

# Evaluation Report

## SMASHfestUK 2018 Festival FLOOD!



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April 2018

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## INTRODUCTION

SMASHfestUK are a London-based science and arts organisation who provide STEAM activities (Science, Technology, Engineering, Arts and Maths) in and around Deptford in the London borough of Lewisham. Lewisham is in the top 20% of the most deprived areas in the country<sup>1</sup>. People from this area have been identified as being at risk of having low science capital, with low science uptake post-16 and careers beyond<sup>2</sup>. SMASHfestUK aim to locate STEM within the heart of this community. They undertake school outreach programmes, pop-up festivals, engage and train young-people as STEM facilitators and hold a free week-long STEAM festival over February half-term. SMASHfestUK have held the STEAM festival in Deptford for four years running.

This report will present the evaluation of SMASHfestUK's 2018 half-term festival FLOOD! The Festival utilises a narrative theme to immerse hard-to-reach children and adults in activities that aid in STEM learning and encourage creativity. This year's theme was Flood!,

*“What would happen if the Thames burst its banks and Deptford become submerged? How would we survive? How could we escape? If Deptford turned into wetlands – what would we live in and what food would we live on? If we got into serious deep water and the whole earth was under threat, could we find another home somewhere in SPACE?”*

SMASHfestUK use this narrative as a tool to motivate adults and children to explore and immerse themselves in a multitude of STEAM activities that follow the general theme. Split over two venues, centrally located within the community, SMASHfestUK provided STEAM based activities that included kids' comedy shows, science themed theatre shows, interactive exhibits, science street performers, science experimentation, maths and engineering structures, STEM demonstrations, craft activities, computer programs and a virtual reality experience. Contributors from eleven universities, museums and academies presented activities (including representatives from, The Flood Hazard Research Centre, University College London, The University of Greenwich, Middlesex University, Kingston University, Queen Mary University of London, The London school of Hygiene and Tropical Medicine, The University of Sheffield, The Royal Astronomical society, The Royal society of Chemistry and The National Maritime museum). SMASHfestUK are enthusiastic about the community being involved in the running of the festival so they work with hard-to-reach teenagers from local schools and volunteer groups to design and facilitate some of the activities across the festival. They also recruit local volunteers to support the running of the festival (this year, some of these were from 'Heart and Soul' a disabled creative-arts community group).

Nationally, and at Governmental level there has been a drive for greater uptake of STEM subjects and for a more qualified and diverse STEM workforce in the UK<sup>3</sup>. This is said to be vital not only for the future economic standing of the UK, but also integral to the countries social development through the use of STEM skills in

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<sup>1</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/465791/English\\_Indices\\_of\\_Deprivation\\_2015\\_-\\_Statistical\\_Release.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/465791/English_Indices_of_Deprivation_2015_-_Statistical_Release.pdf) and <https://www.valewisham.org.uk/lewisham-facts-and-figures>.

<sup>2</sup> ARCHER, L, DAWSON, E, DEWITT, J. SEAKINS, A. AND WONG, B. (2015), "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. J Res Sci Teach, 52: 922-948. ASPIRES report, 2013. Young Peoples Career and Science Aspirations aged 11-14. Kings College London. And ASPIRES 2 Report, 2016. Year 11 Students' views of Education, Careers and Work Experience. February 2016. Kings College London. SOCIAL MOBILITY COMMISSION. STATE OF THE NATION 2016. : Social Mobility in Great Britain. November 2016. Social Mobility Commission.

<sup>3</sup> ROYAL ACADEMY OF ENGINEERING REPORT, 2016. The UK STEM Education Landscape A report for the Lloyd's Register Foundation from the Royal Academy of Engineering Education and Skills Committee. Royal Academy of Engineering and the INSTITUTE OF ENGINEERING AND TECHNOLOGY REPORT, 2008. Studying STEM – What are the barriers: A literature review of the choices students make

providing avenues that help to improve the populations quality of life<sup>4</sup>. There is a growing number of studies that show that children from economically disadvantaged backgrounds are less likely to take up STEM subjects post-16 and beyond into university and the workforce<sup>5</sup>. A number of studies have evidenced that other demographic groups can also be disinclined to follow a STEM pathway. Women are particularly poorly represented in engineering, physics and chemistry and some ethnic minorities have been shown to be under-represented in STEM post-16 and beyond (in particular Black African and Caribbean boys and girls)<sup>6</sup>.

The reasons behind low-uptake among certain demographic groups are complex. However, the concept of science capital has been useful in exploring barriers to STEM engagement that are both intrinsic or extrinsic that can influence participation in STEM<sup>7</sup>. It has been found that children from families well-versed in science and with a high science capital (typically from middle-class backgrounds) were disproportionately more likely to pursue STEM post-16 and beyond. The ASPIRES project found that many young people characterise science as 'not for them' or 'for clever people' at an early age and therefore isolate themselves from selecting STEM-related studies. Studies of young female pupils found that self-concept and self-image were often integral to their decision-making process<sup>8</sup>, and that the lack of female STEM role-models could contribute to this further<sup>9</sup>. Knowledge of STEM careers and pathways has also been found to be limited, with a common view that science qualifications are for those who want to be a doctor, teacher or 'scientist'. Research has shown how people are often not aware the range of STEM careers available outside of the 'big three'<sup>10</sup>.

SMASHfestUK aim to raise confidence in and shift attitudes towards STEM learning by contextualising and locating knowledge within a real-world context using a hands-on and creative medium to relay STEM concepts and theories. Enabling families to engage in creative exploration of STEM in a meaningful and accessible way is key to embedding STEM into the community and, in turn, raising the science capital of its participants.

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<sup>4</sup> HOUSE OF COMMONS PAPER, 2014, Examining Science, Technology, Engineering and Maths Education for ages 14-19. Parliamentary Office of Science and Technology, June 2014.

HOUSES OF PARLIAMENT RESEARCH POSTNOTE, Number 430. March 2013. STEM education for 14-19 year olds

DEPARTMENT OF BUSINESS, ENERGY AND INDUSTRIAL STRATEGY POLICY REPORT, 2017. Industrial Strategy: Building a Britain fit for the Future. 27 November 2017. Department of Business, Energy and Industrial Strategy.

<sup>5</sup> Fidler, P. (2015) 'STEM Careers: The national perspective' paper from the UK Association of Science Discovery Centres, Bristol 2015  
Archer, Dawson, DeWitt et al (2015) 'Science Capital': A Conceptual, Methodological, and Empirical Argument for Extending Bourdieusian Notions of Capital Beyond the Arts in *Journal of research in science teaching*, Vol 52, 7, pp 992-948

<sup>6</sup> (Mujtaba, Hoyles, Reiss et al, 2010, MacDonald, 2014). MACDONALD, A. 2014. 'Not for People like me?' Under-represented groups in Science, Technology and Engineering: A summary of the evidence: the facts, the fiction and what we should do next (WISE report 2014).

MUJTABA T, HOYLES C, REISS M, RIAZI-FARZAD B & STYLIANIDOU, F. 2010. Maths and physics participation in the UK: Influences based on analysis of national survey results. Institute of Education, University of London, London, United Kingdom.

<sup>7</sup> ASPIRES report, 2013. Young Peoples Career and Science Aspirations aged 11-14. Kings College London.

<sup>8</sup> DEWITT, JE, ARCHER, L & OSBORNE, JF 2014, 'Science-related aspirations across the primary-secondary divide: Evidence from two surveys in England' INTERNATIONAL JOURNAL OF SCIENCE EDUCATION, vol 36, no. 10, pp. 1609-1629

<sup>9</sup> CHAPMAN, S AND VIVIAN, R, 2016. Engaging the future of STEM: A study of international best practice for promoting the participation of young people, particularly girls, in science, technology, engineering and maths (STEM). Australian Government (Office for Women, Department of the Prime Minister and Cabinet), in partnership with the Chief Executive Women (CEW) Ltd.

<sup>10</sup> TIMSE Report, 2013. What Influences participation in science and mathematics? A briefing paper from Targeted Initiative on Science and Mathematics Education (TIMSE). INSTITUTE OF ENGINEERING AND TECHNOLOGY REPORT, 2008. Studying STEM – What are the barriers: A literature review of the choices students make. ASPIRES 2 Report, 2016. Year 11 Students' views of Education, Careers and Work Experience. February 2016. Kings College London.

## SMASHFESTUK AIMS AND OBJECTIVES

The aims and objectives of SMASHfestUK are as follows:

To produce an immersive science and arts festival with a strong narrative theme; engaging hard-to-reach audiences with STEM (women, young people, BME communities located in deprived areas).

1. Increase the science capital of the people of Deptford by:
  - i. Increasing knowledge of STEM opportunities and careers
  - ii. Providing opportunities that can bolster further conversation and interest between family members
  - iii. Increasing access to out of school science
  - iv. Providing opportunities to meet and network with STEM experts and professionals
  - v. Developing positive attitudes, values and dispositions towards STEM
2. To bridge the gap between arts and science and show how science is relevant to life (using real-life situations)
3. To engage a teenage audience in STEM by including them in planning and delivering SMASHfestUK 2018.
4. To grow a community of science communicators and develop relationships with scientific and cultural institutions to bring them to local communities.
5. To engage adult volunteers from groups underrepresented in STEM to promote diversity and increase representation.

## RESEARCH METHODS

The evaluation utilized front-end and summative methods that can both capture quantitative comparative data whilst allowing for qualitative reflection. The evaluation encompassed four principle groups using the following methods:

1. **Group 1:** The adult and child visitors to SMASHfestUK 2018

**Method:**

- Postcard-style self-administered evaluation form for adults (including closed and open-ended questions)
- Follow-up on-line qualitative questionnaire (sent to those who left email addresses on postcard forms)
- Micro interviews were conducted with 20 randomly selected adult visitors during the festival
- Children's paper self-administered questionnaire (these encompassed rating-visuals and open and closed-questions)

**Aim:** As well as providing key demographics and ratings, the adult and child visitor evaluation focused on two principle impacts: investigating key elements of science capital and providing evidence of learning and assimilation in both child and adult visitors. The micro-interviews focused on establishing the value of coming to the SMASHfestUK to adults and their families).

2. **Group 2:** The local young people who volunteered as Young Explainers

**Method:** Pre- and post-comparative questionnaire (closed and open questions)

**Aim:** to establish how far being involved in SMASHfestUK contributed to increasing the Science capital of the Young people and investigating the other impacts of being a young explainer.

3. **Group 3:** The science/arts contributors who presented at the festival

**Method:** A post-event on-line survey.

**Aim:** to find out what is the impact of being a contributor, what were the highs and lows. How could SMASHfestUK improve for next year. What examples of science communication/interaction can they provide.

4. **Group 4:** The Volunteers

**Method:** A post-event online survey.

**Aim:** to find out what is the impact of being a volunteer, what were the highs and lows. How could SMASHfestUK improve for next year. What impact did being a volunteer have on them?

The following report will present the results for each of these groups in four sections.

## SAMPLE GROUP FOR EVALUATION

The evaluators were successful in collecting a broadly representative sample for the estimated number of families in attendance across the two sites<sup>11</sup>. The table below provides the demographic of the evaluated sample group,

Group 1	Number of respondents - Deptford Lounge (5 days)	Number of respondents - The Albany (2 days)	Total respondents (across both venues)
Adult visitors (postcard)	90	98	188
Child visitors	142	148	102
<b>TOTAL</b>	142	148	290

Group 1	Number of respondents
Adult follow-up online survey	18
Micro-interviews (qualitative)	20

Group 2-5	Number of respondents	% of total available
Young Explainers Pre	18	62%
Young Explainers Post	10	35%
Volunteers	20	33%
Contributors	11	36%

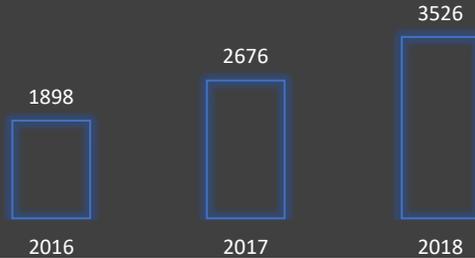
<sup>11</sup> This figure represents double the amount of last year's collection.

**3526**

Visitors  
Attended  
SMASHfestUK  
2018 FLOOD!  
STEAM  
FESTIVAL

The number of visitors to  
SMASHfestUK has risen each year

□ Total number of visitors to SMASHfestUK



**11**

Universities  
and  
Academies  
collaborated  
with  
SMASHfestUK  
in 2018

SMASHfestUK  
recruited over

**60**  
volunteers

from the local  
community and  
from partner  
universities to  
help deliver and  
facilitate the  
festival

**29**

Young-Explainers from  
areas under-  
represented groups in  
STEM participated in  
designing and  
facilitating activities at  
the festival

**49%** of all visitors to  
SMASHfestUK 2018  
Flood! were from

**minority  
ethnic groups**

(currently  
underrepresented in  
STEM post-16)

SMASHfestUK  
attracted more  
**female** children  
and adult visitors  
than male

**96%** of adult  
visitors rated  
SMASHFestUK  
2018 Flood!  
Excellent or  
Good

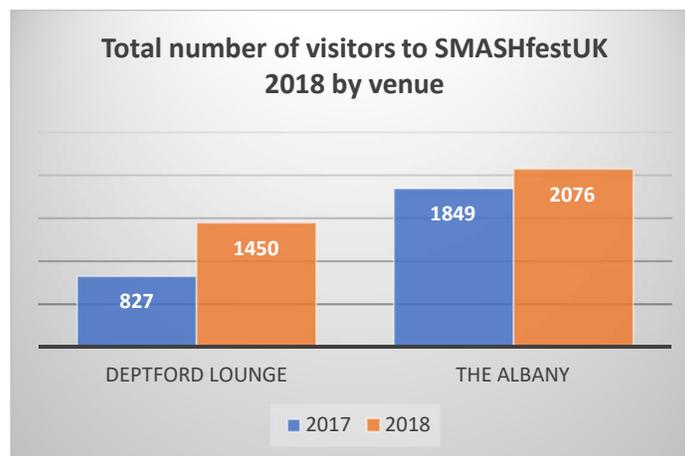
## TOTAL VISITOR FIGURES

The total visitor figures were calculated using tally counters located at the entrance of both venues. The tally counters recorded the total number of adult visitors and children visitors who attended the SMASHfestUK activities per day per hour<sup>12</sup>. The recorded adults and child total visitor figures per day are presented in the table below,

Time (each day)	Deptford Lounge (5 days)	The Albany (2 days)	Both Venues
10 to 11 o'clock	240	451	691
11 to 12 o'clock	267	292	559
12 to 1 o'clock	208	327	535
1 to 2 o'clock	262	345	607
2 to 3 o'clock	295	369	664
3 to 4 o'clock	178	292	470
<b>Total visitors</b>	<b>1450</b>	<b>2076</b>	<b>3526</b>

SMASHfestUK 2018 attracted approximately **3526 visitors** over February half term. These figures indicate an increase in visitor numbers year on year (see chart on page 9).

The chart below shows that the greatest increase in visitor numbers was seen at the Deptford Lounge. This venue attracted 623 more visitors than the previous year (a 75% increase). The Albany also saw increased visitor numbers, although on a smaller scale with 227 more visitors than in 2017 (a 12% increase). Overall, the Festival attracted 850 more visitors than the previous year, an increase of 32%.



The increase in visitors to the Deptford lounge could reflect the increased number, and variety, of activities that were located at this venue in 2018. Feedback from staff at the Deptford Lounge was overwhelmingly positive. Sopia Tupy (Duty Manager) commented,

*“The manner and facilitation that SMASHfestUK use is so effective for the local community. This is a free event, so it is great that it is accessible and engaging for*

<sup>12</sup> Due to available staffing, it was not possible to count the number of visitors who attended events at both sites, nor was it possible to count the number of members of the public who were engaged by the science buskers or Lab in a Lorry both situated in the market place between the Deptford Lounge and The Albany. This has been consistent over the two years.

*the kids making it a fun-day out for the family. Because they are making or doing things themselves the children have a personal investment with the arts and science because it is tangible – they can take it home. Being free is so important, because people in this area really struggle”*

Robert Condon (Library staff) suggested that not only did SMASHfestUK draw in over 50% more visitors than they would normally attract over half term, he also commented,

*“SMASHfest was brilliant last year and just as good this year! The organisation was excellent, and the exhibits held the children’s attention. It would be great to host SMASHfestUK during all of our school holidays”*

The 2018 advertising strategy adopted by SMASHfestUK took a hyper-local approach. Local marketing via flyers, poster and visits to resident’s associations, social clubs and local blog sites was employed. This was in response to 'word-of-mouth' advertising that has been the main local audience driver over previous years.

PICTURES OF SMASHFESTUK 2018, 'FLOOD! AT THE ALBANY'



PICTURES OF SMASHFESTUK 2018, 'FLOOD! AT THE DEPTFORD LOUNGE'



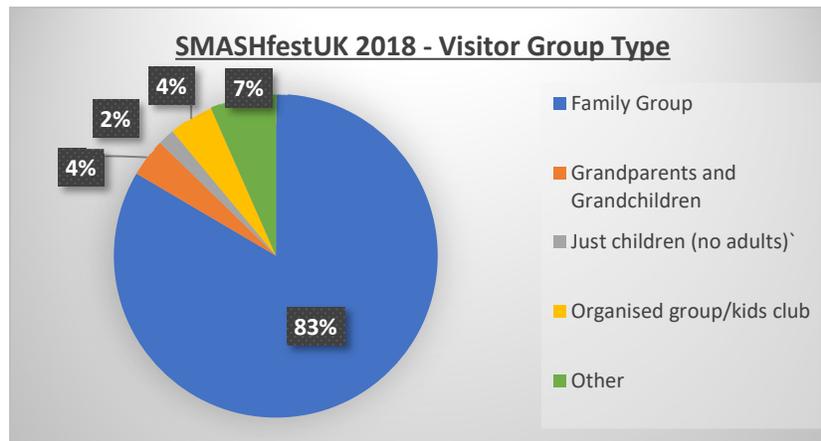
## RESULTS

### VISITOR PROFILE

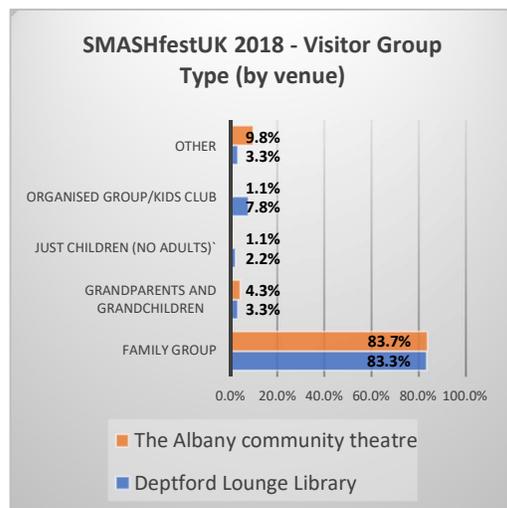
The following section presents the visitor profile of the 188 adult respondents who completed evaluation postcards at SMASHfestUK 2018 FLOOD! These numbers are broadly representative of the total number of families that visited SMASHfestUK over the February Half term<sup>13</sup>.

### GROUP TYPE

**83%** of the visiting groups that attended SMASHfestUK 2018 were **family groups**.



These figures were consistent across both venues.



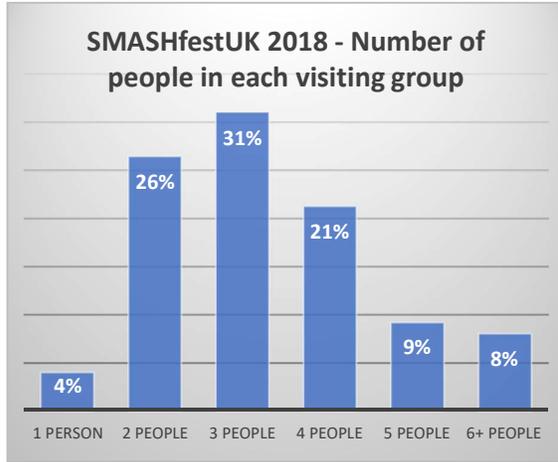
SMASHfestUK were successful in attracting family audiences with predominantly primary school aged children to their festival. The marketing approach and their links with local primary schools reflect this demographic. Attracting family groups is a key priority for SMASHfestUK. Engaging parents in STEM is of vital importance because parental encouragement has been found to be influential to both children's motivation to continue in STEM education and in their knowledge of STEM careers<sup>14</sup>. In deprived areas, where they may be a wider gap in STEM knowledge and where knowledge of STEM careers may be more limited, engaging the whole

<sup>13</sup> The number of families has been calculated at approximately 1110 - 1180. The sample size is therefore representative of the total population of SMASHfestUK visitors with a confidence interval of 5 and confidence level of 95%.

<sup>14</sup> Ferry, Fouad & Smith, 2000. The Role of Family Context in a Social Cognitive Model for Career-Related Choice Behavior: A Math and Science Perspective Journal of Vocational Behavior. Volume 57, Issue 3, December 2000, Pages 348-364. Chapman, S and Vivian, R, 2016. Engaging the future of STEM: A study of international best practice for promoting the participation of young people, particularly girls, in science, technology, engineering and maths (STEM). Australian Government (Office for Women, Department of the Prime Minister and Cabinet), in partnership with the Chief Executive Women (CEW) Ltd., REISS, M., HOYLES, C., MUJTABA, T., RIAZI FARZAD, B., RODD, M., SIMON, S., & STYLIANIDOU, F. (2011). Understanding participation rates in post-16 mathematics and physics: conceptualising and operationalising the UPMAP project. International Journal of Science and Mathematics Education, 9(2), 273-302.

family and imparting knowledge and confidence in STEM is of more central importance.

#### NUMBER OF PEOPLE IN VISING GROUP

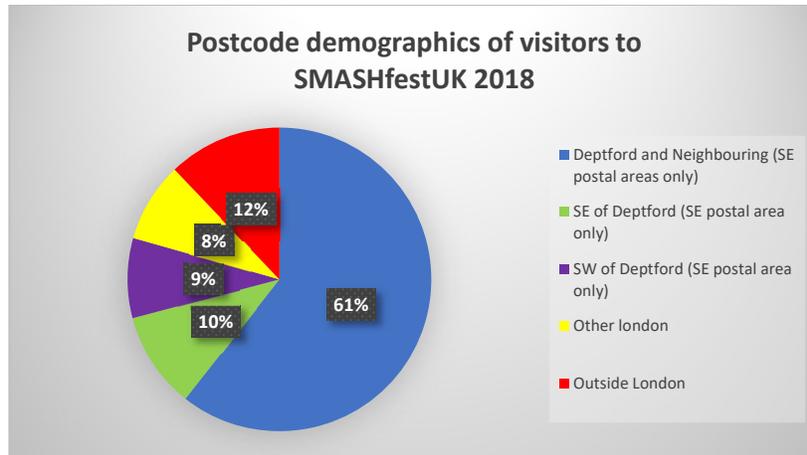


The average number of people per visiting group was 3 people. The most common combination was one parent and two children. Based on the total visitor count approximately 1110 family groups visited SMASHfestUK in 2018.

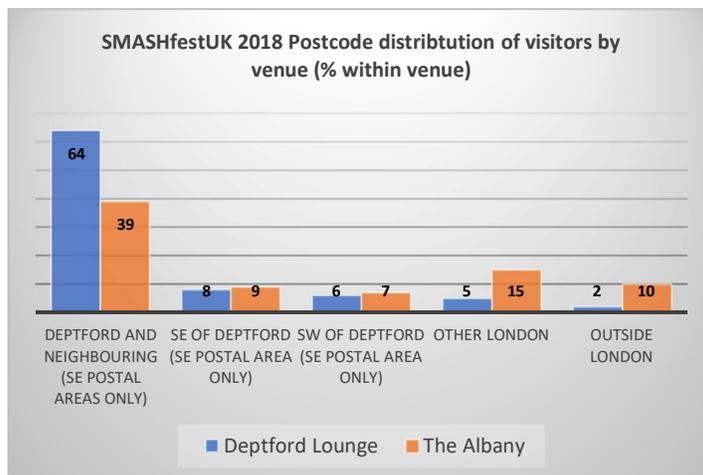
## POSTCODE

SMASHfestUK are situated in Deptford in the London Borough of Lewisham. Lewisham ranks as 48<sup>th</sup> most deprived of all the 326 Local authorities in London as specified by the English Indices of Deprivation<sup>15</sup>. This places it in the top 20% most deprived areas in England. In certain areas of Lewisham deprivation is more concentrated – New Cross and Downham with pockets of deprivation in Evelyn, Lewisham Central, Rushy Green, Whitefoot and Bellingham<sup>16</sup>.

The adult respondents were asked to list their home postcode. The given postcodes were then sorted into postal areas. The results show that most of the visitors to SMASHfestUK 2018 hailed from the local postal area of Deptford or surrounding postal areas (Lewisham). The results are presented below,



80% of all the visitors to SMASHfestUK 2018 had a South East (SE) postal code indicating that they are local to the areas surrounding Deptford. One quarter of all visitors were from the SE8 (Deptford) Postal area. 20% travelled to SMASHfestUK 2018 from other London boroughs or from outside of London (Bradford, Scotland, Wales, Birmingham).



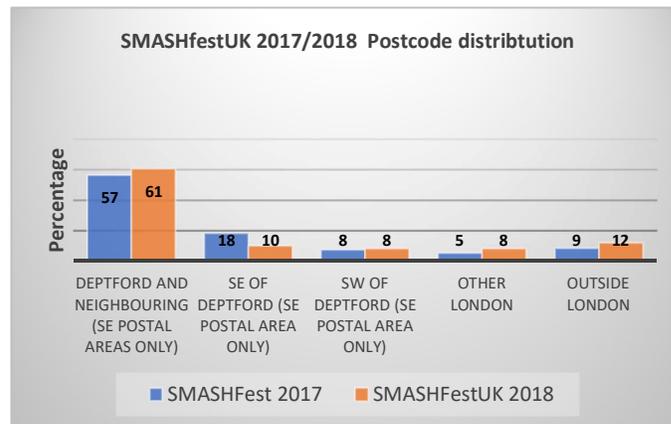
SMASHfestUK at the Deptford Lounge attracted a greater percentage of visiting families from the Deptford local area and surrounding areas than SMASHfestUK at The Albany. The larger two-day event at the Albany venue attracted a larger distribution of families from outside London and other London boroughs.

In 2018, SMASHfestUK attracted slightly more visitors from the Deptford postal and surrounding areas than in 2017. This difference is due to the increase in visitors to the Deptford Lounge venue which attracts a greater number of local visitors and

<sup>15</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/465791/English\\_Indices\\_of\\_Deprivation\\_2015\\_-\\_Statistical\\_Release.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/465791/English_Indices_of_Deprivation_2015_-_Statistical_Release.pdf)

<sup>16</sup> <https://www.valewisham.org.uk/lewisham-facts-and-figures>

drop-in visitors. This year also saw a slight increase of visitors from outside London and from other London boroughs. The chart below presents a comparison from 2017 to 2018 of the postcode distribution of visitors to SMASHfestUK.



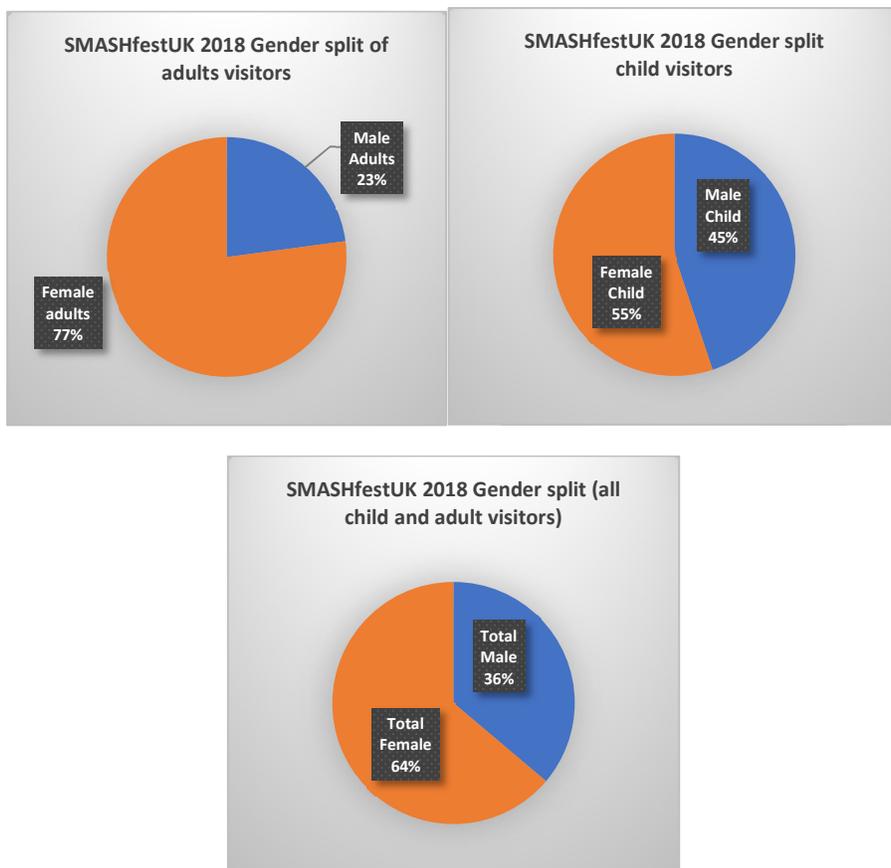
The table below presents a breakdown of the most frequently cited postcodes in 2018. This shows that 42% of the visitors to SMASHfestUK 2018 live in postal areas that are some of the most deprived in Lewisham (SE8, SE14, SE6, BR1)

Postcode	%	Postcode	%	Postcode	%
SE8 (Deptford, Evelyn and Lewisham)	25%	SE6 (Bellingham, Catford, Hither Green, Lewisham)	4%	SE23 (Forest Hill, Honor Oak, Crofton Park, Lewisham)	3%
SE4 (Brockley, Crofton Park, Western Ladywell, Honor Oak, Lewisham)	11%	SE10 (Greenwich, Maze Hill, Greenwich Peninsula)	7%	SE12 (Lee, Grove Park, Chinbrook, Hither Green, Eltham, Horn Park, Blackheath, Lewisham)	2%
SE14 (New Cross, New Cross Gate, Lewisham)	11%	SE13 (Lewisham, Hither Green, Ladywell)	6%	BR1 (Bromley, Bickley and Downham)	2%

Other postal areas BD22, BG14, BR3, CT11, DA1, DA15, DA7, E14, E3, E6, GL6, IP16, LE8, ME1, N17, N5, NW10, NW11, NW2, NW5, RN10, S8, SA62, SE1, SE16, SE18, SE19, SE2, SE21, SE22, SE25, SE26, SE28, SE3, SE9, SL9, SW18, SW3, SW9 and WC1H were represented in smaller numbers.

## GENDER

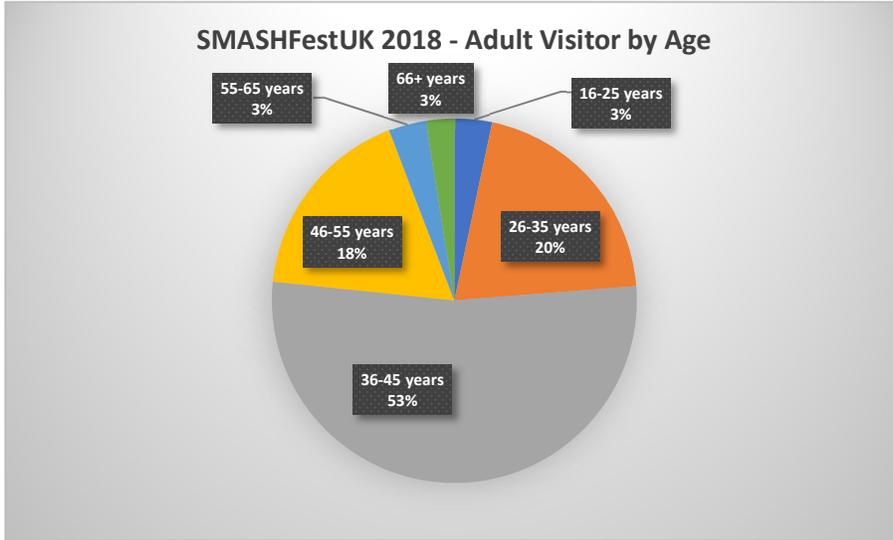
Each respondent was asked to list the age and gender of the total number of people in their visiting group. This allowed for more accurate accounting of the gender and age of the visitor and the size of the visiting groups.



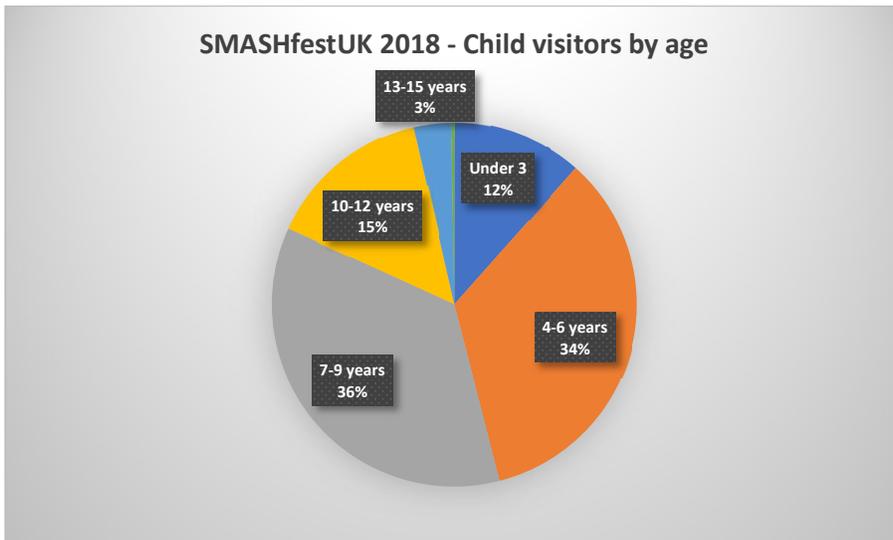
As in 2017, SMASHfestUK 2018 attracted more female visitors than male. There were over one third more female adults than male adults in attendance. These figures are consistent with findings from British Institute of Science report that found that more female adults take their children to informal science activities than males<sup>17</sup>. The SMASHfestUK 2018 visitor figures also show that female child visitors outnumber male child visitors (+10%-points) this is also consistent with visitor figures from SMASHfestUK 2017. This demonstrates that SMASHfestUK are reliably able to attract an over representation of female children year on year.

<sup>17</sup> CASTELL, S, CHARLTON, A, CLEMENTS M ET AL (2014). Public attitudes to science 2014. A set of studies looking at the UK public's attitudes to science, scientists and science policy. March 2014. Department of Business, Innovation and Skills.

AGE OF VISITORS



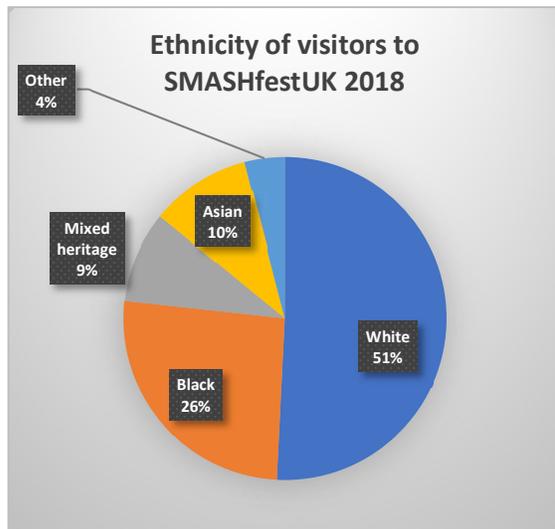
The average age of an adult visitor to SMASHfestUK 2018 is 39 years old. The most common age-bracket is 36-45 years old.



70% of the children who visited SMASHfestUK 2018 were aged between four and nine years old, this is consistent with the figures for 2017 (where 4-9-year-olds accounted for 73% of the total number of children). Primarily, SMASHfestUK are attracting primary school-aged children, however 30% of the child visitors are under 3 years old or between 10-15 years old.

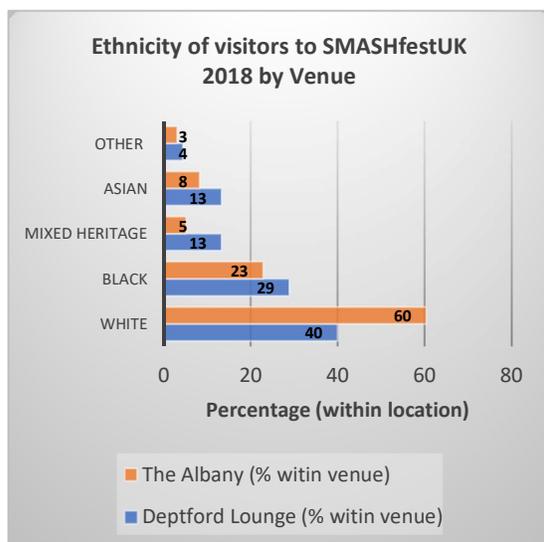
## ETHNICITY

SMASHfestUK is held in Lewisham a London borough that is the 15<sup>th</sup> most ethnically diverse borough in England, with over 46% of its residents from minority ethnic groups (this figure rises to 50% in the Deptford local vicinity). Black African, Black Caribbean and Black British residents make up the largest ethnic group in this area. There is also a significant Vietnamese and Chinese and South Asian community<sup>18</sup>. 49% of SMASHfestUK visitors in 2018 were from a BME or non-white backgrounds. The chart below shows the ethnicity of SMASHfestUK adult visitors and the tables compares the figures to the available data for Deptford and Lewisham.



Ethnicity	SMASHfestUK 2018 (all)	Government data for DEPTFORD (from 2015)	Government data for LEWISHAM (from 2011)
White (British and European)	51%	50%	53%
Black (British, African and Caribbean)	26%	29%	27.2%
Mixed Heritage	9%	7.5%	7.4%
Asian	10%	11%	9.3%
Other	4%	3%	2.6%

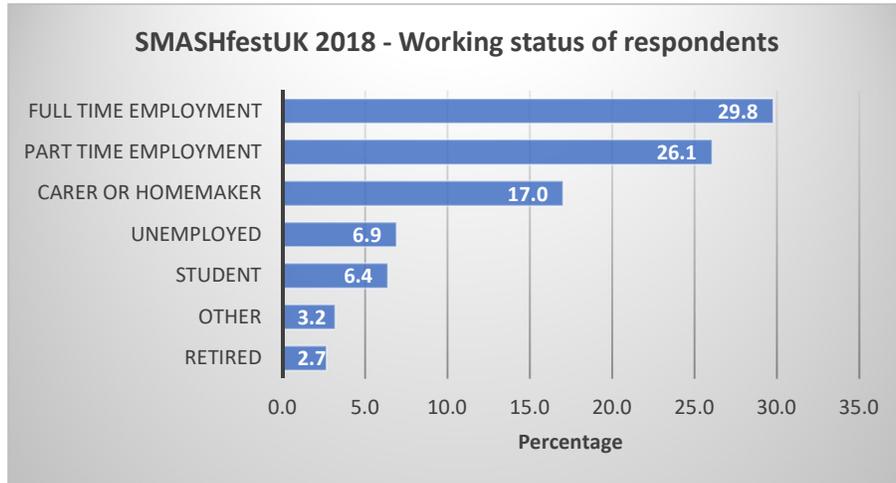
The above chart and table shows that SMASHfestUK attracted an over representation of adult visitors from ethnic minority groups when compared to the figures available for the Lewisham London Borough. The 2018 figures are consistent with the BME representation in the Deptford Local vicinity.



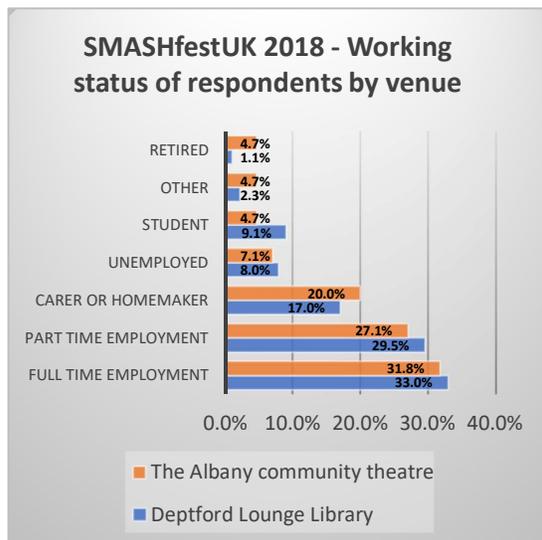
A breakdown of the ethnicity spread by venue demonstrates that the Deptford Lounge attracted more visitors from BME backgrounds than The Albany venue, however, both venues attracted a high number of visitors from BME backgrounds.

<sup>18</sup> <http://lewishamsna.org.uk/a-profile-of-lewisham/social-and-environmental-context/ethnicity> .

## WORKING STATUS



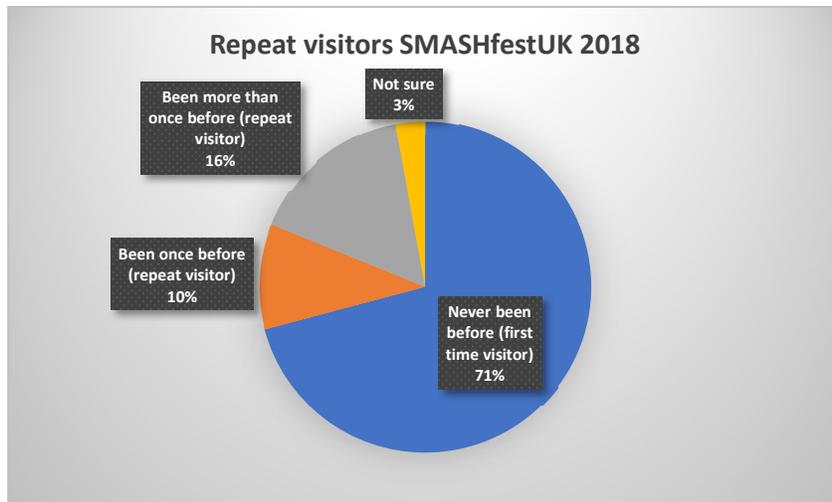
The chart above shows that 56% of the adults questioned were in full-time or part-time employment. These figures are broadly representative of the Government figures for Lewisham which estimates that 62% of its residents are in employment with 6% unemployed. SMASHfestUK 2018 attracted slightly greater number of homemakers for the Lewisham area, however this is not unexpected due to the festival attracting principally family groups.



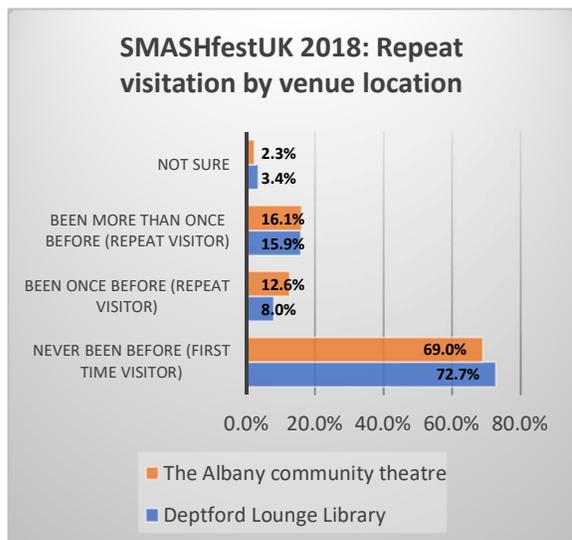
A comparison across the two venues shows a similar spread of representation across the two sites. The Albany attracted slightly more retired and carers or homemakers than the Deptford Lounge.

## VISIT PROFILE

### REPEAT VISITATION



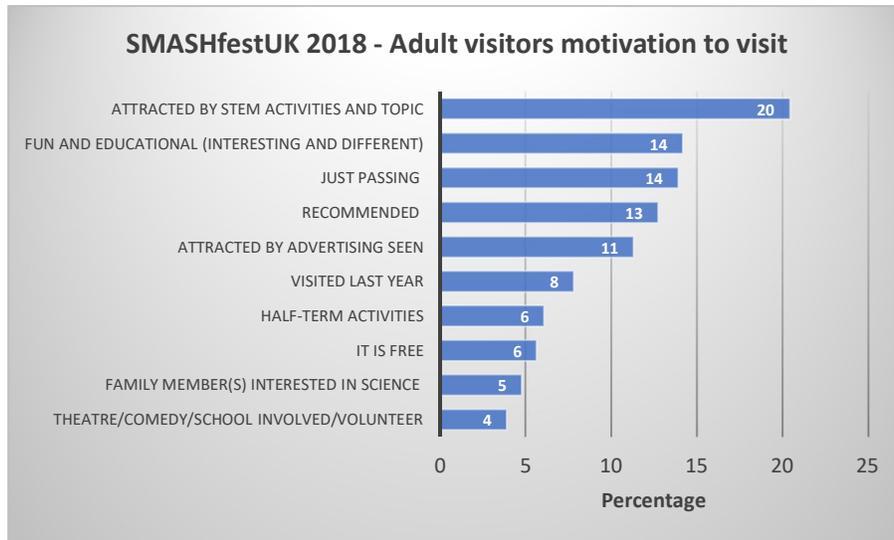
71% of the respondents were first time visitors to SMASHfestUK. The results show that SMASHfestUK are building a loyal following; 26% of the respondents are repeat visitors (16% of these had been to two or more SMASHfestUK festivals). SMASHfestUKs Audience development has improved year on year, seeing a 4% rise in repeat visitors from 2017 (22% repeat visitors in 2017). In 2018, most of the repeat visitors hailed from SE8, SE4, SE14, SE10 and SE13 postal areas.



The visitors to the Deptford Lounge were slightly more likely to be first-time visitors to SMASHfestUK than those that visited events at The Albany.

## MOTIVATION TO VISIT

The respondents were asked an open-ended question relating to their motivation to visit SMASHfestUK 2018. A variety of motivations were presented, the responses have been grouped and are presented below,



The range, variety and interactive nature of the activities on offer at SMASHfestUK was the main motivation for many of the visitors. One visitor commented,

*"Amazing variety of activities, exposing my girls to science"*

(Female, aged 40, SE4)

In addition to this, some adults were motivated because the event offered something interesting and different that was fun and educational for the family,

*"learning about new things. Keeping the kids engaged in a productive way"*

(Female, aged 35, SE13)

Many visitors came because the event had been recommended, via word of mouth, by family, friends or children. This highlights the festival's popularity and demonstrates the effectiveness of SMASHfestUK within the local community. SMASHfestUK's links with local primary schools may have accounted for many of the recommendations by children (to lend weight to this a high proportion of children at the Deptford Lounge attended the local primary schools that SMASHfestUK have close ties with).

Other families were visiting the Library or passing by and decided to come in,

*"I looked through the window and it looked nice and busy and fun"* (Female, 32, SE8)

11% commented that they were attracted by the advertising seen. These ranged from Social Media posts (Facebook, Twitter, What's App group 'HOOP') to direct emails from The Albany/Deptford Lounge website to an advert in The Primary Times.

## SCIENCE CAPITAL

Science Capital is a concept that encompasses science-related knowledge, attitudes, experiences and the resources an individual acquires through life, including what science they know, how they think about it, who they know, and what sort of everyday engagement they have with science<sup>19</sup>. The amount of science capital available to an individual has been connected to both science aspirations and educational participation in science<sup>20</sup>. Research has shown that children with high amounts of science capital in their environment are more likely to do well in science at school and pursue a career in a science-related field when they are older<sup>21</sup><sup>22</sup>. Further studies have shown that levels of science capital (high, medium or low) are influenced by cultural capital, gender and ethnicity<sup>23</sup>. SMASHfestUK 2018 takes place in an area where there is an under-representation of participation in STEM subjects post-16. The area has a high percentage of economically disadvantaged young people, Black and Minority Ethnic communities (BME), women and girls, and young people living in poverty<sup>24</sup> - all have been linked to isolation from STEM progression and building science capital. The key indicators for science capital have been identified as:

- Scientific literacy
- Science-related attitudes, values and dispositions
- Knowledge about the transferability of science
- Science media consumption
- Participation in out of school science learning
- Family science skills, knowledge and qualifications
- Knowing/meeting people in science roles
- Talking about science in everyday life

This section of the evaluation report analyses the effectiveness of SMASHfestUK on impacting on the science capital indicators identified in the ASPIRES report.

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<sup>19</sup> <http://www.kcl.ac.uk/sspp/departments/education/research/Research-Centres/cppr/Research/currentpro/Enterprising-Science/01Science-Capital.aspx>

<sup>20</sup> ASPIRES report, 2013. Young Peoples Career and Science Aspirations aged 11-14. Kings College London.

ASPIRES 2 Report, 2016. Year 11 Students' views of Education, Careers and Work Experience. February 2016. Kings College London.

<sup>21</sup> DEWITT, JE, ARCHER, L & OSBORNE, JF 2014, 'Science-related aspirations across the primary-secondary divide: Evidence from two surveys in England' INTERNATIONAL JOURNAL OF SCIENCE EDUCATION, vol 36, no. 10, pp. 1609-1629

<sup>22</sup> [http://www.bp.com/en\\_gb/united-kingdom/bp-in-the-community/stem-education/stem-skills-gap-science-capital.html](http://www.bp.com/en_gb/united-kingdom/bp-in-the-community/stem-education/stem-skills-gap-science-capital.html)

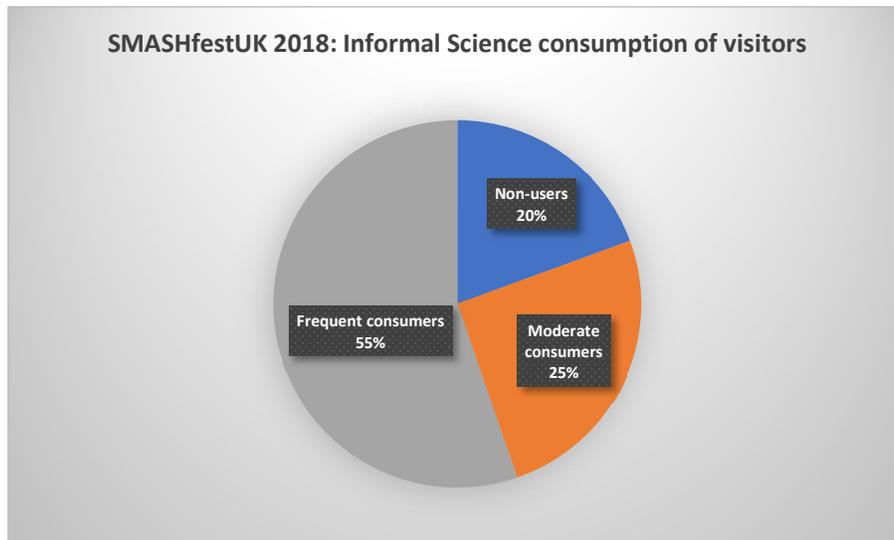
<sup>23</sup> ARCHER, L, DAWSON, E, DEWITT, J. , SEAKINS, A. AND WONG, B. (2015), "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. J Res Sci Teach, 52: 922-948.

<sup>24</sup> <http://www.londonpovertyprofile.org.uk/indicators/boroughs/lewisham/>

## INFORMAL SCIENCE CONSUMPTION – ACCESS TO INFORMAL SCIENCE

To establish how far SMASHfestUK visitors would normally visit science festivals, science events or museums the SMASHfestUK adult visitors were asked to state how many times in a year they would normally attend a science event or activities (excluding school activities). This data was then coded into the following groups,

- Non-user = Never visits informal science events or activities (other than SMASHfestUK)
- Moderate consumer = Accesses informal science events or activities 1-2 times per year
- Frequent consumer = Accesses informal science events or activities 3+ times per year<sup>25</sup>

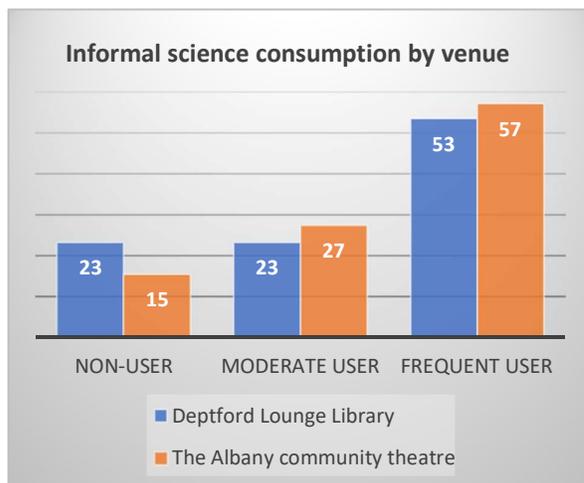


The chart above demonstrates that SMASHfestUK 2018 was able to attract 20% of visitors who never consume informal science activities (other than SMASHfestUK). This is significant in the view of research that suggests that many science festival ‘preach to the converted’ in attracting, “economically privileged and educated audiences that are already invested in science”<sup>26</sup>. The evaluation of SMASHfestUK 2017 demonstrated a similar distribution of non-users, at 17%, providing further evidence that SMASHfestUKs creative and hands-on approach situated within the heart of the community is affective in attracting those who would not usually seek out informal science activities and those also those who infrequently consume informal science.

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<sup>25</sup> These three groups are derived from Hood’s article ‘Staying away: Why people choose not to visit museums’ this article explores the motivations of non-visitors, occasional and frequent museum goers. The categories that Hood uses are also applicable to informal science consumption (Hood, Museum News, 1986).

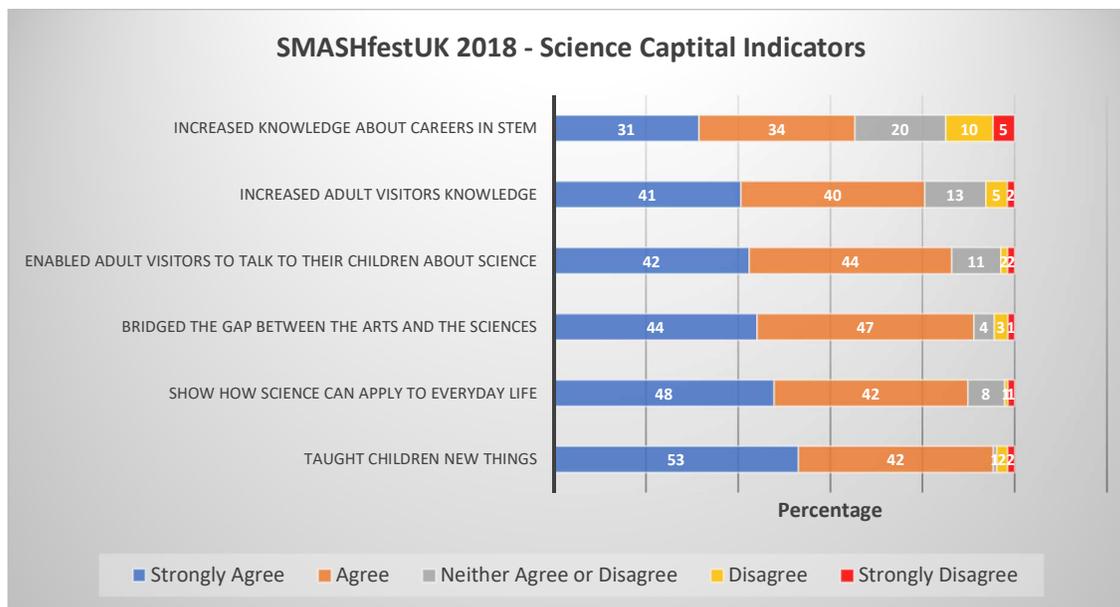
<sup>26</sup> KENNEDY, E, JENSEN, E & VERBEKE, M (2017) Preaching to the Scientifically Converted: Evaluating Inclusivity in Science Festival Audiences. In The International Journal of Science Education, Part B.



A breakdown of the data demonstrates that the Deptford Lounge was more successful in providing access to non-users and moderate-users of informal science than The Albany. This is reflective of the type of visitor, (especially drop-in users), who might access the Library venue over the theatre venue. A familiar, friendly and open-venue (note: glass walls of the Deptford Lounge) allows visitors to know what is available before entering, a closed venue can put-off non- or infrequent visitors who are unsure what may be behind the walls<sup>27</sup>.

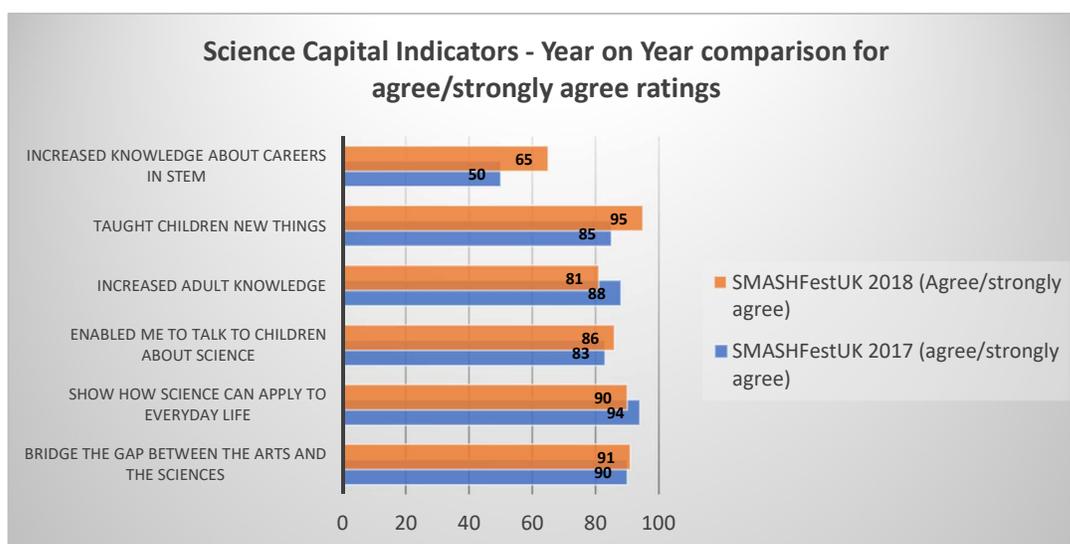
## SCIENCE CAPITAL INDICATORS

The adult visitors were asked a series of Likert-scale questions that aimed at establishing whether SMASHfestUK 2018 was impacting on areas that have been identified as being important in building science capital.



The ratings results show that the adult respondents were most confident that SMASHfestUK 2018 had taught their children new things (95% agree/strongly agree) and helped them and their children in understanding how science applies to everyday life (90% agree/strongly agree). The respondents were less sure that SMASHfestUK 2018 increased their knowledge about science careers (65% agree/strongly agree), although this figure had increased from last year (where only 50% of respondents agree/strongly agreed with this statement). The chart below illustrates the differences in ratings for the science capital indicators from 2017 to 2018.

<sup>27</sup> Spencer H (1991), 'improving public access to museums' in Lord and Lord (eds.) (1991) *The Manual of Heritage planning*. Crown Publishing, London.



The above chart shows that the 2018 respondents were more confident that SMASHfestUK was able to increase their knowledge of STEM careers, teach their children new things and helped them to be able to talk to their children about science. The table below presents the 2018 figures across the different venues.

		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
<b>Bridge the gap between the arts and the sciences</b>	Deptford Lounge	46.7	44	5.3	2.7	1.3
	The Albany	41	50.8	3.3	3.3	1.6
<b>Show how science can apply to everyday life</b>	Deptford Lounge	50.6	39	7.8	1.3	1.3
	The Albany	44.3	45.9	8.2	0	1.6
<b>Enabled me to talk to children about science</b>	Deptford Lounge	47.2	38.9	11.1	1.4	1.4
	The Albany	36.7	50	10	1.7	1.7
<b>Increased adult knowledge</b>	Deptford Lounge	43.7	32.4	16.9	5.6	1.4
	The Albany	36.8	49.1	8.8	3.5	1.8
<b>Taught children new things</b>	Deptford Lounge	53.4	42.5	0	2.7	1.4
	The Albany	52.6	42.1	1.8	1.8	1.8
<b>Increased knowledge about careers in STEM</b>	Deptford Lounge	35.2	31	15.5	14.1	4.2
	The Albany	26.8	37.5	25	5.4	5.4

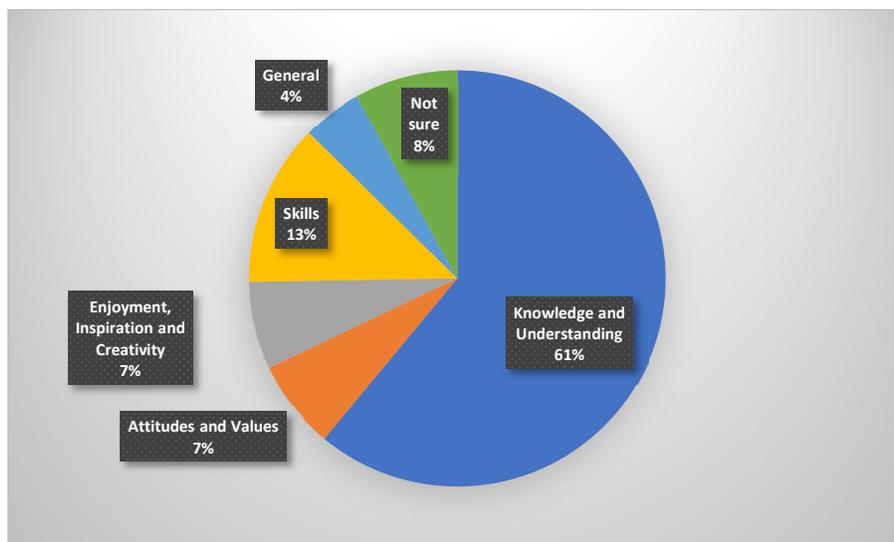
The above table shows that respondents at the Deptford lounge perceived increased adult knowledge exchange, knowledge about STEM careers and felt more confident that the activities at the Deptford lounge enabled them to talk to their children about science than respondents from The Albany. Observation at the activities at the Deptford lounge found that visitors often stayed longer times at each activity. In addition, most of the activities were accessible for family groups to sit and partake in activities for a prolonged length of time (therefore enabling more opportunities for conversation). Furthermore, the Deptford lounge had a dedicated staff member (volunteer) who was stationed at the ID card making table discussing career options with children based on their interests and discussions. It was felt that this encouraged children to think about their future careers whilst being introduced to new career ideas in and around STEM that they may not have been aware of.

## KNOWLEDGE AND UNDERSTANDING

95% of the adult respondents 'agreed' or 'strongly agreed' that **their children had learnt something new** at SMASHfestUK 2018

81% of the adult respondents 'agreed' or 'strongly agreed' that **they had learnt something new** at SMASHfestUK 2018

87 out of the 188 respondents presented written evidence of new things that they had learnt at SMASHfestUK<sup>28</sup>. The responses were coded into the five Generic Learning Outcomes (knowledge and understanding, attitudes and values, enjoyment, inspiration and creativity, skills and behaviour and progression). The results showed the following distribution,



<sup>28</sup> The evaluation form was self-administered this year in 2017 it was in interview format. This resulted in fewer responses to this question with shorter responses. This limited the analysis for this question.

### *Knowledge and Understanding*

61% of the respondents offered comments that were coded to the Knowledge and Understanding learning outcome, providing more concrete evidence of new learning being acquired during SMASHfestUK 2018 for adult visitors. It is important that adults as well as children are engaged in learning at science festivals, because research has shown that parental positive attitudes towards science and maths directly correlate to their children's success in these subjects<sup>29</sup>. Science capital research has also shown that parents who are able to talk to their children about science regularly at home can impact positively on the science capital of their children. The following comments reflect new knowledge and understanding that adult visitors gained during the festival,

*"(I learnt that) using distilled water is better for plants"*

(Female, 36, Hydroponics Exhibit at The Deptford Lounge)

*"(I learnt that) Mint has antibacterial and antiseptic qualities"*

(Female, 42, Hydroponics Exhibit at The Deptford Lounge)

*"(I learnt about) how the river breaks the soil around the path and how the Thames is protected and about Future Farming"*

(Female, 45, River Flow exhibit at The Deptford Lounge)

There was further evidence of assimilated learning at the River Flow exhibit,

*"that rivers dramatically change shape over time and that managing them can cause major problems as well as positives"*

(Female, 34, River Flow exhibit at The Deptford Lounge)

At The Albany venue further evidence of learning was recorded some relating to the performances seen,

*"I learnt lots about historical women in science"*

(Male, 45, Cosmic Jives at The Albany)

*"Neptune takes a very long time to visit the sun. Mercury only takes 88 days. (I also learnt about how a submarine is designed".*

(Female, 13, various activities at The Albany)

### *Skills*

13% of the comments referred to new skills that have been acquired at the festival such as: raft building, making holograms and making and launching rockets. These comments indicate that the festival was also able to build on visitor's skills and encourage creativity and innovation within the context of STEM exploration. Most of these comments came from male visitors.

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<sup>29</sup> Grace A, Jethro O and Aina F (2012). Roles of parents on the academic performance of elementary schools. International Journal of Academic Research in Business and Social Sciences. January 2012, Vol. 2, No. 1 ISSN: 2222-6990

### *Attitudes and Values*

A few of the comments related to emotional responses or attitude changes. One comment referred to the Virtual Reality space experience,

*“This was a reminder of how much I felt in awe about the universe movement of planets/comet around the sun”*

(Female, 36, Brockley, VR experience)

Another indicated a reinforcement or awareness of science and science learning in general,

*“Science is Awesome!”* (Female, 39, Ramsgate, Visiting The Albany)

A further comment indicates that the adult had noticed that the children were engaged in the activities,

*“Children are naturally curious and willing to learn”*

(Female, 20, London, The Deptford Lounge)

The above comments indicate evidence of assimilation of information presented at SMASHfestUK for adult as well as child visitors (see below).

## THE VALUE OF SMASHFESTUK TO ITS AUDIENCES

Twenty micro-interviews were conducted with a random selection of visitors to SMASHfestUK at both the Deptford Lounge and The Albany venue. The aim of the interviews was to establish the value of SMASHfestUK to different types of visitors; what the event provided for themselves and their children. Analysis of the data demonstrated four key areas where SMASHfestUK provides value, these are: access to experts; freedom and creativity; inspiration and; a place in the community. These categories are discussed below,

### **Access to Experts**

Direct access to STEM professional and academics has been identified as being crucial to the visitor experience at science festivals worldwide<sup>30</sup>. SMASHfestUK 2018 provides opportunities for visitors to have direct access to STEM professionals and gather information, knowledge and inspiration from them. A white British mother with two children commented,

*“I think that events like this are really good because they engage the children in science and engineering activities. We came last year and really enjoyed it. We do quite a lot at home, but mainly arts activities and making things – so I suppose engineering – but these events are great because you get to talk to real scientists who can tell you the answers straight away, rather than googling it like we do! The river bit is really good, my son was really engaged in that and the lady was excellent at explaining it to him. These events do a lot for us, they provide an opportunity for the children to engage and because there are activities and people to facilitate - the children are really gripped!”*

<sup>30</sup> JENSEN AND BUCKLEY (2014) ‘Why People attend science festivals: Interests, motivations and self-reported benefits of public engagement with research’ in Public Understanding of Science 23 (5) pp 557-573 and BULITTUDE AND SARDO (2012) ‘Leisure and Pleasure: Science events in unusual locations’ in International Journal of Science Education 34 (18), pp 2775-2795.

This comment shows that at home the mother will facilitate some science learning but does not have the confidence in science to discuss science concepts. A similar comment was made by a Black African father visiting with his two children,

*“I can’t talk to her about space and science at home – so it is important that I take her to things like this so that she can learn about it. She has enjoyed it all”*

The above comment indicates that parents who do not have a strong science background value the experience of meeting scientists and building knowledge. Comparable to this is a comment made by an Indian mother with one son,

*“My son has been everyday with the kid’s club – my son has been fascinated by this! He has told me all about what he has seen with the kid’s club, so today I have brought him down. He watches science programmes, but I cannot answer his questions! But this event means that he can talk with the experts”*

By providing access to experts, and specifically female experts, SMASHfestUK can provide knowledge and understanding, but also present positive unconscious messages about who does and knows about science. This is reinforced by a comment from a Black British woman visiting with her two female children,

*“For people of colour, the yardstick (for science and engineering) is very much white males – so to see women and women of colour in leadership and in engineering roles here - they are being influenced by that and it is a big confidence boost. In the UK we are always seen as the minority – ‘other than’ – and I don’t want my children to feel this. So, I feel that encouraging children of colour and of the female gender is really important. I was going to do engineering at University, but when I went to the open-day there was only one other woman there and the rest were boys – to be honest, that put me off and I chose social science in the end instead. So, I know how much representation matters in making choices and seeing yourself in a role”*

The above comment makes a critical point about the unconscious messages that are received by children that reflect what they see in the world around them. By providing a large number of female scientist presenters and explainers (along with volunteers and Young Explainers) many from BAME backgrounds SMASHfestUK 2018 are able challenge the preconception that STEM subjects are for white males. The over representation of female visitors (adult and child) and the large number of visitors from BAME backgrounds shows that SMASHfestUK are able to attract and maintain interest of these groups currently underrepresented in STEM.

## **Freedom and Creativity**

SMASHfestUK offer a free-choice of activities where visitors can self-select participation and levels of engagement. Free-choice learning has been linked to high levels of affective learning (i.e. enjoyment of learning)<sup>31</sup>. A conversation with a Black African mother with three children elucidates the role that freedom plays in her experience of SMASHfestUK,

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<sup>31</sup> RENNIE, J. L. & MCLAFFERTY, T. P. 1996. Science Centres and Science Learning. *Studies in Science Education* 27, 53-98. RAMEY-GASSERT, L., WALBERG, H. J. III & WALBERG, H. J. 1994. Re-examining Connections: Museums as Science Learning Environments. *Science Education Journal*, 78, 345-363. JARVIS, T. & PELL, A. 2005. Factors Influencing Elementary School Children's Attitudes Towards Science Before, During and After a Visit to the UK National Space Centre. *Journal of Research in Science Teaching* 42, 53-83. TUCKEY, C., J 1992. School Children's Reactions to an Interactive Science Centre. *The Curator*, 35, 28-39.

*“I am confident around science, because I did a pure science degree, so we do talk about science a lot at home and we have a lot of science books that the girls can use. This event offers more freedom – when you are at home it is too structured – homework and sums – but here it is more free and we can talk about what they see and do. You also have the equipment and facilities here too that we just can’t do at home”*

The above comment shows, that although this mother is a scientist herself she values the freedom and ability to explore science in an unstructured way that SMASHfestUK offers. This indicates that even though this family may have high science capital, the SMASHfestUK event offers added-value by providing alternative opportunities to engage and participate in STEM activities. This point is further illustrated by a white British woman visiting with her daughter and two sons,

*“My kids love science and maths. I am a scientist myself – so the children love it too. I’ve found this festival so diverse, we have been three times – loads of ideas. It is close to my house and it is free and there is lots to do. We talk about science a lot at home and do lots of things – we do experiments. This event gives them lots of new ideas – the rocket and the show ‘Look up’ they loved it and they presented it in a fun way. I am more straight with them – here they can meet scientists and other people as well, so that is different from just mum being the teacher”*

A Black Caribbean father visiting with his two children commented about the importance of creativity in engaging audiences,

*“I actually like doing these activities myself, I used to know how to do this – but I forgot – so it is good to learn these skills again. I do actually work with children, I am a community artist, so I can share this with them too. My son actually came here last year with his mum – he enjoys doing all of these activities and learning things along the way. It is very important to be creative”*

## **Inspiration**

Inspiration is a key objective for SMASHfestUK and some comments from the micro interviews indicated that parents were also keen for their children to be inspired, one white British mother visiting with her son commented,

*“He has really enjoyed doing all the things. He loved the theatre because they can go in and make noise and stuff. This really puts science in an accessible context for the children. We are quite an arty family and I’m desperate for one of my children to become a scientist – so hopefully this will help!”*

The above comment also illustrates that this mother aspires for her son to become a scientist but self-identifies as having a ‘arty’ family (perhaps not making the link between creativity and science). She suggests that *interaction* was the key to engaging her son in the activities. A mother of mixed ethnicity visiting with her two children felt that the narrative and creativity of the event had value for her family,

*“This is an excellent display that really gets kids minds working, it makes everyone realise that there is a creative side to the brain. The activities are helpful to the parents too, like growing plants without earth! In Deptford, there are some activities around the arts but not so much focusing on science – so this is great for*

*us to get smart. The kids were tired after swimming, but they still wanted to come here to see SMASHFest! They really like the storyline to find out how they could survive if there was a flood – so it gets their minds working and feeds their imagination”*

SMASHfestUKs narrative structure also helped provide a forum to talk to children about STEM. A Kids Club leader commented,

*“The activities give them an insight into how they would cope if there was a Flood and what could be done. It is educational and covers all age groups. The issue of growing things after a flood, we had a discussion about back at the kid’s club, because all of the soil would be flooded – so you could grow some plants just in water – the children were really interested in that and it started a really interesting conversation with them. One child in particular, who is only five, was really interested in the river exhibit and came back with their parents. We also went through the SMASHfestUK brochure with the children and talked about what activities they might be interested in. They want to visit The Albany on Friday to do raft building”*

This extract demonstrates that the kids club were able to extend learning and discussion beyond the event itself and use the festival to enthuse the children. A white British mother with two children also talked about how she would use the ideas from SMASHfestUK with her own family,

*“with the rivers we will do that on the beach and we’ll talk about that. We’ve not been to anything like this before, not with such a science focus. I think we’d normally go to the science museum in London, but that can get really busy around half-term, so it is great to have some activities that are so local to us. It is also great to have activities that engage both of the children too”*

For this mother, as well as gathering ideas the value was in the locality of the activities and that both children were engaged (this is further explored below).

### **Place in the Community**

The positioning of SMASHfestUK in the local community had significance for some visitors. The micro interviews reveal how position in the community is important for community cohesion and for enabling learning within the ‘known environment’. One white British woman visiting with her two children linked SMASHfestUK with providing a sense of community,

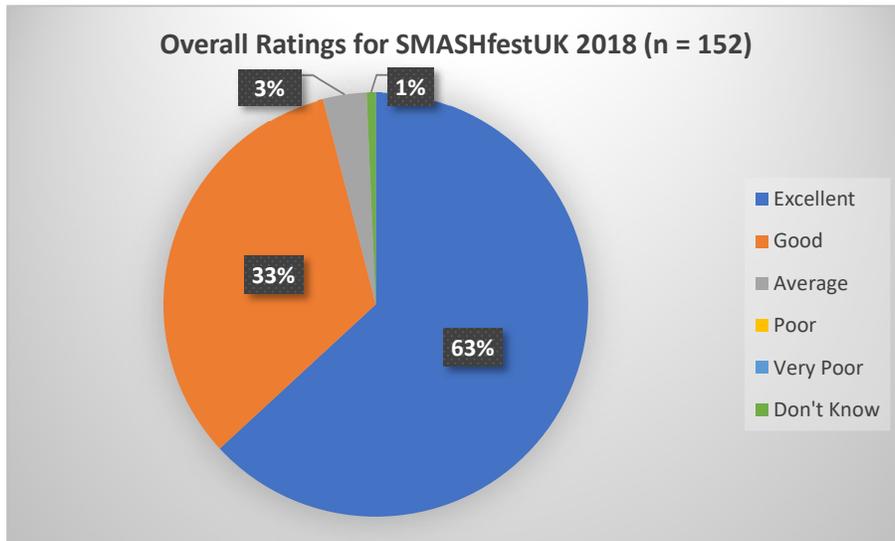
*“I grew up here, I now live in Bromley and have travelled back for this, nothing, like this happens where I live and there is no real sense of community. But it is hard, you know, to engage people from deprived areas”.*

A great grandmother who visited with her two great-grandsons talked about the value of SMASHfestUK being located in a place where the boys feel comfortable as this impacts on their engagement and learning,

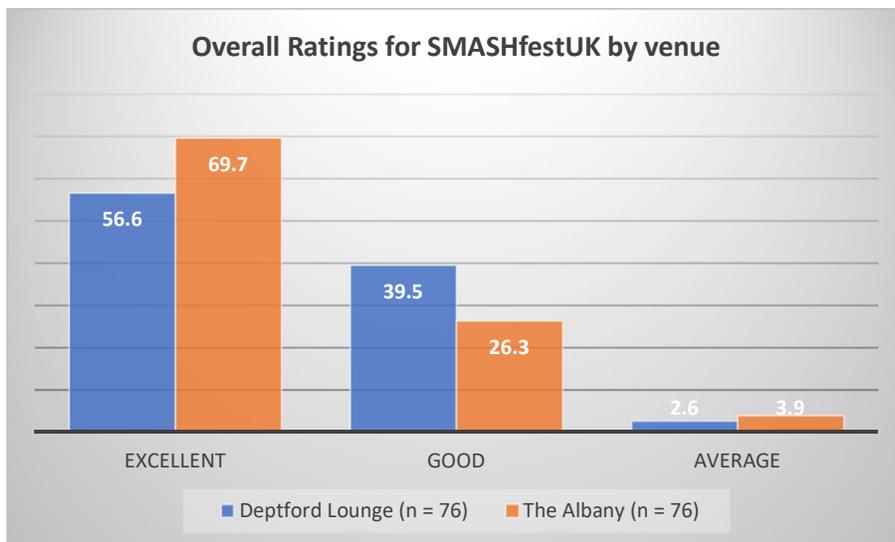
*“they are still here, they have made rockets and they loved that. At first they were a bit bored as they didn’t know what to do, but the organisers here are great and really engage the kids in the activities. The boys have really enjoyed it and got a lot out of it. Being in the community makes it feel comfortable for them – they feel that it is for them too”*

The location of SMASHfestUK within the heart of the community is essential for engaging hard-to-reach groups that would not usually consume informal science activities. As well as providing a sense that the event is ‘for them’ SMASHfestUK also use many local people and link with local schools to reinforce their place in the community. Building up trust is an essential part of engaging with different audiences<sup>32</sup>.

OVERALL RATING FOR SMASHFESTUK 2018



96% of respondents rated SMASHfestUK 2018 as ‘Good’ (33%) or ‘Excellent’ (63%)



More respondents rated the activities at The Albany as excellent than at the Deptford Lounge. This reflects the wider range and scope of the activities and performances at The Albany venue that hosts the main festival across two days.

<sup>32</sup> Dawson, E (2018) Reimagining publics and (non) participation: Exploring exclusion from science communication through the experience of low-income, minority ethnic groups. In Public Understanding of Science, 1-15.

## BEHAVIOUR AND PROGRESSION

This year, 50 visitors to SMASHfestUK 2018 were sent an on-line post-festival survey. This aimed at establishing the longer-term impact of the event on the visitors<sup>33</sup>. The survey was kept deliberately short to garner more replies. 18 people responded to the survey (36%).

**100%** of the respondents said that **they would come to SMASHfestUK again**

All respondents provided positive accounts of their time at SMASHfestUK using words such as, 'interactive', 'amazing', 'excellent', 'fun' and 'fantastic'. Further comments suggested that the activities and shows were 'inspiring' and 'educational'. One female visitor commented,

*"A good educational and fun afternoon. We planted mint stems which we are watching at home. The children played the malaria snakes and ladders game and thankfully survived. And they spray painted waves. They also loved the lanyards and interaction with the enthusiastic volunteers"*

(Female, SE23)

The 18 respondents also provided information on whether the learning and inspiration had continued beyond the festival itself. 89% of the respondents commented that they had continued to talk about the event, the activities and the learning that took place once they returned home. The comments below are illustrative of this,

*"We talked about it quite a bit and remembered what we had done and which our favourite bits were. We are going to try to magic instant freezing water trick"*

(Female, BR1)

*"It was fantastic. We sincerely enjoyed both of the days that we attended. My girls were able to explain what they had learnt to their dad and Grandmother and were so enthusiastic to share new knowledge"*

(Female, SE4)

*"Yes, he can't wait to share with their peers at the school "Show & Tell"*

(Male, SE8)

*"it sparked many conversations amongst us...as well as looking into qualifications and career routes"*

(Female, SE23)

The above comments demonstrate that not only were families talking about and sharing knowledge – an important part of developing science capital – but that they were also encouraged to extend the learning and repeat experiences that they had gained at SMASHfestUK 2018. The comment below elucidates this further,

*"Yes, the children talked about it, they have asked again about Holograms and we have created them at home as well"*

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<sup>33</sup> A prize of tickets to the Wonderlab at the Science museum was offered as an incentive to complete the online questionnaire.

(Male, SW10)

*“My son wrote about it in his journal and we bring up things we heard and learned on the day in daily activities. We will refer back to Smashfest events in future activities. He continues to show others his science experiment papers so is learning by retelling it each time”*

(Female, SW18)

*“Yes, we talked about it for days and researched things further”*

(Female BR1)

*“We have spent time reading through the guide to space and have used the hologram. We are watching the soil-free plants grow. Plenty to continue our learning”*

(Female, SE4)

The above comments show how the activities and performances enthused visitors to extend the learning beyond the festival itself and encouraged family participation and conversations around science issues.

#### ADULT VISITORS: SUGGESTIONS FOR IMPROVEMENT

A few visitors made suggestions for improving or developing SMASHfestUK within the open-text comment on the evaluation forms or by approaching the evaluators directly on the day. The suggestions were predominantly connected to organisational ideas, space and providing a range of activities for different age-groups.

#### Planning and Organisation

Suggestion
Map of the site or Directional signage
Clear signage on each activity with brief description of the key elements
Easier navigation around activities (brochure not clear)
More seating at The Albany (inside and out)
Café at The Albany (better planning for busy times – food, staff and seating)
Narrative of Space and Flood difficult to connect

#### Age-range

Suggestion
Some content was too advanced for 7-year olds
Comedian (Andrew O’Neil) use of language was not appropriate for younger children
Some activities were not as accessible for younger children and needed further explanation (Murky Water testing & Lab in a Lorry)
More activities for a range of ages (with explanation of what is happening at each)

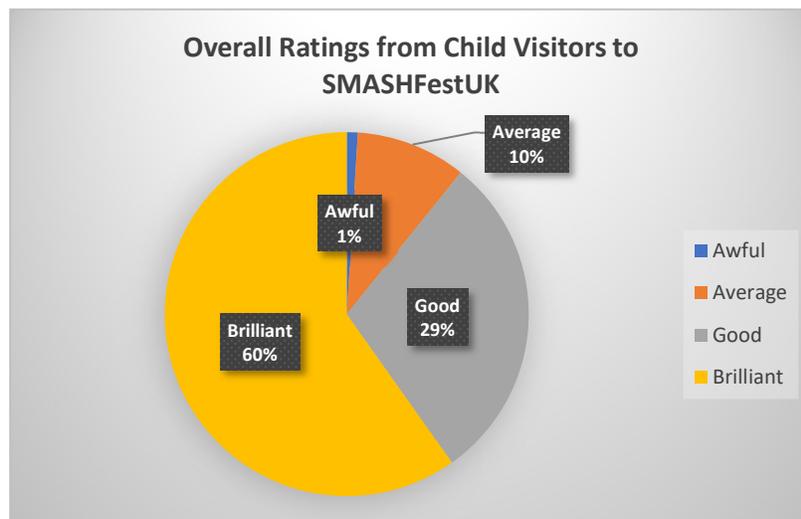
## CHILDRENS' EVALUATION

The views of the children are just as valuable as the views of the adult visitors to SMASHfestUK. The next section presents the evaluation of the 102 children's evaluation forms for SMASHfestUK 2018, FLOOD! Evaluation forms were collected from 52 children at the Deptford Lounge across the five days and 50 children at The Albany venue on Thursday and Friday.

## DEMOGRAPHICS OF THE CHILD RESPONDENTS

Category	Number in sample group	% (within category)
Male	39	38%
Female	63	62%
Under 4	4	3.9%
5-7 years	30	29%
8-10 years	51	50%
11-13 years	17	17%
School in SE postal area	87	95%
School outside SE postal area	5	5%

## OVERALL RATING



**89%** of the children rated the SMASHfestUK festival as **'Brilliant'** or **'Good'**.

The child respondents selected a wide variety of different activities that reflected the 'best thing that they did', these ranged from things that they did or made (kinaesthetic learning) to things that they saw (visual learning). The most popular choice for the activities at the Deptford Lounge were:

- Survive the Swamp immersive experience (SMASHfestUK)
- Building houses on Stilts and Origami boatmaking (Jenny Edbrooke)

- River flow exhibit – Sandpit! (UCL earth science dept)
- Hydroponics – Future Farmers (SMASHfestUK)
- Mosquitos – Bug off! (London school of Tropical Medicine)

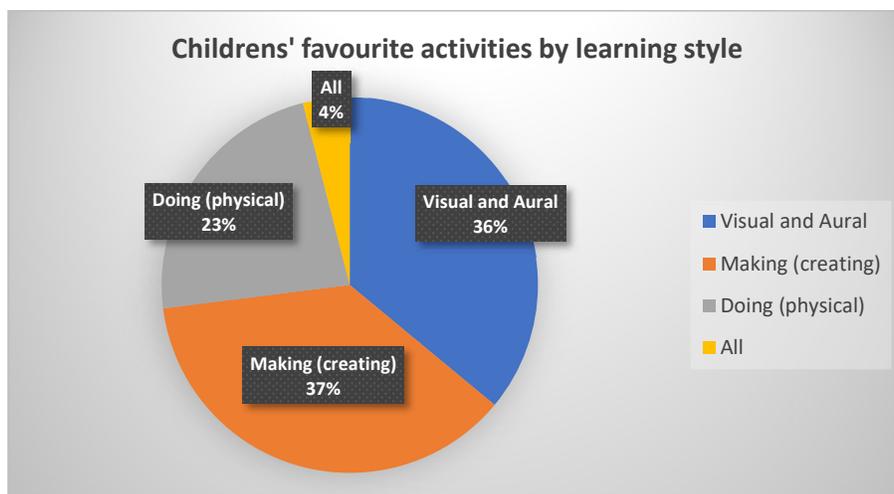
The other activities at the Deptford lounge that were mentioned by a fewer number children were; cloud making, ID cards and Spray painting.

At The Albany venue, the most frequently mentioned experiences were:

- The Virtual Reality Room – Living in Space (SMASHfestUK, Middlesex University and Queen Mary University)
- Rocket making – Living in Space (SMASHfestUK and Middlesex University)
- Raft making – Jenny Edbrooke
- Performances (The Greatest Comic making show on Earth, Comedy 4 Kids, LOOK UP!)
- Making Waves (Sinead Kempley)

The children’s choices were grouped and coded into the following learning styles,

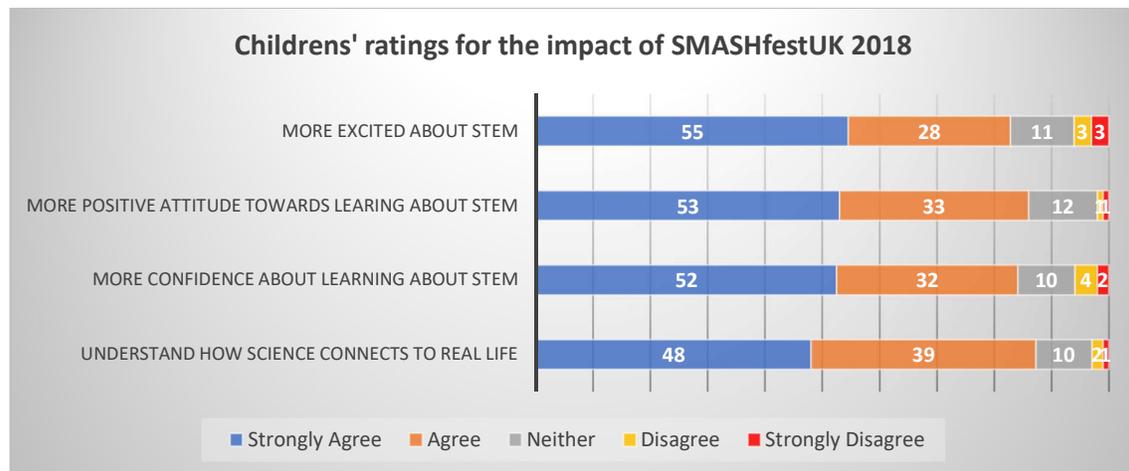
Learning Style	Explanation	Examples
<b>Visual/Performance/Aural</b>	Where children watched a performance or demonstration. Activities that were primarily visual or aural (i.e. using computer screens) with fewer elements of interaction	The Theatre Performances The Virtual Reality Room – living In Space The Hologram making River Erosion – Sand Pit!
<b>Making/Creative</b>	Where children took part in making or constructing something	Raft building Cloud making Rocket making House on Silts
<b>Doing/physical</b>	Where children complete an activity or task	Survive the Swamp Lab in a Lorry Murky Waters Ice burg Room



The child respondents were most likely to select active learning activities that involved making or doing something physically (60%) although 40% of the children selected more passive experiences where they had to watch or listen (note: many of these had elements of interaction with the children). Similar figures were evidenced at SMASHfestUK 2017 illustrating that children are attracted to a variety of learning styles offered at the festival.

### IMPACT OF SMASHFESTUK ON ATTITUDES AND CONFIDENCE

Smiley faces were used for the children to rate how far they felt that SMASHfestUK 2018 had contributed to their attitudes and confidence towards STEM (younger children were offered help in completing this part of the evaluation form).



The above chart shows that children were most confident that the events at SMASHfestUK helped them to understand how science can connect to the real world (87% agree/strongly agree). They also felt that SMASHfestUK had given them a more positive attitude towards learning about STEM (86% agree/strongly agree) and that participation had made them feel more confident about learning about STEM at school (84% agree/strongly agree). 83% of the children agreed or strongly agreed that the events had made them more excited about STEM.

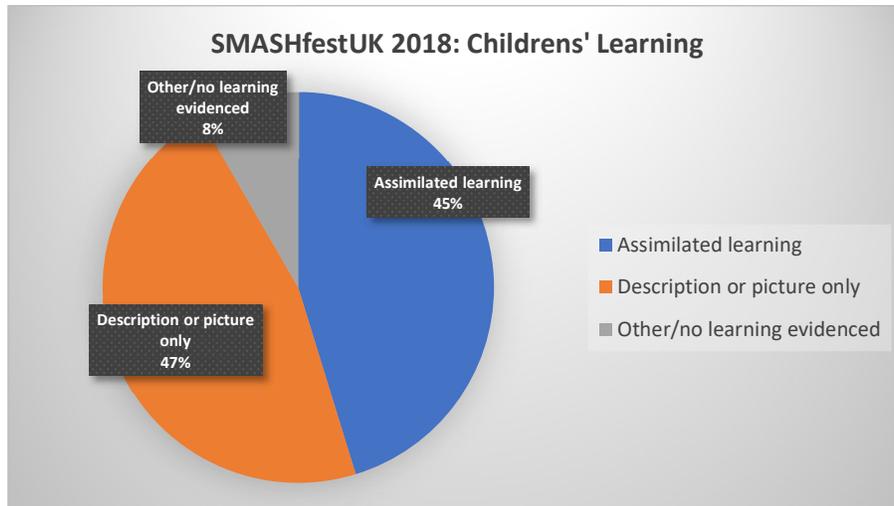
### CHILDRENS' KNOWLEDGE AND UNDERSTANDING

**84%** of the children questioned felt that they had **learnt something new** because of coming to SMASHfestUK 2018

84 of 102 the children provided an explanation, description or picture of something that they had learnt because of attending SMASHfestUK 2018. The responses were coded into the following categories:

Category	
<b>Assimilated Learning</b>	Where the child has demonstrated that they have assimilated knowledge from one or more SMASHfestUK experience
<b>Description of Activity</b>	Where the child had described or drawn an activity without offering a deeper explanation
<b>Other</b>	Where a child has made a comment or drawn a picture unrelatable to the SMASHfestUK activities

The chart below demonstrates the distribution of the coded responses given by the children.



45% of the children who completed this question were able to provide evidence of short-term assimilated learning. Further analysis demonstrated that many of the assimilated learning responses were linked to visual/aural experiences or doing/physical experiences. Many of these responses were linked to specific activities. A selection of these are presented below,

**Bug off! Mosquito (LSTM)**

*"Girl mosquitos bite!"* (Male Child, Age 5, SE13)

*"I learnt how many differerent diseases that mosquitos can give"*  
(Female Child, Age 10, SE8)

**Sand Pit! River Erosion (UCL)**

*"I learnt that no machines made the river Thames flood barrier - only humans"*  
(Male Child, Aged 11, SE8)

*"I learnt about the river Thames. The water - you have to build houses in a safe place because water can destroy cement. I learnt that there were different types of plastics"*  
(Male, Age 11, SE8)

*"(I learnt about) the source and mouth of a river and how a dam is created and how water erodes soil in a river"* (Female, Age 11, SE8)

**Murky Waters & Lab in a Lorry (Kingston University)**

*"I've learnt that if it floods you might not want to go in the water because it will have lots of bacteria in it. You could get diarrhoea, vomit and feel dehydrated - so you get sick. You also need resources to survive"*  
(Female Child, Age 10, SE14)

*"I found out three different types of diseases, lead poisoning, cholera and leptospirosis! I found out that cholera is the most effected one round here"*  
(Male, Age 11, E20).

### **Living in Space - Rocket Making and Launching**

*"(I learnt about) Air and forces - Rocket making. The top of the rocket makes it faster and higher"* (Male Child, aged 8, BR3)

*"Without gas rockets won't launch. Gas is really important for rockets also oxygen"*  
(Female child, Aged 10, SE14)

### **All Activities**

*"About making boats. We learnt about gravity and how many days it takes for the moon to go around the earth - 28 days. I learnt about holograms too. I also designed my own rocket and launched it!"*  
(female child, aged 5, SE8)

## **ENGINEERING KNOWLEDGE**

SMASHFestUK promote, and engage families in, many engineering activities. In 2017 The Institute of Engineering and Technology highlighted a lack of public understanding of engineering professions after it surveyed 2000 parents and found that only 23% of them could offer an acute description of an engineer<sup>34</sup>. It was of interest therefore to establish how far SMASHfestUK could impact on child visitors' knowledge of engineering.

SMASHfestUK were found to be able to promote engineering with 65% of the children questioned feeling confident that after their SMASHfestUK experience they knew what an engineer did. Of these, 20% were able to provide a good description of what an engineer did (i.e. "they make things and design things – you must be creative to be an engineer"), and 65% were able to provide an average explanation (i.e. "Fixes a plane, car and bus and other vehicles") and 14% provided a poor explanation (i.e. "Draws houses for the person who is searching for a house"). Female children were more able to provide more accurate explanations than the boys who were questioned, and the older the children were more able to provide an accurate description than the younger children.

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<sup>34</sup> <https://www.theiet.org/policy/media/press-releases/20150330.cfm>

<https://www.shinyshiny.tv/2017/07/confused-parents-dont-know-what-an-engineer-is-six-times-more-likely-to-know-justin-bieber-than-elon-musk.html>

## CHILD VISITORS: SUGGESTIONS FOR IMPROVEMENT

62 of the children offered some suggestions of what they would like to see or do at future SMASHfestUK events, 40 children left this blank or suggested that they liked it all. The 74 responses have been coded and are presented in the table below:

Suggestion	Number of responses (some children gave more than one response)
More activities (to do or make) general	18
Specific subjects/activities requested (e.g. dinosaurs, medicine, human body, environment, animals, electric circuits. LEGO building, Slime making, sports etc)	13
A wider range of activities for all age-ranges	6
Bigger space for activities/longer run	5
More Physical activities	4
More engineering activities	4
More science experiments (big impact ones)	2
More arts and crafts	2
Free food/tattoos/face-painting	2
More shows with greater levels of interaction	2
Shows that are more fun/happy	2
Better seating and a map of activities	2

In contrast to the adult suggestions, the child visitors were more likely to focus on the range and breadth of activities offered than on the organisational process. Many of the children also offered a range of ideas for future activities and topics. Like the adult respondents, some of the children also mentioned the age-range of activities (particularly at the Deptford lounge) with one child saying that they would like, 'more activities for younger children under six, because my little was crying' (Female Child, aged 11).

## YOUNG EXPLAINERS EVALUATION

29 Young Explainers from the local community were recruited to help to plan and implement some of the activities at SMASHfestUK 2018. This year, Young Explainers ranged from age 12 to age 17. The majority of the Young Explainers were from, or attended schools or colleges, in Lewisham. 80% of the Young Explainers were new recruits and 20% were repeat volunteers.

The aim for the Young Explainers was to encourage participation from local youth and to grow confidence in presenting to the public, in addition, the Young Explainers could gain valuable experience of team-work, organisation, presenting, communication and public-speaking that are invaluable for professional work and could be added to their CV. The experience also aimed to encourage future participation in STEM and to strengthen the young peoples' confidence in STEM subjects/careers and give access to networking opportunities.

The young explainers were given self-administered pre- and post- evaluation forms (on-line and paper copy). 18 Young Explainers completed pre-SMASHfestUK evaluation forms and 10 completed the post-online evaluation forms (with only 8 pre and post completed<sup>35</sup>). Caution therefore needs to be exercised in drawing conclusions from this data.

The Young Explainers and apprentices had the opportunity to engage with just under 3500 visitors across the week and provide support to academics, STEM professionals, performers, artists, engineers and museum professionals. Some of the Young Explainers collaborated with SMASHfestUK to produce hands-on STEM activities for family groups. The Young Explainers main duties were to assist at the different hand-on activity stations and interact with the public by explaining the principles behind the activities. In some instances, Young Explainers were able to lead activities, one Young explainer commented,

*“On Monday morning I was responsible for setting up the virtual reality Google cardboard headsets and talking to visitors about the process of making the helmets and Living in Space after a devastating flood. On Monday afternoon, I helped-out on Survive the Swamp for a while and then moved on to paper boat crafting. On Thursday afternoon I ran the Survive the Swamp game”.*

(Female Young explainer, Deptford Lounge)

Because of the voluntary nature of the role, the distribution of Young explainer volunteers was not consistent throughout the week, with spikes of attendance on Monday and Friday.

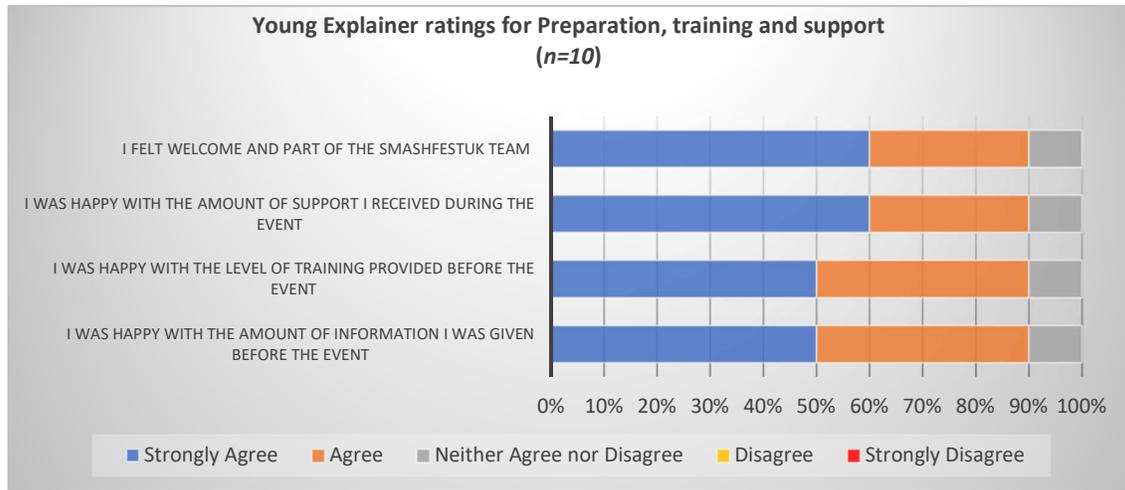
The most enjoyable aspect of the volunteering as a Young explainer varied for the respondents, these have been coded below:

Most Enjoyable Part	Number of responses (some respondents gave more than one answer)
Enthusing children (and adults) in STEM activities	5
Meeting new people/Friendly staff	5
Learning new skills	1
All of it	1

<sup>35</sup> Because of the low return of post-SMASHfestUK evaluation forms pre and post have not been compared for this analysis.

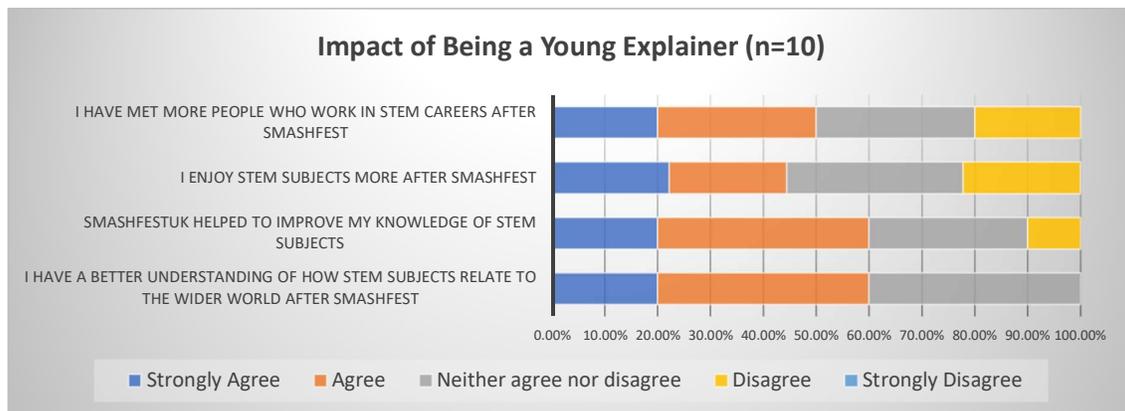
The two principle areas that the Young Explainers enjoyed the most were enthusing adults and children in STEM activities and meeting and socialising with new people.

**YOUNG EXPLAINER: PREPARATION, TRAINING AND SUPPORT**



The respondents were confident that they felt part of the SMASHfestUK team and received sufficient support during the festival. Most of the respondents also felt that the level of training and information that they were provided with before the festival was adequate.

**THE IMPACT OF BEING A YOUNG EXPLAINER**



60% of the Young Explainers (who responded to the survey) agreed or strongly agreed that being part of SMASHfestUK 2018 had helped them to better understand how STEM subjects relate to the real-world and helped to improve their knowledge of STEM subjects. Half of the respondents agreed or strongly agreed that SMASHfestUK had enabled them to network with people who work in STEM careers. Many of the respondents already enjoyed STEM subjects prior to volunteering at SMASHfest, so a lesser percentage of agreement was evidenced in this category. Only 50% of the Young Explainer’s who responded to the survey felt that they had met more people who work in STEM careers after taking part in SMASHfestUK. This was perhaps a result of the distribution of Young Explainers across activities. Many of the Young Explainers this year manned SMASHfestUK activities rather than helping-out at other activities (where student volunteers were available i.e. University outreach activities).

Most of the Young Explainer respondents felt that their attitudes towards STEM had not been substantially changed by their involvement in SMASHfestUK (the pre-evaluation shows that many YEs already had a positive attitude towards STEM). However, the opportunity to display their STEM knowledge and enthuse others had a greater impact on the Young Explainers. One respondent commented that the festival enabled her to see how inspiring STEM communication could be for others,

*“I just realised that if we introduce STEM subjects to these children especially the very young ones. We can inspire them to be more interested in them. We can let them know that these subjects shouldn't be things that we grow up to avoid or develop a fear for. Rather, it can be fun and knowledgeable”.*

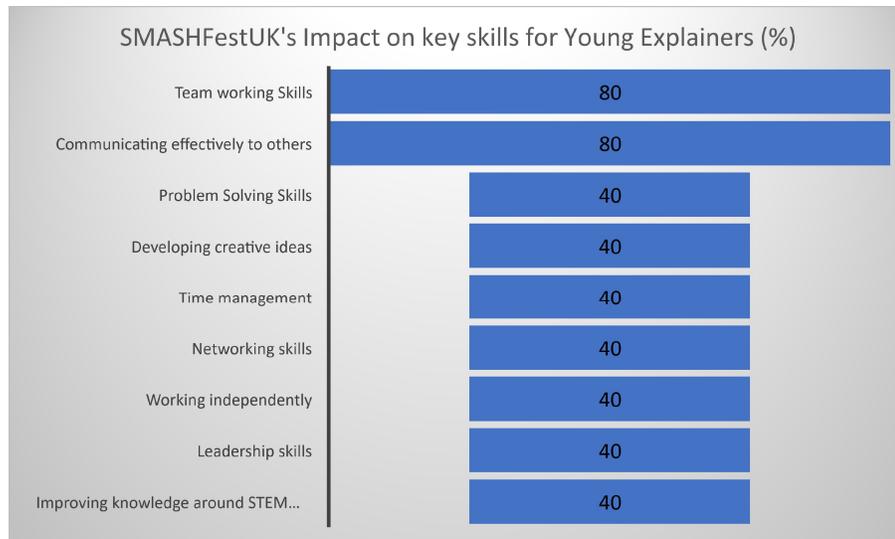
(Female YE, Aged 16)

## IMPACT ON SOFT-SKILLS

SMASHfestUK also aimed to improve the soft skills of the Young Explainers. Pre-SMASHfestUK the soft skills that most of the Young Explainers were interested in developing were:

- Team working skills
- Networking skills
- Working independently/making decisions independently
- Communicating effectively to others

The chart below demonstrates the impact that the respondents felt that SMASHfestUK had on their soft-skills.



80% of the respondents felt that being part of the SMASHfestUK team had helped to build their team working skills and helped develop their communication skills. To a lesser extent taking part in SMASHfestUK had also impacted on problem solving, developing creative ideas, time management, networking, working independently, STEM knowledge and leadership skills for some of the Young Explainers

It was also evident via short interviews with some of the Young Explainers that the experience had helped to build their confidence and enabled them to gain new knowledge. One of the Young Explainers commented,

*“This is my first-time volunteering. I wanted to gain new experiences. I am quite shy, and this pushed me out of my comfort zone. It is also useful for my C.V. so that is a plus too! I had quite a bit of knowledge around STEM subjects, but I have learnt new things here especially helping out at the Hydroponics activity at the Deptford Lounge”.*

(Female Young Explainer, Aged 16)

Another Young explainer who is not studying STEM post-16 said,

*“It has taken quite a lot of energy out of me! I have never done children’s activities before, but they are fun. I’ve learnt quite a lot about how rivers flow – they don’t stay the same shape as they erode away”.*

(Male Young Explainer, Aged 17)

These comments illustrate that by taking part in presenting the activities to the public the Young Explainers are also assimilating STEM knowledge and building confidence. The Young Explainers gave positive feedback of their experience with **100%** of the respondents suggesting that they would **volunteer for SMASHfestUK again**.

#### YOUNG EXPLAINERS: SUGGESTIONS FOR IMPROVEMENT

Most of the Young Explainers did not offer any suggestions for improvement, as they had enjoyed the experience of volunteering. Some presented ideas useful for future planning and these are shown below,

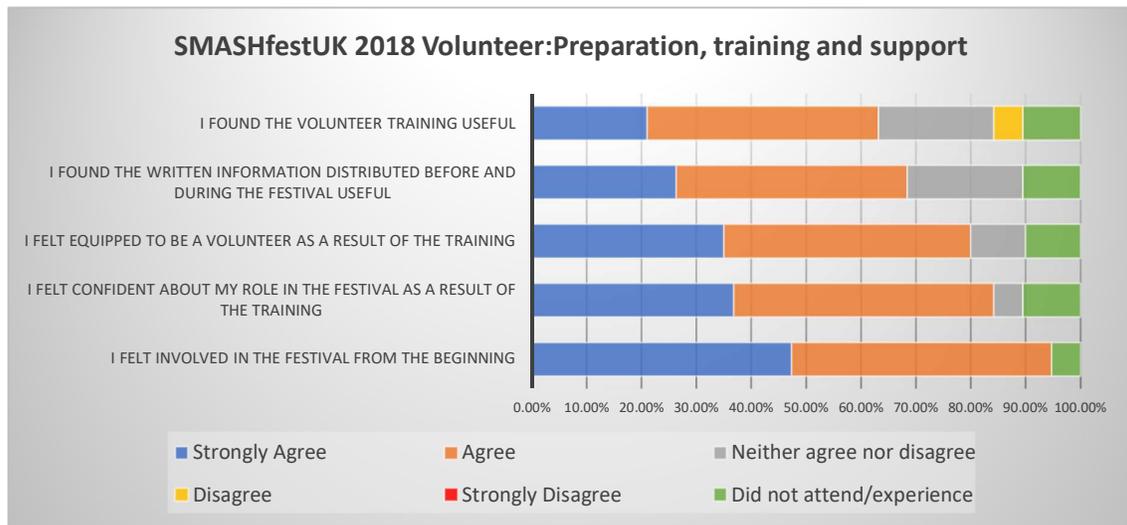
Suggestion
More Networking Opportunities
Opportunity to do work experience with SMASHfestUK
More team-games or ice-breakers to bond the team
More support from SMASHfestUK staff at the start of manning an activity
More advertising of the event

## VOLUNTEER EVALUATION

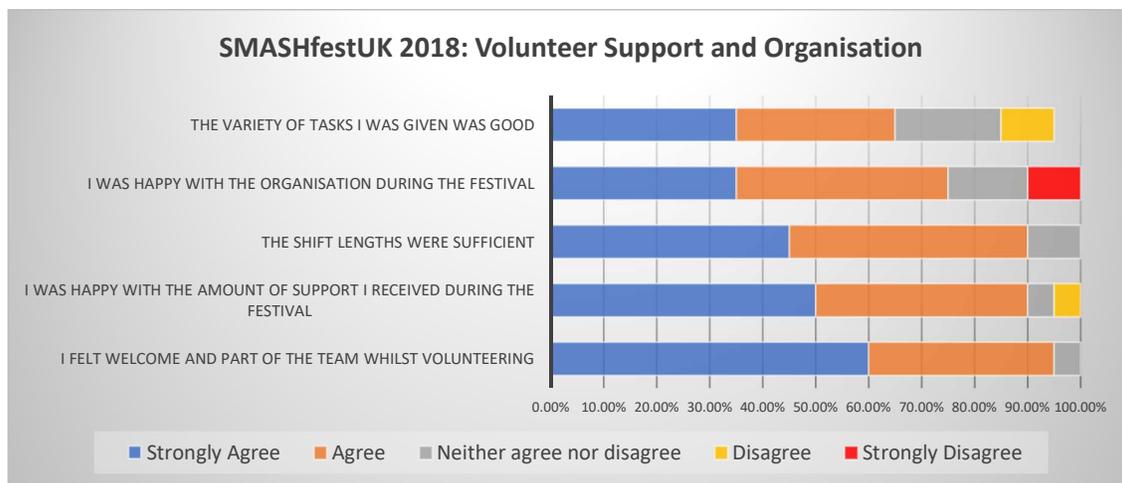
SMASHfestUK recruited over 60 adult volunteers this year from local community groups, STEM organisations, schools and universities. The volunteers were on hand to support the event and gain skills in STEM presentation, participation, organisation, team-work and communication. This year, SMASHfestUK also recruited 6 volunteers from 'Heart and Soul', a group of disabled community members who were able to lend support in facilitating activities or doing front-of-house duties.

20 volunteers responded to the post-festival survey and this provided some information on both how the experience was received and what impact the experience of being a volunteer had on them. The results are presented below,

### VOLUNTEER PREPARATION, TRAINING AND SUPPORT

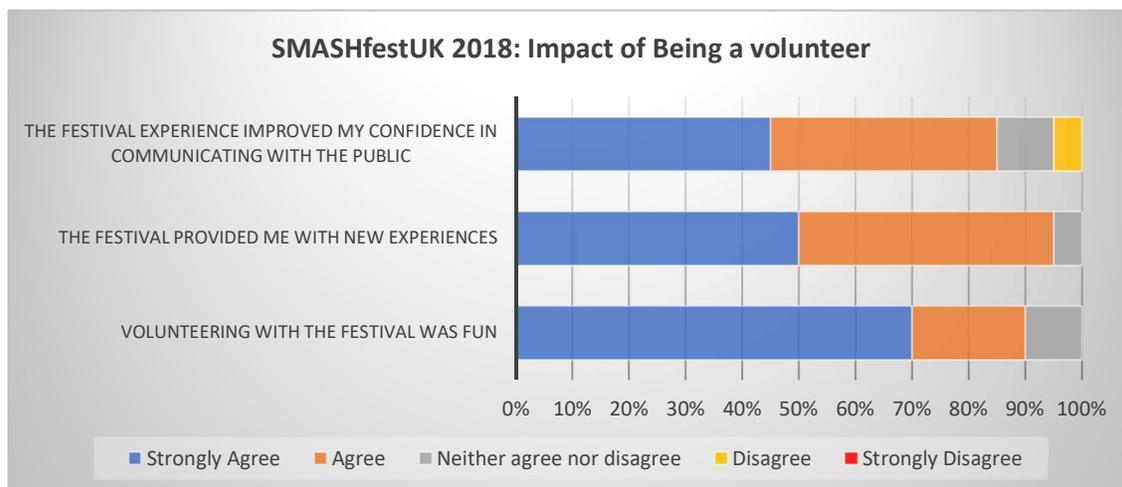


95% of the volunteers who responded to the survey felt confident that they were involved in the festival from the beginning. Over 80% felt that they were confident in their role as a volunteer and that the training had aided them in this. Slightly fewer volunteers agreed/strongly agreed that the written or verbal training was as useful.



Over 90% of the volunteers who responded to the survey agreed or strongly agreed that they felt welcomed, supported and that the shift lengths distributed were sufficient during their time at SMASHfestUK. 75% were happy with the level of organisation and 65% thought that the variety of tasks were good. Some comments referred to a perceived lack of organisation and a lack of access to core staff members (to check information/provide resources). Other comments related to the break/lunch rota or lack of supplies to keep staff warm who were stationed outside. Due to the busyness of the festival throughout each day, some of the volunteers were unable to get the time to look around the festival themselves.

## IMPACT OF BEING A VOLUNTEER



SMASHfestUK 2018 provided the volunteers with new experiences and for many it improved their confidence in communicating with the public. 90% thought that the experience was fun.

The most enjoyable aspect of volunteering varied among the respondents, these are coded below,

Most Enjoyable Part	Number of responses
Enthusing children and seeing children's enthusiasm for STEM	8
Meeting new people and teamwork	6

<b>Learning new things</b>	3
<b>Seeing the shows and helping on activities</b>	2
<b>Engaging the community</b>	2
<b>All of it</b>	1

The is comparable with the Young Explainers feedback, where enthusing children in STEM and social opportunities were most valued.

**100%** of the respondents felt that volunteering **met or exceeded their expectations**. One volunteer commented,

*“It exceeded expectations. I was so impressed by the activities available for kids and with the way the event was organised/run. I’ve never been to a ‘science festival’ before but it was brilliant and particularly for the community – so many parents said that usually there is nothing in Deptford for children and how happy they were with being able to come to SMASHfest”*

#### VOLUNTEER: SUGGESTIONS FOR IMPROVEMENT

The volunteers were able to offer many suggestions for improvement and future development. The suggestions related to both the role and organisation of the volunteers and ideas development for the festival. These are presented in the table below,

<b>Suggestions for Volunteers</b>
<b>Better shift rotation for volunteers</b>
<b>Pre-planning of rota, shifts and activities presented to all volunteers prior to festival</b>
<b>Organise a drinks/social event for volunteers</b>
<b>Hold a training day during the day or at weekends</b>
<b>Organise a chill-out room for volunteers and SMASHfestUK staff (for charging phones, storage, lunch, breaktimes)</b>
<b>Provide warmer areas for activities</b>
<b>Suggestions for Festival</b>
<b>More/different activities for volunteers to man</b>
<b>More seating/tables</b>
<b>Better directional and information signage</b>
<b>Better advertising in the local area</b>

## CONTRIBUTOR EVALUATION

There were over 30 contributors to SMASHfestUK 2018. These included, amongst others, science communicators, comedy and theatre performers, artists, university outreach groups (engineering, sciences, maths, physics, media), Lab in a Lorry, museum representatives and science buskers. The events and activities were designed to impart STEM knowledge and understanding to the public through a predominantly arts-medium in a fun, immersive and engaging way within the overarching narrative of a Flood! The evaluation of this group consisted of an online survey administered after the event. In addition, verbal feedback was collected on the day to assess the impressions of the contributors (and gather formative evaluation). The aim of the evaluation of this group was to assess their impressions of the festival and to evaluate their perceptions of the impact of their participation to the public.

19 of the contributors were contacted for feedback, 68% responded ( $n=13$ ).

### CONTRIBUTORS MOTIVATION TO ATTEND AND VISITOR-FLOW

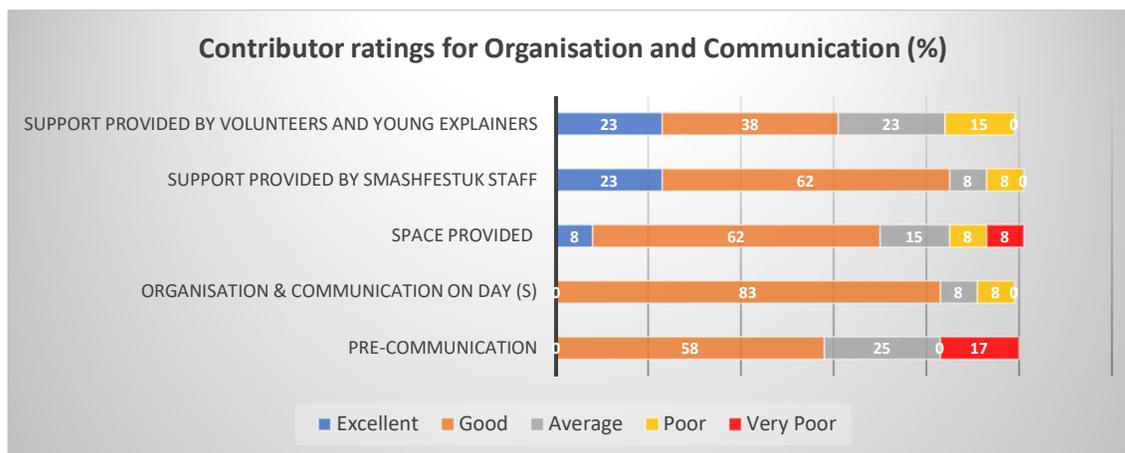
The respondents to the SMASHfestUK contributors survey were motivated in different ways. Most were motivated by the idea of public engagement located in hard-to-reach communities and wanted to spread awareness and excitement about STEM subjects (specifically those from the Universities). Others had contributed to SMASHfestUK on previous occasions and wanted to take part again. Some contributors were hired to deliver specific activities/performances. One contributor was attracted by the unique format that SMASHfestUK offered for public engagement and science communication,

*“I was motivated by the excitement of being involved in a cutting-edge STEAM festival”*  
(Dr. Nathan Adams, University of Sheffield)

The contributors that presented activities for the public had different numbers of audiences throughout the day. Many were busy all day whilst others had busy periods. On average, the respondents felt that they were busy for 70% of the time on the days they attended. Jenny Edbrooke’s houses on Stilts and Raft building, Indrayani Ghangrekar who ran the STEM careers/ID cards and Lucina Offer at the Survival village and Space Camp were the busiest of those that responded (busy 90-100% of the time).

### CONTRIBUTORS RATINGS OF ORGANISATION AND COMMUNICATION

The contributors were asked to rate the level of communication and organisation at SMASHfestUK using a five-point Likert-scale. The results for the respondents are displayed in the chart below,



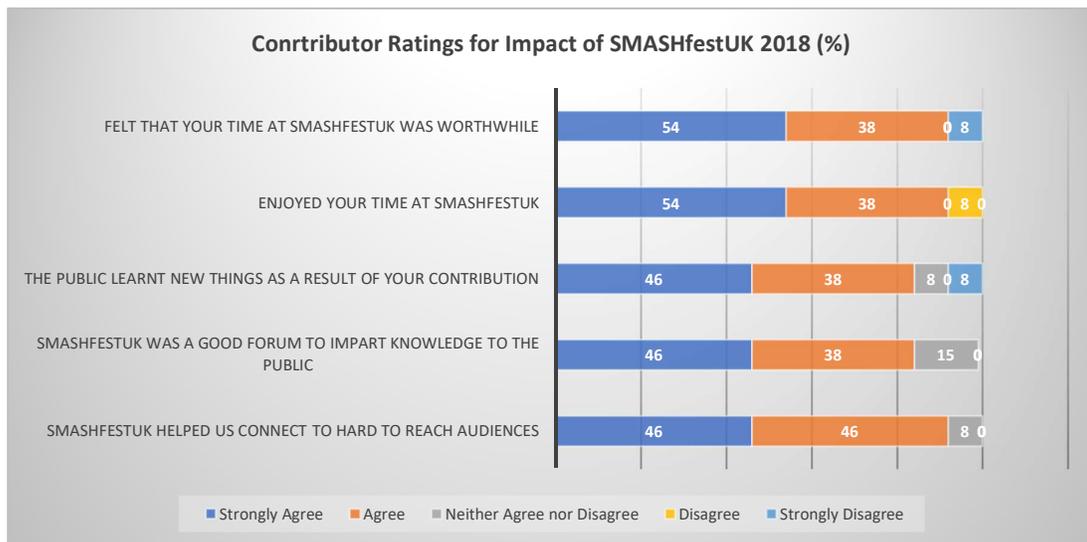
The respondents felt that the level of communication prior to the event and on the days attended was satisfactory, but could be improved. Additional comments gathered from the written and verbal feedback suggest that a clearer timetable of events and plan of the table-space and positioning in advance may have aided some of the contributors in planning what to bring/what to expect and offered an idea of the potential number of visitors. There were also comments that referred to a lack of clarity of the role of some of the contributors, leading to some confusion about what was expected of them during the festival. There was an increase in positive ratings given for organisation and communication on the days attended.

Some of the contributors who responded to the survey were not satisfied with the space provided on the day (s) they attended, further comments confirmed that these mainly related to the space provided in the outdoor area and the upper-gallery rooms at The Albany. Some comments referred to a lack of initial communication about locations, lunch vouchers and set-up times and they also referred to the lack of help in setting-up their stalls dealing with wind, mud and some rain. Some of the contributors who were situated in the first-floor rooms felt that there was an absence of audience flow to the upper gallery and this affected visitor numbers on Thursday in particular (one contributor was then moved downstairs into the garden area on Friday where visitor flow improved). Observation during a brief rainy period on Thursday confirmed that there was a lack of planning of available space inside the building if rain had persisted mainly due to the café also being open for business to the public all day.

Only some of the contributors had contact with the Young Explainers or volunteer helpers during the festival, reflecting the varied ratings. One contributor commented that although some of the Young Explainers were helpful, some varied in their communication abilities and needed quite a bit of support and training on the activities (which there was limited time to provide).

### CONTRIBUTOR RATINGS FOR IMPACT

The contributors who responded to the survey were asked to rate their experience in terms of its worth and impact on a 5-point Likert-scale. The results are displayed in the chart below,



92% of the contributor respondents either agreed or strongly agreed that their time spent at SMASHfestUK was worthwhile, enjoyable and was an opportunity to connect with audiences that they would not usually communicate with. One contributor from Middlesex university commented,

*“we have had a really good reception. It has been really busy and the kids are queuing to have a go! While they wait they can have a go on the refraction*

*glasses and we get the opportunity to talk to them about light and rainbows. We have had a lot of kids that have never experienced Virtual Reality before and that is great – we are able to give them an experience that they haven't had before and wouldn't necessarily be able to get at home and that is really nice to see"*

(Contributor, Middlesex University, VR Space rollercoaster)

Another contributor from the London School of Tropical medicine commented that the experience for them had a two-way reward,

*"This has been the most rewarding of our public outreach because of the diversity of the local population. That is really different from our normal outreach. We have actually met people here who have had real experience of Malaria and Dengue fever and they can talk about their experience with us. We are incredibly happy to have come to SMASHfest"*

One contributor, from the Royal Astronomical society, was struck by the impact her activity could have on both children and adults,

*"Parents and teachers commented on how they enjoyed the gravity mugs and thought they were a clever way to demonstrate it easily. The children were eager to try out the human factor workstations. I never got a moments rest traffic-wise or supporting the volunteers next to me. One 20-something individual was enjoying the rocket station so much that he would finish each task and then come and tell me about it. He kept hanging around me and having a chat and asking questions. Once he launched his rocket he came running back to me to let me know how amazing it was and he was all smiley and happy. He continued to walk around me and tell me how much he enjoyed that, and I responded with much praise and accolades of his accomplishment as well as a bit of a chat about rocketry. A while later he had to go and came up to me and said goodbye and gave me a hug. He reminded me why I do what I do and I left your event feeling lighter than air".*

(Contributor, Earth Survival Skills and Space Camp)

A contributor from Kingston University shared an experience that she had in engaging a disabled visitor,

*"One disabled visitor came with her carer, who was unsure she would be able to participate. However, she was able to complete the session and was really happy about her achievement".*

(Contributor, Lab in a Lorry)

A community artist highlighted the importance of completing activities on children confidence,

*"The children feel so proud of themselves when they have created pieces of work by themselves. It's fantastic to be part of facilitating that"*

(Contributor, Raft building)

84% of the contributors who responded to the survey also felt that SMASHfestUK was a good way to impart knowledge to the public and they also felt confident that the public learnt new things because of their attendance. This substantiates evidence from the adult and child evaluations (see above). Only one contributor (who responded to the survey) was less confident about their impact. Closer inspection of their comments,

both during the event and on the feedback form, found that they had a lack of space for their activity, in addition, they were stationed near the very popular Space Camp activity which had detracted from their own activity.

The majority of the contributor respondents said that they would take part in SMASHfestUK again. One contributor said that they would prefer an indoor location if they took part again.

## AREAS FOR DEVELOPMENT

Five contributors provided ideas for the future development of SMASHfestUK (other suggestions were gathered from contributors during the festival). The replies were mainly focused on organisation of the event. Suggestions given were,

Suggestion
Pre-information packs for each contributor:
<ul style="list-style-type: none"> <li>▪ Catalogue all the other contributors and what they are providing</li> </ul>
<ul style="list-style-type: none"> <li>▪ Give an idea of the space and position of the allotted stand</li> </ul>
<ul style="list-style-type: none"> <li>▪ Provide clear information about lunch and breaks times</li> </ul>
<ul style="list-style-type: none"> <li>▪ Provide clear idea of equipment and facilities available (and provision for rainy days)</li> </ul>
<ul style="list-style-type: none"> <li>▪ Provide information on the volunteers or Young Explainers and what support or information that they might need.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Health and Safety protocol and information on where first-aid kits and fire routes are.</li> </ul>
Engage more teenagers
Larger Venue of better planned space (especially upstairs rooms)
Better signage (especially directional signage)
Regular tea and coffee for outdoor contributors (to keep warm)
Welcome desk at both venues
A better distribution of volunteers and Young Explainers across the week
Increased communication between contributors and SMASHfestUK staff

## CO-COLLABORATION AND CO-PRODUCTION

SMASHfestUK collaborated with a number of University departments, local and national secondary schools, theatre and charity groups, along with the Flood Hazard Research Centre to design and develop performance pieces, art installations, STEM productions and STEM exhibits for the festival. The collaborations provided opportunities for students and researchers to work with others to develop their research skills, their planning and construction skills and their public-communication skills. The activity provided them with opportunities to explore scenarios that are embedded in real-world practice. The collaborations are described in greater detail below:

### **Living in Space (multi-faceted exhibition and immersive experience)**

Living in Space explored whether human beings could successfully migrate to space following a catastrophic natural disaster on Earth. Could humans live on The Moon or on Mars? What would it take to build a world in Space? SMASHfestUK worked with multiple collaborators in researching, designing and developing this theme. The final exhibition piece included: a panel exhibition; an immersive space experience; a virtual reality room with VR roller-coaster through Space; interactive robots; VR space helmets and; 3D visual and sound installations.

**Funders:** Science and Technology Facilities Council, UK Space Agency, Royal Academy of Engineering & Middlesex University

**Co-Collaborators:** SMASHfestUK, Middlesex University, Deptford Green School (London), Llangatwg Community School (South Wales) and ASTROCYMRU (Wales).

**Production:**

- Deptford Green Secondary School: Forty, 12-13-year-old, Design and Technology students researched, designed and created the Virtual Reality Space Helmets for the experience.
- Llangatwg Community School & ASTROCYMRU: Eighty, 13-14-year-olds, developed and designed space flags and helped to develop the storyline for Living in Space.
- Middlesex University
  - 80 Undergraduate Product Design and Design Engineering students designed the overall Living in Space experience.
  - 15 Design Engineering and Mathematics Graduate Academic Assistants and staff designed and engineered the mechanical, robotic and software elements of the Living in Space.
  - 8 staff and 15 students from the Maths Department developed activities for Living in Space.
- Queen Mary University: Researched and produced responsive art works, both visual and audio, based on the Living in Space theme.
- Haberdasher Askeys Hatcham College and Christ the King Sixth Form in Lewisham: 20 Young Innovators 20 developed activities for the Living in Space Camp training.

**Prepare for Flooding! ('hands on and minds on' activity)**

Creative arts, science and engineering skills were encouraged to explore ways in which to protect communities and homes from flooding.

**Funders:** SYSTEM-RISK at Middlesex University, EU Funded Marie-Sklodowska-Curie European training network

**Co-Collaborators:** SYSTEM-RISKproject, Flood Hazard Research Centre at Middlesex University (funded by Marie-Sklodowska-Curie European training network)

**Production**

- Flood Hazard Research Centre worked with 15 Marie Curie PhD researchers on dialogic research training – exploring public engagement with research.

**STEM the Tide Variety Show (performance)**

Told through the medium of music, poetry, comedy, rhyme and song the, 'STEM the Tide Variety Show' explored the prospect and outcome of a Flood hitting London in 2018. Local performers alongside STEM communication experts researched, designed and delivered this show.

**Funders:** Royal Society of Chemistry and Wellcome Trust

**Co-Collaborators:** SMASHfestUK and young performers from The International School in Greenwich and Haberdashers Aske's Hatcham College.

**Production:**

- Greenwich International School and Haberdashers Aske's Hatcham College. 200 young performers took part in the British Science Association and Research Council UK science performers competition. 40 young performers were involved in the final variety show. 3 winners took part in the SMASHfestUK Variety Show at the Albany.

**The Curious Case of the Flood in the night-time (interactive performance)**

The audience for Curious Case had to utilise their STEM skills to solve a post-flood murder mystery case. A team from SMASHfestUK, a theatre director, and three Universities collaborated on this interactive performance.

**Funders:** Royal Society of Chemistry and Wellcome Trust

**Co-collaborators:** SMASHfestUK, Creative Industries team at The University of Greenwich, Academics from Wolverhampton University and Queen Mary's University in London.

### **Haz 2 O – Murky Waters (Investigative interactive activity)**

Visitors were asked to take on the role of an investigative epidemiologist to discover why some people contract illnesses following a flood. Collecting samples, running chemical tests and consultation with the field lab were encouraged in order to explore water-borne illnesses in this interactive investigative activity.

**Funders:** Royal Society of Chemistry and Wellcome Trust

**Co-collaborators:** SMASHfestUK, Dr Nate Adams (Sheffield University) and the UK Emergency Rescue Team.

### **Responsive artwork (throughout exhibition space)**

Eight new art installations were premiered at the SMASHfestUK festival that highlighted the issues and responses surrounding climate change and flooding.

**Co-collaborators:** SMASHfestUK and Middlesex University Theatre Arts Students.

#### **Production:**

- Victor Ren: Personification of a flood (costume installation response piece to a real-life flood experience)
- James Johnson: Cascade (Assemblage installation exploring the effects of floods on lower-class communities)
- Dan Brennan: Water and Waste (Art installation highlighting the consequences of flooding especially on the pollution of sea-life)
- Shu Olteanu: Jelly Fish (Sound installation inspired by aquatic life)
- Maggie Slabonova: Hidden in Ice (immersive installation exploring the effects of climate change on releasing dormant viruses and bacteria)
- Justine Tabu: Melting Antarctica (immersive visual, sound and light installation showing the impact of climate change on Antarctica)

#### **Feedback from collaborative teams**

Working in collaboration with SMASHfestUK was a unique experience for some of the teams involved. Participation provided experience of designing to a brief for a community engaged project and professional experience in creating interactive installations and activities for public engagement.

The opportunity to develop and facilitate the sharing of maths concepts was highly valued by the students from Middlesex University Maths Department with one commenting,

*'At our university the concept of communicating maths is valued and improved though different activities such as SMASHFest and The Skills Show. These aim to make students interact with the public and explain mathematical concepts. Participating in these has made me confident in talking about maths.'*

Another maths student also commented about confidence building,

*'Taking part in SMASHFest was a nice experience for me, it gave me a chance to interact with maths in a different way and with different people too. ... I was able*

*to develop and improve my confidence in maths and with interacting with other people.'*

Tutor Alison Megeney commented that taking part in SMASHfestUK had broadened the maths teams approach to public engagement and provided a springboard to use the activities developed into the classroom context. She is currently undertaking research to explore how taking part in SMASHfestUK has impacted on her students understanding of advanced concepts in Mathematics.

The Theatre Arts team at Middlesex University had their first opportunities to exhibit their art work and 3D installations at the SMASHfestUK festival. This was critical for some of the students to help to focus and hone their research skills and to build confidence in designing to a brief and producing work that reflected their research and developed their understanding of how design can be used to engage and encourage debate. Tutor Kate Lane commented, 'my immediate feedback was very positive, and this fed directly into their work for assessment which because of their involvement with this project the standard of their work after it was at a higher standard. Especially their approach to research and applying it to design development'. A collaboration between STEM and the Arts provided new opportunities for her students to explore, 'the social impact of scenographic practice engaging narrative and aesthetics to communicate and engage scientific concepts'.

There was evidence to suggest that the key impacts in collaborating with SMASHfestUK were as follows,

- It enabled students to work across disciplines (creative arts, theatre, design, STEM subjects etc.)
- It Broadened students' horizons and gave them fresh perspectives in STEAM communication
- It enabled students to work in a real-world application (to a brief)
- It was a valuable experience for staff and students (in terms of public engagement, curriculum design, research, application and production)
- It fed new insights and perspectives into research and practice

Some of the collaborative teams provided recommendations for future collaborations. These are as follows:

Martin Archer (Queen Mary University, London)

- Improved Pre-organisation across collaborative teams
- Transparent application process for contributions based around the full narrative of the festival

Alison Megeney (Middlesex University)

- More support for the team from SMASHfestUK
- Some events in North London and beyond.

Kate Lane (Middlesex University)

- Restrict the amount of space the artists have for greater visual impact

## SOCIAL MEDIA ANALYSIS

In 2018, SMASHfestUK had the following social media presence during the festival period,

Social Media	Dates	Following/Views
SMASHfestUK website	10 <sup>th</sup> Jan – 20 <sup>th</sup> February	4170 views
SMASHfestUK Twitter	All	1568 followers
SMASHfestUK Facebook	22 <sup>nd</sup> Jan – 19 <sup>th</sup> February	9188 Reach (15 posts)
SMASHfestUK Flickr	25 <sup>th</sup> Jan – 21 <sup>st</sup> February	14,216 views

## SMASHFESTUK SOCIAL MEDIA FEEDBACK – A SELECTION OF CONTRIBUTOR TWEETS

**Lydia Cumiskey**  
@LydiaCumiskey

Amazing to see the innovative and creative #FRM approaches these @SMASHfestUK kids designed! 🎨  
+👨🏫 =💡👨🏫 Go team @jsosatw & @MiriBertola!



👤 You and 5 others

**Bug Off!**  
@BugOff\_official

Set up @SMASHfestUK having some really brilliant conversations about mozzies and diseases #science #mosquito #disease #Education



**Bug Off!**  
@BugOff\_official

Such a brilliant day @smashfestuk today! Talking #mozzies and #vectorbornediseases unfortunately our mozzies got a bit cold but we had some people that smelled so tasty some of them came for a sniff anyway



**Nathan Adams** added 4 new photos. 2 hrs · 📷

Been Smashing it up at Smash Festuk this last week. The best Science Festival I've had the pleasure of gradually increasing my involvement with. It's just incredible, how a small team with not an incredible amount of money can achieve a greater level of engagement, narrative and community involvement than I have seen anywhere else. I'm always amazed at the level of energy that Lindsay and Wyn put into this, their Science festival baby, but this year, working on Production for a couple of days before, the level of commitment shown by the staff is wonderful. Also I love the new production accountant. She has the best cosmic cowboy boots and the scariest NO FACE. Please note you can see I was working production and a clipboard with me at all times.



**The Poetry Takeaway**  
@poetrytakeaway

Well done to all @SmashFest, busy, busy Festival and a full house for Poetry Takeaway Live.  
Big up the master chefs @erinbolens @sugarjpoet @ellafears and Mr FluffyPunk @TheAlbanySE8



**SMASHfestUK FLOOD! 2018**  
The Albany 15-16th February  
Deptford Lounge 12-16th February

7 likes

cocomalonemusic I've just had the loveliest afternoon, singing in the variety show for @smashfestuk at The Albany Theatre, Deptford. All the kids were immense and got really involved! There's one more day left, tomorrow, of this years festival. If you've got children and you're in London, get down there, it's a whole load of science and arts fun! Thanks so much for having me back, guys! 🙌

#smashfestuk #science #arts #thealbanytheatre #deptford #singer

4 DAYS AGO



Liked by thealbanyse8 and 21 others

foxdownesjd Photo taken at the start of one of the coolest days of work I've done. Great team @piloton17 @caecrosby and the rest. @thealbanyse8 @smashfestuk. #comedy #events #VR #science #flood #poetry #music #theatre

View 1 comment

You Retweeted

**Dr Sheila Kanani**  
@SaturnSheila

@SMASHfestUK you were amazing!  
@nateadams @SimonDWatt @OpheliaBottom #floods @RAS\_Outreach @RobertMMassey



15/02/2018, 18:03

**Dr Heather Williams**  
@alrightPET

Follow @SMASHfestUK - brilliant festival bringing #science to the masses.

**Dr Nate Adams** @nateadams  
Good bye @SMASHfestUK - you have been wonderful yet again. 🙌




SMASHFESTUK SOCIAL MEDIA FEEDBACK – A SELECTION OF VISITOR TWEETS

 **Anna Woolman** @anna\_wool  
 Cosmic Jives at @SMASHfestUK was amazing! I wasn't expecting to almost cry at the end...  
 16/02/2018, 16:03  
 1 Retweet 1 Like

 **Carmel Britto** @carmel\_britto · 34m  
 The innovative approach by @SMASHfestUK to engaging not only young people but their families as a whole into the world of STEM is priceless. The interactive community learning approach has sparked and fuelled many of our @LPFKiddiesClub children's interest in the world of science

 **LPF Kiddies Club** @LPFKiddies... · 12h  
 #tbt to our club children's very first @SMASHfestUK experience in 2015 we loved it so much that we have been back every year since.  
 What will inspire you to become #STEMHEROES  


 **Rachel Nelken** @rachelnelken · 11h  
 Me & kids had such a great time @SMASHfestUK @TheAlbanySE8 today, blown away by all the imagination and creativity, science & art colliding in a massive maelstrom of fun! Big congrats to @SMASHfestUK team & volunteers and all our amazing @TheAlbanySE8 staff c u next year 🙌

 **Amelia B. Kyazze** @abkwriting  
 Very inspiring and fun day spent in Deptford @TheAlbanySE8 for @SMASHfestUK. A great diverse mash-up of art, comedy, science and tech. Tomorrow is the last day- don't miss out! Thanks to the artists and scientists and volunteers! Really special family day.



Liked by babydaytripper and 13 others  
 ispywithmylittlondoneye This morning we went to the library to do some science and art activities. There were lots of friendly grown ups in green t-shirts who helped me make an eco house out of cardboard, showed me how a river works in a sand tray, how rain falls out of clouds and cut off a bit of a plant so I can grow my own basil plant in a jar! 🌱💧  
 Mumy: This morning we arrived nice and early at @deptfordlounge for the last day of @smashfestuk - a free festival run by a STEM/Arts organisation that comprised experiments, demonstrations, craft activities and much more for kids of all ages. Both children really enjoyed it - not only did they come away with things they'd made but Boodie now understands river erosion! I love how much London has to offer my children 🙌  
 #daysoutwithkids #kidsinlondon #selondon #stemeducation #scienceforkids #freefestival #deptford #deptfordlounge



## DISCUSSION OF RESULTS

SMASHfestUK was successful at exposing visitors to a number of STEAM activities which highlighted the role of STEM in everyday lives. The festival provided opportunities for families to gain science-based knowledge and to experience science beyond the school curriculum via an arts-based medium. In addition, SMASHfestUK was able to promote pathways to STEM careers for all groups. The collaborators benefited from the festival because they were able to promote the public profile of their organization and engage hard-to-reach audiences. The following discussion will assess each of SMASHfestUKs aims against the evaluation results.

### **To produce an immersive science and arts festival with a strong narrative theme; engaging hard-to-reach audiences (young people, BME communities located in deprived areas) with STEM**

SMASHfestUK 2018 Flood! was the fourth SMASHfestUK to be held in Deptford, South London an area in the top 20 most deprived areas in the UK. The demographic data collected for the evaluation of SMASHfestUK over two years demonstrates that SMASHfestUK are consistently able to attract a fifth of their visitors from groups that do not access informal science activities other than SMASHfestUK. This type of visitor was more likely to access SMASHfestUK at the Deptford Lounge than in The Albany venue, but there was considerable evidence to suggest that many of the visitors who accessed SMASHfestUK at the Deptford Lounge also visited the events at The Albany at the end of the week. The festival was also able to attract a large representation from the local population, with 25% from Deptford postal areas and 55% from the areas in and surrounding Lewisham (SE postal areas). Further research found that 42% of these visitors lived in areas that are designated as the most deprived in the Lewisham borough (SE8, SE14, SE6 & BR1).

SMASHfestUK 2018 was able to attract a large percentage of BME visitors, especially from the Black African and East-Asian communities. The figures are representative of the Deptford local population and are over-representative for the Lewisham borough. As a percentage of their total visitor numbers, SMASHfestUK attracted 1728 visitors from non-white British ethnic backgrounds. There were a greater proportion of visitors of BME backgrounds at the Deptford Lounge. Significantly, the contributors, Young Explainers and volunteers also came from a wide range of BME backgrounds and this was vital for presenting STEM within an inclusive framework. This year, direct contact was made with the Chinese and Vietnamese community and as a result the proportion of East-Asian visitors increased by 4.8% from 2017.

More UK women now enter STEM subjects post-16 than previously, but this number is not equally distributed across the STEM fields<sup>36</sup>. Certain fields such as physics, engineering and chemistry are underrepresented in female recruits. Overall, the numbers of women entering STEM education in the UK post-16 is below that of many European countries<sup>37</sup>. SMASHfestUK have been successful in attracting an over representation of female children and adult visitors to their festival over the last two years. In 2018, 55% of the child visitors and 77% of the adult visitors were female. This is significant in the light of literature that suggests that women are less likely than men to feel informed about science and less confident engaging with science or working in a science environment<sup>38</sup>. Self-identity and self-perception have been shown to be strong drivers in girls not selecting STEM post-16<sup>39</sup>. The strong representation of female scientists, presenters, performers and

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<sup>36</sup> INSTITUTE OF ENGINEERING AND TECHNOLOGY REPORT, 2008. Studying STEM – What are the barriers: A literature review of the choices students make. MACDONALD, A. 2014. 'Not for People like me?' Under-represented groups in Science, Technology and Engineering: A summary of the evidence: the facts, the fiction and what we should do next (WISE report 2014).

<sup>37</sup> DEPARTMENT OF BUSINESS, ENERGY AND INDUSTRIAL STRATEGY POLICY REPORT, 2017. Industrial Strategy: Building a Britain fit for the Future. 27 November 2017. Department of Business, Energy and Industrial Strategy and ROYAL ACADEMY OF ENGINEERING REPORT, 2016. The UK STEM Education Landscape A report for the Lloyd's Register Foundation from the Royal Academy of Engineering Education and Skills Committee. Royal Academy of Engineering

<sup>38</sup> CASTELL, S, CHARLTON, A, CLEMENTS M ET AL (2014). Public attitudes to science 2014. A set of studies looking at the UK public's attitudes to science, scientists and science policy. March 2014. Department of Business, Innovation and Skills.

<sup>39</sup> MUJTABA, T. & REISS, M. J. (2016) [Girls in the UK have similar reasons to boys for intending to study mathematics post-16 thanks to the support and encouragement they receive](#). London Review of Education, 14, 66-81.

demonstrators at SMASHfestUK 2018 (including the Arts council sponsored play Cosmic Jives whose central theme was Women in Science) helps to reinforce the role of women in science and engineering roles. Role models have been seen, 'as a way of motivating individuals to perform novel behaviours and inspire them to set ambitious goals. In occupational settings, this is especially true for members of underrepresented or stigmatised groups' <sup>40</sup>. A lack of female role models has often been cited in the literature as one reason why girls or children from underrepresented ethnic minorities don't envision a career in STEM<sup>41</sup>. SMASHfestUK was delivered by a team with a large representation of women and those from BME backgrounds. This is vital in a diverse community such as Deptford as it presents role-models for young people and creates an unconscious image that STEM careers and research is achieved by people, 'just like them'. SMASHfestUK are challenging this perception by providing STEM role-models that could shift the current perception about who 'performs' STEM.

The narrative theme was successful in providing avenues into STEM that link the festival together.

### **Increase the science capital of the people of Deptford**

The relevant science capital indicators have been discussed below in relation to SMASHfestUK 2018.

#### **a. Increasing knowledge of STEM opportunities and careers**

Research has found that many underrepresented groups in STEM are underinformed about the range and types of jobs that are available in the STEM arena. In lower socio-economic areas peoples' knowledge of career options is often configured by who they know or have access to<sup>42</sup>. Knowledge surrounding engineering has been found to be limited among both adults and children<sup>43</sup>. To expose children to a wider career choice (in STEM) at a young age can be critical when it comes to making future educational choices<sup>44</sup>. In 2018, SMASHfestUK increased their emphasis on STEM careers by providing activities and performances that had focal points on career choices (e.g. Making ID cards and Cosmic Jives Theatre show). In addition, volunteers, contributors and Young Explainers were primed to encourage children to discuss careers where possible, especially in the key areas of engineering, chemistry and physics. As a result, this year saw a 15%-point increase from 2017 in adult ratings for 'increased knowledge of STEM careers' at SMASHfestUK. The children's evaluation demonstrated that after their SMASHfestUK experience, over 50% of the children were able to accurately describe or partially describe the role of an engineer (with female children and older children providing the most accurate responses).

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MUJTABA T, HOYLES C, REISS M, RIAZI-FARZAD B & STYLIANIDOU, F. 2010. Maths and physics participation in the UK: Influences based on analysis of national survey results. Institute of Education, University of London, London, United Kingdom.

<sup>40</sup> MORGENROTH, T, RYAN, M AND PETERS, K (2015). The Motivational Theory of Role Modelling: How Role Models Influence Role Aspirants' Goals. Review of General Psychology. December 2015.

<sup>41</sup> RITCHEY, H. (2016). Shaping Our Future Students: The Impact of STEM Outreach Programmes. Centre for Faculty Excellence, West Point, US.

RAMASUBRAMANIAN, S (2015). Using Celebrity News Stories to Effectively Reduce Racial/Ethnic Prejudice. Journal of Social Issues, Volume 71, Issue 1.

<sup>42</sup> ASPIRES 2 Report, 2016. Year 11 Students' views of Education, Careers and Work Experience. February 2016. Kings College London.

<sup>43</sup> THE INSTITUTE OF TECHNOLOGY AND ENGINEERING ([www.theiet.org/policy/media/press-releases/20150330.cfm](http://www.theiet.org/policy/media/press-releases/20150330.cfm))

<sup>44</sup> REISS, M., HOYLES, C., MUJTABA, T., RIAZI FARZAD, B., RODD, M., SIMON, S., & STYLIANIDOU, F. (2011). [Understanding participation rates in post-16 mathematics and physics: conceptualising and operationalising the UPMAP project](#). International Journal of Science and Mathematics Education, 9(2), 273-302  
TIMSE Report, 2013. What Influences participation in science and mathematics? A briefing paper from Targeted Initiative on Science and Mathematics Education (TIMSE).

TISME Report, 2014. Brighter Futures: Five ideas for improving STEM participation in England. Kings College London, Autumn, 2014.

### **b. Providing opportunities that can bolster further conversation and interest between family members**

The adult visitors were enthusiastic about the event and felt that it presented opportunities to enthuse their families about STEM. They also felt that SMASHfestUK provided openings for intergenerational learning, as well as opening-up opportunities to discuss STEM with their children, all of which are key indicators of building science capital within families. The post-festival evaluation demonstrated how conversations and exploration in and around the activities discovered at SMASHfestUK continued beyond the festival itself. Information was shown to be passed on to other family members, friends and school friends (by means of 'show and tell') extending the learning to others that did not attend the festival itself.

86% of the adult visitors felt that the experience of SMASHfestUK had enabled them to talk to their children about science. Further evidence from adult visitors, garnered from the micro-interviews, found that the presence of experts that their children could access to was valuable to parents who are not STEM experts themselves.

81% of the adults felt that they had learnt something new at the festival (46% of these could provide clear evidence of learning). 95% were confident that their children had learnt new things. 84% of the children felt that they had learnt new things (with 45% being able to provide clear evidence of learning). The children also suggested that the event made them more excited about STEM education and that the activities had helped them link STEM learning to the real world.

Intergenerational learning and getting parents as well as children invested and involved in STEM is critical to promoting STEM in communities that traditionally have lacked access points to STEM. Evidence has found that, 'adults from low-income communities and underrepresented groups often do not understand how to help their children succeed in STEM learning, the importance of learning *with* their children lets caregivers know they don't need to have an advanced degree in science or math to contribute to their children's education'<sup>45</sup>.

### **c. Increasing access to out of school science**

SMASHfestUK have demonstrated improved access to out of school science with an average increase of 32% year-on-year in visitor numbers. Demographic data demonstrates the many of these are from the local community (see above). The data also indicates that the number of repeat visitors has risen by 4% from last year demonstrating sound audience development. In addition, SMASHfestUK were able to attract a large number of visitors who would not usually access informal science outside of school (20% or 715) and 25% who are moderate consumers of informal science, only accessing 1-2 times per year. This challenges some evidence that suggests that science festivals generally 'preach to the scientifically converted' in attracting mainly economically privileged and educated audiences already invested in science<sup>46</sup>. Although SMASHfestUK certainly attracts a proportion of this demographic, the evidence gathered points to a large percentage of visitors who do not fit this mould.

### **d. Providing opportunities to meet and network with STEM experts and professionals**

Audiences to SMASHfestUK valued the opportunity for themselves and their children to meet and discuss STEM with experts. The experts not only provided avenues to explore and enthuse visitors in STEM, but also provided role-models that locate STEM as something open to all regardless of social background, gender or ethnicity (as discussed above). SMASHfestUK had over 30 experts available representing Maths, Chemistry, Physics and Engineering as well as artists, performers and pan-discipline science communicators. Many of the

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<sup>45</sup> <https://www.usnews.com/news/stem-solutions/articles/2015/06/29/engaging-parents-in-kids-stem-education>

<sup>46</sup> <sup>46</sup> KENNEDY, E, JENSEN, E & VERBEKE, M (2017) Preaching to the Scientifically Converted: Evaluating Inclusivity in Science Festival Audiences. In The International Journal of Science Education, Part B.

activities at SMASHfestUK 2018 provided deep-engagement experiences that held visitors' attention for 20 minutes or more, this is significant in the light of evidence which shows that science-based interactive exhibits often only hold visitors for on average 40 seconds<sup>47</sup>. Many of the examples of assimilated learning by the children related to things that they had heard or been shown by the experts.

The Young Explainers and Volunteers also got the opportunity to work alongside some STEM experts and help present STEM learning to others. Networking was an area that the Young Explainers in particular wanted to develop, however, it is unclear from the evidence gathered how far networking was achieved during the span of the festival itself (in part due to the busyness of the festival at all times).

Sharing and the extension of knowledge beyond the festival itself was also evidenced in the follow-up evaluation, with examples of knowledge being passed on to others.

#### **e. Developing positive attitudes, values and dispositions towards STEM**

SMASHfestUK has developed a strong following within the local community. The adult visitors were predominantly motivated to attend by the range and scope of the activities available and for opportunities to provide a fun learning experience for their families.

96% of the adult respondents and 89% of the child respondents rated SMASHfestUK 2018 as good or excellent. 86% of the child respondents felt confident that SMASHfestUK had given them a more positive attitude towards learning about STEM and 85% felt confident that it had given them more confidence in STEM learning.

Affective learning is said to engage the emotional and motivational needs of an individual aiding the learning process<sup>48</sup>. The freedom and creativity brokered by SMASHfestUK was found to be important to some visitors; SMASHfestUK was found to provide a space where STEM is accessible and explorable and in opposition to the confines of more formal STEM learning at school and at home. Freedom and creativity are central to science learning but are often overlooked in definitions of STEM practice, so it is significant that SMASHfestUK are able to promote this to the public.

#### **To bridge the gap between arts and science and show how science is relevant to life (using real-life situations)**

91% of the adult respondents felt that SMASHfestUK successfully helped to bridge the gap between the arts and sciences. 90% of the adult and 87% of the child respondents felt confident that the events at SMASHfestUK had helped them to understand how STEM applies to real world experiences. Further evidence to support this was gathered through the micro-interviews where several visitors commented that the storyline of a Flood was integral to building enthusiasm and understanding of how STEM can impact on global issues.

#### **To engage a teenage audience in STEM by including them in planning and delivering SMASHfestUK 2018.**

SMASHfestUK engage young people by co-collaboration; involving them in the production and delivery of the festival in the role of the Young Explainer. 29 Young Explainers were recruited in 2018 from local schools, colleges and community groups. The work that SMASHfestUK conducts with teenagers is particularly important because by the age of 13 visitation of out-of-school science discovery centres decreases across all

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<sup>47</sup> Medved, M. I. & Oatley, K. 2000. Memories and scientific literacy: remembering exhibits from a science centre. *International Journal of Scientific Education*, 22, 1117-1132.

<sup>48</sup> Csikszentmihalyi, M. & Hermanson, K. 2005. Intrinsic Motivation in Museums: Why does one want to Learn? In: HOOPER-GREENHILL, E. (ed.) *The Educational Role of the Museum*. Oxon, New York: Routledge.

socio-economic groups further limiting access to out-of-school science<sup>49</sup>. Opportunities to engage in out-of-school science are particularly important for teenagers who have been found to use informal learning experiences not just as learning experiences, but also to reinforce their self-identity<sup>50</sup>. SMASHfestUK provide physical access points that can help pupils to visualise and try-out and communicate real-world STEM. This could aid in reinforcing self-identity and planning for the future. The evaluation of the Young Explainers (although not substantive) shows increases in confidence and the ability to communicate STEM knowledge to others along with evidence that the Young Explainers themselves were able to gain new knowledge from the experience. Many of the Young Explainers wanted to develop their networking and independent-working skills, it is unclear, whether these skills were developed to their fullest extent.

In addition to the delivery of the festival, SMASHfestUK engaged 40 pupils from Deptford Green school to design and develop VR headsets for the Living in Space installation at SMASHfest. This contributed to part of their Design and Technology learning placing their VR headset designs into a real-world context.

**To grow a community of science communicators and develop relationships with scientific and cultural institutions to bring them to local communities.**

SMASHfestUK have built up a strong and loyal community of science communicators, performers, academics and members of STEM industry. They have built relationships with universities, museums and made successful links with industry. This has grown year on year. This year the Head of Flood Hazard Research Centre and 15 international PhD students also contributed to installations at SMASHfestUK.

SMASHfestUK have also maintained and grown relationships in the local community including Deptford Green Secondary School, Primary schools in Lewisham, Heart and Soul creative arts disability group, GLYPT, The Lewisham Young, Advisors Group, Equality Lewisham, Lewisham Young Mayors Office, Stephen Lawrence Centre and the Lewisham Arts Education Network.

**To engage adult volunteers from groups underrepresented in STEM to promote diversity and increase representation.**

SMASHfestUK had a record number of adult volunteers this year, recruiting over 60 volunteers from the local community and the wider STEM community. Within this cohort were a large number of volunteers from groups currently under-represented in STEM careers (specifically women and those from BME backgrounds). In addition, SMASHfestUK supported volunteers from Heart and Soul, a local creative arts group of disabled men and women. The experience provided this group with opportunities to support the learning and creativity of children and have experience of front-of-house duties. This was especially important for one wheel-chair bound volunteer who commented, "it is hard for disabled people to get full-time jobs, so volunteering for me is excellent because I get to build up my skills and do what I am passionate about". The experience in STEM or arts knowledge varied with each volunteer. Less-experienced volunteers needed more support from the contributors, some of whom commented that there was a lack of time to do this effectively due to the

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<sup>49</sup> ANDERSON, D., HORLOCK, N., & JACKSON, T. (2000). *Testing the Water: Young People and Galleries*. Liverpool University Press, Liverpool. UK.

SIMONS, N (2015). *Investigating Teenage Attitudes towards Science Discovery Centres*. PhD Thesis The University of Salford, UK.

VELURE ROHOLT, R. & STEINER, M. A. (2005). "Not your Average Workplace" - The Youth Science Centre, Science Museum of Minnesota. *The Curator*, 48, 141-157.

<sup>50</sup> FORS, V. 2004. *Science centre exhibits – from a teenager’s point of view*. The 3rd Biennial International Conference on Technology Education Research Learning for Innovation in Technology Education. Gold Coast, Australia: Lulea University of Technology

busyness of the festival. Feedback from the volunteers who responded to the survey was on the whole positive with 100% stating that their experience at SMASHfestUK met or exceeded their expectations.

## RECOMMENDATIONS

The key recommendations that emerged from the evaluation data collected are presented below,

## ORGANISATIONAL RECOMMENDATIONS

### CONTRIBUTORS

- 1) Ensure all contributors are kept up to date and aware of the following, at least a week before the festival: venue facilities, potential footfall per day (for staffing purposes), availability of volunteers (and advice on any special needs that volunteers may have), location and positioning of their stall, health and safety protocol (first aid kits and fire routes) and a list of other contributors in attendance.
- 2) Have a designated **set-up and facilitation team** who are on hand all day to aid in any issues that contributors have with setting up or challenges caused by weather changes. This team could also arrange volunteers needed during busy times by liaising with the volunteer coordinator.
- 3) Have a small **home comforts team** responsible for the comfort of the volunteers and contributors. Making sure they have regular hot/cold drinks, snacks and to be on hand to provide umbrellas, warm hoodies or sunshades if needed.
- 4) Ensure all contributors are met at the door and introduced to the teams that will be facilitating them throughout the day

### VOLUNTEERS

- 1) Pre-plan a lunch time, breaks and activity rota on a numbered system so that all volunteers are clear on their duties, break times and lunch time.
- 2) Consider a social or meet-up for volunteers after the festival
- 3) Space volunteer training days out to accommodate working volunteers/parents

### VENUES

- 1) Have a second volunteer coordinator at The Albany to ensure staffing is adequate across the two venues at all times
- 2) Consider an A4 map and brief list of events and activities with age-ranges to go alongside a more streamlined programme
- 3) Ensure that directional signage is clear and/or have volunteers who direct the public stationed at key points at The Albany (reception area, room to right and left of reception area, to the Red Room theatre, toilets and upstairs events)
- 4) Ensure reception desk at The Albany is manned at all times and that volunteers are primed to welcome guests, hand-out programmes and direct visitors
- 5) A clear plan for extreme weather (rain) is needed to ensure that all stall holders outside know what to do, and where to relocate to, in the event of rain. This will need to be pre-planned with The Albany venue to maintain health and safety across the site

## AGE-RANGE, ACCESS & DIFFERENTIATION ACROSS ACTIVITIES

- 1) Ensure that there are a range of activities for all age-ranges.
- 2) Consider distributing activities for under 4s around activities that have a longer dwell time.
- 3) Consider differentiation of task for different abilities and age-ranges on some activities (Lab in a Lorry and Murky Waters)

- 4) Consider widening access to performances, comedy and science shows by holding mini-shows or presentations at set times within or outside of the Deptford Lounge venue. Bringing the performance element of the festival out from behind closed doors.

## WORKING IN THE COMMUNITY

- 1) Continue the work that SMASHfestUK do with different ethnic groups within the Deptford community. The number of Vietnamese visitors increased by 4% this year due to the working with this group.
- 2) Consider providing more activities during the year in The Deptford Lounge to embed SMASHfestUK further into the local community – so that STEM engagement becomes part of the community

## YOUNG EXPLAINERS

- 1) Need to establish a clearer pathway to engagement for the Young Explainers
- 2) More resources needed for staffing and to support a programme of events for the Young Explainers (mentoring, trips to Universities and out to Industry for training, activity days and STEM learning opportunities etc.)
- 3) Consider a lower age-limit for Young Explainers

## EVALUATION

- 1) Introduce two additional questions to the children's questionnaire. One covering Ethnicity (as this could be different from the parents) and one asking about their motivation to visit.
- 2) Consider using the themes that emerged from the value of SMASHfestUK section to frame questions for next year's survey (Access to Experts, Freedom and Creativity, Inspiration and a place in the community)
- 3) The Evaluation report could be useful to academic partners to reference as evidence for impact (REF impact & public engagement).