September.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Meet the Expert Showcase Event	3	250	750
Overall TOTAL number of participants: 750			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Meet the Expert Showcase Event (11th September)	1	168	168
Meet the Expert Showcase Event (12th September)	1	255	255
Meet the Expert Showcase Event (13th September)	1	197	197
Additional Education Visitors (not specifically booked for EYU)	1	74	74
Overall TOTAL number of participants: 694			

In addition to the schools who specifically booked for the Explore Your Universe event we had an additional 74 education visitors who were in the building across these three days. Whilst not necessarily coming from the top 20% of the Scottish Index of Multiple Deprivation, these pupils will have engaged with the Explore Your Universe activities.

Across these three days we also had 697 members of the public visit GSC who will likely have engaged with the activities. Although not the target audience, this does mean that we will have had additional engagement especially for our experts.

Of the sessions you ran, how many of these were with target schools / groups?

All of the sessions that we ran were with the target schools of the top 20% of the Scottish Index of Multiple Deprivation.

Meeting your Explore Your Universe contracted deliverables

We are short in the number of pupils who attended our Explore Your Universe events, however there was a point in the run up to the event in which we were fully booked. We have therefore reported the number of pupils who attended rather than those who booked.

As we got closer to the events themselves, schools either cancelled or reduced their numbers. This is a common occurrence for free events and is likely linked into the cost of travel for schools to reach us. Whilst we assisted schools with their travels as part of the Scottish Government Transport grants we can supply, this doesn't necessarily fully reduce the pressure on schools to meet costs. In these situations, we tend to find that the numbers of pupils a school bring will reduce to keep their costs as low as possible.

Marketing, press and social media engagement

Our strategy for filling this event was to directly contact schools and local authorities to identify the schools within the top 20% of the SIMD index. We therefore decided not to include any marketing in literature sent out to schools in advance, which we felt would have confused the matter.

On the days of the events, GSC as a company had social media blackout we had planned as part of our new brand launch on Thursday 14th September. Throughout this we didn't have any social media presence in order to increase anticipation for our brand launch.

However, after this event passed and we had opportunity to add to our social media activity, GSC posted to Twitter and Facebook to share information about our Explore Your Universe activities.

These are key channels for us with over 34k page likes on Facebook and 14.9k on Twitter ensuring wide dissemination of our posts and tweets respectively.

We also had posts from All Saints Secondary School on Twitter who shared their excitement and enthusiasm for their chance to visit us. This was followed up by a Twitter post from ReallySmallScience who had a fantastic time throughout the event creating polymer bouncy balls.

Explore Your Universe legacy

As with previous phases of Explore Your Universe, Glasgow Science Centre will use the equipment and expertise gained from Explore Your Universe to supplement our On Gallery engagements as part of our Science on the Spot programme. These are fantastic additions which our visitors have shown great interest in.

We will also use the development of the relationships we have with local institutions to further develop Glasgow Science Centre's Meet the Expert program, both for our own events and for any potential projects that we run in the future.

Your best case study

GSC's relationship with QuantIC, the UK Quantum Technology Hub in Quantum Enhanced Imaging has been further enhanced by their inclusion in this project.

GSC aims to remain relevant and up-to-date by showcasing the latest developments in science and technology across a range of areas such as energy, the space industry, manufacturing and AI. Our exhibition **Making the Invisible Visible** is the first stage of our new programme *Idea #59* which we are currently developing. The success of the exhibition in achieving QuantIC's overall ambition has helped develop a dynamic and positive relationship between Glasgow Science Centre and the team at QuantIC.

QuantIC have been particularly positive about the overall experience of working with GSC's Experience Design Service team:

- "Their input and insight has been invaluable in making QuantIC's research come alive with the public."

Visitor feedback has also been encouraging and dwell time at the exhibition is generally quite long, indicating that the topics being showcased are of interest to visitors, and that the interactive nature of the exhibits is attractive and stimulating to them.

The focus of the *Idea #59* exhibition and the associated programming will be to showcase emerging technologies and to inspire the next generation of engineers, scientists and innovators to get involved.

It is therefore hugely important that we continue to develop our partnerships with the researchers and industry professionals involved – and programmes like Explore Your Universe have helped us to do this.

Peter Chua and the team from QuantIC who were involved in Explore Your Universe found the experience to be useful, with Peter stating that "It was a good learning experience and I think Matt, Vincenzo and Chengzhi found it insightful and engaging, with kids younger than they were used to!"

By providing high-tech equipment and expert interaction, the QuantIC team were able to add a valuable aspect to the event which ensured a 5-star experience for our visiting schools.

Evaluation and Impact of Explore Your Universe programme

We have achieved the contracted number of evaluation surveys which we hoped to gather for schoolchildren and teachers. We met with teachers and pupils in our lunch area, at this point asking them to fill in the feedback form for direct collection at the time.

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
					210	

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
				23	220	

Quotes from families, teachers and schoolchildren

The ReallySmallScience team show pupils how to create their own bouncy balls.

Dr Matt Edgar discusses the cutting edge research taking place with QuantIC

An electrifying experience as pupils get hands on with the Van De Graaff generator led by GSC's very own Zayneb!

Pupils learn about diffraction and how to construct your own spectroscope glasses with Dr Carol Trager Cowan

Astronomer Kerry gets ready to lead a tour of the night sky with pupils in GSC's full dome digital planetarium.

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

Initially, Sam Langford (Science Learning Coordinator) and David Cain (Senior Science Communicator) attended the training academy in February 2017. The updates to activities and newly acquired knowledge was then shared with our Science Communicators and has now become standard as part of our Science on the Spot program.

Our delivery staff thoroughly enjoyed the Explore Your Universe activities and would be interested in a continuation of this program.

This program allowed us to reach school pupils who might otherwise struggle to access GSC, and so we have found this to be extremely valuable. In addition, the organisation of the program, from the training academy in Edinburgh to the circulation of all relevant documentation and information has been extremely efficient.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

The Explore Your Universe programme has allowed GSC staff to improve their understanding of the work done by STFC. The trip to the Royal Observatory in Edinburgh was extremely valuable in helping to learn more about the high quality innovation and research taking place so locally to Glasgow.

In addition to this, hearing from colleagues from other Centres, in particular from Sophie Allan of the National Space Centre, was hugely beneficial and allowed us to see and hear new and interesting ways to deliver the program's activities.

We continue to keep up to date with STFC science and circulate this around the table if we discover anything which is of particular interest to the team.

How many staff members took part in Explore Your Universe phase 3?

At GSC, two members of staff attended the training academy in Edinburgh, and in addition to this four other staff were involved in the delivery of Science on the Spot and Planetarium activities for the events on 11th – 13th September.

In addition, the core science communication team at GSC have been updated on new knowledge and ways of delivering activities which are now embedded in the Science on the Spot programme at GSC. This means we now have a core team of 12 full time science communicators and four senior science communicators who deliver these activities.

STFC Outcomes

Please tell us how the activities and workshops delivered by your Centre have helped to:

- Inspire people to do something new
- Change the way people feel
- Change the way people value science and technology
- Develop or change the skills of participants
- Change people's understanding of STFC science, technology and research

Explore Your Universe presented physics and engineering in a way that was much more hands-on than generally would be the case in the classroom. The activities were presented in a fun and engaging way to inspire pupils and make them feel comfortable in exploring the topic.

A strong element of practical work was built into the programme. This was designed to engage pupils; help them develop important skills, such as communication and problem solving; and enable them to understand the process of scientific investigation.

Our communication with participating schools and pupils has indicated that both teachers and pupils felt that they got something from the activities. For teachers, it provided an opportunity to see complex subjects taught in an interactive way with equipment and expertise that would not have been available to them at school.

For pupils, it was an opportunity for them to experience science beyond a classroom setting. In particular, the feedback we have received from them has indicated that they now view topics such as astrophysics and space differently. Many pupils told us that prior to the workshops they did not understand or appreciate the importance of these subjects, however listening to experts in the field has made them realise the number of different ways they impact upon their everyday lives. Additionally, hearing about the career paths of the various experts made them more aware of the number of exciting opportunities available

Jodrell Bank Discovery Centre

Report summary

Explore Your Universe phase 3 has been very successfully run at the Jodrell Bank Discovery Centre. Prior to this project, elements of the EYU programme were delivered at the Centre, being integrated into various schools' workshops and public shows/activities, however not routinely offered to schools in its entirety. This remains an important legacy for the project for the Centre. As a result of a fresh round of development during phase 3, the EYU workshop was now forms the cornerstone of the Centre's Widening Participation activities. Secondary Schools that are eligible for the University of Manchester's Widening Participation (WP) programme (that is, schools with a high percentage of disadvantaged students) are able to claim a day of free outreach from the Discovery Centre, or a bursary towards a visit to the Centre. All students engaging with the Centre through the WP programme experience the Centre's EYU workshop. The EYU workshop is effective at communicating the benefits of science careers, as well as exciting and inspiring students about science research and increasing aspirations; all of which are closely aligned with the goals of WP. As a result, the EYU workshop is perfectly suited as the Centre's flagship WP engagement. Feedback from students experiencing the workshop, and the presenters who deliver it, has been highly positive. As a result, the EYU workshop is expected to continue as the Centre's Primary WP engagement for the foreseeable future, providing an ongoing legacy for the project.

Introduction

The Jodrell Bank Discovery Centre is part of the University of Manchester. The University runs a Widening Participation programme, which engages pupils from schools that have a high proportion of disadvantaged children. The aim of this programme is to raise aspirations, and increase university applications from students from disadvantaged backgrounds. The Jodrell Bank Discovery Centre contributes to the delivery of the University's WP programme in the area of physical sciences, by delivering free outreach, and providing discounted visits to the Centre, for eligible secondary schools.

The values of the Widening Participation (WP) programme align closely with the goals of the EYU phase 3 project, in particular, "extending the reach into disadvantaged and underserved schools and communities to engage those who are remote from STEM". In the Centre's application for EYU phase 3, therefore, the decision was made to combine these initiatives, and to target the delivery of EYU to the Centre's WP audience. This has proved extremely successful, not least in providing a pre-existing list of target disadvantaged schools, along with a contact list of teachers who have engaged with the Centre's WP activities previously.

Prior to the Centre's involvement in EYU phase 3, EYU equipment and activities had been integrated into various schools' workshops, as well as public shows and activities. This was the legacy of phases 1 and 2. For school groups engaging through the WP programme; a number of different workshops were on offer to them, many of which contained EYU elements.

For EYU phase 3, it was decided that a new and dedicated EYU workshop would be developed, and that this workshop would be delivered to *all* students engaging through the WP programme. This approach was chosen because of the effectiveness of EYU in inspiring excitement about the study of physical sciences as well as raising aspirations and interest in careers in those areas, a close match with the aims of the WP programme.

Feedback regarding the EYU workshop has been very positive. Student evaluation has been good (please see submitted EYU feedback) and members of Discovery Centre staff delivering the sessions have found them to be effective and enjoyable to deliver.

Participation in EYU phase 3 has allowed the Discovery Centre to extend its WP delivery to a wider audience. In the academic year 2016-17, 2,170 students were engaged with a WP engagement from the Discovery Centre. This is a significant increase from 1,411 in the previous academic year (2015-16), much of which can be attributed to delivery of EYU (delivery began in Feb 2017). Data concerning delivery during the current academic year indicates that this effect is likely to continue, with 986 WP students engaged with EYU so far (September to December 2017), compared with 257 who engaged with the programme over this period during the previous year.

The EYU workshop has been so successful as the flagship WP engagement, the Centre will continue to deliver it beyond the lifetime of the phase 3 project, thereby increasing the legacy and sustainability of the EYU programme at the Centre.

Programmes delivered

Bursary Schemes to enable schoolchildren from disadvantaged areas (remote from STEM) to take part in Explore Your Universe curriculum-linked workshops and to visit the science centre (not including travel bursaries)

The Jodrell Bank Discovery Centre offers a limited number of discounted trips per year for visiting secondary schools that are eligible for the University of Manchester's Widening Participation programme. These are schools that have a higher proportion of disadvantaged children (as measured by eligibility for free school meals).

The funding received from EYU phase 3 allowed the Centre to invest in a renewed EYU workshop, which was delivered to all Widening Participation groups, as well as extending the usual discounted offer by making a larger number of discounted trips available for disadvantaged schools.

Through the EYU bursary an additional 600 half price trips to the Centre were made available (£4 per student instead of £8), however take up of this offer was lower than anticipated, with more schools opting for a free day of outreach instead (see 'Section 3. An Outreach Programme', below). This is likely to be due to the additional barriers faced by secondary schools when organising trips, e.g. organising transport and lesson cover.

Four schools took advantage of the half price visit offer, bringing a total of 113 students. These schools would not have been able to claim a discounted visit without the funding provided by EYU phase 3. Details of these schools can be found in the following table:

Visit date	School	Town/city	Post code	Number of students (half price)
14th July 2017	St George's school	Blackpool	FY4 4PH	30
14th July 2017	Liverpool Life Sciences UTC	Liverpool	L1 0BS	11
17th July 2017	Hillside	Bootle	L20 9NU	16
17th July 2017	Handsworth Grange	Sheffield	S13 9HJ	56

However, since the EYU workshop was delivered to all students visiting the Centre from a WP eligible school, the total number of students experiencing the EYU workshop as part of a visit was 632 (please see submitted metrics data for the full list). All of these students received a free or discounted visit.

An Outreach Programme for Explore Your Universe curriculum-linked workshops

The Jodrell Bank Discovery Centre offers free outreach visits to disadvantaged Secondary schools that are eligible for the University of Manchester's Widening Participation programme. These are schools that have a higher proportion of disadvantaged children (as measured by eligibility for free school meals).

The money received from EYU phase 3 allowed the Centre to invest in a renewed EYU workshop, which was delivered to all students engaged in outreach sessions. The EYU workshop became the sole workshop delivered during outreach sessions, replacing several workshop options. Aligning the delivery of EYU with the Centre's outreach programme increased the value for money of the project, as it was possible to take advantage of pre-existing outreach infrastructure and contacts. By attaching the EYU workshop to the WP programme, this also allowed the strategic delivery of EYU into targeted disadvantaged schools.

The EYU phase 3 funding allowed the Centre to extend the reach of its outreach programme, and deliver more outreach sessions than in the previous academic year. Take-up of outreach visits was much greater than that of bursary-supported visits to the Centre. This is likely because of the additional barriers faced by secondary schools when organising trips, e.g. organising transport, and lesson cover.

During the delivery period of the project 1,532 secondary school students experienced an EYU workshop at their school. Workshops lasted one school lesson; typically, between 45 and 60 minutes.

Audience specific engagement

Your programme of activities will have led to engagements with many types of audiences. Please tell us how you successfully engaged with each of the following (A-E):

A. Inspiring family audiences

Approximate number of family audiences engaged: 0

B. Engaging communities and under-represented groups

Approximate number of community audiences engaged: 1,040

All schools engaged in this project were classed as disadvantaged by having a high proportion of students eligible for free school meals. Government data lists the percentage of students eligible for free school meals for each school. Therefore, using this data, it has been possible to calculate the above estimate that around 1,040 students engaged during this project are from a disadvantaged background (i.e. eligible for free school meals). This calculation assumes that the groups engaged are representative of their school overall.

C. Gender reach

	Estimated number	Estimated percentage
Girls	1289	59.6%
Boys	875	40.4%

During the project all engaged schools were mixed, with the exception of Whalley Range (a girls' school). The above estimates assume a 50:50 gender split for all mixed schools engaged during the project.

D. Developing new relationships

As a result of this project, some schools experienced their first engagement with Jodrell Bank Discovery Centre; either a trip to the Centre, or receiving an outreach visit. Examples include Maghull High School, Wigan UTC, Gateacre School, St Anne's Heaton Chapel and Harrop Fold school. It is hoped that these schools will continue to book engagements with us in the future.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)			
Type of event or activity	**Number of events/activities**	**Number of participants per event/activities**	**Total number of participants**
EYU KS3 and KS4 workshops, delivered at JBDC	20	30	600
EYU KS3 and KS4 workshops, delivered as outreach	20	30	600
Overall TOTAL number of participants			**1,200**

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Type of event or activity	**Number of events/activities**	**Number of participants per event/activities**	**Total number of participants**
EYU KS3 and KS4 workshops, delivered at JBDC	25	25 (average)	632
EYU KS3 and KS4 workshops, delivered as outreach	65	24 (average)	1,532
Overall TOTAL number of participants			**2,164**

Of the sessions you ran, how many of these were with target schools / groups?

100%

Meeting your Explore Your Universe contracted deliverables

Aligning the delivery of EYU phase 3 with the Centre's existing Widening Participation activities was extremely successful. This allowed the Centre to easily target disadvantaged schools, as well as take advantage of existing contacts and relationships. Feedback from teachers and students regarding the EYU workshop has been very positive; it is well suited to meet the needs of the WP programme as well as the EYU project. As such, the EYU workshop will continue to form the core of the Centre's WP offer.

Marketing, press and social media engagement

Members of staff were encouraged to tweet their involvement in EYU activities, where possible. This is made more difficult for activities at the Centre, as Jodrell Bank Discovery Centre is in a radio quiet zone where mobile devices cannot be used. Below is a tweet from Jamie Sloan (Education Manager) on an outreach visit to Gateacre School. The tweet was viewed 716 times.

Explore Your Universe legacy

The updated EYU workshop developed for EYU phase 3 has received excellent feedback from both students and teachers. It inspires students about STEM research and careers, and encourages them to continue to study STEM subjects beyond school. As such, it addresses the aims of the Jodrell Bank Discovery Centre Widening Participation programme excellently. This programme aims to increase uptake of university applications by students from disadvantaged backgrounds. The Centre will continue to deliver EYU as its flagship WP activity.

Your best case study

The Jodrell Bank Discovery Centre's updated Explore Your Universe workshop is excellent at educating Secondary school students about the STFC funded astronomy research conducted at the Jodrell Bank Observatory, along with other global institutions such as CERN. The workshop excites and inspires students about STEM careers, as well as encouraging uptake of STEM in higher education.

Whalley Range High School was very active in this project, with more students engaged than any other school. 188 of their (all female) students experienced the EYU workshop as part of an outreach visit, and a further 226 experienced it as part of a visit to the Jodrell Bank Discovery Centre. Feedback from the students was very positive, and teachers praised the workshop for giving

students the opportunity to use high quality equipment, to which they would not usually have access.

The workshop introduces the Lovell telescope, the third-largest fully-steerable telescope in the world. Through diffraction grating glasses, an infrared camera demonstration, and a plasma ball wirelessly lighting a bulb, students are introduced to the concept of the electromagnetic spectrum; the existence of radio waves, and the fact that the Lovell telescope detects these rather than visible light. Students then complete a series of team-building challenges using the laser ray boxes and lens/mirror kits, which simulate a telescope collecting EM radiation. Students then discuss and feedback what skills they used to complete the task. Answers provided often include, team-work, creative thinking, problem solving, etc. The presenter emphasises that the scientists working at Jodrell Bank use these skills every day, and if students choose to study STEM subjects, and follow a career in STEM, they will be developing these skills. In the latter part of the workshop, students learn that the work at Jodrell Bank is just part of the STFC research funded happening around the globe. CERN is used as the second example, and the workshop concludes with a demonstration of the Van de Graaff generator and salad bowl particle accelerator.

Although not part of the official EYU evaluation, the Centre's own evaluation found that 78% of the students that experienced the outreach visit enjoyed the workshop. In addition, 83% of the same group stated they were "more likely to consider going to university". One of the teachers commented, "Engaging practical; simple but relevant."

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
0	30	0	180	0	0	0

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
0	92	0	182	0	0	0

Quotes from families, teachers and schoolchildren

All feedback quotes have been included in submitted evaluation data.

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

EYU has been proved a worthwhile project to participate in. The delivery timeframe and targets have been reasonable and practical to achieve. The EYU workshop has re-focussed the Centre's WP offer and workshop presenters have enjoyed delivering it.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

Yes. In particular, the EYU trip to CERN was an invaluable insight into the work of STFC, which filtered down to the rest of the team.

How many staff members took part in Explore Your Universe phase 3?

All members of the Discovery Centre Engagement Team (seven in total) have delivered the workshop at various times.

STFC Outcomes

Please tell us how the activities and workshops delivered by your centre have helped to:

- Inspire people to do something new
- Change the way people feel
- Change the way people value science and technology
- Develop or change the skills of participants
- Change people's understanding of STFC science, technology and research

Feedback has consistently demonstrated that students enjoy the EYU workshop, and that it is effective in inspiring them about STEM subjects. It delivers experiences and gives students access to equipment that schools are generally not able to provide on their own. During the workshop students work in teams to complete a series of challenges, and then reflect upon what skills they used. Finally, students are shown examples of scientists, and how they use these skills in their work. The workshop addresses misconceptions about STEM study and careers.

National Space Centre

Report summary

The National Space Centre trialled two new interventions in this phase of Explore Your Universe: partnering with Teachfirst to deliver teacher training sessions, and delivering workshops at Her Majesty's Prison Leicester, an audience that certainly can be described as on the whole "disengaged" with science. The two programmes were delivered with mixed success. The feedback from both participants and co-organisers for each programme was excellent, with the feeling that running the sessions was very worthwhile and inspirational, but both programmes failed to reach the target numbers set out in the application for this phase of the project. An attempt to increase teacher numbers with an additional twilight event was not successful as only two teachers attended, despite the session being free, easy to attend, and giving away a take home kit to use for classroom ready activities. This is indicative of a wider trend in falling attendance numbers at teacher training programmes, with teachers finding it increasingly difficult to get time out of the classroom and approval for external training.

Despite failing to reach target numbers in the project timeframe, the project has a very positive legacy, in that both the new partnerships developed through this project are likely to continue in some form through joint delivery in future, with the potential for national as well as regional impact further down the line. With Teachfirst the quality of the programme has already drawn interest from other Teachfirst regional organisers with the potential for the National Space Academy to deliver at different regional conferences. HMP Leicester has also successfully run a further event in support of the prison radio programme, winning funding from the UK Space Agency and building on their link with the Academy's Head of Teaching and Learning and his links to speakers from the space sector.

Programmes delivered

Teacher Training on Explore Your Universe activities

In order to try to target teachers in "hard to reach" or "challenging" schools the National Space Academy team sought a connection with local Teachfirst teachers. Teachfirst are a charity who work for equality of education in England and Wales, and they place new trainee teachers into schools in socio-economically deprived areas or that might otherwise be described as challenging based on results and behaviour. As part of Teachfirst's support for these trainee teachers they run regular conferences. The National Space Academy used the offer of providing an Explore Your Universe session for Teachfirst teachers as a way to build a connection with local Teachfirst co-ordinators and contacts. It was agreed that two teacher trainers from the National Space Academy would deliver concurrent sessions at the Teachfirst Saturday Conference for the East Midlands region held at the University of Nottingham on the 4th of November. The trainers were: Sophie Allan, Lead Physics Teacher for the National Space Academy and contributor to Explore Your Universe content writing since Phase 1; and Lee Sheldon, National Space Academy Lead Educator and primary-secondary transition specialist. Lee was trained up on the Explore Your Universe activities by Sophie in advance of the sessions, where he delivered the Primary and she the Secondary content.

Attendance was lower than expected and reflected a general trend of falling numbers at all National Space Academy CPD, which matches the experience of other providers. In total 12 teachers participated, nine Primary teachers and three Secondary. The feedback was excellent.

A further session (twilight 4 - 6pm) was planned to try to boost numbers for the project, on the 12th of December. Despite being advertised as free to attend with kit supplied to take away (as was the case with the Teachfirst event) only two teachers attended (both secondary). Attendance at this session may have been negatively affected by weather conditions including snow and ice. Feedback was excellent once again.

All of the teachers expressed the view that they would use the activities in the classroom, especially with the kit they were given to take away. A conservative estimate of the numbers of children that the teachers attending will run these activities with each year can be calculated by assuming a class of 30 for each of the Primary teachers, and five classes of 30 for each of the Secondary teachers, giving a total of 270 Primary and 750 Secondary pupils per year, just over a thousand in total.

An Outreach Programme for Explore Your Universe curriculum-linked workshops

The National Space Academy delivered two workshops at Her Majesty's Prison Leicester using modified Explore Your Universe activities. The workshops were each attended by nine people, and were delivered by the National Space Academy's Head of Teaching and Learning, Andy McMurray, who had previously been invited to give a talk at the prison by the prison librarian.

The activities chosen for the workshops had to be altered slightly to meet the prison's safety rules, and were chosen to be hands on as the audience was likely to have widely varying levels of education. Advice was sought from the prison librarian on both of these topics, and all activities had to be agreed and approved in advance of delivery. Andy had to arrive early for security clearance. His experience was that the attendees were all interested and engaged – although as attending the session was voluntary they were likely to be self-selecting. The feedback forms were designed to try to capture information knowing that the education levels of participants could range from a high level of education to very limited or no literacy. This was again done with the advice of the prison librarian, and with advice from the STFC/ASDC evaluation team. A smiley face system was used with space for attendees to write answers if they wanted to.

One of the most striking notes of feedback came from an attendee who said that he felt he had nothing to talk about with his daughter, who was very bright and soon to attend university. The workshop gave him the topic of space and space research that he felt he could discuss with her. This was discussed anecdotally with Andy.

Audience specific engagement

Your programme of activities will have led to engagements with many types of audiences. Please tell us how you successfully engaged with each of the following (A-E):

A. Inspiring family audiences

Approximate number of family audiences engaged: 0

B. Engaging communities and under-represented groups

Approximate number of community audiences engaged: 18

C. Gender reach

All attendees at the HMP Leicester workshops were male as it is a prison for men. Of the teachers attending the CPD sessions the majority were female.

D. Additional Explore Your Universe Activities (not grant-aided)

The National Space Centre has continued to use Explore Your Universe equipment and demonstrations in its Public and School programmes: the development of the Centre's Space Communications team over the last two and a half years has increased the amount of public/family facing talks and busking done in the Centre. The Explore Your Universe activities are often used as a source of inspiration for these.

E. Developing new relationships

The first new relationship developed has been Teachfirst in the East Midlands region, with the National Space Centre and National Space Academy looking into ways to continue this relationship in future, either by supporting existing Teachfirst schemes such as their summer projects for teachers or by sharing information with the Teachfirst network about opportunities for schools and teachers to engage with either the Centre or the Academy. Through the work of the Academy there may be the possibility of developing this connection in other locations in the UK in future as well if the East Midlands relationship continues.

The second relationship that is continuing is with HMP Leicester. The prison library was successful in a bid to the UK Space Agency to pay for the travel expenses of guest speakers from the space sector to attend a further workshop, facilitated by Andy McMurray of the National Space Academy, as part of an event designed to inspire prisoners to develop content for the prison radio programme. The event was hugely successful and the resulting programmes may be shared on the national prison radio network. In light of this programme and the success of the Explore Your Universe workshops, HMP Leicester and the National Space Centre/National Space Academy will be looking for further opportunities to bring the inspirational topic of space science to those that wish to engage within the prison through the prison library programme. This may be dependent on whether any appropriate sources are found, as the prison population is very much outside the target demographic for the National Space Academy's main programmes.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)

Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Teacher Training Session (Primary)	1	20	20
Teacher Training Session (Secondary)	1	20	20
Outreach workshops at HMP Leicester	2	20	40
Overall TOTAL number of participants: 80			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Teacher Training Session (Primary)	1	9	9
Teacher Training Session (Secondary)	1	3	3
Outreach workshops at HMP Leicester	2	9	18
Teacher Training Session (Secondary twilight)	1	2	2
Overall TOTAL number of participants: 32			

Of the sessions you ran, how many of these were with target schools / groups?

Four of the five sessions were with target groups: two with teachers from challenging schools linked to the Teachfirst programme and two with inmates at HMP Leicester.

Meeting your Explore Your Universe contracted deliverables

The project has not met the target deliverables, despite running an extra session for teachers. The problems with recruitment for teacher CPD that providers such as the National Space Academy have been finding increasingly affecting their programmes were not overcome by partnering with Teachfirst, as was anticipated. The number of attendees at the prison workshops were also about half of the target numbers.

Marketing, press and social media engagement

Marketing and social media were not used to promote the HMP Leicester workshops for obvious reasons, the workshops were advertised through the prison library.

The sessions at the Teachfirst Saturday Conference were advertised to Teachfirst trainees through regional newsletters.

The twilight session at the National Space Centre was advertised directly to teachers in Leicestershire through an email marketing campaign and by direct emails from the teachers within the Academy's core team.

Explore Your Universe legacy

The key legacy from this phase of Explore Your Universe will be the continuation of the new relationships with Teachfirst locally and HMP Leicester, with the possibility of these relationships leading to further new connections. A secondary legacy from the project is the opportunity to report that not Explore Your Universe content is still being incorporated into National Space Centre and National Space Academy programmes as a result of the two previous phases of the project.

Your best case study

The workshops at HMP Leicester are an unusual case study, showing how a topic that might be seen as out of reach to a disengaged audience can actually be used to inspire and engage. The attendees varied widely in their educational level, from well-educated to those with minimal or no literacy, yet all engaged with the workshop. Of course, this is a slightly self-selecting group within the prison's population as they chose to attend the workshop. Those that did found it to be something

"different", that it was "interesting" and "enjoyable" and that it sparked conversation and discussion. The support of the prison librarian and prison staff in general was essential to the success of the workshops, both in planning appropriate activities and in supporting the logistics of arranging the workshop. It is possible that this kind of workshop may not be replicable in all prisons as different prisons will have different security issues and protocols as per the level of security or other special provision needed for their inmates.

One of the reasons that these workshops are viewed as such a success from the point of view of the National Space Centre is that they have helped to build a relationship with HMP Leicester's prison library that has facilitated other projects, including one to allow prisoners to create content for prison radio, bringing in speakers from the UK space sector. This and other events connected to HMP Leicester have also added new dimensions to existing links with Leicester Council and organisers of local TED talk programmes.

The link with Teachfirst could also be written up as a case study, as it is the start of a continued relationship between the National Space Academy and the regional Teachfirst programme. One of the reasons why the feedback for the sessions delivered here was so glowing is that the National Space Academy's teacher training sessions are always run by current teachers whose classroom and curriculum knowledge is right up to date, and whose classroom experience adds to the value of sessions.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
				40		40

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
				14		18

*or as agreed by the ASDC project manager.

A further teacher training session was held to try to reach the target numbers for evaluation, as described in previous sections, however only two teachers were able to attend. It was not possible to arrange further workshops in the prison library in the timeframe as these needed to be organised far in advance. In hindsight, the target of 20 attendees per session in the prison was too ambitious, similar sessions run by the prison library usually have between six and 15 attendees.

Quotes from families, teachers and schoolchildren

Quotes from teachers:

- "Really engaging lots of activities and explanations to use with students and affordable".

- “Fantastic resources and engaging session… amazing ideas and fab resources”.
- “Was amazing and much more useful than I could ever have expected… absolutely fantastic, best CPD. Sophie was amazing at adapting to our queries and needs”.
- “(Lee) was very knowledgeable and passionate and explained things well… The session was fantastic – should definitely rebook”.
- “Learnt so much, thank you… Absolutely amazing, loved it”.
- “Inspiring, amazing, motivating… Fun, inspiration ideas for me and the children”.
- “What a fantastic session! Reinvigorated my love for science and I’m so excited to teach my science module this year, which I was dreading before”.

Quotes from HMP Leicester workshop attendees:

- “Thought the afternoon was fantastic… Brilliant and very insightful”.
- “Had some very good conversations and discussions”.
- “Very interesting. Andy done very well dealing with the abundance of questions thrown at him, some all at the same time. Really enjoyable”.
- “It was a good session. Everyone got involved. Teacher was an OK fellow”.

No photos were taken at any of the delivery events – photography was not allowed at the HMP Leicester event for security reasons (it may be possible in future but it will take time to get appropriate permissions) and since the teacher sessions were each run off-site with only one staff member running the session they were too busy to take photographs.

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

The feeling across the National Space Centre’s Education, Space Communications and National Space Academy teams towards Explore Your Universe is very positive, with two very successful phases delivered and a third phase successful in terms of quality even if it didn’t achieve the target numbers. The National Space Academy were involved in the creation of the Explore Your Universe resources and so the team are very familiar with them and have a great sense of pride in seeing the project continue across so many centres – especially as the use of the resources and information diversifies both with the National Space Centre’s teams and across the ASDC network.

The only criticism from this phase of Explore Your Universe was the timescale issues from the application to the agreement of funding to the information about evaluation and planning being shared. In the case of the National Space Centre, the timing did not work out for running any of the programmes outlined in the application before the end of the summer term for 2016/17 (due to the time taken to establish the link with Teachfirst), when in hindsight delivering the teacher programmes in that term would have been useful and may have allowed more time to run follow up events to increase numbers.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

The National Space Academy has a strong link with STFC as we have had funding from them for our regional office at Harwell on and off since 2012. Having said that, Explore Your Universe has given the Academy and National Space Centre a useful framework for building STFC science into the content both organisations deliver. This has allowed the knowledge of STFC research and programmes to be shared across National Space Centre teams including Education and Space Communications, which in turn has raised the profile of this science with the rest of the employees at the Centre. Having stories of UK based (or UK linked international) cutting edge research is always helpful when engaging schools or the public with science, making it more relatable and exciting.

How many staff members took part in Explore Your Universe phase 3?

Four staff members took part directly.

STFC Outcomes

The sessions at Leicester prison have inspired some attendees to start conversations with each other and others (other inmates, staff, family) about science. The teacher training sessions have inspired teachers to do some hands on activities in the classroom, and to be more confident in Primary science teaching for example.

One Primary teacher attending the teacher training session said that they had gone from dreading teaching their science module to being excited to do it. This shows that the programme has helped to change how they felt about their ability to deliver exciting, engaging curriculum linked science.

Attendees at both programmes had little or no experience of connecting with STFC science and it was valuable to the course leaders to be able to highlight the links to science being conducted in the UK. This increased the relatability, as well as being able to talk about the practical applications or how STFC research is being used to answer the 'big questions' in science.

Image: (http://www.eastsussexinfigures.org.uk/webview/welcome.html)

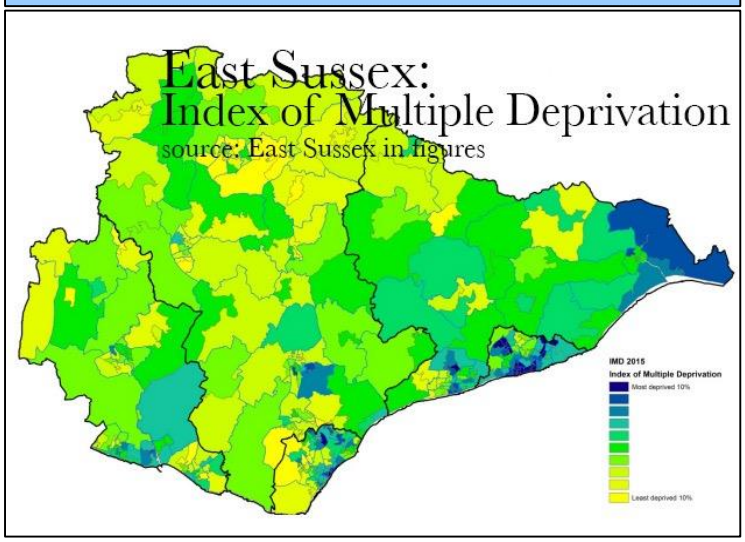


Image: (http://www.1066online.com/maps/east-sussex/sussex-map-3.gif)

The Observatory Science Centre

Report summary

The Explore Your Universe Phase 3 Project has provided a valuable opportunity for The Observatory Science Centre to identify, engage and deliver bespoke workshops to primary schools in Hastings, Bexhill, Eastbourne, Seaford, Peacehaven and Newhaven. These locations are within recognised areas of multiple deprivation.

Teachers observing delivery of the workshops with their class showed a very positive response and appreciation for the educational support the workshops were able to give the children.

Pre-delivery discussion with teachers ensured that dialogue within the workshops linked to subjects currently being studied. This enabled the workshops to further enhance and support learning and helped with revision of the relevant subject. Topics supported throughout the delivery of the EYU Phase 3 project ranged from space, engineering, light, and 'the world around me'.

By delivering workshops with high-end equipment, not generally available in Primary schools, children were engaged and excited about learning and discovering new ways of understanding. The workshops focused on looking at the world around us using the Electromagnetic Spectrum mainly between Ultraviolet to Infrared. The wide breadth of the subject gave opportunity for both teachers and children to understand the links between science and what is used in everyday life.

Throughout the project, children that were identified as having greater educational needs were encouraged to ask questions and explore ideas using the equipment. Some children expressed a delight in how such equipment was used and requested the opportunity to engage further through more science workshops. Many children were enthusiastic and explained that they would share their new understanding and knowledge with friends and family members. Very few had ever had the opportunity to visit a Science Centre or even travelled out of their hometowns.

Such enthusiasm has encouraged links with the schools and the opportunity to continue dialogue.

In total, 1,059 children were engaged with the EYU project at ten schools; a little less than anticipated due to logistics and constraints within the schools, only identified classes rather than the whole school, could be accommodated. However, the delivery of top quality science has proven to be of great benefit to the children and helped schools to consider ring fencing funding for future engagement. In addition to the schools being located in deprived areas, we identified and delivered to a special school that caters for children and young people with special educational needs and disabilities (SEND) including autism, language and communication difficulties and complex learning difficulties.

All of the schools the OSC engaged with through the project have expressed great interest in future opportunities. Some schools have been given Academy status, therefore are looking for best value for money when considering expenditure. It has certainly given us an insight into what is needed in school communities located in deprived areas and those in special measures and what we could achieve with further funding.

To expand upon and further integrate the project as part of an outreach programme for the future, the opportunity to deliver the workshop alongside the Planetarium was trialled. By presenting a whole day of science, children were able to build upon their pre-existing science knowledge and encouraged to ask relevant questions. Teachers also directed questions to elicit dialogue relevant to and supportive of learning objectives.

Overall, the Explore Your Universe continues to be an excellent project and has really brought excitement and interest in science to children of a range of abilities from disadvantaged areas.

Introduction

The Observatory Science Centre presented bespoke educational fun and exciting workshops focusing on Key Stage 2 children in Primary schools located in areas of multiple deprivation. The schools engaged with were located within the towns of Hastings, Bexhill, Eastbourne, Seaford, Peacehaven and Newhaven within the county of East Sussex.

Activities delivered to the schools for the 'Explore Your Universe' Phase 3 project were based on free workshops, presented to Primary School Key Stage 2 children, who were encouraged to consider how science is used in everyday life around us. The use of high-end equipment, including a Van der Graaff Generator and Thermal Imaging Camera, together with relevant dialogue provided a fun and exciting programme, firmly achieving all the goals and the vision of the project.

As a small educational charity, the Observatory Science Centre are unable to offer a science outreach programme free of charge but thanks to the funding of the Explore Your Universe Phase 3, the OSC have been able to target schools located in areas of multiple deprivation that would not be able to afford external science engagement.

Due to financial cuts to schools funding, such as the depletion of Pupil Premium, schools were delighted to receive the offer of science workshops to underpin and enhance children's understanding of science. Whilst the focus and intention was to present to Key Stage 2, some schools requested the inclusion of children in younger year groups to provide an introduction to the subject of science. The workshops were presented in a way that carefully adapted dialogue ensuring the inclusion of all children irrespective of age, ability or learning difficulties.

Prior to commencement of workshops, confirmation of educational objectives and curriculum links were clarified with the class teachers. Where a high-level of support was required for any individual, the schools ensured extra school staff to ensure inclusion where possible.

Programmes delivered

The Observatory Science Centre has an excellent track record of engaging with all types of schools throughout East Sussex and beyond. Engagement with the Explore Your Universe project has been firmly embedded from the launch of the EYU Phase 1, now very much part of the OSC educational programme and benefits both visiting schools and public visitors within the diversity of other events and activities offered.

The Explore Your Universe Phase 3 gave rise to the opportunity to deliver insightful and quality science to children in Primary school education in geographical areas of multiple deprivation within the school classroom environment.

Primary schools deemed as suitable candidates were approached, focusing on those that would most welcome links and future partnerships with the Observatory Science Centre, some of whom we had engaged with historically but had not had dealings with for some years. Pre-visit conversations with the schools identified any specific areas of science to be included in the presented workshops, ensuring relevance to the areas of the curriculum currently covered.

Each presentation, lasting between 30 to 60 minutes' dependant on school timetabling, commenced with dialogue eliciting responses from the children to gauge level of interest and comprehension. The workshops focused on the areas of the Electromagnetic Spectrum, concentrating specifically between the range of Ultra Violet to Infrared. Engaging with the children, initially speaking in a conversational manner, the children were asked 'how do animals, insects and humans see?', even the most reluctant participants were receptive. Revealing patterns and numbers on paper money and driving licences by simply using UV torches created a sense of awe and excitement. Using the Infrared camera to scan faces, show visible handprints on tables and footprints on solid floors gave rise to excited dialogue with many questions such as how? What? And of course, why? The workshops ended with the dramatic climax of a Van der Graff Generator repelling pie tins, making them appear to fly, a perfect visual finale.

The workshops also included other items, such as printed explainers as visual guides, pictures of rainbows and insects, plasma ball and fluorescent light bulbs and multi-coloured slinky.

The workshops created the opportunity to discuss the importance of science and how science is used and needed in so many different roles and professions. Affirmation of the fact that scientists do not conform to any stereotype and that diversity of roles include diversity of people. The schools valued the opportunity to engage with a science professional, there appeared no knowledge of either STEM support networks or STFC. The majority of the accompanying teachers took notes for their own resource material for follow-up science lessons within class.

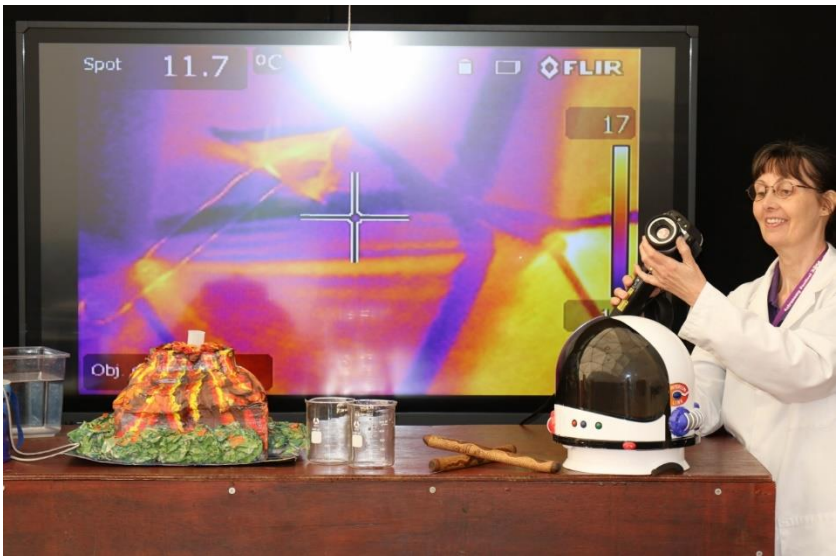
The workshops concluded with the opportunity for final questions from both the children and the teachers. Where time allowed, a repeat of a favourite part of the workshop was earned by the merit of a fabulous fact remembered.

Audience engagement

A. Inspiring family audiences

Every year, on a weekend at the beginning of September, the Observatory Science Centre holds its Astronomy Festival. To maximise the opportunity of science engagement to family groups, the Thermal Imaging camera was used ad hoc for 'science busking'. Creating an environment encouraging science fun and science curiosity within family groups revealed a common learning interest, irrespective of age, gender and interests. Whilst it would be impossible to specify numbers engaged with this activity, this approach to engaging families with science fun will become embedded within the 2018 programme.

For National Science Week (March 2017), a new in-house science show entitled 'Changing World' was launched. Throughout the school summer holidays, the show was presented to family groups repeated daily.



Changing World Science Show

B. Engaging communities and under-represented groups

The Observatory Science Centre has become a Primary source for home-educators in science learning. To take the opportunity to deliver the Explore Your Universe Phase 3 to the home-educating community, groups were invited to a dedicated science learning open day.

Home-educated children were encouraged to engage with science demonstrations to support their individual learning objectives and targets. Access to the Explore Your Universe equipment provided the opportunity to ask questions and increase levels of understanding.

Whilst home-educators voluntarily join specific groups as a platform for education opportunities, there is not a singular database in the public domain to access. Relationships have been established with local group organisers, individuals and enquiries via the Observatory Science Centres website. Social media, specifically Twitter and Facebook has been used to promote science learning open-days specifically for home-educating groups. Since the Explore Your Universe Project Phase 1, the Explore Your Universe equipment has proved of great value, continuing the legacy of the project for the future.

Home Educator Science Learning Day

C. Gender reach

Throughout the Explore Your Universe Phase 3 project, the gender reach of the 1,059 children engaged with in the Primary schools equated to proportionately 50% girls and 50% boys. The response to the workshops by each gender has proved to have a commonality, consistently displayed across all the primary schools engaged with.

In general, girls were initially slightly more cautious to engage in dialogue, however, their questions as the workshops progressed became more specific and responses more verbally detailed. The girls' vocabulary reflected an emotional reaction to the demonstrations with the use of words such as 'exciting, funny, amazing, feel good'. An interesting observation, common through all the schools visited, was a perception by the girls that science is a subject that boys are better at. This preconceived idea of gender stereotyping may have been responsible for the girls' initial hesitancy in engaging with the workshop. Sadly, a couple of the female teachers also had this misconception; one teacher suggested that girls should wear pink lab coats.

The boys exhibited a high level of excitement by merely seeing the equipment set out, even before the workshops commenced. Whichever year group or ability level, the boys consistently expressed excitement and anticipation at what was going to happen next in the workshops by a more physical reaction. Waving hands, shouting out and perceivable impatience was expressed.

Dialogue was punctuated with many 'cools, brilliant and amazing'. The boys generally demonstrated a much greater confidence with engaging with the equipment and wanting to take a 'risk'!

Without exception, by the end of the workshop, all children, boys and girls, were able to understand that science is relevant to everyone.

D. Additional Explore Your Universe Activities (not grant-aided)

The Observatory Science Centre has already embedded the Explore Your Universe equipment in a range of educational workshops and science shows offered to and pre-bookable by schools. The equipment has been adapted to provide support to curriculum linked subjects ranging from space, materials to forces. During the school holidays, pre bookable interactive workshops are offered to children aged 6-8 years and 9-11 years. Many of the workshops include the Explore Your Universe equipment.

School Holiday Fun Science Workshops

The Thermal Imaging camera provided the opportunity to engage with Key Stage 4 children at a Big Futures Careers Show (www.bigfuturesshow.org)

Big Futures Careers Show

Part of the Explore Your Universe equipment (Van der Graaff generator) was used at a Murder Mystery Event evening at the Observatory Science Centre in May 2017.

'Reason to Murder' Murder Mystery Event

E. Developing new relationships

The initial proposal of engagement for the Explore Your Universe, Phase 3, was to engage with Primary schools located within recognised areas of multiple deprivation. As mentioned previously, some of the schools selected had previously visited the Observatory Science Centre but for a variety of reasons, no longer were able to bring children to visit. Changes to school academic status, changes in teacher priorities, school budget cuts and educational subject priorities, all valid reasons cited as to why the relationship between the Observatory Science Centre and the schools changed.

Preliminary approaches to schools revealed that most schools were now academy status, thus the funding for visits for learning outside the classroom was no longer an option controlled by the class teacher. Discussion with business managers in charge of school budgets cleared the way to proceed. Establishing the importance of science in Primary years was readily acknowledged, however, it quickly became apparent that the time given to science education and the standard of teacher expertise was substantially lacking. During most of the workshops, the teachers took notes, recorded demonstrations and asked for confirmation of facts. The completed evaluation forms from teachers acknowledge the need for more science in schools but the majority of teachers declined to leave names and contact numbers. Without exception, every school involved in the Explore Your Universe Phase 3 would embrace the opportunity for more science and support should funding be available. Whilst the lack of funding may prohibit a school trip to the Observatory Science Centre, the suggestion of part funded science experience day in school, e.g., paying for outreach 'science works' or 'planetarium' at the school with 'free' bolt on workshops, appeared a possibility.

Two of the schools selected for the project have subsequently booked the Observatory Science Centre planetarium. Re-establishing links with these schools has proved to be an absolute success and an opportunity to build on further ventures.

Opportunities for the home-education communities have become embedded into scheduling for the future in the form of more specific home-education science learning days. A database of home-educators has now been established and is rapidly expanding to a wider geographical reach.

The Observatory Science Centre prides itself on accommodating bespoke individual, group and school group requirements. The legacy of the equipment used for the Explore Your Universe project is that it can be used in diverse ways within workshops, shows, challenges and extra event opportunities. Being a small science centre, if an opportunity presents itself to using the equipment provided by the project, it will be used.

Explore Your Universe Deliverables

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Outreach workshops to primary schools in deprived areas	9	200	1,800
Overall TOTAL number of participants:			**1,800**

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events /activities**	**Number of participants per event/activity**	**Total number of participants**
Outreach workshops to Primary school in deprived area	4	28	112
Outreach workshops to Primary school in deprived area	2	30	60
Outreach workshops to Primary school in deprived area	4	30	120
Outreach workshops to Primary school in deprived area	1	25	25
Outreach workshops to Primary school in deprived area	3	30	90
Outreach workshops to Primary school in deprived area	6	40	240
Outreach workshops to Primary school in deprived area	2	11	22
Outreach workshops to Primary school in deprived area	6	35	210
Outreach workshops to Primary school in deprived area	4	30	120
Outreach workshops to Primary school in deprived area	2	30	60
Overall TOTAL number of participants:			**1,059**

Target schools

All the Primary schools visited for the Explore Your Universe Phase 3 project were identified as schools that the Observatory Science Centre wished to either re-establish links with, specific year groups or had been unsuccessful historically in engaging with. The initial selection of schools were carefully considered and identified as having potential for relationship and links beyond the remit of the project. The exception to this was the additional school engaged and presented to with children recognised as having high level learning difficulties. The engagement with this school was to specifically gain an insight to how children with the extreme level of learning are supported with science education.

Access to Primary schools now run by Academy Trusts were ideal target schools as future opportunities to link with other schools within the Academy Trust control would be desirable.

Explore Your Universe contracted deliverables

The Observatory Science Centre initiative for the Explore Your Universe Phase 3 was to target Key Stage 2 Primary school children within areas of high deprivation and deliver bespoke science workshops. Many of the children live in deprived circumstances and are unlikely to have had the opportunity or interest to engage with science at any level. Very few children had any experience of Science Centres or even understood the concept of science as a subject.

Creating workshops that connected the word 'science' to applications of everyday life relevant to the children was made possible not only with the Explore Your Universe equipment, but also by the use of appropriate language. Engaging children at all levels of learning abilities relied in part with liaising with the class teachers. Whilst the circumstances of some individual children may present challenges, every group proved responsive with gentle encouragement. Those children who were more able to frame a complex comprehensive response to the demonstrations and dialogue often expressed a desire for more detailed explanations. Children less able to verbally articulate their questions were recognised and given a response in a positive and precise manner to enable clear understanding. Whilst there proved to be great diversity in levels of understanding, the aim was to deliver an all-inclusive workshop, allowing the children to understand that science is significant to them in their everyday lives.

Throughout the project, all the schools, whilst being enthusiastic, limited the Observatory Science Centres opportunity to deliver the workshops to all Key Stage 2 children. The reasons given ranged from school timetabling, the impact of missing scheduled lessons as well as the logistics of available space within the school to present the workshops. The Observatory Science Centre proposed that all years 5 and 6 be given the opportunity to engage with the workshops in school halls. In reality, most of the workshops took place in classroom, limiting delivery to one class group at a time. Should the project be offered to the same schools, following the success of the workshops, delivery would be requested for every year group. The reaction to the workshops exceeded expectation and the evaluation material completed by the children reflects the excitement.

To push the boundaries of the workshop and to enable audience diversity, the workshops were delivered to a specialist school to children with extreme learning difficulties. Despite the extreme educational needs of every individual child, with an adult carer, child ratio of 1 to 2, the workshop was greatly received. Discussing the Electro Magnetic spectrum to these children required a steady pace and creative dialogue but every child became totally engaged.

Delivery of the project to one school required the head teacher to quietly speak with a couple of children with attention difficulties. Behaviour issues manifested in children running around, physical outbursts of temper and screaming, however, the impact on the other children was minimal. The distractions of this nature were somewhat challenging, however, the key was to carry on and repeat any missed dialogue.

Whilst the outcome in numbers engaged with appears somewhat changed from what was originally agreed for the project, the evaluation material collected and the insight to these schools has provided a huge wealth of information.

Marketing, press and social media engagement

The successful element of the project relating to awareness and engagement has been via our website and social media, namely Twitter and Facebook in promoting the home-educator's day at the Observatory Science Centre.

Whilst every opportunity was taken to request photographs of the Explore Your Universe Phase 3 workshop delivered in the Primary schools, the response was an absolute no. Frustratingly, the teachers actively recorded, photographed and made notes at the presentation of the workshops. Post the delivery of the workshops, the Observatory Science Centre requested copies of any photographs taken, however, the risk of breaching child protection policies meant that to date no photographs have been received.

Photographs in this report are for reference only.

Explore Your Universe legacy

The Observatory Science Centre has been able to re-establish links with primary schools through the Explore Your Universe Phase 3 project. Opportunities have been created to liaise with new schools never previously engaged with.

The possibility to expand the outreach programme currently offered to schools to provide a fully interactive science day. Where schools, both Primary and Secondary currently book a planetarium visit, the Explore Your Universe project workshop could be offered to provide a complete package of science.

The 'Changing World' science show, using the Explore Your Universe equipment has become one of the embedded Science Shows in the Observatory's repertoire and will be presented into the future.

School holiday workshops and activities using the equipment will continue to be delivered to children.

The 'Light' workshops developed for schools proved to be extremely popular and teachers are very excited to hear we offer them as an option on a school visit. Modifications have been made to Key Stage 1 and Key Stage 2 workshops to fit in with the daily programme, allowing half hour sessions to be delivered in a fun, fast and exciting way. Light workshops are embedded in the school's programme for the foreseeable future.

The lasting legacy of the Explore Your Universe programme through Phase 1 and 3 is very important to the team at the Observatory Science Centre as the equipment is used throughout the diversity of activities, workshops, shows, busking and events offered both on site and outreach. New and creative ways of using the equipment are continually devised, thus ensuring presentations and public engagement remains new and exciting.

Case Study

'The privilege of witnessing the delight on a child's face at the moment of comprehension with something amazing in science'.

The most memorable moment of the Explore Your Universe Phase 3 project is a small achievement of huge significance for one young child.

One of the schools visited specialised in education for children and young people who have a range of Special Educational Needs (SEN). The visit was arranged for two workshops, eleven children to engage in each workshop with supporting adults.

The children gathered in anticipation of the science workshop; however, one child was reluctant to join the group. Both the unfamiliar equipment and the introduction of an unknown adult was a little overwhelming. Thanks to the excellent professional support of the child's carer, the child remained in the classroom. The workshop commenced with dialogue asking what was light. The children responded to questions with a range of answers and alternative creative ideas. The reluctant child sat quietly and began to observe the other children, the equipment and made eye contact – the first success.

As the workshop progressed, equipment was demonstrated with explanations to support understanding, working together with the children's support team, every child was helped to make links and understand how science was all around in everyday life.

Towards the end of the workshop the child that had been so very reluctant to engage at the beginning stood up, walked up to the equipment and asked in a whisper if they could touch everything as they wanted to feel science. Without another word, each piece of equipment was explored and touched. The room was silent whilst the child investigated everything of interest, once this had been achieved; the child touched the carers hand and nodded.

Everyone in the classroom witnessed at that moment that this child had understood and made a connection with science, which represented something truly amazing.

Evaluation and Impact

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
1,800						

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
1,059						

Please share with us any great quotes from schools

- Year 5 Teachers: "The resources were inspiring to the children, explained well and linked continuously to what they are learning about and in response to children's answers."
- Year 5 Teachers: "My own subject knowledge is not good enough and I don't have the equipment – my own science seminars during teacher training were very poor."
- Year 5 female: "It was different because we don't have this equipment in school…"
- Year 5 female: "This was different as it was all way more dangerous…"

- Year 6 male: “I think that this will help us with school science, I want to know more…”

How Explore Your Universe worked for the Observatory Science Centre

The Observatory Science Centre team are completely immersed in the Explore Your Universe Projects, from phase 1 through to phase 3. Every member of the team is able to engage with visitors, either school children or visiting adults using the high end equipment.

Every member of the Observatory Science Centre team are STEM Ambassadors and as part of continuing professional development are trained with delivery of workshops, outreach and science shows and knowledge of STFC.

There are fifteen current employees on the Observatory Science Centre team whom are engaged in some capacity with Explore Your Universe projects equipment and delivery to school / public visitors. One member of staff delivered the Phase 3 workshops to schools.

STFC Outcomes

Activities and workshops delivered by the Observatory Science Centre have helped to:

- Inspire people to do something new –

Within the classrooms, both the teachers and children have been inspired to continue with exploring ideas.

- Change the way people feel –

Confident!! Particularly girls in Primary schools, science is for everyone.

- Change the way people value science and technology

As a subject, teachers have appreciated the support with teaching science facts and how the subject applies to everything.

Science Oxford

Report summary

Science Oxford's aim for EYU phase 3 was to acquaint new staff with the project and the resources and to integrate the resources into new areas of our delivery. Our target audience for family events were specific areas of Oxford City recognised as being areas of deprivation.

The training and networking opportunities provided through the project were of great benefit to staff in order to gain a greater understanding of the resources and to share ideas with other Centres.

Science Oxford developed practical and transferrable activities for inclusion in our programme of twilight CPD for Primary school teachers. This was a successful element as it provided an opportunity to have maximum impact on the pupils in that school. Feedback from teachers was favourable and many commented that they would be implementing the ideas into their teaching.

EYU based activities were incorporated into several different events for families including a summer holiday club and a Saturday science club for unaccompanied young people, and a family planetarium show. Space is always a popular topic and therefore attendance at these events was good but collection of evaluation was difficult because of the format of events and the forms not really being appropriate for the audience. We were successful in targeting audiences in areas of deprivation by holding the events in those areas and therefore attracting local residents.

Incorporating EYU activities into our careers days for KS3 pupils proved difficult because of the nature of the equipment and difficulty in recruiting volunteers to run activities. The format and target audience of these events therefore was changed to upper KS2 and a more hands-on format in partnership with STFC. Again, evaluation proved challenging in this format and with this age of participant, but use of a voting pad evaluation process allowed us to collect a significant number of responses.

With the exception of the careers days, Science Oxford met or exceeded its target for delivery of CPD and family events. Collection of evaluation data was difficult and we have fallen short of the required number of forms for CPD. Initially electronic versions of the form were sent to teachers which resulted in a very poor response rate, a swap to paper forms being handed out at the end of the course provided a much better response.

The project was successful in its aims of educating new members of the organisation, targeting of specific audiences and incorporating the resources into our programme of school and family outreach activities. However, collection of valuable evaluation data always proves to be challenging and time consuming.

Introduction

Science Oxford participated in phase one of Explore your Universe and were in receipt of the EYU kit and resources. Since that time kit has been fragmented and staff have moved on such that the equipment, resources and legacy of the project was being lost. The EYU 3 project allowed new members of staff to become acquainted with the resources, the kit to be re-assembled and for EYU activities to be developed and adapted to match our current programme of delivery.

Our aim was to integrate EYU into our existing programmes of family events and clubs, teacher CPD, and Secondary careers events, with an emphasis on reaching new audiences and those in recognised areas of need with Oxford City.

Through the programme we have ensured that current staff are more aware of the resources and therefore able to incorporate them into their programmes of delivery. This ensures an ongoing legacy for the project. By delivering our activities in specific areas of the city we have managed to bring the physical sciences and knowledge of STFC to audiences who would not normally engage with these topics or with organisations such as Science Oxford.

By developing EYU related activities as part of our CPD provision and linking them with the ethos of Thinking, Doing, Talking Science, we have ensured that the impact of these activities is wide reaching and sustainable.

Our partnership with STFC at Rutherford Appleton Laboratory throughout the EYU project has been immensely valuable. We have been able to link activities directly with scientists at RAL and running events onsite has provided maximum impact for the pupils involved.

Programmes delivered

Teacher Training on Explore Your Universe activities

A total of seven teacher training events were delivered as part of our established programme of CPD. These twilight training events have a strong emphasis on working scientifically and incorporate a number of practical activities suitable for transfer directly into the classroom. As part of the EYU project, specific space and physics related activities were incorporated into the courses. These included a performance based activity to demonstrate the movement of the earth and the moon and a workshop to demonstrate the movement of light.

Training sessions were delivered in seven different schools between May and December 2017. A total of 110 teachers attended these sessions from all year groups within the school. If each teacher attending implemented the activities with their classes, we potentially reached a total of approximately 2,500 children.

An Outreach Programme for Explore Your Universe curriculum-linked workshops

Our outreach programme for the Explore Your Universe grant targeted family audiences in hard to reach regions of Oxford City. During summer 2017 we delivered a 5-day Space Camp for 7-11 year-old children in Rose Hill, recognised as one of the most disadvantaged areas of Oxford City. A total of 20 children attended each day with some completing the full week and others coming for one or two days. On each day a number of practical activities were run, with a constant theme of space running throughout the week. A number of the EYU resources were incorporated into the week, including the IR camera, the cloud chamber and examining meteorites.

One of our regular Saturday Science Clubs was run as part of the EYU delivery. Science Oxford run a programme of Saturday Clubs which are booked events for up to 15 children per session. The Saturday Science Club Extra is aimed at 9-14 year olds and are unaccompanied sessions lasting two hours which are booked in advance. Twenty-five children attended the Space Astronaut club where they completed a variety of space related hands on activities and listened to the presenter who provided lots of interesting and astounding space facts for them to talk about at home.

In partnership with STFC at Rutherford Appleton Laboratory, we run a month long Planetarium tour in November of each year where we deliver shows in schools and for the public. The public event this year was part of the EYU programme and therefore was run at Wood Farm School, in another recognised area of deprivation. The event was specifically marketed to schools in that area which is an area of the city which does not regularly host science activities.

A total of 90 children and their families attended the event during October half term where Science Oxford delivered a tour of the universe whilst relating the information to work being carried out at RAL.

Inspiring Careers in Physics and Engineering

Science Oxford delivers a programme of one-day career events for KS3 pupils. We worked with a volunteer to deliver a cloud chamber based activity to deliver as part of an engineering career days in October. However, the activity proved to be unreliable and therefore not suitable for the event and was therefore not used. An alternative engineering activity was delivered, but did not make use of the EYU resources. This event has therefore not been included in the metrics for our delivery.

An event for upper KS2 children was delivered in partnership with STFC at Rutherford Appleton Laboratory which highlighted careers in the space industry. Pupils got to visit the laboratory and take part in space related hands on activities and a Space Show. 170 pupils from seven different primary schools attended the event and volunteers from Rutherford Appleton Laboratory contributed to the day.

Audience specific engagement

Your programme of activities will have led to engagements with many types of audiences. Please tell us how you successfully engaged with each of the following (A-E):

A. Inspiring family audiences

Our Planetarium show at Wood Farm School was targeted at family audiences. Held during the October half term holiday the visual content was designed to appeal to young children whilst offering interesting facts and information that would appeal to parents as well.

Approximate number of family audiences engaged: 90 families

B. Engaging communities and under-represented groups

The locations of the planetarium Show and the Space Camp were deliberately chosen to target audiences from Rose Hill and Wood Farm, which are both regions recognised by Oxford City Council as “areas of regeneration” with multiple indices of deprivation. They are also areas which do not regularly engage with outreach opportunities available locally and hence the decision to host events in the locations themselves to encourage participation from the local area.

Science Oxford has good links with schools and community groups in these areas which enabled us to target the promotion of these events with the required audiences.

Approximate number of community audiences engaged: 125 children and their families

C. Gender reach

No specific details of gender were collected for the events, but with space being a universally popular topic, we did not notice any specific gender bias and therefore assume the split to be approximately 50:50

D. Developing new relationships

Wood Farm School was a new venue for us for family activities. The relationship established with the school and the organisation that manages their lettings was therefore a new relationship that was established through this programme. Following the success of the event we would be keen to use this venue again in the future.

Delivering two of the events in partnership with STFC at Rutherford Appleton Laboratory helped to further strengthen the already beneficial relationship that exists between our organisations.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)

Contracted Deliverables Type of event or activity	Number of events/activities	Number of participants per event/activity	Total number of participants
Twilight teacher CPD	5	20	100
Outreach at Holiday Clubs	3	25	75
Outreach at Family workshops	2	25	50
Career Events	2	180	360
Overall TOTAL number of participants: 585			

Final delivery numbers

Final delivery numbers as of January 20th 2018

Contracted Deliverables Type of event or activity	Number of events/activities	Number of participants per event/activity	Total number of participants
Twilight teacher CPD	7	Between three and 25	110
Outreach at Holiday Clubs	5 (min one activity per day)	18 (some attended multiple days)	35
Outreach at Family workshops	2	90 and 25	115
Career Events	1	170	170
Overall TOTAL number of participants: 430			

Of the sessions you ran, how many of these were with target schools / groups?

Our targeted audience for family events was the disadvantaged areas of Oxford City. We achieved this by running the Planetarium Show and the Holiday Club in these regions. The Holiday Club participants were all from the targeted area, the planetarium was more mixed due to it being a booked event. However, postcode analysis revealed a good percentage of participants coming from the targeted areas.

The Career Events did not target the required KS3 audience – see notes below

Meeting your Explore Your Universe contracted deliverables

Teacher training – Successfully delivered on the targets for this aspect of the project

Outreach at Holiday Clubs – We over delivered on the number of EYU related activities that we were able to deliver as part of the club by offering a different activity each day. An average of 18 children attended each day so a total of 90 EYU interactions took place throughout the week. However, a significant proportion of children attended for more than one day and therefore the numbers reported have been reduced to reflect this.

Outreach at family workshops – Saturday Science Club was always going to be a small number of participants due to the booking restrictions and therefore the larger planetarium show was organised to make up the required numbers. Delivery exceeded our target.

Career Events – We tried to incorporate the EYU resources into a short repeatable workshop as part of the career day format, but with the number of students involved, the short turnaround time and the number of volunteers needed to deliver the activity, it soon became apparent that this format was not going to be deliverable. Therefore, we instigated the change in format and target group to partner with RAL to deliver an event for upper KS2. This proved to be much easier to deliver and the target audience much easier to work with.

Marketing, press and social media engagement

All the events delivered as part of the EYU project were advertised through our website and usual promotional channels. In addition, we worked with partners in the targeted areas of deprivation to ensure the information was received by the required audience.

Our Space Camp in Rose Hill appeared in the local community newsletter as well as receiving press coverage by the Oxford Mail.

All events were covered through our social media including Twitter (12,000 followers) and Facebook (2,500 followers)

Explore Your Universe legacy

Participating in EYU phase 3 has been successful in re-engaging us with the EYU kit and resources. Since phase 1, staff have moved on and, although a legacy remained in some of our shows and workshops, any new opportunities were not being exploited. The training provided by EYU 3 has enabled current staff to become acquainted with the resources and develop new activities that match with our current programme of delivery.

These activities will continue to be included in our CPD and outreach activities and the EYU resources will now be more widely utilised in our programme of Saturday Clubs.

New relationships established as part of the project, particularly in areas of deprivation, will continue to be built upon.

Your best case study

Supporting teachers through informal twilight CPD has the potential to impact a significant number of children within a single school. As part of our Explore Your Universe project, Science Oxford developed hands on activities using the EYU resources which were incorporated into our existing programme of CPD delivery.

Our CPD programme has an emphasis on working scientifically and equipping teachers with ideas and strategies that are immediately transferrable into the classroom. As a result, teachers feel empowered and confident to deliver their lessons in new and exciting ways.

A drama based activity to demonstrate the movement of the sun, the earth and the moon provided a memorable way to demonstrate these complicated relationships. In addition, a problem solving workshop to determine how light travels in straight lines was delivered which utilised equipment that schools would have readily available. Demonstrations using some of the more portable EYU kit provided additional ideas and kit is made available to schools via a kit loan scheme.

Our courses were delivered in-school and to all teaching staff, therefore influencing the school as a whole. By working with teachers in this way, and providing practical and transferable ideas for classroom activities, the potential impact on the children is far greater and more sustained than an individual visit.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
		-	-	100		210 across outreach and careers

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
23	2	-	-	32 (final course on 5th Dec)	153	90 (quotations from family event)

*or as agreed by the ASDC project manager.

If you did not meet your contracted targets, please tell us what you did to try to reach these numbers.

Teacher CPD – For the first CPD session delivered as part of the programme the evaluation forms were not yet available from ASDC and therefore we were not able to collect data from those

teachers attending. In earlier sessions, feedback forms were sent electronically to schools after the training event which meant that very few (if any) were completed and returned to us. For later sessions we used printed forms and asked for them to be completed before we left the session. This ensured that forms were collected.

Outreach/careers activities – Participants at the Planetarium show were asked for comments and quotes, but the nature of this public event meant it was very difficult to collect further details. Quotes and results of this feedback have been supplied. Feedback data at the career event was collected via voting pad questions at the end of the day. Selected questions were taken from the full evaluation form and asked to the whole audience at the end of the day. Analysis data from the voting pad software has been provided.

The outreach evaluation forms were used in full at the Saturday Science Club and the Holiday Club events. The format of the forms was not ideal for these activities, particularly the Holiday Club where the children were quite young. In this circumstance, interviews were held with some of the children to ascertain answers that were linked to the questions on the form. This was a very time-consuming activity and therefore it was not possible to collect as many forms as we would have liked.

Quotes from families, teachers and schoolchildren

- "Great ideas to take away and use with my class – especially for an NQT" - CPD
- "It was much more fun than school" – Holiday Club
- "The story telling helped make the stars more memorable" – Planetarium Show

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

The EYU project has definitely given staff an opportunity to learn more about the topic and the resources have enabled us to deliver activities that we previously would not have been able to. However, alterations were required to make the workshop and shows match with our style of hands-on outreach delivery. A significant proportion of our audience are Primary aged children and our entire programme is outreach, therefore some of the resources were rather too factual and some of the equipment was too delicate and technical for use in an outreach environment.

The most successful use of the resources has been in smaller environments such as teacher CPD and our Saturday and Holiday Clubs. In these environments we have been able to make good use of the resources.

Staff attending the training courses have benefitted greatly from the experience, quoting that the opportunity to meet with staff from other centres and to share ideas were most beneficial.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

As an organisation, Science Oxford has a very strong and mutually beneficial relationship with STFC at Rutherford Appleton Laboratory. Working on this project together has enable us to make best use of their experts through organising joint events held at their premises. We have also been able to raise the profile of STFC at RAL locally through the CPD training.

How many staff members took part in Explore Your Universe phase 3?

Six

STFC Outcomes

Please tell us how the activities and workshops delivered by your centre have helped to:

- Inspire people to do something new
- Change the way people feel
- Change the way people value science and technology
- Develop or change the skills of participants
- Change people's understanding of STFC science, technology and research

Running our events in specific areas of regeneration within the city encouraged local residents to participate. These are audiences that would not normally engage with STEM activities in the city. The theme of space and the universe is universally attractive to children and activities were developed specifically for the target audience ensuring that all were engaged.

Introducing these audiences to technologies and equipment that would not ordinarily encounter, such as an inflatable planetarium and EYU kit, hopefully improved their understanding of science and technology. Partnering with STFC at RAL also enabled us to inform audiences of incredible research that is happening on their doorstep and, in the case of the careers event, allow them to see the environment for themselves.

Techniquest Glyndŵr

Report summary

This report details Techniquest Glyndŵr's delivery of the Explore Your Universe phase 3 project, from June - December 2017. Using the fantastic Explore Your Universe equipment, and resources from the STFC website, Techniquest Glyndŵr developed a hands-on workshop for Secondary school students to be delivered both in the Science Centre and on outreach visits to the schools, as well as an interactive show aimed at families and community groups.

Six schools from the local area were welcomed to the Science Centre to take part in the Explore Your Universe workshop, and spend time in the interactive exhibition. The Bursary scheme meant that the groups were able visit at no cost to the school or pupils, and so removed financial barriers and allowed students from some of the most deprived areas in the country (according to the Welsh Index of Multiple Deprivation) to be able to engage with STEM.

Seven schools across North and Mid-Wales were visited by Techniquest Glyndŵr through the Outreach programme, and students from KS3, 4 and 5 engaged with the Explore Your Universe workshop on these visits. The funding from ASDC meant that schools in very rural areas could be visited, and so allowed groups that are typically remote from STEM to engage with the work of the STFC.

The Explore Your Universe workshop for schools was also delivered by Techniquest Glyndŵr at two careers events that were held in partnership with Wrexham Glyndŵr University. 167 Secondary school students from Wrexham and the surrounding area engaged with the workshop at these events, along with several other activities from different STEM providers. The Explore Your Universe workshop gave the students the opportunity to get hands-on with equipment not usually accessible to them, as well as providing an insight into scientific research currently being done in the UK by STFC scientists. The aim of these events was to expose these students to the wide range of careers available in science, and hopefully raise their aspirations to pursue STEM careers in the future.

As well as the workshops for schools, Techniquest Glyndŵr also developed a family friendly show for public audiences and community groups. This show was delivered in the Science Centre over six consecutive weekends, and 844 people engaged with Explore Your Universe during this time. Several community groups also watched the show at special events in the Centre, including a group of local home educator families, two local Guiding groups, and families who are members of the Wrexham Branch of the National Autistic Society.

The learning and equipment provided through the Explore Your Universe project have been part of a successful programme delivered by Techniquest Glyndŵr, and the activities developed through this project will continue to be used by the Science Centre to engage the public with the physical sciences and the inspiring work of the STFC.

Introduction

The Explore Your Universe programme has been delivered by Techniquest Glyndŵr in the form of a 50-minute hands-on workshop for Secondary school pupils, and as an interactive show for families and community audiences. The activities were developed to be as interactive as possible, to allow all audiences to engage with scientific equipment not usually available to them. By allowing audiences to interact with the equipment themselves, a sense of excitement was created as they discovered

more about the physical sciences through hands-on experience. Techniquest Glyndŵr made extensive use of resources provided on the STFC website to compliment the Explore Your Universe equipment and content, and this gave people a real insight and understanding of the exciting work currently being done by UK scientists.

Programmes delivered

Since Science Centres had the option of delivering **four different types of programmes** (or combinations thereof) please only complete the following sections that are relevant to your contracted deliverables and delete the sections that do not apply. **This is your opportunity to tell us, in as much detail as possible, all the amazing things your centre has done over the duration of the project.**

Bursary Schemes to enable schoolchildren from disadvantaged areas (remote from STEM) to take part in Explore Your Universe curriculum-linked workshops and to visit the science centre (not including travel bursaries)

Techniquest Glyndŵr invited six local secondary schools to visit the science centre and take part in the Explore Your Universe workshop as part of the Bursary scheme. These schools were:

- Ysgol y Grango, Rhos
- Ysgol Rhosnesni
- St Richard Gwyn Catholic High School, Flint
- Ysgol Clywedog
- Argoed High School, Buckley
- The Alun School, Mold

The first four schools visited in July 2017, and the final two in November 2017. The pupils who attended were a mix of year groups at KS3 level, and the gender split was fairly even; 53% of participants were female and 47% male. The groups spent from 2.5 hours up to 4 hours at the Science Centre, including one hour spent taking part in the Explore Your Universe workshop, and the remaining time spent exploring the interactive exhibition space.

These schools were targeted as of the six, Ysgol y Grango, St Richard Gwyn, Ysgol Clywedog and The Alun, have catchment areas which have been identified as in the top 20% most deprived areas according to the Welsh Index of Multiple Deprivation, while Ysgol Rhosnesni primarily serves students from the top 10% most deprived areas in Wales. Techniquest Glyndŵr have good , pre-existing relationships with all of these schools and have worked with them previously to try and engage their students from these areas with science, and raise their aspirations in pursuing a career in a STEM based area.

Although some of these schools had attended previous events where the Explore Your Universe workshop was delivered, it was different groups of students who took part in the activity at each engagement.

Travel Bursaries to enable schools from deprived areas, particularly rural areas across Northern Ireland, Scotland and Wales, to take part in an Explore Your Universe curriculum-linked workshop.

Each school attending a visit to Techniquest Glyndŵr as part of the Bursary scheme were offered up to £100 to cover the cost of their travel to the Centre. As these schools are located in what have been identified as more disadvantaged areas, this proved to be a great tool for removing the barrier

of cost for these students to visit the science centre. Of the six schools, Ysgol Rhosnesni, St Richard Gwyn and Ysgol Clywedog made use of the travel bursary, and were able to cover the cost of their travel to the centre in full.

An Outreach Programme for Explore Your Universe curriculum-linked workshops

Techniquest Glyndŵr visited seven secondary schools with the Explore Your Universe workshop as part of the outreach programme. These schools, and year groups of participants, were as follows:

- Ysgol Bro Hyddgen – pupils from years 8 and 9
- The Maelor School – pupils from years 7, 9, 10 and 12
- Ysgol Dyffryn Nantlle – pupils from year 8
- Llanidloes High School – pupils from year 8
- Ysgol Emrys ap Iwan – pupils from years 8, 10 and 11
- Hawarden High School – pupils from years 8, 9, 10 and 11
- Newtown High School – pupils from year 8

The first four schools were visited in the summer term 2017, and the remaining three in November and December 2017. The groups who took part in the workshop were a mix of ages, from year 7 up to year 12, with content adapted to suit the level of the pupils in each session. 52% of the students who took part in the workshop were female, 48% male.

The sessions were booked by a member of Techniquest Glyndŵr's calls team, who contacted the schools to promote the programme and arranged a suitable date for the workshop to be delivered. Two members of the science communicator team would then deliver these activities at the school, this is consistent with the usual bookings and delivery procedures of Techniquest Glyndŵr.

The workshops were developed to maximise the opportunity for students to get hands-on with equipment they don't normally have access to in school, including the Van der Graaff generator, thermal imaging camera and Ferro fluids. The equipment is split into four stations, and students spend time on each station in small groups, exploring the science and applications of the items. Resources from the STFC website were used to create information sheets for each station, and the students used these to aid more independent working. The workshops were designed to fit into a standard school lesson of 50 minutes to an hour, meaning up to six workshops could be delivered in a school day.

One of the strengths of Techniquest Glyndŵr and its science communicator team is that they are very adaptable to the needs of their audience, and they have been able to provide the workshop to groups of KS3, KS4 and KS5 at the same event. They have also been able to vary the length of the workshop to suit the timetable of the event, for example at The Maelor School a longer two-hour session was delivered to year 12 pupils which incorporated more of the equipment than the usual workshop, such as the cloud chambers, while at Ysgol Dyffryn Nantlle three 90 minute sessions were delivered to pupils in year 8 as part of a school-wide STEM day. Each of the other schools had between three to five, one hour workshops delivered to the mix of year groups described above.

Four of the seven schools visited are located in very rural, and in some cases remote, areas. Ysgol Dyffryn Nantlle is based on the outskirts of Snowdonia on the North West Wales Coast, while Ysgol Bro Hyddgen, Llanidloes High School and Newtown High School are all in rural mid-Wales. These schools are quite far removed from Science and Discovery Centres, so it is important that

Techniquest Glyndŵr is able to visit them to ensure their pupils are exposed to scientific research and equipment that they may not hear about or use in school, and are engaged with STEM in an informal and hands-on way. Newtown High School and Ysgol Emrys ap Iwan also serve communities identified as disadvantaged, and in the top 20% most deprived areas of Wales according to the Welsh Index of Multiple Deprivation, so again for them to have access to STEM enrichment from outside of their school is an important tool in raising aspirations and confidence for these pupils.

All of the resources developed for the Explore Your Universe schools workshop were translated in to Welsh, as Techniquest Glyndŵr strives to be a truly bilingual company. By being able to offer the activities in Welsh, Techniquest Glyndŵr ensures their offer to schools are fully inclusive, and deliveries of the workshop at Ysgol Bro Hyddgen and Ysgol Dyffryn Nantlle were delivered through the medium of Welsh, which removed any language barriers for the students to fully engage with the science.

Inspiring Careers in Physics and Engineering

Techniquest Glyndŵr ran the Explore Your Universe workshop for schools attending two STEM career events. Both events took place in June, and were attended by schools from Wrexham and the surrounding counties.

The first event was a STEM career day run by Glyndŵr University and aimed at Year 10 students from Communities First areas. Communities First is a Welsh Government programme which aimed to support the most disadvantaged people in the most deprived areas of Wales. 73 pupils from four schools attended this event; Flint High School, St Richard Gwyn, Ysgol y Grango and The Alun School, and the groups were made up of year 9 and 10 pupils. During this event the groups rotated around three out of four activities, including Explore Your Universe run by Techniquest Glyndŵr, as well as activities run by The Royal College of Anaesthetists, the Institution of Civil Engineers (ICE) and Glyndŵr University Engineering department. This event was funded by Reaching Wider, at no cost to the schools, and the variety of activities on offer ensured that these students from disadvantaged areas got to engage with a wide range of science and engineering.

The second event was run by Techniquest Glyndŵr for International Women in Engineering Day, as part of a global scheme to encourage more girls to consider engineering as a career, which occurs annually on 23rd June. The event was funded by the Royal Academy of Engineering as part of a larger Techniquest Glyndŵr project, and allowed 94 female pupils from six local schools to attended free of charge, including a subsidy for coach hire. The schools involved were St Richard Gwyn, Ysgol Clywedog, Ysgol y Grango, The Marches School, Hawarden High School and Connah's Quay High School, and the pupils were smaller groups of female students in years 8, 9 and 10. Although some of these schools engaged with the Explore Your Universe workshop on other occasions, it was different groups of students who took part in the activity at each event.

The Explore Your Universe workshop was delivered by Techniquest staff, and was one of five activities the students took part in. Other activities included the ICE 'Bridge for Schools' challenge, as well as hands on activities provided by engineers from Glyndŵr University, University of Manchester, Manchester Metropolitan University and the Institute of Mechanical Engineers. The event was attended by 11 female engineers and scientists who ran or facilitated each of the sessions, all of whom were volunteers and were excellent role models for the female pupils, encouraging their enthusiasm and breaking down gender barriers to STEM careers.

Audience specific engagement

Your programme of activities will have led to engagements with many types of audiences. Please tell us how you successfully engaged with each of the following (A-E):

A. Inspiring family audiences

The Explore Your Universe family show was delivered over six weekends in June and July 2017. For families visiting Techniquest Glyndŵr, admission to the live science show is included in their entry price, and shows run at least twice a day. Birthday parties are also hosted in the Science Centre at weekends, and these groups have their own science show, which during this time would have been Explore Your Universe. As an addition to the kit provided, Techniquest Glyndŵr purchased a large quantity of diffraction specs so that everyone in the audience of a family show could view the spectrum, which were used in an impressive demonstration using the spectral tube box. Over the course of the six weeks, the show was delivered 22 times to family audiences, and a total of 844 people saw the Explore Your Universe family show.

B. Engaging communities and under-represented groups

Techniquest Glyndŵr engaged with several community groups with the Explore Your Universe family show. In October 2017 families who are members of the Wrexham Branch of the National Autistic Society came into the Science Centre to watch the public show, and took part in additional hands-on elements from the school's workshop including a closer look at the thermal imaging camera, spectroscopes, Ferro fluids and meteorites.

A large group of families whose children are home educated also visited the centre, a total of 45 children and 25 adults took part in the public show as well as interacting with the equipment from the school's workshops. Home educated children are often largely under-represented in STEM engagement and the families were very grateful of the opportunity to engage with equipment that would be otherwise inaccessible to them.

Techniquest Glyndŵr also hosts local Guiding and Scouting groups quite frequently, and two groups of Girl Guides, aged 10 to 15, made evening visits to the Centre in November 2017. These visits included watching the Explore Your Universe family show, as well as taking part in some of the hands-on activities from the school's workshop. The activities enabled several of the Guides to achieve their Science badge.

C. Gender reach

Techniquest Glyndŵr is committed to ensuring that all activities are gender neutral and that all staff are fully trained in Gender Equality Awareness, and the development and delivery of the Explore Your Universe activities were no exception. The gender split of school pupils engaged with, both in Centre through the Bursary scheme and on outreach visits, was very even, with 53% of the audience being female and 47% male. Similarly, with families and community groups, it is estimated that the split was around 50:50 as there was no noticeable imbalance in the audiences reported. The only exception was for specialist groups and events that are aimed solely at female participants. The Guiding community groups were all female, and the International Women in Engineering Day was exclusively aimed at female students, with a view to addressing the huge gender imbalance in Engineering and STEM related careers in general.

As previously mentioned, all Techniquest Glyndŵr staff receive Gender Equality training, and as such all staff delivering any workshop or show have an awareness of how to achieve gender balance throughout their engagement, and how to use appropriate language which will not exclude or alienate any members of their audience, to ensure that gender does not become a barrier to engaging with STEM subjects.

D. Additional Explore Your Universe Activities (not grant-aided)

In June 2017 Techniquest Glyndŵr held its first ever 'After Hours' adult evening event, with interactive demonstrations from the Explore Your Universe kit making up the majority of their activities. Around 30 adults attended this event, and feedback from the evening was very positive, with much enjoyment from interacting with the equipment observed by the delivering staff.

E. Developing new relationships

Participation in this project has allowed Techniquest Glyndŵr to strengthen their relationship with Glyndŵr University, by enabling the two organisations to work in partnership in delivering the two careers events. Relationships with local Home Educator groups has also been strengthened by providing them with engaging and relevant science through their participation in the Explore Your Universe activities.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
One hour workshop in Centre	Six events / 12 workshop sessions	50	300
One hour workshop outreach at school	Six events / 30 workshop sessions	100	600
One hour workshop delivered as part of physics and engineering careers event	Two events / 10 workshop sessions	75	150
30 minute public show	12 events / 24 shows	50	600
Events with groups to widen participation i.e. Guides, Homes Educators, Autism Society	Three events	20	60
Overall TOTAL number of participants: 1,710			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
One hour workshop in Centre	Six events / ten workshop sessions	Varied – from 26-59 per event	285
One hour workshop outreach at school	Seven events / 25 workshop sessions	Varied – from 56-124 per event	619
One hour workshop delivered as part of physics and engineering careers event	Two events / 10 workshop sessions	73 / 94 at each event	167
30 minute public show	12 events / 18 shows	Varied – from 11-149 per show	844
Events with groups to widen participation i.e. Guides, Home Educators, Autism Society	Four events	Varied – from 12-70 per event	147
Overall TOTAL number of participants: 2,062			

Of the sessions you ran, how many of these were with target schools / groups?

One of the main targets of Techniquest Glyndŵr's school's engagement, both through the Bursary and Outreach scheme, was to engage with schools which serve pupils who are considered to be from areas in the top 25% of the indices of multiple deprivation. Of the 13 schools engaged with, six are located in areas of the highest deprivation, according to the Welsh Index of Multiple Deprivation.

Techniquest Glyndŵr also wanted to reach those schools which are geographically remote from STEM through the Outreach scheme, and five of the seven schools visited are located in rural areas of Wales, well over an hour from their nearest Science Discovery Centre.

The community groups that were set out to be engaged with in the application; Guiding groups, home educators and the National Autism Society; all took part in events as part of this project, with more than twice the expected numbers from these groups engaging with Explore Your Universe activities.

Meeting your Explore Your Universe contracted deliverables

An area in which Techniquest Glyndŵr successfully exceeded their contracted delivery targets was with family and community groups, with 244 more people than anticipated engaging with Explore Your Universe through the family show.

The number of events for school pupils engaging through the Bursary scheme was unfortunately slightly lower than anticipated. Although six events happened, schools did not always bring the amount of students they had originally booked in, possibly due to pupil absence or other school activities, and so 15 less pupils than were expected took part in the Explore Your Universe activities at the Science Centre.

The outreach visits however again slightly exceeded the targets, as seven events were delivered rather than six, and a total of 619 students and teachers took part in the Explore Your Universe workshop. The seventh delivery was a result of lower than expected numbers from the original six events, during which the maximum number of workshop sessions did not occur. However, as money had been saved from the shorter events attended by science communicator staff, Techniquest Glyndŵr was able to arrange the seventh event in order to raise the numbers to meet the target.

Marketing, press and social media engagement

Between the 5th and 20th of June 2017, Techniquest Glyndŵr strongly promoted the 'After Hours' event using social media, as well as listing the event on websites for the Festival of Learning and Adult Learners' Week. The event was also listed on Eventbrite, and details were emailed to Techniquest Glyndŵr's mailing list. Posters and flyers were also created to advertise this event, and were distributed around Wrexham town centre.

From 5th June to 14th July 2017, the Explore Your Universe family show was advertised on the Techniquest Glyndŵr website, as well as through their social media channels, to promote the weekends that the family show was running in the Centre.

Live tweets and Facebook posts were made on 23rd June to promote the Explore Your Universe activity being undertaken by the female students at the International Women in Engineering Event, which were shared by other contributors to the day and the schools involved.

Between 27th September and 1st October, there was promotion on social media for the family event for the Wrexham branch of the National Autistic Society, who also advertised the event themselves using posters produced by Techniquest Glyndŵr.

Social media was also used to promote the Explore Your Universe activities that local home educator families took part in in November, and Jaclyn Bell's visit to the Centre to see the Explore Your Universe school workshop in action was also used to promote the project on social media.

Explore Your Universe legacy

The Explore Your Universe workshop for schools has been on the Techniquest Glyndŵr Secondary education programme since September 2017, and is available for school groups at KS3 and 4 to book at any time.

Techniquest Glyndŵr are also currently in the process of developing a new advanced show for KS4 and 5 students. The show will take place in their Stardome Planetarium, and will feature an immersive experience showing how atoms travel in the Large Hadron Collider, and will look into how atoms on Earth can give us clues about how the universe developed. The show will also use equipment from the Explore Your Universe kit to enhance student's learning experience.

The family show is on the Techniquest Glyndŵr public programme again for this year, giving visitors another chance to engage with Explore Your Universe, and this show will continue to be adapted and used for family and community groups in the future.

The work of STFC learnt about during this project is already being mentioned in other relevant activities delivered by Techniquest Glyndŵr staff, for example the James Webb telescope is often mentioned in Stardome Planetarium shows, and scientific research and developments from STFC will be featured at the monthly Astronomy Club held at the Science Centre.

Most of the schools engaged with through this project are ones that Techniquest Glyndŵr had previous relationships with, and they will continue to strengthen these relationships through further engagements in the future. The engagement through the Explore Your Universe project has allowed Techniquest Glyndŵr to extend its reach in mid-Wales as several of the schools in this area who were involved in the outreach programme are ones that Techniquest Glyndŵr have not previously engaged with. These schools have since become involved with further projects offered by Techniquest Glyndŵr, for example Ysgol Bro Hyddgen and Llanidloes High School have both signed up to participate in the RSC funded Young Chemistry Communicator project, and Ysgol Bro Hyddgen have also held one of Techniquest Glyndŵr's NSA funded transition days at their school.

Working towards the mission statement for phase 3 of Explore Your Universe has impacted Techniquest Glyndŵr's approach to developing new content for schools, as from audience feedback and staff observation, it is clear that the hands-on activities provided by Techniquest Glyndŵr have inspired interest and a sense of excitement amongst students around the physical sciences. Participants enjoyed the opportunity to get hands-on with equipment not normally available to them, and it inspired them to think more about the practical applications of the technology and how it relates to them. As a result of this, Techniquest Glyndŵr will most likely use the model of a workshop which allows participants to explore the equipment for themselves again in the future.

Your best case study

One aspect of Techniquest Glyndŵr's delivery of the project that was particularly impactful was the use of the Explore Your Universe workshop at the International Women in Engineering event. The Explore Your Universe workshop was chosen as an activity for this day to give the female pupils an insight into current scientific research being done in the UK, in order to highlight the career possibilities available to them and raise their aspirations for pursuing a career in STEM. From the feedback gathered from the female participants it appears the activity was highly successful in its aim to engage more girls with STEM subjects, as 99.5% of students who participated in the activity said it had increased their understanding of engineering, and 99% said it had raised their awareness of STEM careers. More notably, there was an overwhelming response from the students who said the activity had inspired them, and 93% of students said the event had given them the feeling that STEM careers could be for 'people like me'. Initiatives such as this are hugely important at addressing the huge gender imbalance within STEM, as the female students largely went away feeling more enthusiastic and more confident in engaging with STEM subjects. Following the Explore Your Universe session, one student said they had learnt that STEM "offers many different jobs and opportunities", while another participant said the activity had helped them "not to feel pressured by stereotypes within the field of STEM".

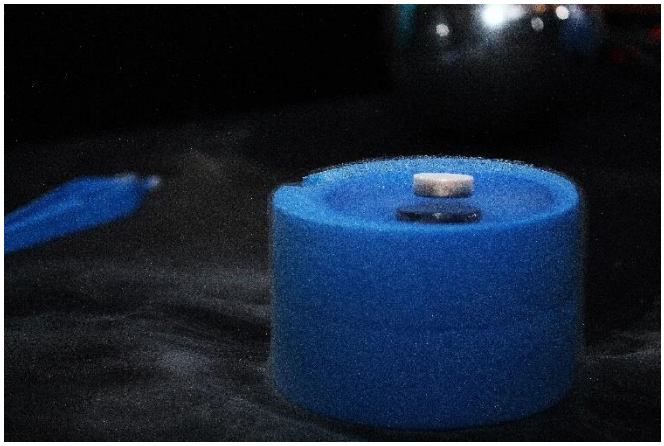
Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
	90		120			

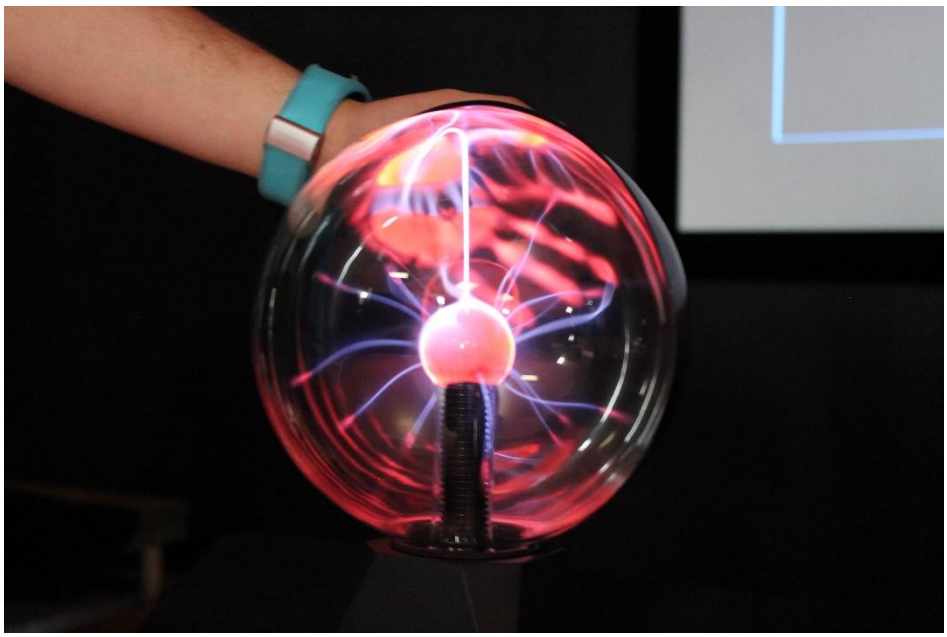
Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
	100		190			

*or as agreed by the ASDC project manager.

Quotes from families, teachers and schoolchildren



Photos of the super conductor experiment from the Atoms to Astrophysics family show. (Photo credit- Techniquest Glyndŵr- permitted to use in future publications)



"*Very informative talk and visual elements were very good"* – parent at home educator event.

"The Plasma ball and the Van der Graaf machine. In fact the whole talk was fantastic. Thankyou!" – audience member at family show 20/6/17.

Photo of plasma sphere demonstration in family show (Photo credit- Techniquest Glyndŵr- permission to use in future publications)

"*The show was really interesting and the experiments were cool"* – child at NAS event.

Families who are members of the Wrexham branch of the National Autistic Society getting hands-on with the Explore Your Universe kit.

(Photo credit- Techniquest Glyndŵr- photo permission given by parents to be used in future publications)

"Hands on activities were excellent and well planned" – Teacher from Hawarden High School

Pupils getting to grips with the thermal imaging camera.

(Photo credit- Techniquest Glyndŵr- permission to use in future publications)

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

All staff involved in the Explore Your Universe project were enthusiastic about the opportunity it provided to work with high-end kit and engage people with scientific research currently being done in the UK. The quality and range of equipment provided as part of this project was highly praised by staff, and all deliverers of the workshop were excited to facilitate hands-on learning using this equipment, as they appreciated that it is not usually freely available to school's students or public audiences. Feedback from presenters about the quality of the workshop that was developed was highly positive, with one commenting that it was "nicely put together- plenty of content to keep students engaged through the whole session". Staff have also commented on the relevance of the topics explored through this project, and several staff members have used their own learning from this project to inform their presentations of other activities, for example the Stardome Planetarium shows, and to assist their development of activities for event such as the Astronomy Club.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

Techniquest Glyndŵr staff attending the Explore Your Universe training academy were initially unsure what the STFC was, however over the course of the two days their understanding improved greatly. This knowledge was then passed on to other staff members, and subsequently a number of colleagues attended STFC lectures delivered at Daresbury Science Park in their free time. Kevin Jones, who attended the training academy and visited CERN as part of this project, has since used knowledge gained through this project to develop the new KS4/5 dome show, which will incorporate the themes of Big Telescopes and Inside the Atom. Many of the staff involved in this project now follow updates from STFC on social media, and content is often shared amongst staff for their own interest.

How many staff members took part in Explore Your Universe phase 3?

In total there were seven member of the science communicator team involved in the delivery of the Explore Your Universe activities, and one member of the education team involved in the development and evaluation of these shows and workshops. Three members of Techniquest Glyndŵr science communicator staff attended the training academy at the Royal Observatory in Edinburgh. Kevin Jones, the lead presenter for this project, then developed the family show and workshop alongside Dawn Pavey, then Projects Coordinator. Four members of staff were trained in the family show, and delivered this to public audiences during the six weeks it was on in the Centre. Three of these presenters, plus an additional two (including a fluent Welsh speaker), were then trained in the workshop for schools, and these five then became the core team of deliverers of the activity. Several other staff members also interacted with pupils as they took part in the school's workshop, as they assisted the main presenters in facilitating the pupil's engagement with the activities.

Explore Your Universe Equipment

The feeling amongst Techniquest Glyndŵr staff is that the equipment provided is fantastic; there are lots of novel things that most people have not had chance to see before. Staff also liked that the equipment had relatively little consumables, so they could effectively develop the workshops and store it ready to go for each delivery, with no need to constantly replace items used, always a winner with presenter staff!

The IR camera, Van de Graaf, and spectroscopy demo have been regularly used in other activities as they are great educational tools for schools and public alike.

Despite being pitched slightly above the normal level of a Techniquest Glyndŵr family show, the EYU public show was received really well as there were enough visual and interactive demos to keep everybody happy, and more enthusiastic adults were pleased to see the real world applications of current science.

Teachers were particularly impressed with the salad bowl accelerator, and many have vowed to recreate their own. They were also pleased to see us use the IR camera to demonstrate conduction, convection and radiation; something which they are unable to do in class as they don't have the resources.

The only disappointments staff have reported with the equipment was that they were unable to get the cloud chamber to work, and that the quality of the Ferro fluids deteriorated fairly quickly.

Techniquest

Report summary

Techniquest was delighted to be one of the partner Science and Discovery Centres selected to deliver Explore Your Universe Programme, giving us the opportunity to engage with schools in disadvantaged and underserved schools and for pupils to participate in a workshop that used the amazing stories and technologies of the STFC to inspire a sense of excitement around the physical science.

Techniquest delivered the Explore Your Universe workshop to a total of 1,287 Primary aged pupils.

The big question posed by the workshop was how do scientists discover more about the universe, from tiny particles making up atoms to stars and galaxies? The workshop was highly interactive providing opportunities for pupils to;

- Explore the particles that make up atoms and how the behaviour of these particles enable us to stick a balloon to a wall or make our hair stand on end.
- Experiment with a Van de Graaff generator, strip lighting, magnets and a smart material called ferrofluid, to explore magnetic and electric fields.
- Discover how splitting light and a thermal imaging camera allow scientists to find out about stars hidden inside clouds of cosmic dust.

The ideas explored during the workshop were linked to the work of real scientists and the STFC in the UK today and how scientists use these ideas to discover more and more about the universe we live in.

The EYU workshop was a mixture of demonstrations and pupil team challenges. The workshop included a number of science communicator presented lively demonstrations introducing the topic. Pupils were then encouraged to apply their new found knowledge to a challenging task which they carried out in small groups. On completion of the task, pupils then discussed their findings. They are encouraged to reflect on what they have discovered through experimentation.

100% of teachers loved the activities that engaged their pupils making science lessons more fun. They also all mentioned that they would not have the resources or equipment in schools to be able to do any of the activities.

Introduction

Techniquest delivered the EYU workshop to 13 schools and a total of 1,287 year 3-6 pupils. The workshops were delivered to schools:

- In disadvantaged areas
- With high rates of free school meals
- Rated as having areas needing improvement in terms of RAG ratings
- That were not regular visitors to Techniquest.

As a result of funding Techniquest was able to offer the workshop to these schools at the subsidised rate of £100 for four workshops. This makes the workshop less than £1 per pupils and so the targeted schools were able to afford it.

Programmes delivered

Techniquest applied for the bursary scheme for funding to subsidise the costs of delivering the workshop. Techniquest has had its core funding from Welsh Government reduced and strategically it has been decided that all workshops have to be fully funded/full cost recovery. The funding enabled Techniquest to provide a subsidy to schools for the EYI workshop. Techniquest only advertised the workshop to areas that are known to be high in terms of multiple deprivation. Additionally, we wanted to support those schools identified as needing improvement in the RAG ratings. Of the 13 schools that received the workshop– all in disadvantaged areas- 11 of the schools were categorised as yellow or amber. Of the 13 schools that received the workshop seven of the schools had at least 25% free school meals with the remainder having 15-20% free school meals. The selected schools are not regular visitors to Techniquest and this was another variable taken in to account in allocating the subsidised workshop.

Audience specific engagement

A. Inspiring family audiences

Not applicable

B. Engaging communities and under-represented groups

Not applicable

C. Gender reach

The workshop was delivered to a total of 1,287 pupils of which 619 were girls and 668 were boys.

D. Additional Explore Your Universe Activities (not grant-aided)

The EYU workshop is now part of Techniquest's programme for schools and will be advertised on the website.

E. Developing new relationships

Schools were selected because they were not regular visitors to Techniquest or did not book outreach. It is hoped that by experiencing this exciting and stimulating EYU workshop that the schools will realise the benefit of working with Techniquest to enrich and enhance the STEM curriculum.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)			
Contracted Deliverables **Type of event or activity**	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Delivery of workshops	12	100	1,200
Overall TOTAL number of participants: 1,200			

Final delivery numbers

Final delivery numbers as of January 20th 2018			
Contracted Deliverables Type of event or activity	**Number of events/activities**	**Number of participants per event/activity**	**Total number of participants**
Delivery of workshops	13	Varied from 57-120	1,287
Overall TOTAL number of participants: 1,287			

Of the sessions you ran, how many of these were with target schools / groups?

Techniquest only advertised the workshop to areas that are known to be high in terms of multiple deprivation. Additionally, we wanted to support those schools identified as needing improvement in the RAG ratings. Of the 13 schools that received the workshop– all in disadvantaged areas- 11 of the schools were categorised as yellow or amber. Of the 13 schools that received the workshop seven of the schools had at least 25% free school meals with the remainder having 15-20% free school meals. The selected schools are not regular visitors to Techniquest and this was another variable taken in to account in allocating the subsidised workshop. All of the selected schools met at least one of the aforementioned criteria.

Meeting your Explore Your Universe contracted deliverables

The fact that Techniquest was able to subsidise the cost of the workshop to the targeted schools ensured that the deliverables would be met.

Marketing, press and social media engagement

Techniquest tweeted prior to each delivery stating that EYU will be visiting the schools.

Explore Your Universe legacy

- The EYU workshop will be part of the programme we offer to schools
- If and when applicable the demos and equipment will be used in other workshops and shows
- Techniquest, like ASDC /EYU, has its core the mission to engage, excite and enthuse audiences and also has a strategic aim to work with disadvantaged and underserved groups and we will continue to develop and to deliver stimulating and exciting workshops. It is excellent when we have opportunities to work with ASDC on national engagement projects like EYU, Destination Space as then we know we are guaranteed programmes that address our mission as well as yours and partner organisations.
- Techniquest ensures that as a priority we market any subsidised programmes to the same schools as targeted by EYU. In SE Wales we have some of the most deprived communities in UK and it is imperative that Techniquest makes its attempt to address inequality.
- Techniquest was and is totally committed to the EYU mission of engaging schools in areas of disadvantage because it complements our own mission to do the same.

Your best case study

Explore your Universe workshop in Ysgol Santes Tydfil in Cymraeg.

Connor and Callum visited Ysgols Santes Tydfil to deliver the EYU workshop and the children and teachers were equally excited about the workshop and the fact that the workshop was delivered in welsh.

A number of the children commented on their evaluation forms about the welsh delivery:

- *"It was great that you speak welsh."*
- *"It was cool that it was in welsh."*
- The teacher agreed commenting "*Thank you for providing the workshop in welsh."*

The teacher felt that the workshop content would complement future lessons and that it managed to convey tricky concepts in a way that was accessible, engaging and relevant. The pupils also commented that they would learn more about the workshop content in future lessons- showing that the teacher must have emphasised this during the workshop. It shows that the workshop was not a bolt on experience.

Pupils in welsh medium schools are taught totally through the medium of welsh and so their English language skills take longer to develop- this makes spelling very interesting!

Copying exactly as the children wrote in respect of best bits of the workshop:

- *"I like the Barbis her as it sticd up and it was fune"*
- *"it was reli good"*

The spelling might be a challenge but the messages are clear.

Also the children really grasped that the Galaxy is very very big and atoms are small.

The word – spelt in a variety of ways!- that was mentioned the most was fascinating.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
210						

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
297				10		

Quotes from families, teachers and schoolchildren

Pupils learning by doing at YG Cwmbran.

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

Explore Your Universe was a good project to be a part of because it gave us an opportunity to explore different topics that we would not have necessarily discussed with KS2. It also provided a good platform to discuss Britain's involvement with cutting edge research. It was worthwhile being able to take demos, activities and equipment that would not have been available in schools.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

I feel like my colleagues are more aware of the STFC and the cutting edge research it funds. Colleagues were more aware of the role and profile of the work of STFC.

How many staff members took part in Explore Your Universe phase 3?

A team of four science communicators were trained to deliver the EYU workshop.

STFC Outcomes

Techniquest was delighted to be one of the partner Science and Discovery Centres selected to deliver Explore Your Universe Programme, giving us the opportunity to engage with schools in disadvantaged and underserved schools and for pupils to participate in a workshop that used the amazing stories and technologies of the STFC to inspire a sense of excitement around the physical science.

The evaluations from both pupils and teachers were excellent in terms of enjoyment, participation and understanding of concepts covered. Techniquest has an excellent reputation for delivering high quality workshops that enhance the curriculum. Staff enjoyed delivering the EYU workshop because it focussed on cutting edge research highlighting to pupils the continued importance of STEM. It has made developers at Techniquest aware of the relevance of science and to ensure that we reference the importance and significance of research as an integral part of developing future workshops. Science is not history and pupils must be made aware that research happens every day.

W5 Interactive Science Centre

Report summary

W5 was very keen to be involved in Explore Your Universe Phase Three from the time of the initial announcement. Explore Your Universe has been a very successful programme, enjoyed by all in W5 who participated in Phase Two. W5 was regretfully, not involved in Phase one of the programme.

Phase Three of Explore Your Universe (EYU) was particularly straightforward as W5 decided to use the parts of the Phase 2 programme which were identified as most effective and then roll it out to a wider audience. One additional advantage of the brief was the desire from to reach audiences that were far from STEM. This allowed W5 to reach geographically isolated communities and deliver a high quality physics engagement programme in their local schools.

In order to increase the value of the programme W5 decided to opt for a mix of the bursary and outreach elements of the programme. The outreach programme was more useful to schools who had large distances to travel to their nearest STEM provider or science centre and the bursary programme allowed schools who operated near W5 to avail of the science discovery centre's other facilities. This enhancement to the workshop was greatly valued by the teachers.

The initial delivery target for W5, as agreed in the EYU contract, was to deliver eight EYU workshops inside W5 to 240 students and to deliver five days of workshops on outreach to 600 students. This is a total of 840 students reached as a result of the funding. By the end of the delivery period W5 had delivered nine EYU workshops inside W5 to 259 students and delivered six days of workshops on outreach to 668 students. This was a total of 927 students reached as a result of the funding. The vast majority of the students involved in the workshops were Year 10 students. W5 felt that this was an important audience to target as these students are reaching a stage in their academic career where subject choices are available and can dramatically affect future career decisions.

The EYU Key Stage 3 workshop has been adopted into a plan of work that would allow schools to access it in the future should they wish to during a visit to W5. Some of the material from the EYU training has already been used to advise on content for other space and tech related content development in W5.

There were very few issues with the delivery of this programme as it was an extension of an already successful project. Some schools found transport costs a barrier to engaging with the bursary programme. Selected schools were invited to apply, targeted on their geographical location and access to STEM facilities, however there were schools who were outside of the criteria for application who found out about the programme and were disappointed that they could not participate.

Introduction

The main target of W5's outreach programme were schools in rural communities who are geographically remote from STEM provision as many opportunities are often targeted at schools in urban communities. These were identified through a combination of the index of multiple deprivation measure (Northern Ireland Statistics Research Agency) and using contacts in STEM Hub NI, which is based in W5. STEM Hub were able to ascertain which schools have less external STEM provision or are traditionally hard to reach.

It was felt that the most efficient way to use the funds available was to provide a combination of bursaries and outreach. From experience of delivering many funded programmes, W5 has learned that schools often perceive barriers to participation in different areas depending both on geography and limited budgets.

One of W5's priorities when delivering the Explore Your Universe programme was to maximise the numbers of students who could access a high quality experience. The majority of the bookings for the Explore Your Universe workshop in W5 have been by schools that experienced the workshop through the previous funding round so it was important to engage as many different schools as possible during Phase 3. This helps to build sustainability long after funding ceases. There is no substitute for first-hand experience when it comes to understanding the value of a programme. This was especially true when sharing some of the amazing stories from STFC facilities and staff.

Throughout the EYU workshop W5 sought to tell the amazing stories of staff and facilities. This was often done creating personal links to each of the stories like using Jocelyn Bell Burnell as a case study because of the local connection or showing pictures of W5 on a visit to CERN.

Programmes delivered

Bursary Schemes to enable schoolchildren from disadvantaged areas (remote from STEM) to take part in Explore Your Universe curriculum-linked workshops and to visit the science centre (not including travel bursaries)

The bursary scheme that W5 offered was created to offer eight workshop places for school groups that had been identified as benefitting most from the Explore Your Universe programme. They received a full subsidy towards the cost of the workshop and admission to W5. The schools who were successful are listed here along with dates the workshops took place; Holy Trinity College, Cookstown (21/09/17), Newry High School (29/09/17), Ashfield Boys High School (05/10/17) and Larne Grammar School (21/11/17).

The participating students in each of these schools were all Year 10 students with the exception of Larne Grammar School who brought a mix of Year 9, 10 and 11. All the schools selected were applicants from a list of schools who STEM Hub NI struggle to engage with and most of these being rated high on the indices of multiple deprivation measures (Northern Ireland Statistics Research Agency, 2010).

Holy Trinity College, Cookstown are based over one hour from their nearest EYU centre (W5 being the only one in Northern Ireland) which significantly contributed to their selection.

Newry High School are also located more than a one-hour drive from W5. The school catchment area is mainly in top 25% on IMDM.

Ashfield Boys High School, although the school Post Code does not register as being in an area in the top 25% of IMDM, the school catchment area is largely in top 25%. Within the school 40% of the pupils are eligible for Free School Meals, SEN registered pupils sit at 32%, with 61 pupils with statements. Latest inspection report highlighted the following areas as having important areas for improvement: overall effectiveness, achievements and standards, provision for learning, leadership and managements.

Larne Grammar School although being a grammar school in name, sits in an area inside the top 25% on IMDM and in top 10% most deprived SOA per district council. There were only 15 students from Larne Grammar engaging in this section of the programme. The reason these 15 were selected from Year 9-11 was that the teacher in charge wanted to reward some pupils for sustained effort in STEM during the previous academic year. The rest of Year 10 in Larne Grammar were involved in the outreach programme.

Travel Bursaries to enable schools from deprived areas, particularly rural areas across Northern Ireland, Scotland and Wales, to take part in an Explore Your Universe curriculum-linked workshop.

During the initial application W5 did not include travel bursaries as it was considered that this money would use as significant proportion of the funding and reduce the number of people reached by the programme.

After an initial mailshot to schools that met the criteria on either the Indices of Multiple Deprivation/ being geographically remote from STEM it was clear that some schools felt that they would enjoy the added value of a visit to W5 but could not afford to cover transport costs. As a result of this W5 reallocated £200 of the budget to provide £100 travel bursaries to Newry High School and Ashfield Boys High School.

These schools each received a visit to W5 and a 50-minute EYU workshop at no charge to the school.

An Outreach Programme for Explore Your Universe curriculum-linked workshops

Providing an outreach programme encourages school participation from those who simply cannot afford coach costs to transport entire year groups of students to STEM centres like W5. An outreach programme is a very efficient use of resources as it utilises the infrastructure that W5 already has in place for bringing the workshop to schools. Bringing the workshop to schools is often the best value for money when funding is restricted as you can reach much larger numbers of students in a shorter period of time.

Each of the schools in this section of the programme are schools who rarely engage with W5 or STEM Hub NI. Many of the schools also geographically remote from external STEM providers and others didn't have a physics teacher in their school. Physics was taught by non-specialists.

Outreach visits were delivered in five separate schools as was stated in the initial application and each of the participating schools received four 50-minute EYU workshops on the day. The participating students in each case were Year 10 with the exception of Ballymoney High School who chose Year 9 classes to be involved. All the schools involved (with the exception of St. Genevieve's High School) were mixed gender schools where close to 50/50 ratios are expected. St. Genevieve's High School is an all-girls school.

The schools participating in W5's outreach programme are listed below with the date of each visit and a brief description of why each school was selected:

Castlederg High School had a visit on 18th September 2017. They were selected because the school has a two-hour drive to nearest EYU centre of which W5 is the only one in Northern Ireland.

North Coast Integrated College had a visit on 25th September 2017. They were selected because the school is more than a one-hour drive from an EYU centre.

St. Joseph's College had a visit on 26th September 2017. They were selected because they rarely engage with external science provision and their catchment area mainly in top 25%. 54% of the students are eligible for free school meals, SEN registered pupils 26%, and the school has separate Learning Support Centre to help with educational challenges.

St. Genevieve's High School had a visit on 27th September 2017. They were selected because the school sits in an area in top 25% on the Indices of Multiple Deprivation Measures (NISRA, 2010).

Ballymoney High School had a visit on 3rd October 2017. They were selected because the school is more than a one-hour drive from the nearest EYU centre.

Larne Grammar School had a visit on 6th November 2017. They were selected because although being a grammar school in name, it sits in an area inside the top 25% on IMDM and in top 10% most deprived SOA per district council. Larne Grammar School also sent a small number of Year 9, 10 and 11 pupils who were high achievers in STEM to W5 as a reward for hard work in the previous academic year. These numbers were separated in the reporting.

Audience specific engagement

Your programme of activities will have led to engagements with many types of audiences. Please tell us how you successfully engaged with each of the following (A-E):

A. Inspiring family audiences

Approximate number of family audiences engaged: 0

B. Engaging communities and under-represented groups

Approximate number of community audiences engaged: 0

C. Gender reach

The majority of the schools engaged through Explore Your Universe phase 3 have been mixed gender schools and in each case the groups have been assessed to have a ratio 50:50 (girls: boys). St. Genevieve's High School is a school for girls with 118 students participating in the programme and Ashfield Boys' High School is a school for boys with 50 students participating.

In total this meant that out of the 927 students engaged, there were an assumed number of 498 girls and 429 boys participating.

There were very few gender related barriers when working with mixed schools although the language used in the workshop was specifically written to deal with gender bias in STEM against girls. Jocelyn Bell Burnell was specifically chosen to address this issue by incorporating her story as a positive female role model in physics without reinforcing the problem of mentioning negative stereotyping.

D. Additional Explore Your Universe Activities (not grant-aided)

The Key Stage 3 Explore Your Universe workshop was booked multiple times by Ballyclare High School since the conclusion of Phase 2. The teacher thoroughly enjoyed the workshop used the workshop to reinforce what was being taught in the classroom.

E. Developing new relationships

There have not been any new relationships developed by W5 as a result of participating in EYU Phase 3. This is mainly because there are limited facilities in Northern Ireland directly related to the work of the STFC. Strong partnerships were created during EYU Phase 2 and have continued on since then. Academic partners like Queen's University Belfast Astrophysics Research Centre and Armagh Planetarium/ Observatory have been invited to support several events since Phase 2. Critical industry partners like BOC also have a good working relationship with W5. W5 is called upon annually by BOC to support their school's engagement programme in return.

Contracted Explore Your Universe Deliverables (as in our proposal)

Original contracted deliverables (in original proposal & contract)

Contracted Deliverables Type of event or activity	Number of events/activities	Number of participants per event/activity	Total number of participants
Workshops in W5 through Bursary scheme	8	30	240
Workshops on outreach	5	4 * 30	600
Overall TOTAL number of participants: 840			

Final delivery numbers

Final delivery numbers as of January 20th 2018

Contracted Deliverables Type of event or activity	Number of events/activities	Number of participants per event/activity	Total number of participants
Workshops in W5 through Bursary scheme	9	~29	259
Workshops on outreach	6	4 * ~28	668
Overall TOTAL number of participants: 927			

Of the sessions you ran, how many of these were with target schools / groups?

All of the audiences engaged were target schools. Total 927 participants.

Meeting your Explore Your Universe contracted deliverables

There were very few challenges in the delivery of this programme. One of the most difficult moments was that class sizes were often slightly lower than teachers had anticipated upon application to participate. This margin of error was not factored into the original proposal so it meant that W5 had to seek an extra outreach visit to meet the agreed target.

Another minor challenge was finding enough schools to take part in the bursary programme. This was addressed by supplying a £100 travel bursary to two schools who eventually participated. This fund proved critical to overcome the perceived barrier of travel costs.

Marketing, press and social media engagement

W5 utilised social media platforms and website to promote our involvement with the Explore Your Universe programme W5 website has an average of 26,000 monthly 'users' and an average of 38,000

monthly ‘sessions’. W5 social media: Facebook ‘Likes’ – 29,130 Twitter ‘Followers’ (W5atodyssey, W5Education & STEMW5) – 4,200".

This programme differed slightly from other funded programmes that W5 has been involved in because of the very specific criteria for participation and limited number of participants. It was felt early on in the development process that it should not be advertised publically as a targeted mailshot would be much more efficient.

W5’s social media interactions with regard to this programme were mainly to promote the work of STFC and the wider Explore Your Universe programme rather than pushing teachers to apply for participation.

Explore Your Universe legacy

It is W5’s intention to continue to offer the Explore Your Universe Key Stage 3 workshop to schools who are interested in exploring physics or technology based material. The family show will also remain part of a bank of shows which can be rolled out onto W5’s exhibition floors at suitable times of the year like World Space Week in October.

W5 are currently not running any other workshops which use the equipment regularly, however many of the amazing stories have been integrated into other activities. A new show has recently been created for W5’s inflatable planetarium and it focuses heavily on the James Webb Space Telescope. The visit to the Royal Observatory Edinburgh as part of the training for EYU phase 3 has been critical in understanding the UK’s involvement in MIRI.

Links to local academic and industry partners will be maintained and strengthened over the coming years as it is clear that engagement is mutually beneficial and provides added value to both the partners and public.

It was clear that the equipment used during EYU workshops was valued by teachers and contact was made by a teacher at St. Genevieve’s High School who wanted order details on the infrared camera that was used during the outreach visit as he was keen for the school to buy one in their next budget.

Working on Phase 3 of EYU has certainly provided an evidence base that a holistic approach to teaching science is appreciated by teachers who are often forced by time constraints to teach parts of the curriculum in isolation. Including elements of history and personalising the big stories helps students to fully engage with the content and leads to comments such as “I understand that. That is the first thing in science I actually understand.” Year 10 girl in Larne Grammar School.

Your best case study

St Genevieve’s High School

St. Genevieve’s High School is an all-girls school in West Belfast. The school does not currently have a STEM club or a physics teacher within the school for year 13/14 classes.

Brendan Kerr, one of the teachers in St. Genevieve’s High School contacted STEM Hub NI about trying to encourage the students in the school to think more about STEM opportunities. STEM Hub was aware of the Explore You Universe programme and got in touch with the Education Team at W5. Soon after applying to participate it was clear that Explore Your Universe could potentially be very effective in inspiring the girls at St. Genevieve’s.

W5 visited all the Year 10 students in St. Genevieve's on 27th September 2017. Each class took part in a 50 minute Explore Your Universe workshop in which the students explored STFC's big themes of Big Telescopes, Inside Atoms, Amazing Materials and Big Data. The students were able to build their own telescope using a metre stick, two pieces of blue-tac and two lenses as well as investigate interactions of subatomic particles with balloons and a Van de Graaff generator, as well as replicating Sir. Isaac Newton's famous experiment when he split light.

The students spent time thinking about the past, present and future with Galileo, Jocelyn Bell Burnell and the scientists working of the James Webb Space Telescope. All-in-all it was a whistle-stop tour around our Universe before consider the potential in the room for new innovation in science and technology.

The teacher in charge was so impressed he's now on the hunt for funding to secure an infrared camera for the school! Could this be the start of a STEM club in the school? W5 hopes so.

Evaluation and Impact of Explore Your Universe programme

Contracted online evaluation data input (by December 1st 2017)						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
	30		180			

Final online evaluation data input as of December 1st 2017*						
Outreach		**Inreach**		**Teacher / CPD**	**Careers**	**Other (please specify)**
Primary	Secondary	Primary	Secondary			
	103		181	8		

Quotes from families, teachers and schoolchildren

- "I understand that. That is the first thing in science I actually understand." Year 10 student, Larne Grammar.

How Explore Your Universe worked for your Centre

How did you and your colleagues feel about Explore Your Universe?

The training for Phase 3 was very useful and inspiring. I felt it was essential to get the first-hand accounts of people working in STFC facilities and see the facilities themselves in order to have integrity during the whole programme. This was especially useful considering that some of the individuals working on the programme were non-physics specialists. It is easy to talk about

something that has been developed by someone else, but when audiences want to know more you have a reserve of information to draw upon.

Some of the demonstrations and activities that were provided at the training were not suitable for the audience and the format W5 had chosen to work with but I feel there is still benefit in seeing these. The modular nature of the activities not only allows individual centres to choose which parts they feel might be most appropriate but also to think of different ways of working that might be employed by other centres. Demos that are poor models (like the particle accelerator bowl) can be used to provoke and empower other learners as long as the presenter is aware and interacts with the audience appropriately.

Delivery of Phase 3 was very straightforward. A lot of the more complicated and expensive demonstrations such as the cloud chamber had been dropped from delivery during Phase 2 in W5 in favour of more simple experiments which demonstrated fundamentals. The infrared camera and U.V. experiments were effective but it seemed that the single experiment that got the best reaction was making a telescope using a metre ruler, two pieces of blue-tac and two lenses. The presenters felt that this experiment reflected one of the key messages of Explore Your Universe which was that of promoting accessibility to fundamental science.

Do you feel that your colleagues are more aware of STFC's science and technology as a result of the Explore Your Universe programme?

The education department are definitely more aware of STFC's science and technology now. The EYU newsletter was circulated round the team when it came in and several of the team twitter accounts follow STFC Matters. W5 has subsequently put in its own funding application to the STFC which was successful part in thanks to the new confidence the team has around STFC's themes.

Each time a school workshop was coming up, a current affairs section of the PowerPoint presentation would be updated with STFC research that was being tweeted that week. This also covered anniversaries of events of 2016 and the launch of XFEL.

The easiest way to help students engage with the research and technologies was often to include applications and the concept of down-streaming. Posing the question of what a smart phone would look like without prior investment in space technologies seemed to motivate Year 10 students to take an interest in projects like the James Webb Space Telescope.

How many staff members took part in Explore Your Universe phase 3?

During Phase 3 of Explore Your Universe in W5 there were two members of staff who were trained to deliver workshops and three staff that were trained to deliver the Explore Your Universe floor show. Some of the EYU material was used to inform and inspire a further member of staff who developed a separate show in W5's inflatable planetarium.

STFC Outcomes

In very practical terms, W5 hopes that this programme has inspired science-led initiatives in the schools that were involved in Phase 3 whether in-house or with external providers. As mentioned in the case study already, some teachers were very impressed with individual pieces of equipment that were used during the programme and have the intention of purchasing these pieces for their own schools. It would be our intention, and often the intention of teacher who made contact to become involve in Explore Your Universe, to see an increase in the number of pupils keeping science as part of the subject choices for longer in their academic career.

More broadly that that, W5 would expect that the holistic approach to presenting science has aided students to appreciate the interdisciplinary nature of science and the requirement for a vast array of different skill sets and attitudes that are required to make science successful.

It would be a great encouragement to see these people with non-traditional scientific skills become inspired enough to pursue careers in science and technology in a way that uses their own creativity effectively whether in problem solving, communication or another under-represented pathway.

A short-term objective of this programme is that it would also become a regularly booked workshop within W5 that teachers value and that it would be a workshop that evolves and changes over time to reflect current research.