

Committee:	Date:
Education Board	21 July 2016
Subject:	Public
STEM offer at the City's cultural institutions	
Report of:	For Information
Director of Community and Children's Services	

Summary

This report provides the Education Board with an outline of the Science, technology, engineering and mathematics (STEM) offer that is provided as part of the educational offers at the City's cultural institutions.

Recommendation(s)

Members are asked to note the report.

Main Report

Background

1. The City's cultural institutions each have their own educational offers for schools and individual learners. This report provides a brief overview of the STEM offers that are included within these programmes.

Current Position

London Metropolitan Archives

2. London Metropolitan Archives (LMA) has a thriving programme of STEM courses. Some of the workshops offered to schools and colleges include:
 - 'Sweet London' and 'Have Your Cake', both based on the Lyons Collection, students look at changing states of materials and chemical reactions and produce ice cream and cake in our education space.
 - 'Document Doctors' where students take on the role of conservators and examine the importance of conservation by gathering temperature, humidity and light level data within the areas that documents are stored.
 - 'Bridges and Towers' where students study forces, materials, structure and bridge design, through the famous case study of the Tower Bridge. Participants have also the opportunity for hands on practical science activities by building towers from a variety of materials.
 - Public health is examined through the 'Diseases!' course that looks either on the cholera or smallpox epidemics of the 19th century. The workshop focuses on epidemiology and mapping as well as symptoms and treatments of the diseases. Practical activities include the building of a simple water filtration system.

3. LMA provides career consultation and support through Science Summer Colleges and events such as the STEM in the City, the Lord Mayor's career event at the Guildhall. As a case study we focused on the inherent science skills and knowledge needed in running an archive using the Great Parchment Book. This demonstrated a great technical approach to accessing a 17th century burnt parchment, by digitally flattening the pages. Participants were able to use the technology and were amazed with what could be achieved in a short space of time.
4. LMA has also worked with a number of partners to run conferences and seminars as a way to look at science in our collections and identify what is relevant to contemporary societies, for example the Smallpox in London conference and seminar was part of the conservation and digitisation of smallpox maps, a project funded by the Wellcome Trust. LMA worked closely with the London School of Hygiene and Tropical Medicine on content for the conference and seminar. We also held a conference on Science in the Archives, with speakers from CERN (the European Organisation for Nuclear Research), Imperial College and the Bodleian Library.
5. Finally, LMA is part of STEMNET, as members of the Development team and certified STEM ambassadors. LMA contributes to the local community by delivering STEM sessions in primary schools as well as to City academies. We actively raise awareness about the importance of our archival collections, while at the same time we use our enthusiasm and commitment to inspire learners and teachers to enjoy STEM subjects.

Museum of London

6. STEM is a particular area for development for the schools programme at the Museum of London Docklands. We run a popular drama and hands-on workshop for primary schools called Capital Engineers that introduces pupils to the engineers who build some of London's iconic landmarks; a session called Sail to Steam that uses the development of ships to explore forces and motion; a science session called 'This is Your River' in collaboration with Thames21 that explores the issue of water pollution; and a math's workshop called Modern Money Matters that compares shopping today and in the past.
7. We are also developing a numeracy outreach session and online resources for supplementary schools focusing on how the museum's collections can inspire and support everyday maths.
8. We have an online learning resource called Starting Out that aims to develop numeracy skills by introducing secondary school pupils to the financial perils of leaving school and starting work:

<http://www.museumoflondon.org.uk/Resources/microsites/learning/startingout/startingout.html>.

9. STEM related topics are often part of our family events programme at both museums, for example over 3,000 people took part in the Families Find Out festival at London Wall on 12 and 13 March 2016. As part of British Science Week, we teamed up with Science Communication students from Imperial College London who developed a variety of stalls and activities to reveal the science behind our city.

Tower Bridge and the Monument

10. Crunching Code & Raising Roads – KS2 and KS3 workshop. Pupils discover the inner workings of Tower Bridge, from Victorian times to the present day. The day includes a facilitated tour and a workshop. In the facilitated tour, pupils take part in an active exploration of the Bridge's Victorian Engine Rooms, learning about steam power and water hydraulics, and in the towers, pupils examine the science behind the construction of the Bridge. In the hands-on workshop, pupils construct their own mini bascule chambers, and write code which is used to raise the bascules on their models. Students gain an understanding of the Bridge's mechanics and physics, put coding into practice, and develop their teamwork and problem-solving skills. The workshop and facilitated tour are free as part of the group admission price (City of London Corporation-sponsored schools may visit for free).
11. A Capital Idea – A Capital Idea is our facilitated tour of the Bridge, available for KS1 – KS5, which we are able to adapt to the specific curriculum or topic focus for the visiting groups. All groups will gain an understanding of the science behind the Engine Rooms and the construction of the Bridge.
12. Museum of London Archaeology (MOLA) – We are in talks with staff at MOLA to develop a joint session which allows school and/or community groups to explore the foreshore near Tower Bridge.
13. British Science Week – A regular feature in the Bridge's family learning calendar. In 2016, we created a series of science stations throughout the exhibition and Engine Rooms which allowed families to explore different aspects of the science behind the Bridge. We developed a stamp card to encourage families to visit all four stations. Circa 800 adults and children took part in this activity. March 2017 will be bigger and better!
14. Engineering Open House Day – We are taking part in the Institute of Engineering and Technology's Engineering Open House Day on 29th July: <http://www.engineer-a-better-world.org/engineering-open-house-day/>. Families will take part in a tour led by our learning team, and work together to build their own models of the bascule chambers and write code to make the bascules raise.

Families will also have the opportunity to meet one of our wonderful Senior Technical Officers, to gain insight into the life of a working engineer. The aim of EOHD is to raise awareness amongst families of engineering as a career opportunity, especially for girls.

15. Family Learning

- We worked with Maths On Toast to develop maths-based family learning activities. These activities included hands-on investigations of the weight of the Bridge, using problem-solving, estimation and calculation. Participants were able to find out how many of them were equivalent to the weight of one bascule, complete with a certificate recording this. Other maths-based activities developed in collaboration with Maths On Toast focused on the shapes found in the Bridge, and the reasons behind the use of different shapes for different purposes.
- Theatre in the Engine Rooms: in collaboration with the Science Theatre company, we staged a promenade performance within the Victorian Engine Rooms in November 2015. This show not only conveyed some of the history of the Bridge, but also included science demonstrations to enhance understanding of the science behind the Bridge.

16. The Monument – As we develop the learning programme for The Monument, as well as looking at its role in commemorating the Great Fire, emphasis will be placed on its science story: its function as a telescope and place for scientific experimentation. In collaboration with Spectrum live interpretation company, a Robert Hooke character has been created, in order to engage audiences with this surprising aspect of The Monument's story. The Hooke character will debut at our family learning weekend on 6 and 7 August 2016.

Open Spaces

17. STEM are major contributors to the prosperity of the UK, and STEM skills are considered by the Government to be vital in stimulating economic growth and to build a science-literate society. The Open Spaces learning department offers a range of science programmes for school groups from nursery to A level. Our activities are designed to enhance and enrich learning in the school classroom by providing opportunities for students to take part in fun and inspiring activities which deliver National Curriculum science objectives through active engagement with extraordinary natural spaces. Students are able to apply their science knowledge and skills in a new context and develop key skills.

18. We facilitate students' progression in science through a variety of learning experiences. Activities include exploring life cycles in our butterfly house activity, investigating habitats and adaptation within our ponds, finding out about the rocks and soils of the Heath, and practical Ecology fieldwork sessions involving fieldwork design, hypotheses testing and sampling techniques. These activities support teachers in delivering National Curriculum science content whilst

showing students how their learning relates to the wider world beyond the classroom. Where appropriate, we further support STEM education through, for example, enabling students to apply their scientific knowledge and skills to a real-life practical engineering problem centred around the Hampstead Heath Ponds Project, and recording and interpreting mathematical data as part of scientific fieldwork.

Barbican

19. The Barbican's offer to schools is driven by the Barbican's programme, and the models that have been developed offer numerous opportunities for this arts driven work to cross-over with STEM subjects. The extent to which the opportunities for an 'arts' project to link in to other areas of the curriculum largely depends on the approach the school takes, and the connections which are made across subject areas. In our experience this happens more naturally in primary schools, where the infrastructure and delivery methods generally lend themselves to cross curricular work, although we are increasingly exploring opportunities for such cross fertilisation to take place in the secondary and college sector too. Specific examples include:
 - The Big Barbican Workshop – a day long offer for schools which includes elements of all the artforms – this has been designed around the concept of cities and the built environment – offering numerous links to STEM subjects.
 - Barbican Art gallery's curatorial focuses on Architecture, design and fashion particularly lend themselves to development of work resonating with STEM subjects. Major schools projects have directly linked into this – including the Bridging Worlds Barbican Art Book – which used photography to explore the Built environment.
 - The 2014/15 Barbican box, curated by complicité exploring themes related to Neuroscience and the brain.
 - The partnership work developed with the Museum of London, Tower Bridge/ Monument and Guildhall Art Gallery – specifically including the City Stories project, which draws on the City's architecture and environment as a stimulus for creative work.
 - The programme of work delivered around 2013s Digital Revolution exhibition, including Coding workshops and digital creativity, as well as the digital focussed Barbican Weekender.
 - Forthcoming Barbican programming such as a focus on Arts and Science in 2019 will offer further opportunities to develop offers which explicitly link to STEM curricula.

20. The Barbican's new schools partnerships work – which will start in September will take a whole school, long term approach. Working through senior leadership in the schools, Barbican will seek to use its offer to help a school directly address its priorities, including those identified in school improvement plans. Where these include STEM specific priorities, as the examples above illustrate the Barbican

will be well placed to support schools in addressing these. Following initial conversations with our first partnership schools we are already developing new initiatives to help address schools priorities, including a creative coding project.

Barbican Children's Library

21. In partnership with STEMNET Barbican Children's Library will be holding a STEM (Science, Technology, Engineering, Maths) Club every Wednesday during August when we will be undertaking a variety of exciting activities to tie in with The Big Friendly Read, the 2016 Summer Reading Challenge. All sessions are suitable for children aged 6-11.

Conclusion

22. This report provides the Education Board with an outline of the STEM offer that is provided as part of the educational offers at the City's cultural institutions which Members are asked to note.

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