Text only version of Artswork's STEAM toolkit
(published September 2019)

## Front Cover:

**Artswork's STEAM toolkit: powering your STEM curriculum through arts, culture and creativity**

[artswork logo]
[supported using public funding by Arts Council England]

## Inside front cover:

**"The arts give us the tools and skills that are essential to help us make our way through life. We owe it to the next generation to ensure that they enjoy an education that offers them the whole of life and culture: head, heart and soul." (Cultural Learning Alliance)**

## Contents:

## Poster 1:

**Participation in structured arts activities can increase cognitive abilities by 16-19%.**

The Cognitive Ability Test is widely used in schools as an indicator of ability. Structured arts activities offer a way to boost children's thinking skills, improving their performance across the board and providing knock-on effects of better life chances as adults.

(Culture and Sport Evidence Programme (CASE), Department for Culture, Media and Sport, 2010).

## Section 1: Exploring STEAM

### i. Introduction

**S**cience
**T**echnology
**E**ngineering
**A**rts
**M**aths

Welcome to Artswork's STEAM Toolkit

This resource encourages opportunities for creative, connected learning by highlighting programmes that put arts and creativity at the heart of STEM learning. STEAM approaches extend the range of opportunities for children and young people to apply their learning and understanding in broader contexts, enabling new learning to occur.

The new Ofsted Framework (2019) requires schools to provide breadth and balance in their curriculum and build children and young people's cultural capital. Embedding a STEAM approach into your curriculum is one approach that can demonstrate this.

The Artswork Team

## ii. STEAM - what's it all about?

**STEAM is used to define a method of teaching that sees five subject areas – Science, Technology, Engineering, Arts and Maths – join together for a more holistic approach to learning. The term has become increasingly prevalent in recent years, due to concerns over the lack of creativity in the school curriculum.**

Artswork supports a range of programmes that work to embed arts, culture and creativity in the heart of the curriculum, and it is our goal that these projects will create a step-change in the way schools engage with the arts, and in how they enable their pupils to meet their full potential, through a well-rounded 'core and cultural' education.

The presence of the arts in England's schools is falling significantly. Teaching time is being cut, with a focus on exam or 'core' subjects instead; funding is being redirected in favour of STEM (Science, Technology, Engineering and Maths) subjects, and agendas like the EBacc mean a shift in the focus of educators because of Governmental pressure to fit within a specific model of learning.

The British Educational Research Association (BERA) stated in a recent report that "the number of students choosing post-compulsory study of STEM subjects is seen as being critical to a country's economic success, yet concerns have been expressed about the way those subjects are currently taught" (British Educational Research Association, 2016).

BERA lists these concerns specifically as:

- A lack of creativity
- A need to focus on inter- and multi-disciplinary work
- A need for a broader conception of Science
- STEM subjects' marginalisation of concerns for society and the environment

Their research into the effectiveness of STEAM approaches places a heavy emphasis on the importance of teachers. "STEAM provides an opportunity to change the more regular ways of teaching in schools – it emphasises more engaging, participatory, and socially relevant approaches – but teachers need to discuss amongst themselves how they aim to use them", they explain.

The Joint Council For Qualifications reported a 34% drop in Arts GCSE entries between 2010-2018. In 2018, these registrations fell by a further 51,000. DfE figures from June 2017 show that "between 2010- 2017, the number of hours the arts were

taught in secondary schools in England fell by 21%". Also during this time, the number of arts teachers fell by 20% (Department for Education, 2017).

Yet in their report, *Creativity vs Robots*, Nesta remarked that 87% of jobs in the creative economy were at no or low risk of automation in the near future, compared to only 40% of other jobs (Bakhshi, Frey and Osborne: Nesta, 2010). "We need our young people to be prepared for the changing needs of the labour market. Employers value employees with 21st Century skills – a mix of cognitive and personal skills, like creativity and collaboration – as well as content knowledge", implores Nesta's Hasan Bakhshi MBE. "We must focus on mechanisms that promote the fusion of arts, sciences and technology, right through the talent pipeline." (Cultural Learning Alliance & Nesta, 2017)

## Why are the arts so crucial to the future of our education system?

"The arts have the power to change and shape young lives", writes the Cultural Learning Alliance in their collaborative toolkit, *Arts in Schools*, 2018. "They provide knowledge, skills, values and attributes that can play a significant role in young people's development, creating opportunities for them to express their ideas and form values, and equipping them to navigate a rapidly changing world" (Cultural Learning Alliance, Incorporated Society of Musicians & WHAT NEXT?, 2018).

The Fabian Society's study on the decline of arts education in primary schools (Primary Colours, 2018) urges educators to reverse this trend for prioritising certain subjects over others: "Schools are required to provide a broad and balanced curriculum, but the 'core' subjects are often prioritised to the exclusion of everything else. The national curriculum should make the importance of arts and cultural education more explicit" (Cooper, for Fabian Society, 2018).

In the words of the Cultural Learning Alliance, "the arts are not an add-on, or a nice-to-have. They are part of the fabric of our society, and all young people have a right to experience the best, and to be given the opportunity to contribute to the arts and culture of the future" (*Arts in Schools* toolkit, 2018).

BERA provide us with an important warning, however – that "by simply bringing in external educators who run activities, the opportunity to alter and develop practice [in schools] can end with their involvement" (British Educational Research Association, 2016). This is why it is so important that we continue to work with schools across the South East, and support the sharing of the benefits of a creative and cultural education.

The Fabian Society's survey, in association with YouGov (2018) revealed some startling figures:

* 68% of teachers in England say arts provision in their school has decreased since 2010.
* 56% do not believe they have access to the resources and support necessary to deliver a high-quality arts education.
* 59% believe their school does not give enough emphasis to the arts.
* 49% of surveyed teachers said the quality of arts provision in their primary school has worsened since 2010.
* 45% of teachers also believe they do not have the skills needed to provide a high-quality arts education.
* 58% of teachers believe there are fewer out of school arts trips, compared to 2010.

## **Poster 2:**

**Learning through arts and culture can improve attainment in Maths and English.**

Evidence points to gains in attainment across a range of subjects as a result of studying the arts. A 2015 Culture and Sport Evidence (CASE) review found a positive relationship between arts and educational attainment.

(*A review of the Social Impacts of Culture and Sport*, 2015)

## 2. STEAM in Action (Case Studies)

In 2017, Artswork (with support from Arts Council England) enabled the creation of seven STEAM Networks across the South East. Establishing new working relationships between education, cultural and STEM partners, the Networks piloted models for Continuing Professional Development for teachers, as well as pupil resources. Alongside this, they provided support for schools working towards Artsmark and Arts Award, embedding the Arts Council's Quality Principles throughout. The following case studies are taken from a number of these Networks; we hope they inspire and encourage you in your own STEAM journeys.

## i. CASE STUDY | STEAM: Cleaning Up with Eastbourne Schools Partnership

### The Project

To the east of Beachy Head sits the seaside town of Eastbourne, East Sussex. With a rich history of both famous artists (Claude Debussy, George Orwell, Eric Ravilious) and scientists (Frederick Soddy, Thomas Henry Huxley, Bruce Woodgate), it provided a fitting location for the birth of a new network seeking to combine the two subject areas, in a curriculum-crossing approach to learning.

Supported by Artswork as part of its mission to increase creative learning opportunities in schools across the South East, the Eastbourne STEAM (Science, Technology, Engineering, Arts and Maths) Network formed in November 2017. Education, arts and science organisations came together, along with six participating secondary schools from Eastbourne and the surrounding area, to investigate the ways art and science could work simultaneously, in a series of cross-curricular projects. Photography was the tool chosen to communicate learning.

Through combined arts-based and scientific inputs and activities, the programme centred on raising pupil awareness of the need for urgent ecological and environmental change, and to protect the world's oceans and coastlines from plastic pollution.

### The People

Partners:

- Eastbourne Schools Partnership (led by Eastbourne College)
- Photoworks
- STEM Sussex

Participating Schools:

- Cavendish School
- Ratton School
- Eastbourne Academy
- Eastbourne College
- Willingdon Community School
- Seaford Head School

**“The cross-curricular nature [of the project] meant that students could transfer skills and understand that subjects are not all separate from each other. They could also understand that art can be a powerful and evocative tool to communicate a message.” (Teacher)**

### The Beach Clean

Pupils spent a day at Eastbourne beach, working with artists, scientists and teachers, researching and exploring the impact of plastics on beaches and marine life. The first part of the day was spent collecting, sorting and clearing plastic and other rubbish from the beaches, with help from Eastbourne Borough Council, Surfers Against Sewage, STEM Sussex, and the Marine Conservation Society.

In the afternoon, photographer Elizabeth Doak led a programme of creative photography activities, with support from the rest of the artist team. The activities were designed to help students investigate the debris they had collected, through the medium of photography. Several schools went on to incorporate the actual items found during the beach clean into their individual projects.

### Different School Approaches

Four of the six participating schools took part in all stages of the process, completing the in-school project according to the brief, and exhibiting work in the final exhibition, entitled *Riptide: Observations of Marine Pollution by Young Photographers.*

- Some schools delivered the project as an extra-curricular club
- Schools looked at artists known for exploring environmental themes and those working with waste/recycled materials
- Marine biologists and STEM Ambassadors visited the schools to give talks on ocean ecology and the impact of plastic waste
- Pupils worked with sculpture, journaling, photography and graphic design
- Other schools were taken off timetable to work intensively on the project
- Teachers attended four CPD sessions, led by Photoworks and STEM Sussex

**“Art and science work really well together. It is a good idea because everything is closely linked.” (Pupil)**

### Inspiring Creative Learning

“Students were inspired by the science topic. It was easily graspable, urgent, and relevant to them”, reported one school. In particular, the beach clean day “brought home an understanding of plastic pollution and its impact on the oceans”.

Students engaged in creative learning, developing their skills through experimenting with a range of photographic techniques. Student feedback demonstrates their enthusiasm and personal enjoyment of the project. “It was educational and a great way to express our creativity”, said one student. “I really enjoyed the process of creating a piece. I found the different activities inspiring”, said another.

Several students mentioned the impact of the project on their understanding of marine conservation. In fact, an evaluation of the project by Culture Shift found this was the area with the highest levels of student enthusiasm. Students talked of it giving them a passion for ecology, and how eye-opening the experience had been for them. “It was really interesting to learn about the harm that we as humans are causing. [Taking part in] the beach clean made me feel really good inside. I wouldn’t think twice about doing another one”, said one student.

Further student comments demonstrated an approach to science and art as complementary but distinct, where science is understood as ‘learning facts’, and art is seen as ‘creativity and self-expression’: “It was nice to tie the two together…to learn more about the subject, then make something to express our feelings about it.”

There is the possibility that comments like this reflect the approach taken by most schools during this project - choosing to first teach their students the science content, and then having them express their learning through photography. “It would be interesting to see if future iterations of this project could explore deeper connections and similarities between the arts and sciences, rather than simply reinforcing their distinctiveness”, reported Culture Shift.

## Conclusions

This programme demonstrated the benefits for both students and teachers in working across/with a combination of art and science subject matter. Feedback clearly shows that structured CPD was valued greatly by teachers, and that both teachers and pupils enjoyed the opportunities to work collaboratively, across other disciplines and alongside other schools in the region.

The programme was challenged by a number of factors, including pressure on teachers’ time, difficulty for schools in taking on projects additional to the existing curriculum, working across different departments, and a lack of flexibility in timetabling. “These challenges were compounded by some additional difficulties around communication with schools, setting project expectations, and clarity around roles and responsibilities within the project team at the start” (Culture Shift). Despite challenges, teachers and students actively engaged in the work and “derived value from it”, the evaluation report explains.

There is an appetite amongst partner schools to build on this work with further programmes. Should another programme be funded, it "would be interesting to see if deeper engagement between arts and sciences is possible" (Culture Shift), a move that would see schools feeling more able to move beyond using arts primarily as a tool for communicating academic subjects. Something that would lead to the arts being used more prevalently as "a method of exploration and discovery" in their own right.

**To download and read the full case study, visit: https://artswork.org.uk/resources/steam-cleaning-up/**

## Poster 3:

**Learning through arts and culture develops skills and behaviour that lead children to do better in school.**

Transferable skills, including confidence and communication, are boosted by between 10-17%.

(*Understanding the impact of engagement in culture and sport*, 2010)

## Poster 4:

**Arts in schools can be used to combat inequality.**

In 2011, the President's Committee on the Arts and Humanities found that "arts-engaged low-income students tend to perform more like average higher-income students".

A further study from 2012, found that students whose education involved arts were "three times more likely than students who lacked those experiences to earn a degree".

(*The arts and achievements in at-risk youth*, 2012)

## ii. Case Study: STEAM in Motion with Thanet STEAM Network

### The Project

Following Artswork's call for schools to form STEAM Networks across the South East, Thanet-based Chatham and Clarendon Grammar School were selected to head up the Network for their local area. Working with three other schools, the Network was designed to function as the starting point for a collaborative arts and culture programme that worked to inject creativity into STEM subjects.

The physics-based theme of 'motion' was chosen, and staff from across the four schools created STEAM schemes of work, delivered to students during a Spring/ Summer term. Support, sharing and collaborative input came from organisations including Turner Contemporary, Dreamland, and Canterbury Christ Church University, with bi-termly meetings held in the run up to a two-day STEAM event, Big Geek Festival. Thomas Brewin, Head of Design and Technology at Chatham and Clarendon, spoke to us about the programme.

**"The Thanet STEAM Network has facilitated a strong link between the arts and sciences within participating schools." (Chatham and Clarendon Grammar School)**

### The People

Partners:

- Thanet Schools STEAM Network (led by Chatham and Clarendon Grammar School)
- Turner Contemporary
- Dreamland
- Canterbury Christ Church University
- Genetic Moo

Participating schools:

- Chatham and Clarendon Grammar School
- Christ Church CofE Primary School
- St. Peter-in-Thanet CofE Junior School
- St. Laurence-in-Thanet Junior Academy

### Big Geek Festival

"Working with our partners, we organised a two-day *Big Geek Festival*, to support the school-based schemes of work", explains Thomas. Across the schools, pupils from Years 4 and 5 attended the festival, which was hosted at Dreamland and Turner Contemporary in Margate. "The children took part in a 3D printing workshop led by Year 12 students from Chatham and Clarendon Grammar", he says. "They had been trained beforehand at our school's 3D HUB." Alongside this, staff from Turner

Contemporary delivered gallery-based activities, a creative practitioner ran a dance workshop, and Genetic Moo (Artists-in-Residence at Dreamland) co-delivered a workshop with more Year 12 students from Chatham and Clarendon. Other workshops at the Festival included a 'Makey Makey Invention' workshop and a 'Forces' park experience, where students were allowed time at Dreamland to access the park's rides.

But it wasn't all just fun and games. "The park experience was used to create 'motion poetry' as part of St. Peter-in-Thanet CofE Junior School's STEAM scheme of work", Thomas explains.

During the Festival, Year 8 pupils from Chatham and Clarendon took part in a Rollercoaster workshop, led by Canterbury Christ Church University in the educational space at the Turner Contemporary gallery. Thomas describes the workshop as "a team-building activity using K'Nex to create functioning rollercoasters as a practical application of physics".

With the *Big Geek Festival* acting as the launch event for the whole STEAM initiative, teachers were then provided with a Professional Development session led by a STEM Ambassador and local artists, to gather input and ideas for the work that would be carried out back in the classroom.

**"This journey has helped formalise leadership of the Arts within our school. Our Headteacher and named Governor for Arts provided support and enthusiasm throughout, and colleagues bought into a strong vision." (Chatham and Clarendon Grammar School)**

**Learning and Reflections**

Evaluating the programme, Thomas cites the issue of time as a limitation and a pressure. He says that working within such a strict timeframe was a real challenge, and they ultimately had to "work outside of the original timeline in order to provide a quality programme and ensure involvement of all partners and students".

Despite this, he says the project has brought about unmistakable benefits to staff and students at the
participating schools. As a result, Thanet STEAM Network is continuing beyond its initial life expectancy. He labels this "a very strong statement of [the success of] the project", and explains that through further collaborative reflection with the partners, it has been agreed that the Network will continue in a similar format.

“Building relationships with local arts partners is key, as is communication”, he says. “In the future, we aim to keep seeking funding and to keep working with partners in kind as much as possible.”

**To download and read the full case study, visit: https://artswork.org.uk/resources/steam-in-motion/**

## Poster 5:

**Employability of students who study arts subjects is higher, and they are more likely to stay in employment.**

In the UK, the creative economy accounts for 3.12 million jobs. That’s 1 in every 11 people employed here. (*Creative Industries Focus on Employment*, 2016)

## iii. Case Study: STEAM through Structure with Hampshire Secondary STEAM Network

### The Project

Between January and September 2017, Gosport-based Bridgemary School led a STEAM Network in the area, to build links between the arts and sciences and provide high-quality learning opportunities in the process. Working in partnership with artists local to each school, as well as with Winchester Science Centre, the programme explored how collaborative, creative approaches could link and enrich learning across the whole curriculum. As part of this, a CPD programme for teachers and practitioners took place, as well as opportunities for pupils to gain an Arts Award, and support for participating schools to work towards Artsmark.

A Network meeting day at Artswork (in Southampton) allowed time for inspiration, via the range of partners and resources available to all schools involved. At the meet-up, the Network settled on the theme of 'Structures'. Due to differing needs per school, it was decided that a range of approaches would be taken, with clusters of schools working on different projects together. Emma Cairns, Associate Senior Leader and Head of Art and Technology at Bridgemary, filled us in on how her school's work took place.

**"For some schools in the Network, a collapsed timetable for a fortnight was the way forward. For others, it was as an after-school activity. For us at Bridgemary, it was a term's worth of work." (Emma Cairns, Bridgemary School)**

### The People

Partners & Practitioners:

- Hampshire Secondary STEAM Network (led by Bridgemary School)
- Winchester Science Centre
- SEARCH Museum, Gosport
- Splodge Designs
- Bridgemary Carnival Association
- STEAMCo
- Arts University Bournemouth (AUB)
- BAE Systems
- CEMAST Engineering College
- Academy of Music and Sound
- Y Services
- St Vincent's College

- Solent Local Enterprise Partnership

Participating Schools:

- Bridgemary School
- Rowner Primary School
- Christ the King College
- Cowplain School
- Wildern School
- Admiral Lord Nelson School
- Woodlands School

## Bridgemary School: The Hunger Games

Having had previous success with a *Harry Potter*-themed STEAM project, Bridgemary School decided to base their 'Structures' work around themes taken from the popular book and film series, *The Hunger Games*. "Students completed cross-curricular tasks, connecting their work creatively through the over-arching theme", says Emma. "They learnt about polymers and designed and created their own 'victor parachutes' [to transport eggs to the ground without them cracking]." After looking at the design/concept of bridges as structures, pupils worked with local company Splodge Designs to create 'Tower Bridge' for a carnival.

Developing partnerships with STEM Ambassadors greatly enriched the project, Emma believes. "Students received high quality information and feedback from experts within STEM fields."

The school also developed the role of STEAM Student Ambassadors, to work alongside teachers in the planning of a STEAM project for Year 9 pupils. "We want to ensure the legacy of STEAM can be sustained", Emma explains. "Students have said they want more STEAM projects!"

## Successful Outcomes

- Bridgemary ran a reading initiative as part of the Hunger Games focus. Teachers reported an increase in positive attitudes towards reading and improved motivation during library sessions too, as well as greater confidence in personal reading abilities.
- They also noted "greater vocabulary [being] used when pupils discussed the books with their peers".
- The school saw an increase in attendance when compared to the previous academic year, and behavioural changes were observed too. To their amazement, incidences of bad behaviour halved during the STEAM project.

Students were asked for their opinions on the project:

* 83% said they would like another STEAM project taught in Year 9
* 86% voted for another six week-long STEAM project
* 70% agreed that STEAM's cross-curricular approach made a difference to their learning
* 74% said they would like other subjects to be involved in future STEAM projects

**"Cross-curriculum links are essential to a child's understanding and interdependence, for overlapping knowledge and drawing connections between concepts." (Teacher, Bridgemary School)**

## Challenges and Learning

Time

"On top of a full school timetable and running a department, there never seemed to be enough time to run this as just one staff member", says Emma. "The school should consider having a STEAM Lead who has allocated time to be able to plan and deliver the work as part of the curriculum." She believes this would show a greater commitment to developing STEAM within the school too.

Arts Award

Initially, 42 Pupil Premium pupils were invited to work towards an Arts Award. Unfortunately, only 21 achieved an Arts Award. "With hindsight, I wish this opportunity had been open to all students, as it would have been interesting to see how many would have signed up."

Staff Changes

In the midst of the project, the Head of Maths, the Head of Science, and another Maths teacher all left the school. To ensure the legacy of STEAM, Bridgemary had to work to 'induct' several new members of staff, to make sure the project could continue to be a success.

## Approaching similar work in the future

As this was the school's second STEAM project, Emma says this "proves it is sustainable as a model for delivering an interwoven curriculum". For future projects, she says the school will adopt the same model again.

## Recommendations for Other Schools

Mentally preparing for the journey itself is crucial, says Emma. "You need staff to be willing and prepared for all the ups and downs throughout the project."

As well as this, uniting subject areas with a shared goal really aids in connecting the dots. “We found that having the learning attached to our school rewards system was pivotal in uniting the STEAM subject areas and allowing it to have a strong Literacy foundation”, explains Emma. Basing the project around a book meant that schools could hone in on Literacy skills and ensure that this was being evidenced in lessons. Emma would also recommend creating STEAM Student Ambassadors so that future work can be carried out by students themselves. “They could then mentor other students on STEAM projects, or be used as reading budies to support low readers in accessing the stories.”

**Continuing a STEAM Legacy**

“Our Transition programme now focuses on STEAM and provides a natural transition that runs parallel to the Primary Curriculum.” The school has plans to further its links with Higher Education too, embedding connections into their KS4 Curriculum, “to allow greater insight into Higher Education routes post-16”.

“I would have liked the opportunity to have visited other schools, to see their work in action”, says Emma. This is something she hopes might be incorporated in future projects. She is pleased with the success of the project and feels that, despite its challenges, the hard work has very much paid off. “Thank you for the opportunity to be a part of the STEAM Network, and to work with external providers. We must allow Art to have a place in the curriculum.”

**To download and read the full case study, visit: https://artswork.org.uk/resources/steam-through-structure/**

## Poster 6:

**Volunteering and caring are both developed by arts engagement.**

A Culture and Sport Evidence (CASE) review found a direct correlation between arts engagement and young people volunteering and caring. (*A review of the Social Impacts of Culture and Sport*, 2015)

## Poster 7:

**Students from low-income families who engage in the arts at school are 20% more likely to vote as young adults.**

"Young adults with arts-rich experiences in high school were more likely to vote and/or participate in a political campaign." The most significant differences were noted in groups of low socio-economic status. (*Doing Well and Doing Good*, 2009)

"Art and music-related leisure, reading for pleasure, and visiting a museum at age 16 increased the odds of civic engagement by 29." (*Teenage Time Use as Investment in Cultural Capital*, 2003)

## iii. Case Study: STEM to STEAM: Breaking the Code with South Oxfordshire Schools Partnership

### The Project

In March 2017, six schools from the South Oxfordshire Schools Partnership embarked on a mission to embed the Arts into a STEM-dominated curriculum. Their central theme was 'Breaking the Code', inspired by the work of Alan Turing and Bletchley Park. Participating schools explored a fusion of Arts and STEM subjects, to create their own response. Over the course of a year, 700+ students worked on STEAM-inspired projects. Schools took several different routes, including visits to Bletchley Park, an exploration of DNA and the work of Rosalind Franklin, a study on synaesthesia, plus ideas surrounding genetic modification, mutation, and the concept of 'designer babies'.

**"The importance of STEM to STEAM cannot be underestimated in our rapidly changing world." (South Oxfordshire Schools Partnership)**

### The People

Partners & Practitioners:

- Theatre of Debate
- Bethany Mitchell (Modern Art Oxford)
- Oxford Contemporary Music
- Oxford Brookes University
- Drew Morris (Artist)
- Charlie Speke (Artist)
- Jasmin Vardimon Dance Company
- Luna Russell (Community Artist)
- Science Oxford

- The Wellcome Trust
- Think Lockhart
- STEAM Co.
- Bletchley Park
- Didcot Power Station
- Callum John (Film Production)

Participating Schools:
- Larkmead School
- Fitzharrys School
- Carswell Primary School
- Aureus School
- King Alfred's Academy School
- St. Helen & St. Katherine School

## Different School Approaches

Larkmead School

- All Year 9 students took part in a STEAM day
- There were workshops in coding, science, drama, dance, and on DNA and the concept of 'designer babies'.
- Based on learning from the workshops, students produced a range of performance pieces, which were showcased via in-school performances and an event at Didcot Cornerstone.
- Worked with four primary schools exploring forensic science and creating dance and drama pieces as a response to the learning. Over 100 Year 5 primary school children took part in a Breaking the Code Day.

Carswell Primary School

- Pupils went on a visit to Bletchley Park.
- Using their trip as inspiration, pupils produced a film called *Breakers* – looking at how technology might affect the future of education.
- Students took part in a coding workshop with Science Oxford and worked with Think Lockhart to create costumes and props.
- Filming took place in school and on location at Didcot Power Station.

Aureus School

- All Year 7 pupils were taken off timetable for a day to explore the science behind forensics and coding, and the perception of women in Science.
- Held a Teach Meet to share experiences of the project with others.
- Worked with Science Oxford and a range of Art, Dance and Drama practitioners on a variety of workshops.

Fitzharrys School

- Year 9 pupils explored genetic mutation and created soundscapes as a response, through electroacoustics.
- Brian Mackenwell's team from The Wellcome Trust delivered workshops and lectures on genetics and mutation.
- Paul Whitty, Professor and Research Lead for Arts at Oxford Brookes University, led a series of workshops on electroacoustics.

King Alfred's Academy

- A small group of Year 9 pupils worked with Science Oxford to explore synaesthesia.
- Led by Bethany Mitchell from Modern Art Oxford, pupils created textile installations based on their interpretations of what it might be like to 'hear' colour.
- Pupils also explored taste and the way it might be represented through printed shapes.

St. Helen & St. Katharine School

- Year 7 pupils devised a piece of theatre based on Linda Liukas' *Hello Ruby: Adventures in Coding*.
- Students worked with coding and attended Theatre workshops led by Physical Theatre Practitioner, Andre Reblo (Jasmin Vardimon Dance Company).
- Using the characters in Liukas' book as a springboard, pupils created their own dialogue and action sequences, to bring the page to the stage.

## Challenges & Learning

Larkmead School's Andrea Phillips explains some of the challenges the schools faced along the way. "Creating a partnership group/network was a challenge in terms of getting schools on board." She suggests there were numerous factors that contributed to this. "The shrinking Art faculties in schools meant a lack of staff to deliver the work. An academic focus on the curriculum also created challenges in 'releasing' students to participate in workshop days."

"One secondary school were allowed to come off timetable to do the Science parts of the project, but had to do the Music side of the work within their allocated Music lesson time." Andrea believes these sorts of time limitations on the curriculum are particularly prevalent at secondary education level.

Collaboration across curriculum areas was also a real challenge, she says. "Specialists in STEM subjects were keen to deliver their input to the project, but seemed more reluctant to embrace the artistic side of things." Arts staff, on the other hand, were "proactive in learning about STEM, and attended the workshops provided to support CPD and knowledge exchange".

Despite the challenges, Andrea says the learning for pupils was “fantastic…with some really creative outcomes”.

## “Science and Arts should collaborate: arts have a scientific process, science has a creative process!” (Teacher)

“This was a really exciting project”, wrote one student. “It was great to see what we could learn and create.”

Communication, interpersonal skills and increased confidence in contributing to group discussion, were all cited as learning points across the schools. Pupils were able to pick up “key skills [such] as teamwork, how to execute the same task in different ways, and being creative/thinking creatively”, said a teacher from St Helen & St Katharine School. There was also a growth in analytical skills, increased confidence in recognising and explaining personal creative decisions, and creative thinking – “interpreting abstract ideas through visual arts”, says Andrea.

### Looking Ahead

Andrea says there is “most definitely a strong need for this work”, when asked about the future. “The focus of STEAM highlighted to all who participated that creative subjects and STEM work very well together to support and embed learning. We were surprised by how many students found the exploration of Science through the Arts really stimulating”, she explains.

With a future increasingly shaped by technology and Artificial Intelligence, Andrea believes there is an “even greater need to develop initiatives like these.”

Encouragingly, she reports, “there is a growing body of economists and leaders in education, the Arts, and well-informed politicians who understand the need for Arts to remain central to our education system. Promoting STEAM helps to promote the importance of creative skills, which are essential for our future workforce”.

**To download and read the full case study, visit: https://artswork.org.uk/resources/stem-to-steam-breaking-the-code/**

## Poster 8:

**Young offenders who take part in arts activities are 18% less likely to re-offend.**

Re-offending rates among young people who took part in Summer Arts Colleges were 54% compared to a national re-offending rate of 72%. Between 2007 and 2010, this saved the Criminal Justice System more than £1 million. (*The Art of Engagement: Outcomes and Impact of the Summer Arts College Programme*, 2014)

## Poster 9:

**Engaging in creativity at home improves children's behaviour, boosts mood, and raises ability in reading and maths.**

As part of a UK study, Child of the New Century, researchers found connections between children engaging in creativity in the home and improved moods and behaviour, as well as higher academic ability.

(*Child of the New Century*, 2016)

## 3. Tips, Tricks and Insider Knowledge

### Top tips for running STEAM projects in your school:

- Good communication is the key to success!
- Build good working relationships with external partners.
- Have a Named Governor for Arts – extra support for STEAM from Leadership team is very valuable.
- Explore opportunities for STEAM-based Professional Development for your staff.
- Try and bring in specialists from outside sources – i.e. Universities, STEM experts and local businesses.
- Consider linking with Teaching and Learning Responsibility (TLR) opportunities or other additional teaching qualifications.
- Develop a strong Arts Award offer to run alongside the project.
- Carry out an audit of what STEAM activities are already happening in your school.
- Consider having a STEAM Coordinator or STEAM team in your setting.
- Think about ways to promote STEAM-related careers as part of the project.
- Allocate a good amount of time to the planning stages of the project.
- Make sure staff are on board and can commit to the project – their support is incredibly important.
- Think about evidencing the impact of STEAM projects – how do you know it is an effective way of working?

- Utilise free/affordable or in-kind contributions from partners.
- Ringfence an amount of your budget to pay for administrative support – chasing and collating evidence, maintaining contracts and communication, etc.
- If possible, bring participating schools together early on, so they can be involved in funding bids and feel involved and united from the outset.
- Remain inclusive – don't worry about students' ability for performances etc, letting them explore and put themselves out there will build confidence and peer respect.
- Consider how STEAM approaches can provide valuable evidence to Ofsted by demonstrating breadth and balance in your curriculum whilst also raising the profile of the arts and creativity.

**"STEAM gives students continuity in their overall curriculum and learning." (Teacher)**

## Embedding STEAM in your Artsmark journey

Putting the arts at the heart of education through Artsmark can help unlock your pupils' potential. Artsmark is a practical tool for schools seeking to enrich their arts provision. Want to turn STEM into STEAM with Artsmark?

Have you considered:

- Building in STEAM as a development priority?
- Using your Statement of Impact to evaluate the difference a STEAM programme has made to your pupils, school and your own teaching?
- Naming someone (if appropriate) as the STEAM Lead/Coordinator?
- Using the two years of your Artsmark journey to take the time to embed small things to create big change in the future? (e.g building in CPD, planning for academic year ahead, protecting budget)
- Working with other schools to share resources? (materials, equipment, skills, CPD costs etc)
- Seeking partnership with local STEM businesses and organisations to potentially fund new equipment and new programmes?

**"Artsmark does brilliant work in schools and education to ensure young people access a broad and balanced curriculum that includes high-quality arts and culture." (Michael Ellis MP, DCMS)**

**Find out more about Artsmark at http://bit.ly/2YJXIIf**

## Source List

### Sources: *STEAM: What's it all about?*


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### Sources: Poster Statistics


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- Child of the New Century. (2016). Home and Family. [Online]. Available at: http://www.cls.ioe.ac.uk/cnc/page.aspx?sitesectionid=64&sitesectiontitle=Home+and+family
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- Department for Culture, Media and Sport (DCMS) (2010). Understanding the impact of engagement in culture and sport. Culture and Sport Evidence Programme (CASE). London: DCMS.
- Grossi, E. et al. (2010) The impact of culture on the individual subjective well-being of the Italian population: an exploratory study. Applied Research in Quality of Life.
- Konlaan, B. et al. (2000) Visiting the cinema, concerts, museums or art exhibitions as determinant of survival: a Swedish fourteen-year cohort follow-up. Scand J Public Health.
- Robson, K. (2003). Teenage Time Use as Investment in Cultural Capital. Working Papers of the Institute for Social and Economic Research paper 2003-2012. Colchester: University of Essex.
- Stephenson, M., Adams, M. and Tarling, R. (2014). The Art of Engagement: Outcomes and Impact of the Summer Arts College Programme 2007-2012. Norwich: Unitas.
- Taylor, P., Davies, L., Well, P., Gilbertson, J., & Tayleur, W. (2015). A review of the Social Impacts of Culture and Sport. London: DCMS.


## Poster 10:

**People who take part in the arts are 38% more likely to report good health.**

Nordic data found that people who visited cinemas, art exhibitions, museums or concerts regularly had a lower mortality risk. (*Visiting the cinema, concerts, museums or art exhibitions as determinant of survival*, 2000)

Italian data shows that cultural access is the second most important determinant of wellbeing, above factors including occupation, age, income and education. (*The impact of culture on the individual subjective wellbeing of the Italian population*, 2010)

## Links, resources and further information

### Useful Websites

www.culturallearningalliance.org.uk/evidence
www.baccforthefuture.com
www.bera.ac.uk
www.stemtosteam.org
www.steamco.org.uk
www.stem.org.uk/impact-and-evaluation
www.bostonartsacademy.org/steam-lab

### STEAM teaching resources and inspiration

Saw Trust (free resources) www.sawtrust.org
TES STEAM Resources: www.tes.com/teaching-resources/steam
How to Smile Blog (Space Toolkit with NASA): www.howtosmile.org/blog/posts/explore_science_space_earth_2017_toolkit
Education Closet (STEAM Resource, USA): www.educationcloset.com/steam/steam-resources-for-any-classroom/
Into Film (search STEM/STEAM related films, access free resources and start a Film Club: www.intofilm.org
The Big Draw (drawing for Maths and Science): www.bshs.org.uk/the-big-draw-2016-from-stem-to-steam

### Further STEAM Reading

Why STEM can only take us so far' - Cultural Learning Alliance:http://bit.ly/2UR7tqt
ImagineNation: The Case for Cultural Learning - Cultural Learning Alliance:http://bit.ly/2GxuJzJ
Reviewing the Potential and Challenging of Developing STEAM Education – BERA:http://bit.ly/2W1fgyh
Reflections: How STEM becomes STEAM – The STEAMJournal:http://bit.ly/2GuJFi9
The Value of a Liberal Arts Education:http://bit.ly/2XF2SEM
STEM vs. STEAM: How the sciences and arts are coming together to drive innovation:https://ind.pn/2W3bxQV

### Education Grants

The Goldsmiths' Grants for Teachers: http://bit.ly/2ISZh1B
The Foyle Schools Library Programme: http://bit.ly/2IHGw1Y
London Mathematical Society Education Grants: http://bit.ly/2Zxso0s
EMI Music Sound Foundation Grants: http://bit.ly/2XEKVGg

**Inside back cover:**

**“STEAM means different things to different people. Having the arts for art’s sake is valid, and yet the arts can teach and enlighten. Their influence can be both subtle and pervasive. STEAM has depth. It is integrated and cross-curricular. What’s most important is to take off the labels and educate to educate, not to do well on a test or a particular protocol, but to become a whole person.” (Ruth Catchen, *Reflections – How STEM Becomes STEAM*, 2013)**

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