

Written evidence submitted by NRICH, University of Cambridge

Background

[NRICH](#) is a world-leading collaboration between the Faculties of Mathematics and Education at the University of Cambridge. The multiple award-winning project focuses on problem-solving and on creating opportunities for school-aged students to learn mathematics through exploration and discussion:

- NRICH resources are accessed by over 200 countries and jurisdictions worldwide
- Over 90% of UK teachers delivering mathematics in our primary and secondary schools are familiar with NRICH (Source: Teacher Tapp)

During the pandemic, when NRICH pivoted its support towards families by launching [Maths at Home](#) in anticipation of the first national lockdown, the response was staggering: the initiative attracted up to 1.3 million page views a week (Source: Google Analytics). NRICH later featured in the Department for Education's list of education suppliers for schools seeking online support during lockdown and NRICH activities subsequently featured in the catch up materials provided by the National Centre for the Teaching of Mathematics. NRICH continues to provide thousands of free online mathematics resources for ages 3 to 18, covering all stages of early years, primary and secondary school education - completely free and available to all.

NRICH aims to:

- Enrich and enhance the experience of the mathematics curriculum for all learners
- Develop mathematical thinking and problem-solving skills
- Offer challenging, inspiring and engaging activities
- Show rich mathematics in meaningful contexts
- Work in partnership with teachers, schools and other educational settings to share expertise

NRICH's approach towards supporting teaching and learning both at home and in school is research-based. Our published research has revealed the significant impact of online tasks for increasing parental engagement in mathematics and the potential for engaging reluctant learners using online cross-curricular resources. NRICH is ideally placed to share its 25 years of expertise developing world class teaching resources to inform discussions regarding the positive impact of screentime and the challenges that it can pose schools and families.

What is the current understanding of how screen time can support and impact children's development and educational outcomes, including the effect on concentration and behaviour?

NRICH has published research which indicates that online learning can lead to both increased student and parental engagement in mathematics. Two examples are presented in this submission.

Increasing parental engagement with mathematics

NRICH secured funding from Tata and Nesta to investigate ways to increase parental engagement with mathematics. Working with schools in areas of high deprivation, NRICH developed a series of online homework activities, including short video clips for parents which modelled playing games to help build their confidence working with their child. The resources were trialled by Category 5 and 6 schools. Data was collected using both teacher and student interviews and questionnaires as well as drawings by the students themselves doing their homework. The findings revealed a significant increase in parental engagement compared to the start of the project. They also showed extended engagement by the students, often several weeks after the tasks had been set; student interviews revealed that they had enjoyed the tasks so much that they had chosen to share them with friends and family (Figure 1). The project also highlighted the challenges that too many students were facing accessing online resources due to limited opportunities to attend homework clubs and learn with others, lack of access to a laptop when there were siblings on the household, staying alone in their bedrooms so sharing experiences was limited, and low broadband capacity in the family home. The project resources are now freely available to all schools under the banner [Solving Together](#). The research findings were presented to a conference of the British Society for Research in Mathematics Education (BSRLM) and later published in its [Proceedings](#).

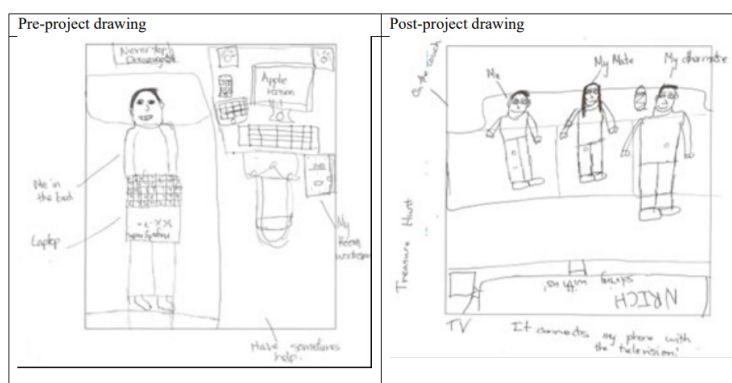


Figure 1: Student drawing (pre-project doing mathematics homework alone, post-project gathered together with friends exploring a project resource)

Increasing student engagement with mathematics

The Natural Curriculum is an online teaching and learning resource using BBC natural history videos to inspire and enthuse young learners. The project, which adopts a cross-curricular approach, began as a collaboration between primary school teacher David Millington and the Educational Recording Agency (ERA). Initially its resources focused on using natural world video clips as a stimulus for teaching primary literacy. The project later expanded to include primary mathematics. In the academic year 2021/22 NRICH and The Natural Curriculum collaborated to design and pilot online problem-solving mathematics lessons for primary-aged learners. The lessons were trialled in primary settings where feedback was collected using pupil questionnaires and teacher interviews. The findings indicated positive impacts on both pupil engagement and learning, but also highlighted possible challenges facing practitioners regarding the perception of the primary mathematics curriculum among some learners.

A key design decision was ensuring that the selected video clips were essential viewing for completing the problem-solving activity, rather than solely acting as a stimulus for further work. For example, in [Starling Murmuration](#) students needed to observe a video clip of starlings to enable

them to check that the presenter's estimate for the total number of starlings in the murmuration for themselves (Figure 2). Each lesson followed The Natural Curriculum planning template which consisted of a selected natural history video clip and associated warm-up Number Challenge, followed by The Problem and Further Challenges (see Figures 2 featuring a screenshot from the Starling Murmuration lesson).

Home | Lower KS2 Maths Lessons | Year 4 Maths | Starling Murmuration

Investigations & Problem-solving (2): Starling Murmuration

Learning Objective
We are learning how to solve a natural world problem by using and applying our skills and knowledge of number (including estimation and working with large numbers).

Clip Description
With its short tail, pointed head and triangular wings, a starling looks a bit like a four-pointed star when it is in flight. (This is how the species got its name!) At a distance, this common bird appears black in colour. On closer inspection, its glossy feathers shimmer with shades of green and purple.
In this fascinating clip, we are treated to a starling murmuration, high above the Royal Pier in Aberystwyth. This involves thousands of starlings moving together, twisting, turning, swooping and swirling across the sky in beautiful, shape-shifting clouds. Why do you think the starlings flock together in such huge numbers? **Watch the clip to find out.**

Whiteboard Number Challenge
When starlings fly together, scientists have discovered that they tend to follow the movements of the seven birds nearest to them, leading to the fantastic acrobatic displays in the clip.
Can you work out the next number in the sequence below?
1, 7, 49, 343, ...
If you continued the sequence, could the number 16,802 appear in it? How do you know?

1 - Learning Objective | 2 - The Problem | 3 - Further Challenges

Figure 2: Screenshot showing opening page of Starling Murmuration resource

Almost two-thirds (64.0%) of the students participating in the pilot reported that they had enjoyed learning about nature, especially learning new facts about the natural world. More than three-quarters of them (75.6%) had 'learned something new about nature'. Just over half (54.8%) reported that they had 'learned some new maths in these lessons'. The findings were published in The Mathematical Association's journal *Primary Mathematics*, and they were also presented at a conference of the BSRLM and published in its [Proceedings](#)

The findings indicated that bringing the natural world into the classroom was a popular teaching and learning approach among many students. The students reported enjoying watching the videos, estimating numbers and making snowflakes. Learning new facts about the natural world was valued by many learners.

Summary

NRICH research has demonstrated how online learning can increase engagement with mathematics among students and their families. Possible barriers to implementation include access to the internet, being able to collaborate with others through homework clubs encouraging group working and expecting homework to be completed away from others in the bedrooms in the family home.

NRICH would be delighted to explore our research, its findings and implications further with the Select Committee.

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