

BoxED Interim Evaluation Report March 2018

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1.0 Executive summary

[BoxED](#) is an outreach and widening participation initiative designed, developed and delivered by members of the [Faculty of Health and Applied Sciences](#) at the University of the West of England (UWE), Bristol. The scheme aims to provide inspirational and engaging workshops to secondary school pupils in the local area, particularly targeting widening participation and attainment in order to encourage a wide range of young people into higher education. The following report documents the key findings of an evaluation undertaken in conjunction with the [Centre for Research in Biosciences](#) (CRIB) and the [Science Communication Unit](#) (SCU), UWE assessing the levels of satisfaction with the service and the breadth of science capital in school children aged 11-16 years in the Bristol area. The evaluation examined BoxED activities between October 2017 and March 2018. Post-activity questionnaires and semi-structured interviews were employed to gauge opinions from a total of 376 school pupils and 2 school teachers. This evaluation forms part of a wider series of BoxED evaluation activities including additional questionnaires, observations and teachers interviews which are currently ongoing.

1.1 Key conclusions

- Generally, students enjoyed the activities offered to them by the BoxED scheme.
- Students found the experimental and hands-on aspects of the activities most appealing, as well as the opportunity to learn new things.
- Some students found the explanatory elements of the sessions to be less enjoyable.
- A very high proportion of the students that enjoyed the activities were definitely or likely to consider attending university in the future, with a large number inclined to study or work in a scientific field.
- Teachers were very satisfied with the project, especially with the levels of engagement that students showed during the activities.
- All teachers agreed that they would like to participate in a BoxED workshop again.

1.2 Key recommendations

- Continue to centre activities around the experimental and hands-on opportunities available to that specific subject, as these are most enjoyed by the school pupils and teachers alike.
- Explanations by BoxED staff should be concise and clear; with time taken to ensure that school pupils develop greater understanding of the technical language used.
- Greater attention should be paid to the logistics of the sessions on delivery; ensuring punctual timekeeping and fewer technical difficulties.

- Evaluation of BoxED activities to be developed further, to more clearly identify 'changes' in student attitude, participation, attainment and behaviour, pre and post activity.

2.0 Introduction

The main campus of the [University of the West of England \(UWE Bristol\)](#) is based in the North of Bristol, with additional campuses based around the city centre, Gloucester, and Hartpury, delivering a number of undergraduate and postgraduate courses to 28,679 students (UWE, 2018). The university consists of four faculties: the Faculty Arts and Creative Industries (ACE); the Faculty of Engineering and Technology (FET); the Faculty of Business and Law (FBL); and the Faculty of Health and Applied Sciences (HAS).

With a large and robust network across the city, the [Faculty of Health and Applied Sciences](#) has often contributed to and supported various Science, Technology, Engineering and Mathematics (STEM) events within the community, including public engagement as well as school and college interventions. However there have been several challenges in regularly delivering such activities. Although passionate about their subject and with a desire to participate in knowledge exchange and engagement, few academic staff based at the university were able to provide enough time to deliver their research to the public consistently in an appropriate format, as has been recorded elsewhere (TNS BMRB, 2014; Burchell, Franklin and Holden, 2009). School environments offer excellent opportunities for engagement, with teachers keen for content that might add value to their curricula, as well as opportunities to meet 'role models' (Bowater & Yeoman, 2013) but it can be hard to access schools, and design activities which are engaging to young people (Wilkinson & Weitkamp, 2016). Therefore public engagement events and school outreach activities were often arranged through informal connections via individual staff members at the university. This could have a detrimental effect, deterring future engagements of both staff and/or schools, as the model appeared patchy and sporadic.

Concurrently, UWE Bristol is recognised for its commitment to inclusivity, social justice and equality of opportunity. Its [2020 strategy](#) has the ultimate goal of 'transforming futures' through research, learning and teaching and knowledge exchange and this is mobilised around its [Widening Participation strategy](#) which seeks to:

- Build on the university's successes to date in widening access from under-represented groups, to UWE Bristol but also to HE in general
- Set out how we will collaborate with partners across our city region to remove structural barriers to progression into, through and beyond higher education
- Ensure that the programmes and support we offer is appropriate and enables all of our learners to succeed
- Support all of our graduates into successful and appropriate graduate outcomes; ensuring that under-represented groups are not less likely to gain a graduate level job or to continue to further study. (UWE Bristol 2017/18)

The development of [BoxED](#) (EDucation in a Box) in 2015 was designed to combine this widening participation agenda, with the practical issues facing UWE staff who were keen to

engage in school outreach activities but were time restricted, whilst also providing expertise to help staff tailor their subject knowledge appropriately for the audience. The additional key intention of BoxED was that it widen and maximise engagements with schools by providing a 'free' resource to them.

A proposed model was developed so that academic and research staff, supported by technical staff within Faculty of HAS and ACE, worked alongside each other to develop activities which could then be delivered by trained Faculty Student Ambassadors. An initial pilot was well received by both UWE staff and schools and sowed the seed to develop these resources further, as a significant opportunity to deliver outreach, widening participation and engagement (Bourne et al., in press; Last, 2016) . It benefited schools which were now able to more easily access inspirational STEM activities but also, serendipitously provided opportunities for university students to develop employment and enterprise skills, as well as their abilities to publicly engage and communicating the ongoing research of our university staff to schools.

3.0 Evaluation methods

The overall aim of this interim evaluation was to formatively assess the efficacy of the BoxED outreach initiative employed by UWE Bristol.

The objectives of this evaluation were to:

- Assess the breadth of science capital in school children aged 11-16 in the Bristol area.
- Determine the levels of satisfaction with the project, and identify possible areas for improvement.

The evaluation comprised the development of a post-activity questionnaire for school pupils in combination with retrospective semi-structured teacher interviews. The survey aimed to collect data from between 300 and 500 school pupils, with interviews carried out with at least 3 school teachers. This is an interim evaluation report, reporting on a selection of data collected between October 2017 and March 2018, with evaluation data still being collected and analysed in additional schools and from teachers.

3.1 Post-activity questionnaire

Data from 376 school pupils were obtained through post-activity questionnaires. Schools were selected based on their application and uptake rate into UWE Bristol, as well as their location within low widening participation areas.

Questions used in the post-activity questionnaire related to:

- Basic demographic information regarding the school pupil: age; gender; ethnicity; etc.
- School pupils' current science capital (ASPIRES, 2017) including but not limited to: levels of engagement with scientific content outside of the school environment; rates of participation in scientific interventions outside of school; perceptions of science as a future career prospect; recognition of a scientific network (family/friends).
- Student satisfaction levels with the project, and identifying areas for improvement.

3.1 Semi-structured interviews

Teachers were invited to participate in an interview if they had been present in the classroom during the BoxED intervention, and to gain a greater understanding of the school's needs in terms of outreach. Requests to participate in the semi-structured telephone interviews were sent on two occasions, in addition to forewarning immediately

after sessions had completed in the classroom. Two teachers have currently been interviewed. Although useful in providing extensive and intricate feedback, semi-structured interviews can be regarded as commitment-heavy and time-consuming; thus a low uptake rate of teachers was to be expected, especially during term time.

The semi-structured interviews centred around a series of open questions relating to:

- Particular aspects of the BoxED initiative that attracted teachers to book a session
- Teacher's opinions of the activities: what worked well; what requires improvement
- Probability of future bookings
- Perceptions of the relevance of the content used in BoxED sessions.

The evaluation had ethical approval from UWE Bristol, to inform participants of the nature of the evaluation, ensure appropriate consent measures were in place and that data was stored securely.

4.0 Results

4.1 School pupils

Data was gathered from five local schools which had participated in the BoxED project between November 2017 and December 2017, with a total number of 376 participants sampled¹. Of those 376 participants, 37.8% (n=142) were 11-13 years of age, and 61.2% (n=234) 14-16 years. 42.3% (n=159) of participants were female and 42.6% (n=160) of participants were male, with 57 participants preferring not to say, or not stating their gender. 74.5% (n=280) participants identified as White, 23.2% (n=87) identified as a Black, Minority or Ethnic (BME) group, and 2.4% (n=9) preferred not to say their ethnicity.

4.1.1. Science Capital

We asked students a number of questions which were designed to gauge their existing science capital. Table 1 shows that there were high levels of agreement with regards to the relevance and interest of STEM subjects. 95.2% (n=357) of participants either agreed or strongly agreed with the statement "*science and technology are relevant to everyday life*", whilst 88.2% (n=328) agreed or strongly agreed that "*I learn interesting things in science lessons*". There was a moderate difference in response to this question by gender, with 82.3% (n=130) of female students agreeing or strongly agreeing, compared to 94.3% (n=149) of male students.

Although 68.4% (n=255) of participants agreed or strongly agreed that they "*know quite a lot about science*", only 58.4% (n=219) stated that they feel "*confident giving answers in science lessons*" suggesting that knowledge may not necessarily translate to classroom engagement for all students. Males were more likely to agree with this statement, 94.3% (n=108) of males either agreed or strongly agreed that they were confident in giving responses to questions in class, as opposed to 82.3% (n=130) of females. There were slightly higher levels of confidence expressed by those who identified as Asian (75%, n=21) or Black 59.1% (n=13) identified as Black than those who identified as White (55.6%, n=155).

It was also apparent that interest in formal school settings did not always relate to experiences informally. 71.4% (n=266) of the evaluation participants, though identifying the relevance of science and expressing at least some interest, do not actively read about science in the news, books and magazines, or watch scientific TV programmes. Once again males were slightly more likely to agree with this statement (Q4f), 34.6% (n=55) of participants who agreed or strongly agreed with this statement identified as male, whereas

¹ BoxED is delivered to approximately 5,000 pupils per year, 376 therefore exceeds the number of responses required (n=357) for a statistically representative sample.

23.4% (n=37) identified as female. Nor were students particularly searching online for science content, with only 39.3% (n=147) of participants saying this was something they did. This statement (Q4i) did demonstrate some difference of opinion by gender, with 48.4% (n=77) of males agreeing or strongly agreeing that they searched online, as opposed to only 30.4% (n=48) females. Interestingly, those participants that identified as Black showed the highest levels of engagement with online scientific content, with 72.8% (n=16) in agreement with this statement, compared to 36% (n=100) of respondents who identified as white.

The majority of respondents, at 71.7% (n=269) stated they do not often visit science museums, schools, or science events outside of school (Q4g), with only 28.3% (n=106) students saying this was something they did often. There was no obvious difference according to gender or ethnicity in response to this question.

Table 1 Science capital assessment of school pupils (n=variable per question).

	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)
Q4a - Science and technology are relevant to everyday life. (n=375)	43.7	51.5	4.5	0.3
Q4b - Studying science can lead to a broad range of careers, not just being a 'scientist'. (n=376)	43.1	53.7	2.9	0.3
Q4c - I learn interesting things in science lessons. (n=373)	29.2	59	10.2	1.6
Q4d - I know quite a lot about science. (n=373)	10.2	58.2	27.3	4.3
Q4e - I am confident giving answers in science lessons. (n=375)	13.6	44.8	32.5	9.1
Q4f - I actively read about science in the news, books and magazines or watch scientific TV programmes. (n=373)	7.2	21.4	47.5	23.9
Q4g - I often visit science museums, zoos, and science events outside of school. (n=375)	5.9	22.4	47.7	24
Q4h - I talk to my friends and family about what I learn in science lessons at school. (n=373)	9.9	34.3	35.4	20.4
Q4i - I go online to find out about science (e.g. websites, You Tube, science games). (n=374)	9.6	29.7	36.6	24.1
Q4j - I am part of a science club. (n=374)	1.9	2.4	37.2	58.6

55.8% of participants (n=208) said they do not talk to their families or friends about what they learn in science lessons. Females appeared to be slightly more likely to talk about science with their peers and family: with 47.4% (n=75) agreeing or strongly agreeing to this statement, as opposed to 44.3% (n=70) of males. Interestingly, those who identified as Black appeared to be the most engaged with talking about science outside of school, with 72.7% (n=16) agreeing or strongly agreeing with this statement. Only 42.5% (n=118) of those who identified as White showed agreement with this; 40.7% (n=12) identified as Asian; and 55.5% (n=5) identified as another ethnic group.

Only 16 of the students who participated in the evaluation were part of a science club.

This data indicates that BoxED activities have considerable potential to influence students participation and engagement during school time, particularly as students may not be as engaged in informal contexts or with their friends, care givers and families.

4.1.2 Enjoyment and Engagement

When asked how much they enjoyed the BoxED activities, 60% (n=216) of participants enjoyed the activities on the day, or enjoyed the day very much (Figure 1). 28% (n=103) were unsure and "did not enjoy or dislike the day". Whilst only 12% (n=46) of students said they did not really enjoy the activities on the day.

When asked "which part of today's activities did you like the most?", 69.7% (n=237) responded that they enjoyed the experimental/practical aspects of the activity the most. 22.1% (n=75) responded that they enjoyed learning new things. 1.8% (n=6) of respondents said that they enjoyed everything about the activity.

When asked "which part of today's activities did you like the least?", 26.9% (n=71) responded that they enjoyed everything, and did not dislike anything about the activity. 20.1% (n=53) disliked the informative/explanatory elements of the activity, and 11.4% (n=30) disliked some of the experimental/ practical aspects despite these being generally the most popular aspect amongst other participants. 9.5% (n=25) disliked filling in worksheets the most, as well as having to answer questions and fill in tables. 4.2% (n=11) most disliked the logistics of the session.

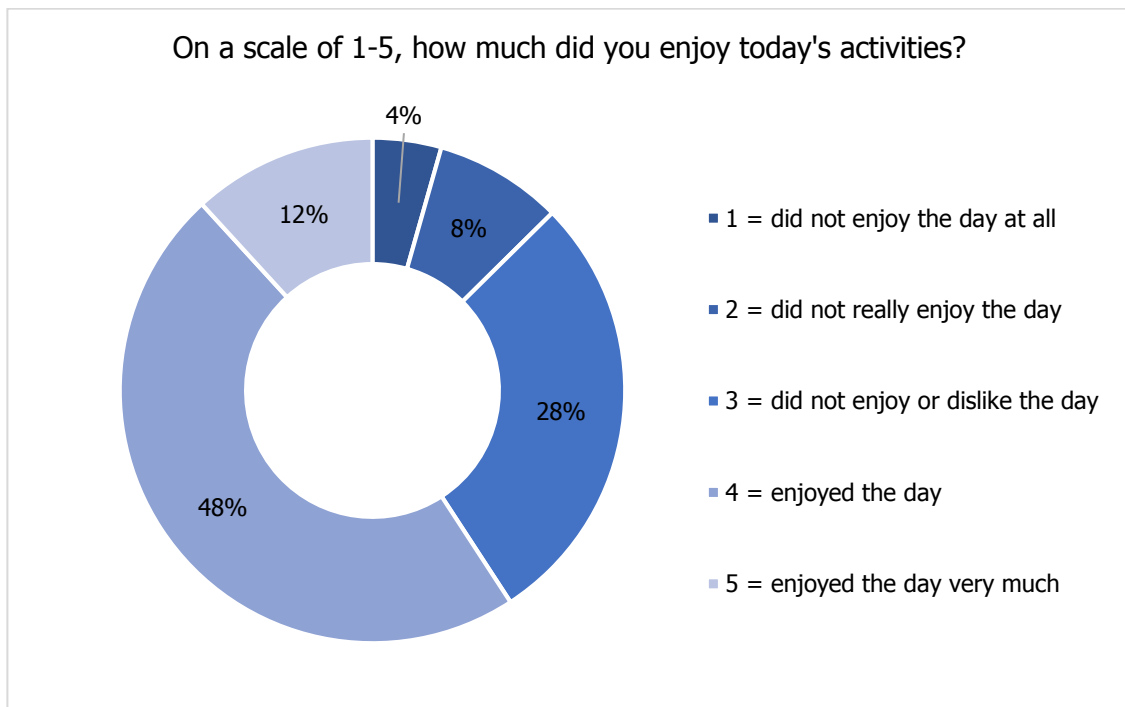


Figure 1 Assessment of student satisfaction levels with the activity (n=365)

We also examined in more detail those who did and did not enjoy the activities, and their future plans for university (Figure 2). For those planning to go to university, who stated they are likely to go or are definitely going to university, enjoyment levels were high, with 61% (n=130) saying that they enjoyed the day. For those that are unsure about university (54.8%, n=51), or who stated that they will not or are unlikely to go to university, enjoyment levels were still high (55.1%, n=16), suggesting the activities can be well placed regardless of a students future higher education plans.

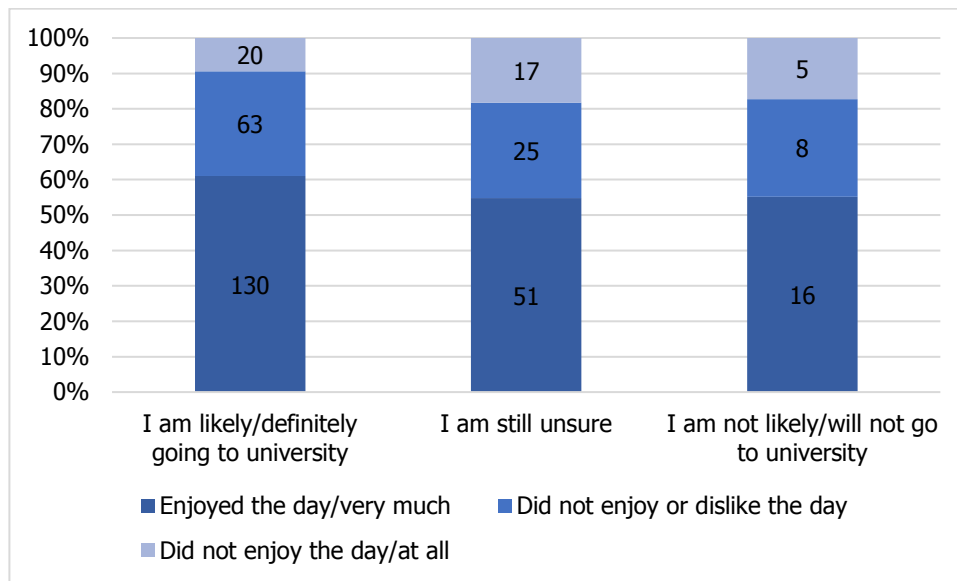


Figure 2 Participant enjoyment levels compared to their respective university considerations (n=335)

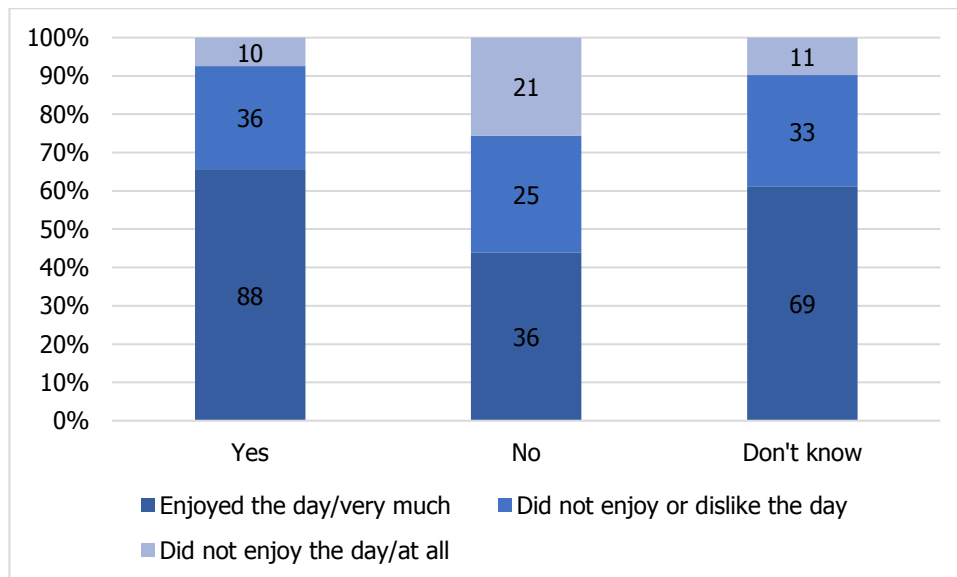


Figure 3 Participant enjoyment levels compared to their respective desire to study science in Further or Higher Education (n=329)

In regards to specific intentions to study science, Figure 3 shows that intentions to study science only moderately impacted on enjoyment of the activities. 65.7% (n=88) of students who answered 'yes, they might study a science subject in the future' enjoyed the day, and there was also high agreement amongst students who were undecided on whether they would, at 61% (n=69). Amongst those students who answered 'no' they did not plan to study science in the future there was moderately less enjoyment but still over two fifths of students reported enjoying it at 43.9% (n=36).

Of those participants who enjoyed the day very much, 61.5% (n=24) responded that they would like to work in a scientific field in the future (see Figure 4). Of those who did not really enjoy the day, 23.1% (n=6) said they would like to work in a scientific field, 50% (n=13) did not, and 26.9% (n=7) were still unsure.

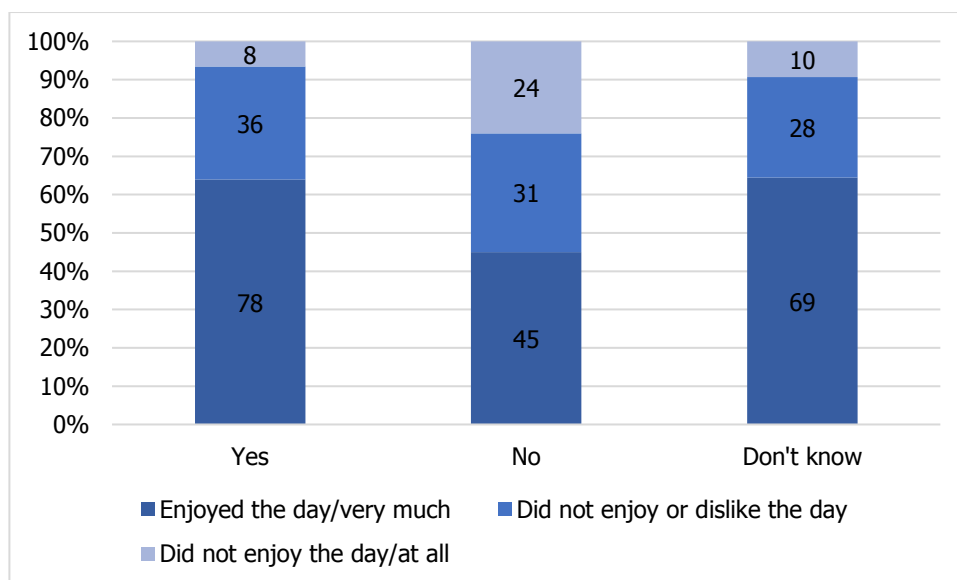


Figure 4 Participant enjoyment levels compared to their respective desire to work in a scientific field in the future (n=329)

Examining by gender, males were slightly more likely (66.4%, n=103) than females to report enjoyment of the activities (53.5%, n=83) but these responses aligned with other attitudes to science that were expressed.

Table 2 Participant satisfaction levels compared to gender (n=365)

	Male (%) (n=155)	Female (%) (n=155)	Prefer not to say (%) (n=17)	No response (%) (n=38)
Did not enjoy the day at all	1.9	4.5	23.5	5.3
Did not really enjoy the day	9.7	6.5	11.8	7.9
Did not enjoy or dislike the day	21.9	35.5	29.4	23.7
Enjoyed the day	51.6	43.2	35.3	52.6
Enjoyed the day very much	14.8	10.3	0.0	10.5
	100%	100%	100%	100%

4.1.3 BoxED participant comparison to other studies

In examining this data we also took the opportunity to compare participants perspectives to other existing datasets. Although the questionnaire was only distributed to participants post engagement with BoxED and therefore we are not able to gauge specific change due to the intervention, this data does suggest BoxED may compliment student attitudes and engagement with science.

According to Table 3, 96.8% (n=364) of BoxED participants agreed that studying science leads to a wide range of career options, which is considerably above recently collected UK (41%) and international data (24%). They were also more likely to identify the relevance of science to everyday life at 94.9% (n=360) compared to other research which has suggested this is typically identified by just over 1 in 4 students. They also reported above average interests in science.

Interestingly however these results suggest BoxED is, as intended, reaching students who may otherwise not be accessing science in their daily lives. 28.5% of BoxED participants engaged with science outside of school, compared to UK averages of 68% and 15 to 23%², internationally. This suggests for some students BoxED may be offering additional access to science which would not otherwise be available to them.

Table 3 Comparison of BoxED evaluation findings against other key datasets

	Wellcome Science Education Tracker 2017 (%) (n=4,081)	PISA 2015 results (%) (n=500,000+)	BoxED results (%) (n=376)
Engaged with science content outside school	68%	15-23%	(Q4f) 28.6
Visited a zoo or aquarium	26%	-	(Q4g) 28.2
Visited a science museum, science centre or planetarium	20%	-	(Q4g) 28.2
I find science interesting/I am interested in learning about science/ I learn interesting things in science lessons	68%	64%	(Q4c) 88.2
Science is relevant to everyday life	26%	-	(Q4a) 95.2
Interest in a science related-career/Studying science leads to a wide range of career options/I expect to work in a science-related career	43%	24%	(Q4b) 96.8

² PISA asks this as a series of questions to which there are differing rates of agreement.

4.2 School teachers

Two school teachers have currently participated in a semi-structured interview, but preferred to answer questions in an email format rather than verbally in person or over the phone, due to time constraints at work and ease of response.

When asked "what particular aspects of the BoxED project make it work for your school?", Teacher 1 responded,

"how practical and hands-on it was, the students really enjoyed it".

Teacher 2 on the other hand commented on the:

"ease of booking" as well as "how engaging the content is, and the fact that it's someone different [to teachers] delivering the content".

Teacher 1 continued to comment that she was inclined to book the activity because the project:

"linked so well to the GCSE specification".

Teacher 2 also responded that:

"we've had BoxED before and it was great, and it's also coming up to Science Week".

Both teachers responded that their favourite aspect of the activity delivered to them was often the practical elements, supported by the equipment that BoxED provides.

"The antibiotic resistant mini ball games were great fun, a really good way to explain this concept."

- Teacher 1

"The microscopes used with year eight really engaged the most difficult pupils."

- Teacher 2

Teacher 2 commented on an area for possible improvement, and highlighted their least favourite aspect of the activity:

"There would be a need to increase the pace of the sessions and also there would be some merit in some behaviour management sessions for BoxED staff around high expectations, (whilst we would like our students to not speak when someone is talking, this doesn't always happen and if the teacher steps in, it can undermine the presenters)." - Teacher 2

Teacher 1 did not provide any comments on areas for improvement, as well as least favourite aspects of the activity.

When asked for one word to sum up the activity, all respondents (n=2) answered with the word, "*engaging*".

When asked if respondents would like to participate in this kind of BoxED activity again, Teacher 1 answered "*Yes!*" and Teacher 2 answered "*Definitely*".

Additional data is currently being collected to supplement this qualitative information.

5.0 Key conclusions and recommendations

5.1 Key conclusions: School pupil perspective

Generally, students enjoyed the activities offered to them by the BoxED schools outreach scheme. Only a very small percentage of the 376 students that participated in the evaluation of the project reported not enjoying the activities that they participated in.

A large proportion of the students found the practical and experimental aspects of the activities to be most enjoyable, alongside the opportunity to learn new things. Many of the students enjoyed every aspect of the activities on offer, and could not suggest areas for improvement.

However, some students suggested that the explanatory elements of the activities could be improved, in addition to the session logistics (in regards primarily to session timing and technical difficulties with equipment or activities). Some suggestions of improvement were also given to the design of the worksheets and resources used during the session.

In terms of science capital, a significant proportion of student participants agreed that science is considered interesting, as well as relevant to their everyday lives. Only a small number of students engaged with science outside of the classroom, in the form of visiting science museums and zoos, reading scientific magazines, watching scientific television programmes, or speaking about science with their family and peers suggesting BoxED is reaching groups of pupils who may otherwise be underserved by informal science activities.

Of those that really enjoyed the activities, a large proportion of students were definitely or likely to consider attending university in the future. They were also inclined to study science at further or higher education.

5.2 Key conclusions: School teacher perspective

Although limited to a small sample size of teachers interviewed in the evaluation of this project at the current time, it was found that teachers were generally very satisfied with the BoxED scheme.

Highlights of the scheme included the high engagement levels that the activities instigate in their pupils, as well as the practical and hands-on nature of delivery. Other areas of appreciation included the relevance to the GCSE curriculum specifically, as well as availability during National Science Week.

One area for improvement was identified in BoxED staff classroom behaviour management, in order to garner greater respect for staff from school pupils.

All teachers currently interviewed agreed that they would like to participate in the BoxED outreach scheme again in the future.

5.3 Recommendations

- Continue to centre activities around the experimental and hands-on opportunities available to that specific subject, as these are most enjoyed by the school pupils and teachers alike.
- Explanations by BoxED staff should be concise and clear; with time taken to ensure that school pupils develop greater understanding of the technical language used.
- Greater attention should be paid to the logistics of the sessions on delivery; ensuring punctual timekeeping and fewer technical difficulties.
- Evaluation of BoxED activities to be developed further, to more clearly identify 'changes' in student attitude, participation, attainment and behaviour, pre and post activity.

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