

MARCH 2020

NEWSLETTER

GREAT NORTH MATHS HUB

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Eleanor Baggaley**

As an education community, we have entered uncertain times. In the Great North Maths Hub, we recognise that the teaching community across our region is working hard to ensure schools remain open for the most vulnerable as well as keeping themselves and their families safe. Whilst in the background, we are planning for future activity, we wanted to keep in touch with you all in the present.

Our newsletters will continue to contain articles written by our Local Leaders of Maths Education community in the hope it will spark your interest and offer ideas for you to reflect on and try out. Maybe not to use immediately, but to keep, store and use when normality returns.

We will continue to do the same on Twitter, offering ideas for those of you setting home learning as well as resources for practitioners.

Finally, to those of you keeping schools open - thank you. To those of you keeping your loved ones safe - thank you. To everyone keeping themselves safe - thank you.

Stay safe and healthy
The Great North Maths Hub Team

Primary Maths in Science

Laura Tullock

Our Primary Maths in Science Work Group met for the first time in January. An exciting venture between Science Learning Partnership and the Great North Maths Hub. Inspired by the success of our Secondary Maths in Science Work Group, this seemed like the perfect time, given the focus of the new inspection framework, to look at this from a primary perspective.

This new inspection framework makes explicit reference to the need for children to apply their mathematical knowledge across the curriculum. With this in mind, the main focus of the Work Group was to explore how we can meaningfully teach Maths in the context of a Science lesson without being detrimental to either of the subjects. Therefore allowing children the chance to apply their mathematical skills in a different context. We decided to start looking at statistics. Why? So often, we hear colleagues share the fact that statistics is no longer taught in their Maths curriculum, but is part of their Science curriculum. We wanted to explore what this looked like, what practise we can learn from and how we can develop our practice.

A closer look at the National Curriculum programmes of study for Maths and Science shows the close links between the skills of both subjects. For example, which programme of study would you suggest the following statement came from? Maths? Science?

They must be assisted in making their thinking clear, both to themselves and others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

This statement does indeed come from both programmes of study. This made us start to reflect on the need to ensure, no matter where we teach the statistics strand, that time is taken to ensure misconceptions are planned for and addressed. Teaching statistics in Science lessons will involve more than just asking children to draw a graph to present results.

Your task...

A new roller coaster is being built in Blyth.



MathsHUBS
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As structural engineers, we need to test the height (angle?) of the ramp needed to ensure that the roller coaster car travels the furthest distance at the end of the ride.

Using the equipment in front of you, how can we test this?

So what could graphs look like in a Science context? We need them for a purpose; to show our results and help to draw conclusions.

But if we are teaching statistics in Science, we also need to develop children's mathematical skills and knowledge.



Our participants were set the following task, each with phase specific to help them to measure the distance the roller coaster car travelled.

Early Years were measuring the distance travelled using non standard units (handspans, post it notes) whilst Upper Key Stage 2 were using tape measures, measuring in cm and mm and recording as decimals.

It became clear in just that small activity that the opportunities for children to apply their mathematical knowledge in Science lessons are plentiful. In this case, measuring, counting, recording in decimals. But it also started to raise some questions for us as practitioners around the sequencing of both our Maths and Science curriculums. For instance, if we are expecting children to record decimal measurements, does the timing of the Science lesson take into account when children are taught this in their Maths lessons. Equally if children are measuring in non standard units, have they been taught the skills of this in Maths? E.g. where to start measuring from or selecting appropriate non standard units.

Keeping these thoughts in mind, we moved to creating graphs of our results. As part of scientific enquiry, children need to understand and interpret graphs in order to draw conclusions. But children often encounter difficulties when constructing graphs. The Science Investigations in Schools Project (AKSIS) run by the UK Associations for Science Education and King's College, lists some of the difficulties which include: Physical drawing a graph; Using the language of graphs e.g. horizontal, vertical, axis; Choosing the right scale for the axis; Appreciating the difference between a line graph and a bar chart; Transferring data from a table to a graph.

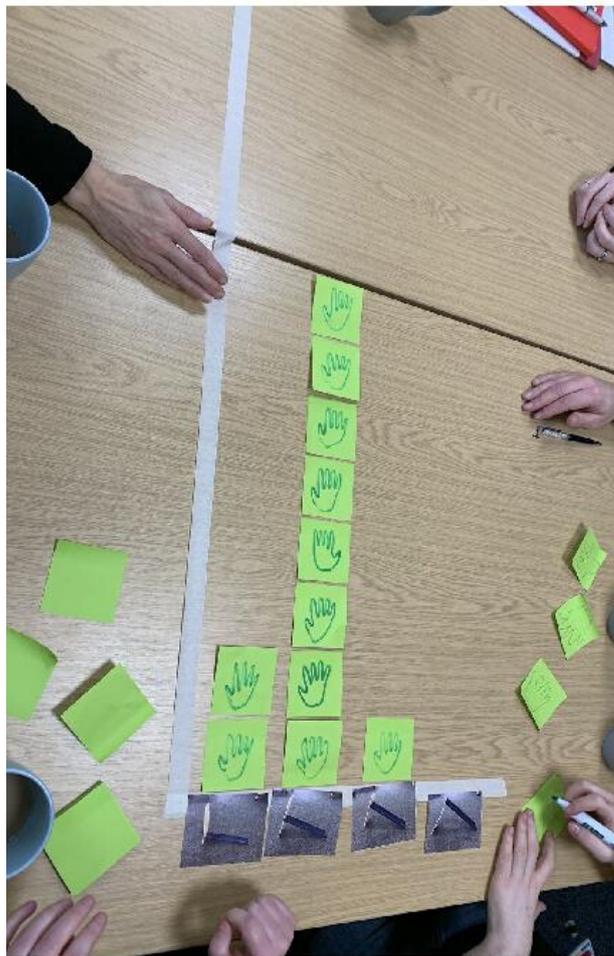
These difficulties are discussed in *Teaching Primary Science Constructively* (edited by Keith Stamp and Christine Preston) and strategies shared to develop children's understanding in how to create and use graphs. In our session we focussed on one suggested strategy: table graphs using masking tape.

Using masking tape means the graph can be created on many surfaces, but more importantly before any construction on graph paper (where relevant), children are given the opportunity to create a graph on a larger scale.

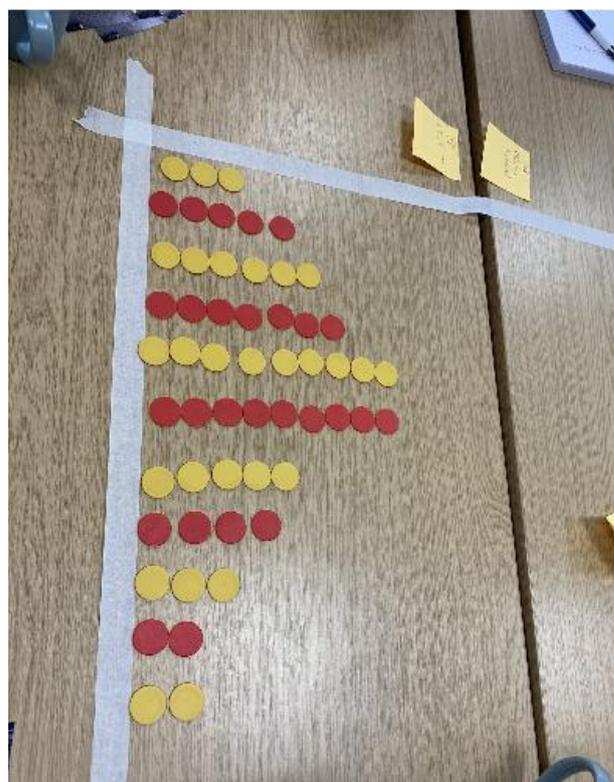
We took the results from each phase in turn and explored what these could look like as table graphs.



Our Early Years graphs looked like this:



In constructing KS1 graphs, it became clear that until children are confident in counting in 2s, 5s and 10s, constructing scales may be trickier and so practical equipment was used instead of a scale on the y axis:



Finally in Lower KS2, more precise measuring skills were used to create bar charts, and in Upper KS2, scatter graphs were created. After the creation of each graph, we reflected on the specific Science and Maths skills the activity was developing. The key point that resonated with us all is that children must be explicitly taught to create graphs, not just told to draw one. Suddenly we realised there's a lot more to this Maths in Science than just moving statistics into the Science curriculum!

We started to consider Science lesson design and asked ourselves lots of questions: Do we need to build some time in to revisit any key skills? Where do we teach the graphing skills within a lesson? Does this mean the lesson extends?

These questions will naturally lead us to question our curriculum designs - how do we sequence our Maths and Science curriculums to allow for each other to compliment each other. Prioritising what we teach and when will be important. Being explicit about what Maths skills should be revisited or taught in Science lessons will be key and striking the balance so that neither subject is lost or overshadowed by the other will be important. We are nowhere near finished and had we not been interrupted by our current situation, we might have been a bit closer to finding some answers. For now, we'll leave you with a Tweet from one of our participants who tried out table graphs with his class, using Numicon to represent the bars:



Maths in Science- some thoughts from a secondary perspective

Karen Knox

When the most recent changes to GCSEs were implemented, it quickly became clear that maths had been incorporated into the new Science specifications to a far greater extent than before. For many teachers of science this was not an issue, but for some it was problematic. Exam boards started to publish valuable support and guidance, but a science colleague and I thought we could do more to make a difference, thus maths in science was created. We were not the first to work on this theme and we certainly will not be the last - the demand is still out there- and we borrowed shamelessly from previous work and other esteemed colleagues' creative efforts. We decided to focus on curriculum and pedagogy with the theme being science to use in maths, and maths to use in science - what was the same, what was different, and could we reach a consensus?

How amazing were our first cohort of teachers? From initial scepticism, presuming that they were not the one in their school to make a change, the participants embraced the ideas and ran with them!

We started to synchronise curriculum delivery, or at the very least make it more informed and coherent; we discussed different representations - and that was novel for maths and science colleagues alike; attempted to wean colleagues away from dependence on formula triangles, particularly as an initial device for introduction of formulae and provided maths teachers with a greater wealth of contexts for many topics. Joint departmental meetings were held back in school, and many themes explored. Productive discussions and collaborative planning became a feature of the process, as school colleagues valued the opportunity to sort out curriculum, delivery and technical language away from the day-to-day pressures of school, with the intention of sharing with departments once back in their settings. Our second cohort are in the process of review and implementing the first steps towards joint developments. Already, the discussions are thought provoking, and could promote considerable change. All in all, a resounding success, with a lasting impact in many schools.

Well done, those folk!

Eleanor has been with Great North Maths Hub since 2017, prior to that she had been involved in a number of Maths Hub Work Groups through her role as a Core Maths Lead as well as completing her PD Lead Accreditation. Eleanor has a background in secondary mathematics teaching across North Tyneside and Northumberland. She strongly believes that every child should have the opportunity for success, regardless of their starting point and in whatever form that success looks like to them. Within Hub, Eleanor supports our Secondary and Level 3 projects; this year she will be leading Girls' Participation, Supporting Core Maths, Developing Action Research and PD Lead Accreditation.

