Unlocking Potential Through Interdisciplinary Partnership

Symbiotically enhancing young people's STEM learning through sustained and purposeful partnership between two educational professionals working across disciplines.

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Professor Lynne Bianchi, Lynn Provoost and Dr Janet Hanson

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Professor Lynne Bianchi

Lynn Provoost

This report documents the impact of a long term partnership between two education professionals – Professor Lynne Bianchi, who has a background in Science, and Lynn Provoost, with a background in the Arts. Before delving into the history and impact of the partnership, some background information on both individuals and their respective organisations is provided.

Professor Lynne Bianchi is Vice Dean for Social Responsibility, Equality, Diversity, Inclusion and Accessibility and Founder and Director of Science and Engineering Education Research and Innovation Hub (SEERIH) at The University of Manchester. Lynne is a specialist in curriculum and professional development, innovation and research in primary science and engineering education. Having qualified as a teacher, she worked in schools in Greater Manchester before achieving her doctorate in Science Education. Prior to joining The University of Manchester, she developed her work in curriculum and teacher development at the Centre for Science Education at Sheffield Hallam University for 14 years.

Lynn Provoost joined The Derby High School as a newly qualified teacher in 1999 and is Assistant Headteacher – Personal Development, Partnerships, Communication and Marketing at The Derby High School in Bury. Lynn is also Lead Practitioner for the Northwest Comino Creative Consortium, a founding member of Bury Local Cultural Educational Partnership and Fellow of the Royal Society for the Arts (RSA).

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Science and Engineering Education Research and Innovation Hub (SEERIH), The University of Manchester

SEERIH was launched by Lynne in 2014 in the Faculty of Science and Engineering at The University of Manchester. It is a leading UK centre of expertise for Science and Engineering education with a vision to improve the attainment of pupils in schools in areas of high socioeconomic deprivation. The team at SEERIH develop and engage teachers in innovative, research-informed continuous professional development programmes to ensure high-quality learning outcomes for young people. SEERIH aims to enthuse teachers, young people and their communities about the wonders of science and engineering in the world around us.

The Derby High School, Bury

The Derby High School is a mixed 11-16 secondary community school, located in Bury, Greater Manchester, England, with around 937 students. In 2003 The Derby High School was awarded Science and Arts Specialist School Status by the Specialist Schools and Academies Trust (SSAT), and the school has maintained an inclusive approach to making the Arts and Sciences available to all students. Compared with most schools, a significantly high proportion of students are disadvantaged and the proportion of students from minority ethnic backgrounds is well above average, with the majority of students being of Pakistani heritage. The school is currently the highest performing school in Bury for student progress and has held this position for many years, pre- and post-pandemic and currently a finalist in The Pearson National Teaching Awards in the Making a Difference Secondary School of the Year category and through to the final six in The Goldsmiths Community Engagement Award.

Comino Foundation

Since the early 2000s Lynne and Lynn have been supported by the Comino Foundation to realise their shared vision to enhance educational provision for young people. The Comino Foundation is an educational charity committed to supporting innovative practice that develops young people's Personal Capabilities. Through its concept of GRASP (Getting Results and Solving Problems), Comino promotes thinking processes that encourage inquiry, experimentation and reflection to get results and solve problems. True to the legacy of its founder, engineer and entrepreneur Dimitrius Comino, the Foundation works with teachers to develop practical pedagogies designed to enrich learning in Science, Engineering and Technology and to help young people fulfil their potential. In partnership with Ideas Foundation, Comino formed the North West Comino Creative Consortium (NWCCC), through which a number of schools in the North West of England engage in high-profile, creative projects designed to bring digital and creative skills into the classroom through the curriculum.

Centre for Science Education, Sheffield Hallam University

The Centre for Science Education was a research and innovation hub within Sheffield Hallam University. It was a centre of excellence which grew over 25+ years influencing science education practice in the UK and beyond. Professor Bill Harrison, Emeritus Professor of Science Education at Sheffield Hallam University, was Head of the Centre for Science Education until his retirement. Bill's influence on Lynne, as Director of Studies for her PhD and later across the early years of her professional career was significant. Bill was also a director of the Vector STEM Partnership consultancy and led the Comino Centre for Personal Capabilities and Leadership from 1990 to 2005 during which time he initiated and directed the development of the STEM Leaders Qualification.

The approach to writing about the partnership

The processes adopted in writing this report are similar to those in case study research which holistically examine entities, for example, persons, organisations or events, to illuminate or explain something (Thomas, 2011). In this instance, the approach is used to explore how a partnership between two education professionals with different disciplinary backgrounds can lead to significant enhancement in pupils' access to STEM learning.

One of the authors, Dr Janet Hanson, was invited to work with Lynne and Lynn to undertake an in-depth exploration of their partnership. Janet is Visiting Research Fellow in the Centre for Real-World Learning at the University of Winchester and has been involved in numerous collaborations with them, primarily through projects undertaken on behalf of the Royal Academy of Engineering.

Lynne explains the reason for writing the narrative at this point in time:

> *"It felt the right time to lay down in words some key messages so that others can read, question and respond professionally through peer-review, feedback and (of course!) ongoing support, should what you read spark something that speaks to your ideas and passions."*

Janet began by engaging both professionals in conversations to scope their story and to create a timeline of significant events between 2000 and 2024. In line with a bounded case study (Thomas, 2011), the events were limited to those specified by Lynne and Lynn to include ones that principally involved the two of them, and where the educational focus was mainly within the curriculum, rather than on programmes that were extra-curricular.

Once the boundary of the case, or the partnership, was established, relevant sources of evidence were gathered and analysed to build up a chronological narrative of the key events and to identify evidence of their impact. These sources included project reports, evaluation studies, Ofsted reports of inspections of The Derby High School, articles in academic and practitioner journals, newspaper reports, webpages, and online videos. Every source has already been published in the public domain. Video content was a valuable source for gaining the pupils' perspectives on their experiences of being involved in The Derby High's activities. For simplicity through the report, pupil groups are referred to by their year group rather than by age or education stage, so Table 1 provides information on pupils' ages and educational stages in England.

Once the overall narrative detailing the events was established, the evidence of impact, or the 'So what?' issues, became clearer. After further reflection, Lynne and Lynn identified key factors that might explain their successful interdisciplinary practice, which could be of interest to a wider audience.

Primary Year Groups	National Curriculum Phase	Secondary Year Groups	National Curriculum Phase
Year 1 (age 5-6 years) Year 2 (age 6-7 years)	Key Stage 1	Year 7 (age 11-12 years) Year 8 (age 12-13 years) Year 9 (age 13-14 years)	Key Stage 3
Year 3 (age 7-8 years) Year 4 (age 8-9 years) Year 5 (age 9-10 years) Year 6 (age 10-11 years)	Key Stage 2	Year 10 (age 14-15 years) Year 11 (age 15-16 years)	Key Stage 4
		Year 12 (age 16-17 years) Year 13 (age 17-18 years)	Key Stage 5

Table 1. Stages of the education system in England

The vision for the partnership

With a passionate commitment to teaching and learning for 5 to 16 year-olds, both professionals share a vision to unlock young people's potential using creativity and partnership to meet the demands of the mainstream curriculum. They believe that schools should impart more than just academic knowledge and that access to Science, Technology, Engineering and Mathematics (STEM) can be invigorated when exploiting interdisciplinary learning opportunities with the Arts. Furthermore, they are convinced that these opportunities should be accessible to all pupils.

In pursuit of this vision they have formed collaborations with a diverse range of educators, STEM and Arts organisations and industry partners. The focus has always been to extend experiences for pupils, teachers, senior leaders and parents/carers at The Derby High School in Bury and in schools within the networks supported by SEERIH.

What brought Lynne and Lynn together initially and has sustained the relationship is an educational philosophy that values upskilling teachers through innovative, interdisciplinary professional development and diversifying the mainstream curriculum offer. They promote learning experiences that develop the thinking skills, personal competences and dispositions needed by pupils to manage their learning, interpersonal interactions, and future careers. Lynne coined the phrase Personal Capabilities (PC) in her doctoral thesis (Bianchi, 2002) to refer to ten of these skills and dispositions (see Table 2), of which creativity and problem solving have been particularly important throughout their partnership.

Their vision has unfolded over more than twenty years of collaborative learning and is distilled in this report into a chronological narrative divided into six phases:

Phase 1:
2000 to 2007 charts the early days of the partnership between Lynne and Lynn and examines how they laid the foundations for embedding the development of pupils' Personal Capabilities within the mainstream curriculum by exploiting interdisciplinary approaches within Science and the Arts.

2000 to 2007

Phase 2:
2008 to 2011 turns the focus onto STEM learning and its potential for developing pupils' wider skills and dispositions, notably their STEM leadership skills and their accreditation through a brand new BTEC course.

2008 to 2011

Phase 3:
2012 to 2015 highlights the importance of interdisciplinary professional development for teachers if the innovative pedagogic changes necessary for unlocking pupils' potential through Science and the Arts are to be realised.

2012 to 2015

Phase 4:
2016 to 2019 celebrates the incredible success of the campaign known as the Great Science Share for Schools (GSSfS) which has shown that pupils from diverse backgrounds can engage enthusiastically with Science when it includes space for creativity and is relevant to solving the problems of their world.

2016 to 2019

Phase 5:
2020 to 2021 includes the time of the COVID-19 pandemic, which presented all schools with many challenges but also opportunities to reframe learning. At this time, creativity was exploited to find alternative ways to reinforce the value of STEM learning and Personal Capabilities for all pupils whilst in lockdown.

20020 to 2021

Phase 6:
2022 to 2024 documents the ongoing partnership, how the GSSfS campaign extended its reach, and how SEERIH and The Derby High widened outcomes with local, national and international organisations to contribute to the regeneration of communities.

2022 to 2024

Framing the aims of the partnership

Although the vision has been clear throughout, in hindsight the rolling nature of the partnership has honestly meant that while individual projects had clear aims and objectives, the partnership's overarching aims have been framed retrospectively. Nevertheless, they are as true today as when the partnership began.

It is fair to say that the evolution of the partnership was never predicted and that the serendipitous nature of funding, both extended and occasional, has enabled the partnership to continue.

This is not stated as an apology but to recognise that creative partnerships like this often happen in this way, and it is only with hindsight that one can truly appreciate how many stories have created a whole, and how many parts of the story have resulted in an impact greater than the sum of the parts.

Therefore, the aims of the partnership have been articulated within three interconnected blocks, one for The Derby High School, one for SEERIH, and one containing overarching aims for the partnership (Figure 1 – page 11).

A theory of change has been driving the partnership, although implicit and understated until now. However, with the holistic narrative and evidence of outcomes in plain sight, it becomes possible to articulate an emerging descriptive theory of change for the partnership (Noble, 2019). This is discussed in the Summary along with an assessment of the achieved aims.

Figure 1. Aims of the partnership

What have been the ingredients for success?

Before moving to the narrative, it is important to remember that the success of evolving projects and partnerships, such as this one between these two leading professionals, can often be challenging to fully encapsulate.

Both Lynne and Lynn speak of how their passion to broaden ambitions for young people has been a key lever for them to 'push the boundaries' when taking action through their partnership, as Lynn explains:

> *"Our young people, our community that we serve, there's something extra special about them. We do serve an area of deprivation, so it's up to us to work with those young people and work out how we're going to remove the barriers in their lives."* **Lynn Provoost, cited in Ashoka, 2023**

Over the years, 'sparks' or seeds of ideas have coalesced around a number of factors that have proved influential in gaining them support for their ambitious vision, both from within their own organisations and through external partnerships. This section illustrates two ways in which key 'ingredients' for the success of the partnership might be articulated. Initially, they demonstrate that by keenly observing the broader educational policy landscape and being ready to act swiftly and creatively to propose solutions for perceived educational challenges, they were able to leverage policy initiatives to achieve their goals. Subsequently the insight they brought to leading professional development activities with teachers, which aligns conceptually with the framework of the 4Ps of Creativity model (Rhodes, 1961) (see Figure 2), illustrates how and why this partnership has successfully engaged teachers in their vision for unlocking pupils' potential.

Leveraging policy initiatives

One contributing factor has been Lynne and Lynn's ability throughout the partnership to harness various educational policy imperatives of the day in support of achieving their aims, which has gained them funding, resources and influence. Lynne's early research on PCs, particularly pupils' creative thinking and problem solving, put her in a strong position to offer guidance to curriculum organisations, thereby gaining her a reputation for expertise in this area. As well as evidence that PCs support academic outcomes, pupil wellbeing and career progression (Kashefpakdel and Ravenscroft, 2021), employers continually urge schools to do more to encourage young people's 'work readiness', demanding skills such as teamwork and problem solving (CBI, 2019). Since the pandemic it has been shown that the need for creativity in the workplace is likely to increase significantly (Taylor et al., 2022), thereby adding to the authority of their proposals.

Similarly, Lynn has always stressed that a rounded curriculum including Arts and Science should be accessible to all pupils whatever their age, gender or ability, and her focus at The Derby High on providing a balanced curriculum has ensured that pupils are not pigeon-holed as either academic or practical learners as they are encouraged to voice their aspirations and are then supported to achieve them. The success of this approach has been evidenced through the numerous positive Ofsted comments about The Derby High's curriculum and pupil achievements since the beginning of the partnership which are cited later in the narrative.

Their joint emphasis on combining Science and the Arts is proving to be a gamechanger in the race to raise pupils' interest in joining the STEM workforce, which is losing talent through its significant underrepresentation of women, racially minoritised and working-class people in the workplace (APPG, 2021). Engineering in particular is seen as an interdisciplinary sector requiring skills to work well with people from many different disciplines (Royal Academy of Engineering (2024). For these reasons, practical, project-based learning in authentic contexts, for example, when The Derby pupils develop their conceptual knowledge and skills through scientific inquiries and artistic creations, is proving to be highly effective in helping pupils, particularly girls, develop their STEM identities and 'capital' needed to progress in STEM careers (Archer et al., 2023; Moote et al., 2024).

Drawing on a framework for creativity

In addition to both professionals' readiness to take (informed) risks and seize opportunities, an overarching lever for success could be attributed to their deep and intuitive understanding of the factors underpinning classroom practice for developing pupils' creative thinking and their determination to enable teachers to engage with these. Lynne and Lynn have always positioned creativity as a curricular goal and their actions since the beginning of the partnership reflect factors identified by Murcia et al. (2020) as contributing to achieving this goal. Karen Murcia and her colleagues devised a framework to support teachers make creativity more explicit in their classrooms. The basis of the framework was an adaptation of Rhodes' (1961) 4Ps of Creativity model, which proposed that creativity could be discussed and understood according to the 4Ps of product, person, place and process (Figure 2).

Each of these 4Ps has played a part in the professional development approaches through which Lynne and Lynn have supported teachers engaged in teaching for creativity.

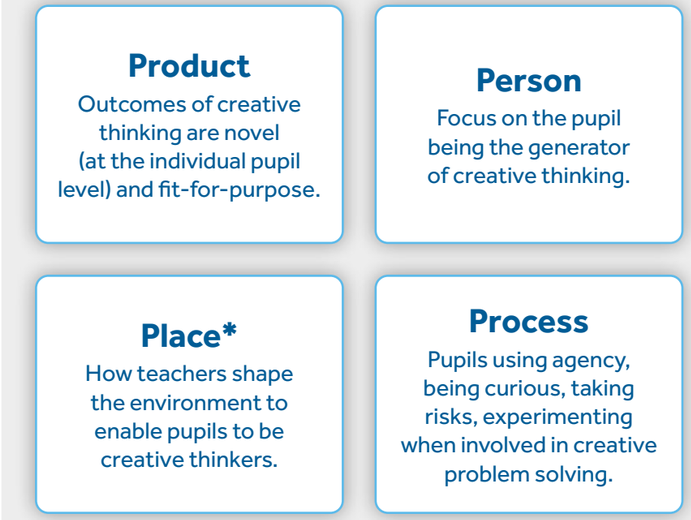

Figure 2. 4Ps Creativity model adapted by Murcia et al. (2020) from Rhodes (1961)

*Rhodes originally used the term Press to refer to things helping or hindering the creative environment, but Place is more commonly used in an educational context.

Product: Creative outcomes can be produced in all subjects, and they are not limited to physical or artistic artefacts, they can also be processes, services or systems, as acknowledged by Cropley (2015) for engineering. The partnership demonstrates how the Arts can be the vehicle through which creative outputs in other subjects can be realised. Creative outputs should be novel, but this can be at the level of the individual pupil and is not limited to the outputs of 'gifted' individuals (Lucas, Spencer and Stoll, 2021). This particular focus on product helps teachers understand what creativity might look like in the classroom, and that it can be cultivated in all pupils.

Person: While teachers can be encouraged to teach creatively, the pupil must be recognised as the agent of their own creative outputs, and teachers' understanding of the importance of promoting this agency is critical for pupils to demonstrate creativity. Teachers can model creative thinking, but they also have to enable pupils to learn to be creative, so they need to have confidence in their ability to manage sometimes unpredictable situations in the classroom or science labs, hence the value of the practical 'hands-on' professional development provided through SEERIH (see for example, Bianchi, 2016).

Place: Teachers and school leaders are responsible for cultivating the right environment for pupils' creative outcomes to be realised. Teachers should offer practical learning challenges relevant to the lives of pupils, provide opportunities for peer collaboration and access to resources, both within the school and through external partnerships. The environment should also encourage pupils to experiment and allow them time to learn from their mistakes (Lucas and Hanson, 2021).

Process: Since pupils are encouraged to demonstrate agency, they need to develop Personal Capabilities that are required for the processes of creative thinking and problem solving. Murcia et al. (2020) describe these as being curious and willing to ask questions, making connections between disparate ideas, be willing to take a risk, and experimenting to find solutions and develop new ideas.

These 4Ps may challenge many teachers' perceptions about creativity and how to cultivate it, but the preparation that Lynn undertook with teachers at The Derby High, and the collaborative, interdisciplinary professional development programmes that Lynne provided with colleagues at SEERIH for teachers in Greater Manchester and beyond (Bianchi and Turford, 2022; Earle and Bianchi, 2022) all contributed to successful implementation of teaching for creativity over the length of this partnership.

Chronological narrative – **how has the vision been achieved?**

This report continues with the chronological narrative of the partnership activities and their impact between the years 2000 to 2024, illustrating these claims about the levers for success.

2000 to 2007

Phase 1:

The foundations of the partnership – developing pupils' Personal Capabilities

2008 to 2011

Phase 2:

Pupil leadership and empowerment through STEM

2012 to 2015

Phase 3:

Interdisciplinary professional development for creative curriculum innovation

2016 to 2019

Phase 4:

Sharing and co-creation to unlock pupil potential

2020 to 2021

Phase 5:

Resilience and sustainability

2022 to 2024

Phase 6:

Regeneration and progression

2000
to
2007

Phase 1:
The foundations of the partnership – developing pupils' Personal Capabilities

What happened?

A belief in the power of education to unlock pupils' potential has been at the core of the partnership. This began in 2000 as Lynne sought schools to participate in her doctoral research study exploring teachers' experiences of developing pupils' Personal Capabilities through the mainstream secondary Science curriculum in England. This work was later integrated into curriculum reform in Northern Ireland and influenced thinking at national level in England. The Derby High was selected as a site for Lynne's research at the same time as their curriculum re-design was taking place. Lynne's focus on pupil-led learning and leadership dovetailed with their ambitions and the pedagogies related to incorporating personal skills and capabilities, which became the core of every unit of study in the Year 7 Science and Arts programme. Lynne worked with Paul Kerr, Director of Science Specialism and The Derby High Science Department and curriculum development team using an Action Research approach. This meant developing practice-based methods to incorporate the Personal Capabilities into pupils' curriculum through active, project-based learning using a Science and Arts infused approach. Teachers co-designed approaches with the senior leadership team at The Derby that were trialled over an academic year, with pupils keeping a reflective log that profiled their progress. To do this, each Personal Capability was broken down into descriptors that explain the behaviours, actions and approaches they may exemplify in their learning (Table 2).

Personal capability is demonstrating the behaviours associated with the skills and characteristics of:
Positive self-image: Valuing oneself and one's achievements
Self motivation: Being able to motivate oneself to do what needs to be done
Problem-solving: Being able to analyse a problem and form strategies to work towards a solution
Creativity: Being able to think of and share new or novel ideas
Verbal communication: Being able to communicate one's opinions and feelings appropriately, by means of the spoken word
Critical thinking: Being able to critically review and evaluate practice in order to improve
Social intelligence: Being able to respond appropriately to different situations and people
Teamwork: Being able to work well in teams
Self management: Being able to take charge of one's own learning
Tenacity: Being able to persevere at a task in order to meet deadlines.

Table 2 Personal Capabilities (Bianchi, 2002)

The culture of innovation within The Derby High's senior leaders was vital in supporting risk-taking through creative pedagogic experimentation. Headteachers, Alyson Byrne (2002-2015) and Helen Hubert (2016-present) have played a vital role in establishing this culture at The Derby High in which creative leadership has flourished and led the school to excel despite the significant challenges posed by its location, facilities and demographic of the intake. What has always underpinned its distinctive approach was the leap it took in 2003 to apply to the Specialist Schools and Academies Trust (SSAT) to become the first ever specialist Science and Arts school in England. Although many questioned the rationale for this, for Alyson, Lynn and Paul, working with the Comino Foundation, it seemed like an obvious and natural progression.

It must be recognised that support from the wider Comino 'family' has been hugely influential in sustaining the partnership. Drawing on the legacy of its founder, engineer Dimitrius Comino, the partnership drew on the GRASP thinking approach on many occasions. The Getting Results And Solving Problem (GRASP) questions focused thinking on pursuing authentic methods to achieve results that truly responded to the needs of learners. Comino associates Jose Chambers, Pat Walters and Deborah Davidson have all played significant roles in supporting The Derby High's vision, with the North West Comino Creative Consortium becoming increasingly influential in diversifying pupils' creative, digital and practical experiences beyond the mainstream curriculum. These experiences have been integral to The Derby

High's growth over this period and are fully profiled in annual NWCCC publications (for example, NWCCC, 2020). This partnership report focuses specifically on mainstream 'within-curriculum' interventions in Science and the Arts that have been achieved between The Derby and the Centre for Science Education and SEERIH.

So what?

In this early phase of the partnership it was important to show progress in school improvement and academic outputs and influence. Lynne and Lynn were able to demonstrate success in both these areas. By 2001 The Derby High had already established a strong culture of encouraging pupils' personal development, and in particular their creativity, as Ofsted noted:

> *"Pupils' opportunities to develop creative skills, particularly through music and drama, are better than in most schools and this contributes well to personal development."*
> **Ofsted, 2001, p.11**

Six years later, in 2007, the school's interdisciplinary approach to the Science and Arts curriculum was having a significant impact on the pupils, the school and the community, as Ofsted again noted that:

> *"The school's specialist science and arts status underpins improvements to the curriculum and the outstanding contribution made by students to the school and local community... Students make good progress in the skills they will need in the world of work."*
> **Ofsted, 2007, p.4-5**

Further external commendation was achieved when The Derby High was awarded the Times Educational Award for Educational Excellence in Science and Creativity in 2005.

2008
to
2011

Phase 2:
Pupil leadership and empowerment through STEM

What happened?

The culmination of Lynne's doctoral study and work with national curriculum development teams across the UK encouraged her to seize the opportunity to take the approaches further and to seek wider dissemination and endorsement of the capabilities-infused approach to STEM learning at secondary school. In partnership with Edexcel/Pearson and in her role as Senior Research Fellow in the Centre for Science Education, she led a team to develop, trial and launch a Level 1 and 2 BTEC qualification called the STEM Leaders Qualification (SLQ).

This SLQ for pupils from the age of 14 was a BTEC in Work Skills at Level 1 or Level 2 - BTEC National Award Work Skills Leadership Skills (STEM) Qualification - Level 1 and 2. It was equivalent to a full GCSE and contributed to a school's league table points. This was a significant step in having an accrediting body support this field of study, and it marked the first STEM Leaders Qualification of its time within a national and international award scheme.

The SLQ enabled schools to:

- **accredit skills and capabilities along with the personal leadership development not usually recognised in STEM qualifications.**
- **contextualise and embed enhancement and enrichment activities, such as work experience and enterprise, in STEM subjects.**
- **strengthen engagement in the emerging national STEM strategy.**
- **use the STEM context for embedding, developing and assessing a range of Personal Capabilities.**

One of the trial schools was The Derby High, naturally taking forward their commitment to the approaches. Lynn oversaw the work within the Science department with Paul Kerr. The SLQ gave The Derby High an opportunity to gain equivalence for other mainstream qualifications for pupils, embracing their new Science and Arts curriculum offer as a context. This met the needs of pupils and developed their leadership qualities to enable them to cope with real-world challenges. The school piloted the SLQ using a fast-track programme of work for six Year 11 pupils. The pressure was on from the start, given the amount of work these youngsters were required to do during this period and that they were due to complete their education by early June 2010. This provided a challenge for the school and the SLQ team, yet all pupils successfully achieved the Level 2 BTEC in STEM Leadership Skills Qualification.

In 2010/2011, with ongoing support from the Headteacher Alyson Byrne and the Senior Leadership Team, the SLQ offer at The Derby was extended to further groups of pupils because it provided:

- **a qualification that drew on experiences across STEM and also other areas of the curriculum.**
- **a programme of work delivered by a range of departments and teachers both within and outside curriculum time.**
- **a qualification to fit alongside the range of BTEC courses offered at The Derby High School.**

All Year 9 pupils successfully completed two units of the SLQ through a programme of work led by form tutors. Year 10 pupils studied a further 2 units of the SLQ as part of the Creative and Media Diploma.

The experience of developing and managing the SLQ provided the inspiration for further curriculum change to embed real-world learning at The Derby High, thereby affording greater alignment between the curriculum and pupils' needs. Based on the BTEC model, Lynn changed many Arts qualifications for Years 10 and 11 to BTEC qualifications that involved pupils running 'enterprise companies', learning how to run a business and developing their problem solving and teamwork capabilities. These companies were based in the Arts, so included dance, performance and media companies, and they became vehicles to deliver the academic curriculum, including Science. A multifunctional Creative Arts building was established which could be configured to accommodate primary school learners visiting to participate in a custom made 'Inspire Day' or be transformed to replicate the facilities used by industry partners such as an advertising agency.

The Derby High teachers designed multidisciplinary workshops in consultation with primary colleagues, and The Derby pupils led projects, ran workshops and shared their learning with visiting primary children. The secondary pupils' learning and assessment was reported to become more relevant to them as they moved out of the classroom, recorded their own progress in their portfolio and engaged in self and peer assessment.

So what?

The impact on pupils in The Derby High was realised through the continued emphasis on practical learning as well as academic education. The SLQ provided a worthwhile accreditation for pupils who generally struggled to achieve in pure academic subjects. The success of efforts by The Derby's leadership team to rebuild the curriculum to meet the needs of such pupils was recognised by Ofsted in its 2010 inspection. Inspectors concluded that:

> *"The curriculum provides an outstandingly broad range of opportunities for students to learn from many varied experiences... Flexible organisation allows students to undertake a mix of courses which are personalised to their needs and career aspirations... The curriculum is enhanced by a range of outstanding partnerships in arts, science and sports."*
> **Ofsted, 2010, p.7**

Lynne's work at the Centre for Science Education was highly innovative. The team of curriculum specialists were focused on their intent to push the boundaries of possibility to inspire pupils to learn Science in increasingly life-relevant ways. The upscaling of Lynne's research to a national level was significant in demonstrating how close-to-practice research and development could influence curriculum diversification nationally. By progressing to publish two BTEC courses, the opportunity to influence pupils' learning on a wide scale was realised. This continued to consolidate the recognition and relevance of Personal Capabilities and leadership skills development, and their relevance within STEM learning.

Furthermore, Lynne's research was gaining national recognition as interest in pupils' Personal Capabilities increased. Prompted by the Rose Review (2009), the Qualifications and Curriculum Authority (QCA) began to develop a proposal for a National Curriculum for England and Lynne was invited to be part of this consultative process. She was also appointed as an Educational Specialist Consultant by the Council for Curriculum, Examination and Assessment in Northern Ireland. The learning from her doctoral study was built into the Thinking Skills and Personal Capabilities Framework during the revision of Northern Ireland National Curriculum. This work continues as a core entitlement to all learners in the region.

2012
to
2015

Phase 3:
Interdisciplinary professional development for creative curriculum innovation

What happened?

As Lynne and Lynn moved into their second decade of collaboration, they were contributing to debunking one of the most unhelpful myths about creativity in schools, that it is uniquely the preserve of the Arts and not relevant to other subjects. In taking creativity into Science they not only showed that it is relevant and connected to domain knowledge, but also that it can be learned, it is teachable, and it is relevant to all pupils, not just inherited by a few 'gifted' individuals (Lucas et al., 2021).

The pair maintained professional dialogue during this period, whilst developing independent projects that forwarded their own and the Comino Foundation's values. The North West Comino Creative Consortium (NWCCC) was being framed at this time, and as a key partnership school, Lynn focused on the creation of spaces for creativity at The Derby High. This involved utilising the new 'Inspire' building and school grounds to cement the school's foundations for approaches to learning Science through the Arts, and also to demonstrate to local primary and secondary schools how the Arts could gain prominence through Science at a time when their place in the curriculum came increasingly under threat as school budgets were squeezed.

By networking with influential partners outside the school, Lynn continued to facilitate exciting access for pupils to real-world, practical learning opportunities. Working in partnership with the Comino/Ideas Foundation partnership, she was working with two nationally recognised professionals in animation and scriptwriting to mentor pupils in creating animations. By adopting an established model of work developed by St Ambrose Barlow RC High School, The Derby team were inspired to exploit their position as the lead school in the authority for the Creative and Media Diploma. They knew they had the specialists and skills to lead on a similar animation project. Teachers and students worked with the professionals and equipped with the skills and knowledge The Derby took the project out to local primary schools. These became a signature approach that drew much interest, attention and opportunity for pupils' creative and leadership development.

At this time, Lynne continued to be influenced by The Derby's pioneering approach, and whilst working on a Primary Science Teaching Trust funded project – Scientific Weaving – took inspiration from the animation approach. Scientific Weaving was a primary teacher professional development project that sought to 'weave' together three areas of pupils' learning – personal development (by way of Personal Capabilities), Science content knowledge (concepts) and Science enquiry/disciplinary knowledge (working as a scientist). Over two years Science subject leaders from Greater Manchester and Sheffield worked with academic research scientists and primary Science curriculum specialists. What evolved was an immersive approach to teacher development, where residential events provide time and laboratory-based experience to upskill teachers with subject knowledge and ideas to activate pupils' learning through a skills and enquiry-rich approach. Teachers returned to school to trial ideas and develop their learning on iterative cycles of work, underpinned by Action Research.

Towards the end of this project, Lynne saw potential to introduce the animation project to teachers involved in the Scientific Weaving approach. This provided inspiration and encouragement for some to involve their pupils in communicating their learning in this way. The knowledge from the NWCCC and The Derby High led to a coming together of both projects and resulted in a series of animations explaining the Science concepts behind States of Matter and how these relate to broader concepts around global warming and climate change. In 2014 the primary pupils led learning in the wider community by showcasing the results of their efforts through 'The Sky's the Limit' animation premiere event at the Rock Cinema in Bury, where their creations were shown on the large IMAX screen to great acclaim. This tells another story of how the power of real-world and practical learning, together with a commitment to share and learn from each other, led to pupils having an extraordinary experience where creativity within the Science and the Arts emerged strongly again.

In late 2013, Lynne made the decision to move institution and to continue her career at The University

of Manchester. Supported by the Comino Foundation, Lynne made the transition in January 2014 to launch the Science and Engineering Education Research and Innovation Hub (SEERIH). Just prior to this move, she devised a novel way to bring a culmination to her work with Sheffield primary schools, and to evaluate the impact of her professional development activities with teachers. A pupil conference was organised that placed children at the heart of sharing their Science investigations and learning from each other. Pupils led the learning and teachers were able to formatively evaluate the extent they understood concepts. Lynne was able to review the extent to which the professional development had influence teachers' scientific understanding and their pedagogical approaches with pupils in their own classrooms. Little did she know at the time that this was the very first event that later formed the Great Science Share for Schools.

In their usual partnership style, the conference was found to be another coming together for Lynne and The Derby High. A 2015 Children's Conference was designed, this time involving twenty Greater Manchester primary schools (180 pupils, 40 teachers in attendance). The Arts became a key way to involve The Derby High in this event by commissioning their pupils to work with researchers to use dance to communicate scientific concepts. A very visual and engaging approach using dance, non-typical of mainstream Science learning, drew on the expertise of Millie Hall, Head of Dance, and was further testament to the impact of Lynne and Lynn's commitment to embrace creativity and exploit an interdisciplinary Science and Arts partnership.

So what?

With Lynne now based in Manchester, the impact of the partnership between the two and their shared interest to devise interventions to inspire pupils and their teachers continued to be realised This was demonstrated in 2014, when Ofsted praised the outstanding leadership of The Derby High headteacher and senior team who provide:

> *"...an uncompromising approach to securing the very best for the students in the school. Their work is underpinned by a strong sense of purpose, a thorough understanding of their community and a determination to provide the best life chances for all students".*
> **Ofsted 2014, p.4**

Between 2012 and 2015 The Derby High won numerous awards for Science and creativity:

- **2012 Institute of Physics Teacher Award for Paul Kerr, senior Science staff member.**
- **2013 TES Award 2013 for Educational Excellence in Science and TES Award 2013 for Creativity**
- **2014 The Science Department was commended in the Science category at The Education Business Awards.**

Reflecting back on their partnership during this period, Lynne and Lynn noted a step change in the working relationship between SEERIH and The Derby High. They expressed this as having a much stronger awareness and understanding of their shared interests which was leading to a more equal partnership. Lynne suggested, that in previous years, SEERIH had worked more on a delivery model, particularly with The Derby High's feeder schools. However, a growing appreciation of each other's educational priorities, for example, teacher professional development for SEERIH and school recruitment for The Derby High, enhanced their partnership work. They each aimed to utilise the other's skills within collaborative and shared endeavours, working with each other as opposed to alongside each other.

2016
to
2019

Phase 4:
Sharing and co-creation to unlock pupil potential

What happened?

This period saw the rapid expansion of the ideas cultivated throughout Lynne and Lynn's collaboration, expanding interdisciplinary opportunities with a firm commitment by both to co-create an annual project that benefitted both areas of interest. This was approached with enthusiasm tempered with an awareness that creative tensions would need to be tackled when they appeared. Learning from previous experience had shown that dialogue, clarity of vision and scope and high-quality pupil learning needed time – something that was often hard to come by in such a busy school with high demands from pupils and curriculum. SEERIH's focus on working 'within the curriculum' also meant that projects sought to impact on mainstream learning for all, as opposed to an extra-curricular Science club approach.

A major catalyst for this expansion was the designation of Manchester as European City of Science in 2016 and the official launch, by SEERIH, of the campaign now well known as the Great Science Share for Schools (GSSfS). This was a revolution of the children's conference 2014 and 2015 and is aimed at children aged 5 to 14, with the core values of being child-focused, inclusive, non-competitive and collaborative.

The Derby High created a key component of the GSSfS held in Manchester Town Hall in an interpretation of Science through Dance. This took form of a collaboration with The Hallé and Dance Manchester to create a performance called Stellarium. Astrophysicists Dr Rowan Fiske from the University of Manchester and Professor Helen Mason from Cambridge University, teamed up with NWCCC secondary school pupils to create the Science-Dance which told the story of the formation of a star in the solar system, as identified by Rowan in her doctoral study. The performance was a means for Rowan to publish her work in a creative form for the first time. Science and Dance teachers, together with The Hallé, a dance choreographer and pupils, worked with Rowan to create a unique performance. This proved to be a challenging creative interface that led to a fascinating way to spark interest in Science in pupils, and particularly in girls, who are less likely than boys to aspire to have careers in those fields but do engage positively with Dance. It was a valuable opportunity to demonstrate that academic learning could be facilitated through the Arts that are often regarded as 'less academic' subjects (Ashby, 2016/17). The creative challenge came in the way all parties need to preserve the integrity of each other's professional work, and to seek to find a middle ground to accommodate each other's knowledge and skill set. A Science-Dance focus has become a legacy component of all Great Science Share for Schools' events, with a special adaptation during the COVID-19 years.

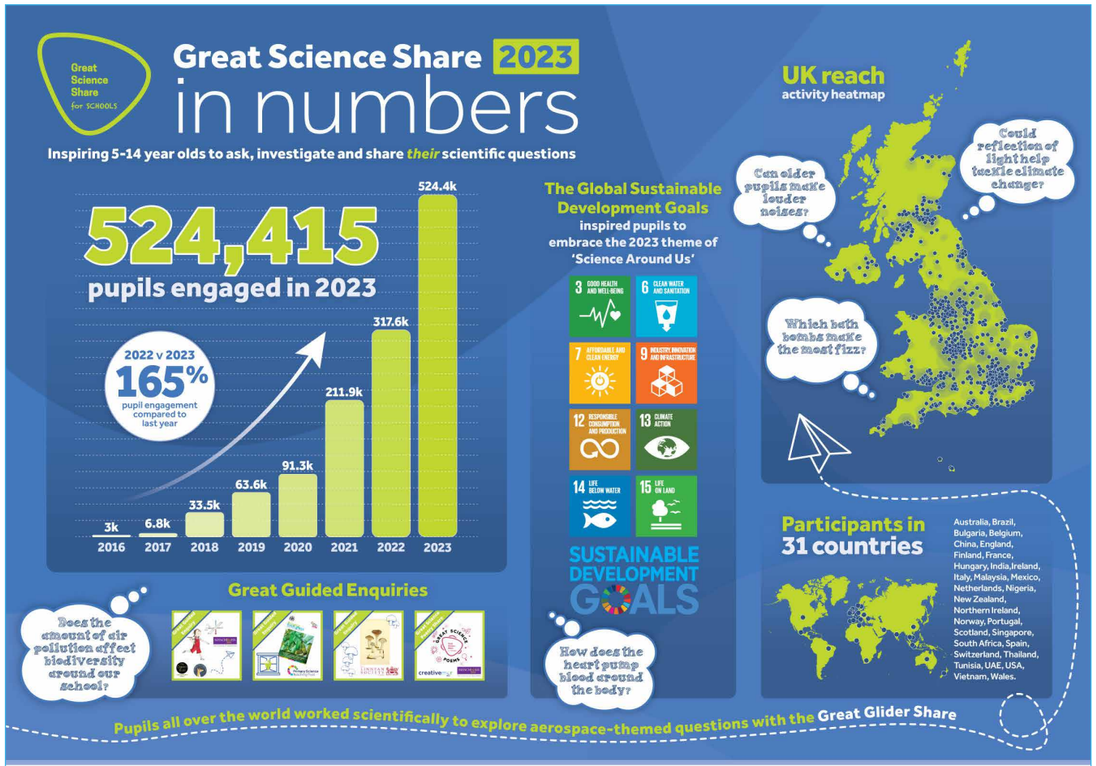

Figure 3 Great Science Share 2023 in numbers (The University of Manchester)

Following its launch, GSSfS grew in size and importance and achieved impact at an international level, as the infographic for 2023 illustrates (Figure 3).

Also in 2016, reflecting confidence in the scientific capability of the Derby High's pupils, the Director of Science specialism, Paul Kerr, applied on behalf of the school to take part in an amateur radio competition arising through a collaboration between the UK Space Agency, the Radio Society of Great Britain (RSGB) and the European Space Agency (ESA) (AMSAT-UK, 2016). The result was a spectacular opportunity for the school to host an amateur radio call to the International Space Station to interview astronaut Tim Peake on 25 April 2016 (Holland, 2016).

In 2017, The Derby High's bid for the Artsmark Platinum status encompassed all these novel experiences, illustrating the extent to which the Arts were an essential part of the curriculum and could inspire and invigorate interdisciplinary learning. By then, with both academic (GCSE) and practical (BTEC) qualifications offered, hundreds of pupils were involved in creative experiences throughout the year. Following this, The Derby High launched two initiatives, the Resilience Programme and 'Be Amazing' to audit all learners to discover their aspirations. Teachers then worked with this information to engage pupils in activities designed to promote the necessary skills and experiences to prepare them to fulfil their aspirations.

As the wider movement to portray STEM as a creative endeavour gathered momentum, the acronym STEAM became popular, indicating the importance of the Arts to STEM endeavours. Although the connection between creativity and STEM was already well established at The Derby High, the school's vision to take learning into new places and spaces to accommodate diverse learning needs drove its proposal in 2018 for the STEAM Garden. Through their continued professional dialogue, Lynn and Lynne brought their joint expertise to this proposal and the design for the garden was co-created with The Derby pupils. What emerged was a STEAM Garden that exploited Science, Engineering and the Arts once again. With a core focus on design that enhanced pupils' learning around recycling,

reuse and repurposing of resources, the garden was designed to embrace sustainability issues. In addition, the pupils' involvement in the proposal enhanced their leadership skills and demonstrated the value of outdoor learning for wellbeing, foreshadowing experience during the pandemic years.

The Derby pupils pitched their ideas to the Royal Horticultural Society (RHS) and won the RHS 'Green Plan It Challenge'. The charity Curious Minds funded the development of the garden and supported The Derby High to develop a creative approach to support the teaching of STEM (Provoost, 2018). The garden was a huge creative challenge for Lynn and her team but one that the school met and launched in a Summer Garden party in July 2018.

The STEAM Garden provided another focal point to bring the local primary school community onto the school grounds. Developing inter-school relationships in Bury was an area of shared interest – The Derby to fulfil its recruitment responsibilities and SEERIH to extend its Science Subject Leader Networks that were operating in other areas of Greater Manchester. Reaching out to Bury schools, in 2019 SEERIH delivered its third annual conference in Bury. This served to offer Science subject leaders sponsored professional learning provided by CPD experts in the UK. Input from The Derby High was built into the programme through a keynote address to demonstrate how teachers exploit the synergies between Science, the Arts, Drama and Dance. The Derby teachers led workshops using Arts-based techniques of modelling, making, mantle of the expert, music and movement as means through which pupils could engage creatively with learning in Science.

A serendipitous meeting in the STEAM Garden between Lynne and Helen Woodward (Educational School Improvement Consultant and Coach) led to a transnational leap for the GSSfS. Here the power of partnership shines again, this time with three passionate female leaders willing to co-create an experience by exploiting their knowledge, skills and opportunities. 'Going the extra mile' is a term that operates on many levels in this part of the story.

Antarastriya Yuwa Barsa School in Nepal was inspired to participate in GSSfS 2019 because three things came together: 1) the focus on asking, investigating and sharing a scientific question (the core premise of GSSfS); 2) pupil leadership by The Derby High School pupils; and 3) the commitment to improve learning for Nepalese children. What was realised was a rapidly developed project where Helen Woodward, as part of the Rebuilding Schools Nepal project, engaged pupils in Nepal in scientific investigations using an enquiry that The Derby High pupils designed. They created a short film for her to take with her (Woodward, 2020). This film involved pupils sharing their scientific questions and investigations, demonstrating how children could do a simple enquiry based on the concept of seed dispersal. Filmed in the STEAM Garden, they showed the Nepalese pupils how to create paper helicopters to represent seeds. They also prepared a basic kit pack for Helen (a non-Science specialist) to take with her to Nepal and explained how to use it. The pupils in Nepal responded in an amazing way, and due to the commitment of all three partners, they shared their learning back with The Derby pupils by recording their investigations and the questions they asked. Helen claimed that the project *"widened the horizons of children on both sides of the world"* (Woodward, 2021, p.32).

So what?

The power of GSSfS to engage pupils in Science enquiry complemented by opportunities in the Arts was illustrated by the sheer number of schools, children and teachers taking part year on year, rising from 3000 pupils in 2016 to over 64,000 pupils in 2019, when an evaluation of GSSfS was undertaken by ImpactEd Evaluation (2019). It was not just the numbers that were impressive, the report found that when the Personal Capabilities of pupils from the participating schools in the North West of England were compared with schools in more prosperous regions, the North West pupils were well matched with pupils from other areas. Furthermore, the North West GSSfS pupils were found to have particular strengths in problem solving and creative thinking and in academic persistence. Given that they mostly represented highly disadvantaged areas of England, this should be recognised as a significant achievement (Bianchi, 2020).

Not surprisingly, personal awards and recognition for Lynne and her team also accrued during these years. In 2017 and 2018, The University of Manchester awarded its Making a Difference Award to Lynne and SEERIH for the Great Science Share for Schools and for empowering young people to tell others about Science. In 2018, the GSSfS also won a Chemical Industries Award.

Lynne and SEERIH's professional development work with teachers on embedding engineering in Science, Design Technology and Computing subjects through tinkering (Bianchi, 2016) caught the attention of the Royal Academy of Engineering during this period. In collaboration with the Centre for Real-World Learning (CRL) at the University of Winchester, Lynne began a fruitful partnership with the Academy which has led to a significant body of work through the participation of SEERIH's network of schools. Lynne and her colleagues' most recent achievement is the creation of an original progression framework for engineering thinking for pupils aged 5-14 across Key Stages 1, 2 and 3 (Bianchi and Wiskow, 2023; Bianchi et al., 2023).

The commitment of The Derby High School to the Arts was recognised through the award of Artsmark Platinum status in 2017:

> *"We were very impressed by The Derby High School's strong commitment to the transformative power of the Arts, which is making a difference to teaching, learning, pupil confidence and parental engagement..."*
> *Artsmark*

In 2019, The Derby High School won one of the inaugural Business of Science and Innovation Secondary schools Awards. Also in 2019, Lynn's passion for promoting Science and Arts was rewarded through a Let Teachers SHINE Award to her for "*Developing a love of science in secondary school through co-creation with science and arts colleagues*".

Ofsted continued to heap praise on The Derby High School's leadership team. In 2018, in a letter to the Headteacher, the Inspector noted that:

> *"You leave no stone unturned in your quest to improve the life chances of pupils at The Derby High School...Staff share your vision and welcome your open and consultative approach. They value the many opportunities that you give them for their professional development".*
> **Ofsted, 2018, p.1**

2020
to
2021

Phase 5:
Resilience and sustainability

What happened?

The COVID-19 pandemic created global disruption to every aspect of society. SEERIH reacted by making a firm commitment to reimagine opportunities and not to cancel or postpone work with schools. The Derby High was faced with a huge challenge, with pupils in areas of high socioeconomic disadvantage suffering from the realities of digital poverty and much more.

In this crisis, education professionals across the world reviewed their approach and this partnership was no different. The resilience and creativity that Lynne and Lynn had developed over time stood them in good stead and together they looked at what were the most pressing needs to continue to increase the learning potential for young people. Not only did they recognise they needed to support pupils to cope with the effects of the pandemic by maintaining their sense of wellbeing and belonging to their community, but they also recognised the need for academic progress and motivation to be maintained. Lynne and Lynn exploited providing collaborative professional learning opportunities, moving online to support teachers to adapt and review how pedagogy and assessment practices could continue to make the curriculum accessible to all (Booth, 2020).

One of these collaborations for The Derby High was an invitation from Forth Together CIC to become the lead UK secondary school in a pan-European Make it Open pilot project which focused on making Open Schooling easier for teachers and schools to adopt. The project targeted the Science curriculum, using Maker Education and Citizen Science to engage young people through hands-on and social activities embedded in their local communities. An example of a resource created by The Derby High is the Zero Waste School.

As the restrictions of the pandemic took hold in 2020, a flourishing of Arts-inspired activities demonstrated how The Derby High pupils and staff were supporting each other's wellbeing.

With the support of the Comino Foundation network and NWCCC, the Facebook group 'Friends of The Derby' was launched in 2020 for parents and carers to celebrate children's lockdown achievements. The hub has now grown into a supportive parent-to-parent digital space (NWCCC, 2020, p.11).

> *"Ongoing collaboration between The Derby High and NWCCC schools enabled pupils to explore and share their lockdown journeys through artistic interpretations"*
> **Robert F. Kennedy, Human Rights UK, 2021**

As well as shining a light on the importance of wellbeing, the COVID-19 pandemic also heightened interest in environmental sustainability and the need to protect human health in globalised societies (European Environment Agency, 2022). This area of work was key to SEERIH's work within The University of Manchester and its commitment to responding to the United Nation's Global Sustainability Goals. Creative inspiration took hold again with the creation of the 'Great Science Share for Schools Changemakers Challenge'. This was a way for The Derby High to maintain its association with asking, investigating and sharing scientific questions when in lockdown, giving pupils leadership opportunities linked to real-world challenges that mattered to them.

The link to the GSSfS Climate Action theme saw pupils being set a challenge to design and sustain a 365-day project to find approaches to reduce the carbon footprint of their school. Working towards net-zero was the focus Drawing on their partnership, Lynne and Lynn brought together a panel of experts for the pupils to speak with virtually on 15th June 2021. At this time pupils pitched their ideas to leading figures in STEM, government, industry and the wider Comino community. Supporters included Andy Burnham, Mayor of Greater Manchester; Professor Jose Chambers, Comino Foundation; James Frith, formerly Labour MP for Bury North; Dr Geoff Mackey, BASF; Councillor Tamoor Tariq, Bury Council; and Professor Alice Larkin, University of Manchester. Pupils gained feedback on their ideas and were supported to consider ways of funding their initiatives and bringing people on board. True to form, one year later as part of GSSfS 2022, the pupils presented their responses which included:

- **the establishment of a classroom or space that could be shown to be carbon-neutral. The pupils successfully bid to secure a decommissioned yellow school bus for this purpose. Through the efforts of pupils and staff, the 'Sustain Bus' as it was named, was turned into a carbon-neutral space and the pupil leadership headquarters. Charity fundraising, producing the pupil newspaper, running sustainability workshops and operating The Derby High Radio are all key features of this development that is still ongoing. It was launched officially in Summer 2022 in the STEAM Garden.**
- **a programme of primary outreach activity where Year 9 pupils from The Derby provided a series of lessons for primary pupils and activities to inform the community of issues around sustainability.**
- **a partnership with Ashoka which was established to explain the challenge and to involve them in supporting the pupils, linking in with a wider personal skills development programme with which pupils were involved.**

So what?

The pioneering work within the Great Science Share for Schools and the models of collaboration that continued to be showcased led to the number of pupils involved in GSSfS in 2021 rising to nearly 300,000. In 2021 GSSfS even reached Western Australia, with the campaign engaging pupils in sharing their Science inquiries at Curtin School of Education (Bianchi, 2021; Murcia and Cross, 2021).

The Derby Diploma was launched to establish a formalised way for every pupil in the school to be engaged at least once a week with clubs and enrichment activities. This was taking forward the learning from the partnership and the interlinked work with NWCCC that The Derby High was involved with. The Diploma is a way to credit pupils for the enrichment experiences they participate in at The Derby High.

2022
to
2024

Phase 6:
Regeneration and progression

What happened?

As the country emerged from the pandemic in 2022, The Derby High was at the forefront of wider education regeneration initiatives in the North West region. The GSSfS Changemaker project transformed into the 'Students as Changemakers' project and expanded into a new collaboration with Ashoka-UK and Ireland. Ashoka is an international organisation which, in partnership with the Greater Manchester Combined Authority (GMCA), was embarking on an ambitious vision to build Greater Manchester as the first changemaker region in the UK (Kewalramani, 2022). Following a teacher-pupil sharing event with Ashoka and Edge Foundation, The Derby High provided a case study for an Edge Foundation report that showcased three aspects of the school's activity. These included:

- **Year 9 'Changemaker' pupils co-creating units of work for Science which they taught to their peers and showcased teacher-pupil co-leadership of learning**
- **the Sustain Bus, highlighting opportunities for real-world learning provided to The Derby pupils**
- **the effective ways in which pupils harnessed social capital to secure sponsorship for adapting the bus (McInerney and Kewalramani, 2023).**

Other accolades came as the news of the Sustain Bus development and community interaction was shared more widely. In 2022, The Derby High was nominated to participate in the Rebuilding Schools initiative. James Daly, Conservative MP for Bury North, recommended the school for investment to the School Rebuilding Programme, stressing the value of the school to the community of Bury, saying:

> *"Lynn Provoost, who is part of the senior management team at Derby, took my breath away by articulating with members of staff what could be achieved in that school."* **Daly, 2022**

The Derby High has continued to support the global awareness of pupils, and the international expansion of the GSSfS, by securing funding for pupils to go to Thailand during their work experience week in 2024. The Year 10 International Changemakers will teach their GSSfS scientific investigations to children in Khao Lak. They will learn about how the community recovered from the 2004 tsunami and work with the Rohingya community to explore how they integrated with the Thai community. Working with an ecotourism organisations, they will participate in conservation work in the rainforest and explore how the sea turtle population in the East Indian Ocean can be protected. A visit to a local elephant orphanage will help pupils to learn how the protection of the Asian elephants might be enhanced. Throughout the experience pupils will record and live feed their findings back to pupils in Years 7 to 9 who will use their colleagues' research to form their own Changemaker initiatives concurrently during work experience week.

So what?

As if confirming Mr Daly's opinion of The Derby High, Ofsted reported in 2023 that:

> *"There is no ceiling to the expectations that leaders have for every pupil…Leaders are passionate about the programme of personal development that they provide. They are committed to widening the horizons of their pupils and developing their talents. Leaders ensure that pupils learn how to be tolerant citizens who respect and embrace diversity. Pupils benefit from high-quality careers provision. Engagement with employers and further education providers enables pupils to make decisions that support their future career aspirations. Almost all pupils progress successfully to education, employment or training."*
> **Ofsted, 2023, p.2**

Pupils were awarded the 2022 BBC Regenerators Award (BBC Bitesize, 2022) for their innovative response to the GSSfS Changemaker challenge and the legacy that the Sustain Bus would provide to improving awareness of environmental sustainability issues within the community (Heywood, 2022).

As part of that legacy, The Derby High's Head Student, Areeba Malik, was invited to join the Ashoka Global Youth Panel, another example of the impact of her early involvement in the Sustain Bus development. The following year, 2023, she was appointed Deputy Youth Mayor of Bury (Bury Council, 2023). In 2024, The Derby High School became finalists for The Pearson National Teaching Awards in the Making a Difference secondary School of the Year category and Goldsmiths' Community Engagement Award. Teaching Awards will be announced soon after publication of this document!

SEERIH also made the THE Award Shortlist 2022 – Outstanding Achievement in Widening Participation, which marked out their national success in inspiring engagement of teachers and young people from areas of high socioeconomic deprivation through the Great Science Share for Schools.

The number of pupils involved in GSSfS continued to rise, reaching 524,400 by 2023. One of the most recent developments for GSSfS has been the alignment of the campaign with UNESCO values. In March 2024 The University of Manchester proudly proclaimed that:

> *"The Great Science Share for Schools (GSSfS), a pioneering campaign dedicated to fostering scientific curiosity and education among young learners, has been granted the prestigious patronage of the United Kingdom National Commission for UNESCO (UKNC) in 2024. This recognition underscores the event's profound alignment with UNESCO's (United Nations Educational, Scientific and Cultural Organization) values, solidifying its status as a beacon of excellence in science education."*
> **The University of Manchester, 2024**

This moves the campaign, together with The Derby High partnership in it, to new heights. The next decade will see ongoing development of growth and quality in the UK along with an international reach. This will build on the links already made in 33 countries and become more formalised in approach.

Summary

Final thoughts on the power of partnership to leverage educational change

This final section reflects on the current position of Lynne and Lynn's interdisciplinary partnership and achievement of their aims. It introduces a potential theory of change which might be used to reflect further on the nature of the partnership and its future path. Finally, it offers some thoughts, or challenges, on how the issues raised here might impact the wider educational environment.

Achieving the aims

Although there is much published guidance on best practice for implementing change in schools (for example, Sharples et al., 2024), Lynne and Lynn acknowledge that they have never previously documented the overarching aims of their partnership in a comprehensive written account. Nor had they considered evaluating its wider impact until now, but this narrative has presented compelling evidence of its success, which can be observed by mapping the aims to some of the major outcomes of the partnership (Table 3. – pages 34-35).

Developing a theory of change

The chronological narrative has also facilitated another way of considering outcomes in terms of a theory of change for the partnership. A theory of change offers a valuable opportunity for reflection on the partnership journey and the processes that have nourished and sustained it (Laing and Todd, 2015). Going forwards, a theory of change will also be valuable for checking that the vision is still appropriate and for communicating it clearly to potential future partners. At a broader level it may be useful for planning future activities by highlighting the 'forces and parameters' (Noble, 2019) likely to be relevant to education in the future, both in the North West of England region where the partnership has flourished, and more widely.

A potential theory of change for the partnership going forward might be expressed as follows:

If we

- maintain a creative ethos supported by informed risk-taking
- provide interdisciplinary professional development for teachers that links Science and Arts teaching
- provide real-world Science and Arts learning experiences for pupils using active, interdisciplinary teaching approaches
- foster partnerships between schools and their external communities

Then we might

- increase opportunities to support schools, teachers and pupils change their practices and mindsets
- enhance the multiplier effect of these activities to extend their influence

Which will then

- enable teachers to provide a high-quality experience of education in Science and the Arts
- unlock potential for pupils to develop agency, creative thinking and problem-solving skills fit for the future
- encourage pupils, their parents/carers and their community to understand the value of education for Science and the Arts.

Finally, Lynne and Lynn attribute much of their success to their longstanding relationship with the Comino Foundation, which has provided consistent foundational support for their vision and ambitions through the Comino 'family' of Trustees and Grantees. True to the values of founder Dimitrius Comino, this 'family' group have offered both collegiality and acceptance of (calculated) risk-taking while trusting in the alignment between Lynne and Lynn's values and those of the Foundation. The approach to problem solving adopted by Dimitrius Comino has established a lasting legacy which is passed on to all those connected with Comino:

> *"...Dimitri had a great passion for solving problems, especially problems that occur in real life, which he always saw as opportunities. He was never attracted to conundrums or crosswords, or forms of problem more accurately described as puzzles – all of which have defined or closed end solutions. He always preferred problems which offered the prospect of many potential solutions although only one or two might prove optimal. Not only did he think through and solve problems that affected his own life, he was also concerned to analyse and describe the process of problem solving so others could use it."*
> **Darbyshire and Duckworth, 2011, p.16-17**

Wonderings, or challenges, for the next phase

Having reflected on twenty years of partnership and now looking to the future, Lynne and Lynn invite readers to consider the following issues:

- **How could a stronger policy shift towards technical education stimulate greater opportunity for interdisciplinary learning and creativity in STEM education?**
- **Have we capitalised enough on the rapid transformation of teaching, learning and assessment that we experienced through the COVID-19 pandemic, or are we at risk of losing the innovative and risk-taking ethos that embraced the teaching community at that time?**
- **How can we continue to develop pupils' Personal Capabilities so that they can take full advantage of technological advancements such as artificial intelligence?**

If you would like to engage in a purposeful discussion with Lynne and Lynn about these issues in their future journey, please get in touch with them.

Table 3.

Table 3a. Partnership aims and outcomes achieved Phases 1-3

	Phase 1		Phase 2	Phase 3	
	SEERIH's use of Action Research for professional development	SSAT Specialist Arts and Science School recognition	STEM Leaders Qualification BTEC	Science through Arts Workshops in Inspire building	Use of animation to explain Science concepts
For The Derby High School					
Raise pupils' aspirations by increasing their awareness of future study and career options		✓	✓		✓
Improve pupils' Personal Capabilities, specifically their creative and critical thinking, problem solving and leadership skills	✓		✓	✓	✓
Encourage teachers, pupils, their families and the community to value the Arts and Science equally	✓	✓		✓	✓
For SEERIH					
Increase teachers' access to professional learning and collegial peer support for quality Science teaching	✓		✓		
Foster interdisciplinary, real-world learning through the curriculum	✓		✓		✓
Cultivate strategies to support the smooth transition of pupils from primary to secondary Science education				✓	✓
For the partnership as a whole					
Increase the use of learning approaches that develop pupil agency	✓		✓	✓	✓
Demonstrate the power of using the Arts to explain Science to the public				✓	✓
Demonstrate that being open to creative thinking and input from other disciplines can enhance opportunities for learning Science	✓	✓			✓

Table 3b. Partnership aims and outcomes achieved Phases 4-6

	Phase 4			Phase 5	Phase 6	
	Launch of GSSfS and its global expansion	Artsmark Platinum award	STEAM Garden	GSSfS Changemakers Challenge	Changemakers Sustain Bus	UNESCO recognition for GSSfS
For The Derby High School						
Raise pupils' aspirations by increasing their awareness of future study and career options	✓	✓	✓	✓	✓	✓
Improve pupils' Personal Capabilities, specifically their creative and critical thinking, problem solving and leadership skills	✓	✓	✓	✓	✓	✓
Encourage teachers, pupils, their families and the community to value the Arts and Science equally	✓	✓	✓	✓	✓	✓
For SEERIH						
Increase teachers' access to professional learning and collegial peer support for quality Science teaching	✓		✓			✓
Foster interdisciplinary, real-world learning through the curriculum	✓	✓	✓	✓	✓	✓
Cultivate strategies to support the smooth transition of pupils from primary to secondary Science education	✓		✓		✓	✓
For the partnership as a whole						
Increase the use of learning approaches that develop pupil agency	✓	✓	✓	✓	✓	✓
Demonstrate the power of using the Arts to explain Science to the public	✓	✓	✓	✓	✓	✓
Demonstrate that being open to creative thinking and input from other disciplines can enhance opportunities for learning Science	✓	✓	✓	✓	✓	✓

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It was something that you could say My hard work has gone into having that there. I felt like I was going to cry, it was really exciting because we're helping to shape so many people's futures, not just our own.
Year 10 Pupil,
The Derby High School

Our workshops in the Sustain Bus will help us to teach young kids about how they can make a difference in their community and to inspire them, because in the end they will be our future.
Year 10 Pupil,
The Derby High School

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