

SPRING: 2022

NEWSLETTER

GREAT NORTH MATHS HUB

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The last half term seems to have flown by! It seems like only yesterday we were getting ready to break up for Christmas and now here we are, publishing our Spring Term newsletter.

This edition of our newsletter really focuses on one of our core values: Collaborate. The Oxford English Dictionary defines collaborate as ‘work jointly on an activity or project.’ Indeed this is what we see in all of our Work Groups; professionals working together either on mathematics subject knowledge, mathematics teaching, or systems, culture and mindsets in school.

In the case of this work, I don’t think that the word ‘project’ referred to in the dictionary definition is strong enough. Improving mathematics pedagogy is a project, it’s long term, it takes time, but the term ‘project’ also implies there is an end point. What I see from participants in our Work Group is a real drive to continually collaborate and therefore to continually improve.

This edition highlights the strong links that we like to make here in the Great North Maths Hub between ourselves and other curriculum hubs, Teaching School Hubs and Research Schools. This region is so lucky to have a wealth of expertise to support teacher development at all stages and in so many curriculum areas. We want to make as many people aware as possible of the incredible opportunities these hubs can offer you and your school. This is your region and these are your hubs, make the most of them! In the words of Henry Ford, ‘if everyone is moving forward together, then success takes care of itself.’

Amy Banks, the lead for Northumberland Tyne & Wear Science Learning Partnership (NTWSLP) joins us in this newsletter to share her thoughts on the links between maths and science. We have worked for several years with NTWSLP as part of our Research and Innovation Work Groups, this year included.



Laura Tullock
Maths Hub Lead



It's great to hear Amy's thoughts and alongside those, we have delved into the archives to share two articles which were written in 2020 to share the work of our primary and secondary Maths in Science Work Groups, run in partnership with NTWSLP. We hope that these spark some ideas and thoughts with you!

It is a real pleasure to introduce to our newsletter our maths stars, nominated from across the region. This time we have are celebrating leadership, teaching and pupils! Thank you to those who took the time to nominate their maths stars this half term. Remember to keep nominating by emailing lindsey.hassan@churchillcc.org

Laura Tullock, Maths Hub Lead
#EncourageSupportCollaborate
#yourregionyourhubs

Meet Amy Banks

Amy started working with the Science Learning Partnership in September 2021, taking over as the Science Lead Practitioner for Northumberland, Tyne and Wear SLP. She comes from a primary school background and still teaches Year 4 at a school in North Tyneside two days a week.



To become a teacher, Amy completed a SCITT PGCE through Nottingham University, specialising in Science & Mathematics at primary level. Before this, she studied Cell & Molecular Biology at Newcastle University. She is passionate about engaging pupils in STEM subjects and inspiring teachers to make meaningful links between those subjects in the curriculum.

Linking Maths with Science: Why is making links between these subjects important in both primary & secondary settings?

Amy Banks

Mathematics is important because it has applications in a range of contexts, including other areas of the curriculum. Much of the mathematics as we know it today has developed in response to practical challenges in science and technology. In science, we investigate geometric principles such as symmetry, reflection and shape. We use algebra in chemical formulas, ratios and genetic matrices. We even use Maths to analyse nature, discover its secrets and explain its existence. So, as well as being a subject in its own right, mathematics is a subject that can be applied.

The National Curriculum for Maths clearly makes reference to mathematical skills 'supporting learning across the curriculum'. A primary school teacher, who will teach nearly all subjects and areas of the curriculum, is uniquely placed to take advantages of opportunities to apply mathematical skills in meaningful contexts; through science, technology, geography, the arts etc. It is vital that teachers make explicit to the children what mathematics is being applied and where, so they too can recognise the importance of the subject and how it helps us in real-life contexts.

The aims of the primary science National Curriculum clearly spell out the central role of scientific enquiry in developing pupils' ideas, skills, knowledge and understanding in a way that sustains their natural curiosity (Maintaining Curiosity OFSTED Science subject report, Nov 13). An integral part of this scientific enquiry is collecting, analysing and presenting data, which is a perfect opportunity for the use and development of mathematical skills.

Mathematics introduces children to concepts, skills and thinking strategies that are essential in everyday life and support learning across the curriculum. It helps children make sense of the numbers, patterns and shapes they see in the world around them, offers ways of handling data in an increasingly digital world and makes a crucial contribution to their development as successful learners.

It is important to consider the timing of these links in terms of what is being taught in each subject at specific times of the year. For example, 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? For these cross-curricular links to work, it requires teachers to look carefully at their long-term plans and make deliberate choices of where to teach specific parts of the curriculum.

In secondary schools, concerns have often been raised by teachers about the level of understanding of the mathematical aspects of science amongst students. Confusion may be caused, for instance, when mathematics and science teachers use different terminology or approaches when explaining ideas. With a greater emphasis on mathematical skills in science GCSE examinations, it is important that teachers have a solid understanding of how to embed good quality assessment of pupils' mathematical skills in science. The Association for Science Education (ASE) have developed some guidance, focused on developing greater clarity and coherence when working with mathematical ideas, language and procedures in science and mathematics lessons, to help children transfer their mathematical skills and understanding effectively to their science learning (The Language of Mathematics in Science R. Boohan 2016).

When looking at our world today, it is constantly changing and evolving. We have seen some highly beneficial changes and advances but there are also some negatives. People have been making huge demands on the planet's resources and the environment. This has led to us now having to try incredibly hard to find solutions for almost everything we do. Studying maths and science will help in preparing us for a job that will put us in the driving seat; it will give us skills and knowledge to improve the world around us and also the future of the planet. The North East of England in particular are becoming a driving force for Green Energy and the Green Revolution. We need to equip our children with the skills base they need for these career opportunities that are opening up to them.

However, to enthuse children enough to pursue Maths & Science into further education or careers, we need to start early. By engaging pupils from as early as pre-school, it motivates them to learn more. It is through learning Science & Mathematics that we can learn how to protect the environment, reduce global warming, combat the effects of climate change. It is exciting to see what can happen when young minds switch onto the possibilities of scientific discovery. The more maths & science are considered essential by children, the more we can look forward to the prospect of an abundance of great STEM teachers in the future too.

Maths in Science in a Primary setting

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.

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.

Your task...

A new roller coaster is being built in Blyth.



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?



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.

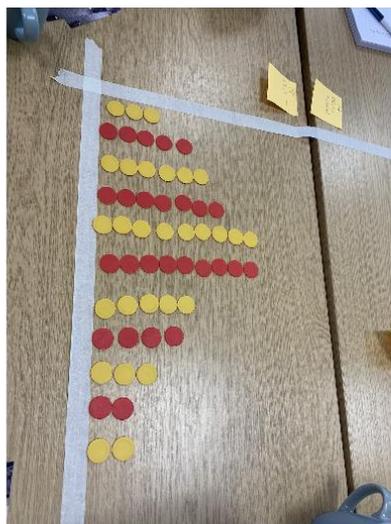
These difficulties are discussed in *Teaching Primary Science Constructively* (edited by Keith Stamp and Christine Preston) and strategies shared to develop children's understanding in how to create and use graphs. In our session we focussed on one suggested strategy: table graphs using masking tape.

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:

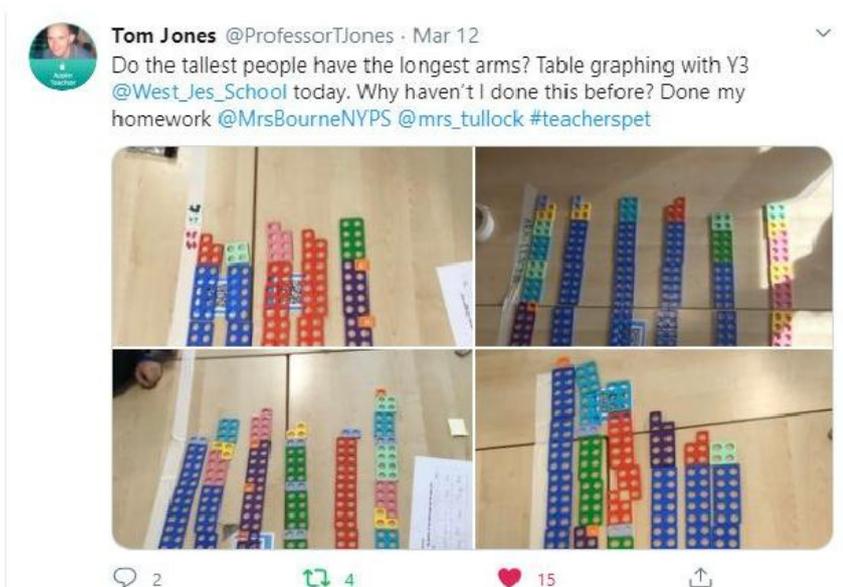


Finally in Lower KS2, more precise measuring skills were used to create bar charts, and in Upper KS2, scatter graphs were created.

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

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!



MATHS STARS

A shout out to this half term's leaders, practitioners and learners who have been nominated by colleagues for their hard work, enthusiasm and dedication to maths learning and teaching.

CELEBRATING LEADERSHIP

Paula Bailey, Head Teacher of Parkhead Community Primary School

Paula is being recognised by her mathematics leader, John Bee, for her unwavering support for many years with Parkhead's teaching for mastery journey and her supportive role of John as a primary mastery specialist.

Well done, Paula, and thank you for continuing to support John in this important role.

CELEBRATING TEACHING

Emma Wake & Emma Cull, Christchurch Primary School

Emma Wake and Emma Cull are being celebrated as maths stars by their Head Teacher, Louise Bradford. Louise said:

"Emma Wake is the maths coordinator at Christ Church Primary and has been working alongside Emma Cull to set up maths mastery teaching across school. Despite all of the challenges related to COVID, they have worked so hard during the last few years and have risen to any challenges faced with a smile and a 'can do' attitude. Their teaching within their own class is fantastic and the whole school has benefited from the training they have provided and the individual support they have given to individual teachers." Well done, Emma and Emma, for the fantastic work you continue to do leading Christchurch on its teaching for mastery journey.

CELEBRATING PUPILS

The young mathematicians of Broadwood Primary School

Well done to all of the maths stars at Broadwood who have been nominated for their enthusiasm, excitement and positive attitudes towards maths learning. Particular recognition is being given to: Nursery where the children are applying their mathematical subitizing skills to their favourite literacy stories and songs to explain what they see and how they know.

And to:

Year 3 who are 'buzzing' in their exploratory maths lessons; using manipulatives to investigate, and using wonderful maths talk to articulate their mathematical thinking.

Well done to all the learners at Broadwood!

GET INVOLVED

If you have a colleague or students who deserve recognition for maths learning, teaching or leadership, do get in touch. Your school could be celebrated in next half term's newsletter.

Please send 'shout outs' to: Lindsey.hassan@churchillcc.org