Equals

Realising potential in mathematics for all

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Recall of tables

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Supporting mathematics in education

Equals

Realising potential in mathematics for all

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Designed by Nicole Lane

Editors' Page

As I write I am both reflecting upon another significant year and looking forward to the Autumn term and the first ever *Equals* Conference (more on that soon). This year has been wonderful because my work with the Maths Hubs has afforded me access to colleagues supporting SEND children in many schools including Special School and alternative providers. The insight that has given me has been humbling, as since Christmas I have had the great privilege of seeing the amazing work done by colleagues across the country. In this edition two of these feature; Wendy Skelton from Fountain School and Nicola Haycox from Oak Wood Primary School. My definition of an educational professional is someone who responds to the needs of their children and makes the right decisions to enable them to move forward (I do not use the word progress here). It is the opinion of *Equals* that some of the best educational practice is taking place in the special school and alternative provision sector. Day in and day out these colleagues are making informed decisions based upon their deep knowledge of their children and the developmental steps they need to fulfil their mathematical potential.

I would also like to highlight one of the pieces in this edition written by Pete Jarrett, a key member of the *Equals* team. In his piece 'Little by little, one travels far' he gives a behind the scene insight into how an understanding of a specific area of maths difficulty, dyscalculia, grows in public understanding. This is a really interesting read and one that should give hope to all who are seeking to provide the best support for their pupils.

The 2022 *Equals* Conference will showcase the very best practice from leading special schools and also provide delegates with access to respected professionals who can provide advice regarding specific areas of mathematical difficulty. The keynotes will be provided by Professors Margaret Brown and Steve Chinn and in addition to this there will be workshops on anxiety, dyscalculia, metacognition as well as updates upon the growing developments emerging from the Maths Hubs SEND work groups. The conference programme will be available very soon and if you want to find out more then please register your interest here: www.m-a.org.uk/equals-conference

Special Maths

***Equals* editor Alan Edmiston reflects upon his recent time working with Special Schools.**

The word special here refers to something that is precious, to be treasured and displayed for all to see and admire. This past week has confirmed my belief that this is what we should do with the work that is being done in special schools up and down the country. In tribute to the work in special schools each issue of *Equals* will feature a piece inspired by the work being done in this setting. In the last edition we featured a piece on maths and stories by Anne Haberfield of Castles School in Cambridge. In this edition there are two short pieces:

1. My reflections upon observing a maths lesson in a school for autistic children,
2. An insight into the maths provision in Oak Wood Primary School as shared by Nicola Haycox their Early Years and KS 1 lead.

I had the real pleasure of observing a maths lesson in a special school this week and it has had a profound impact upon me. What was new was my induction, by the children in year 7, into the world of 'BfDI'. For those of you, like me, new to Battle for Dream Island please take a look on YouTube!

The children in this class are obsessed by the inanimate objects that star in these short videos so much so that the characters, and their voices, are a real presence in the classroom. I need to say this as the maths lesson that took place became an extension of BFDI world in the minds of the children involved.

The children were doing some work on co-ordinates that began with an exploration of programming Bebot to follow simple commands such as 4 forward and 3 left. The lesson itself took place outside on large sheets of paper and felt pens. Once the students realised that the steps taken by this little robot were the same they could then proceed to divide up the paper into a grid and then use this knowledge to move it from place to place. I am not sure how it happened but once the grid became drawn and the idea of giving instructions clear then this 'new' knowledge became a tool that was easily assimilated into their BfDI world. Suddenly their squares became full of (very well drawn) BfDI characters that had to be found by the robots. The maths ideas were seen as something helpful and supportive of their thinking and personal games. It was so lovely to see a group of learners incorporate maths to support their play. All too often in mainstream education we struggle to help children to see the relevance and application of the concepts we introduce them to. In this group there were no cries of 'Where will I ever use this?' but rather a seamless transition of the maths knowledge into their play. The maths had become a tool to support and enrich their inner lives.

The maths ideas were seen as something helpful and supportive of their thinking and personal games.

I also had the pleasure this week of talking to Nicola Haycox, of Oak Wood Primary School, a participant in one of my SEND work groups run by the Origin Maths Hub. What impressed me about Nicola was how she exemplified the need for teachers to make the correct professional decisions for the pupils in their charge. With Nicola there is no blind obedience to published schemes or the slavish following of the White Rose materials. They use these materials as a very valuable resource where they are best placed to support their children, but it is the class teachers who make the decisions. The staff at Oak Wood Primary School are seeking to make the development of their children as positive, engaging and enjoyable as it can be. Their maths curriculum for example is well thought out and very detailed. The paths pupils follow are all guided by the response of their pupils, for example they may spend a term exploring and investigating a single number. Their curriculum is personalised and begins where the pupils are at in developmental terms. The teaching for mastery materials produced by the English and Maths Hubs, including the five big ideas, have been adapted and personalised where they best fit to support pupil understanding.

It is from talking to colleagues like Nicola that I have come to realise how important many of the teaching for mastery ideas are in enriching and improving the teaching of mathematics. Teaching for Mastery is something we will come back to in future editions of *Equals* for it is through the engagement of colleagues from special schools, like Nicola, that some really interesting developments are beginning to take place.

Recall of tables

Our friend **Mark Pepper** continues his piece on the recall of tables and the implications of this for students as they get older.

Students unable to rapidly recall multiplication tables are at a considerable disadvantage in exams and in everyday life - Part 2

It is clearly apparent from Part 1 that whilst Jim was competent in maths generally he had considerable difficulties with number fact recall and this was likely to adversely affect him in the non-calculator paper of the maths GCSE. Of course we predominantly covered general aspects of the maths curriculum but for our purposes here his mental maths ability will be the main focus. In order to try to improve Jim's number fact recall I introduced a mental maths starter to take place in the opening ten minutes of each lesson.

Content of the mental maths starter

The mental maths starter consisted of a two-pronged strategy which made use of two very different approaches. Whilst generally the use of rote learning should be minimal there are occasions when pragmatism dictates that use should be made of it. I felt that the memorisation of number facts was necessary if Jim was to learn his tables relatively quickly. Hence the start of each mental maths starter consisted of fairly rapid questions within the 2 to 10 times tables. This was supplemented by requests to Jim to learn a specific table by the following week.

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As I was conscious that this policy was unlikely to result in total recall of tables, it was underpinned by another strategy that was aimed at enabling Jim to obtain the answers as quickly as possible by applying certain strategies. These included memorising the single number fact of 7 x 7 = 49, knowing the squares of numbers from 2 to 10 and considering "quick ways" for specific tables and the consideration of efficient ways to find the factors of numbers (see Part 1).

The reason that the knowledge that 7 x 7 = 49 is helpful is that it is near the middle of the tables and so it is helpful as a starting point for working out the products of some other numbers such as 8 x 7. This can be obtained by adding 7 to 49 to reach 56.

Knowledge of the squares of other numbers up to 10 is helpful in finding the product of other numbers around the middle of the table.

"Quick ways" could involve the 9 times table in which the number multiplied by 10 can be obtained by placing a zero after the final digit and then subtracting the original number.

Jim's variable performance within the mental maths starter

There was considerable variation in Jim's level of performance within the mental maths starter. In the first two sessions he remembered some tables and also used strategies that we had previously discussed to obtain answers to questions within tables that he had not memorised. Yet in the third session he struggled with many questions which even included those within the 2 and 3 times tables. In his response to 4 x 8 he became flustered and reverted back to his counting on strategy, starting at 8 + 8. This was an extremely unexpected development and I considered the factors that may have influenced his performance. My perception was that in the third session he lacked confidence and showed some signs of anxiety.

At the start of the fourth session Jim looked very happy and he told me that he had recently taken a maths test at school and that his result was such an improvement on the previous time that he had taken a test that his grade within his school's assessment procedure had advanced from 1.8 to 3.6. This had a very positive effect on his level of confidence and he answered questions quickly and accurately. His whole bearing was one of high confidence and for number facts that he had not memorised he used the strategies that he had recently learnt to obtain the correct answers with commendable speed.

In the fifth session there was some regression as Jim's responses to questions involving number fact recall were inconsistent and appeared to be directly linked to his levels of anxiety. This was apparent in the variance of his ability to rapidly recall number facts in the mental maths starter. He would respond quite quickly with correct answers to some questions whilst with others there would be long hesitation before he would tentatively give an answer which was not always accurate. Yet during the main section of the lesson when the need to know a multiplication table question was incidental to the main question, Jim would usually give the correct answer quite rapidly. It seems probable that this discrepancy can be accounted for by the fact that at a later stage of the lesson Jim was more relaxed and furthermore he did not feel the level of anxiety that had been generated earlier in the lesson when he had been required to answer a series of oral questions associated with multiplication tables.

From this point onwards throughout our sessions Jim consistently gave correct answers to all of the questions that involved multiplication tables.

A profound change in Jim's use of number fact recall in the sixth session

The breakthrough arose in the sixth session. Jim was answering a question in which he needed to know the product of 7 and 6. He instantly said "42". I asked him how he had arrived at that answer and he explained as follows "I knew that 7 x7 was 49 and so I subtracted 7 from 49". Later we discussed square numbers and he demonstrated that he knew all of them from 2 to 10. I tested him with a series of quick fire questions and he answered all of them rapidly and with commendable accuracy. From this point onwards throughout our sessions Jim consistently gave correct answers to all of the questions that involved multiplication tables. He never resorted to the counting on method.

Links between number fact recall and levels of anxiety and self confidence

It has been widely reported that levels of maths anxiety are high amongst students in both the primary and the secondary sectors of the UK. Pisa (2018) ranked the UK 69th out of 72 regarding life satisfaction. Feelings of anxiety are liable to have an adverse effect on the performance of the students. A vicious circle can then develop in which the student underperforms partly as a consequence of feelings of anxiety and as a result the student's self- confidence can then be diminished still further with the result that the feelings of anxiety are exacerbated. It is particularly unfortunate that levels of anxiety are likely to be at their height when taking an exam. A consequence of this is likely to be that in responding to questions involving multiplication tables some students may feel the need to use a "safe" strategy of counting on even when it is demonstrably inefficient. An instance of this took place in the episode described earlier in which when Jim appeared to be particularly anxious he reverted back to his counting on strategy.

It has been widely reported that levels of maths anxiety are high amongst students in both the primary and the secondary sectors of the UK.

How widespread is poor number fact recall?

During the course of one of our lessons I asked Jim if many of his classmates did not know their multiplication tables. He said that it was a widespread issue and he estimated that over half of his class did not know their tables. He said that his teacher's response to this was to occasionally set homework of learning tables but as it was made clear that this undertaking was optional, "no-one bothered to do it".

It seems probable that poor number fact recall amongst students in the secondary sector and beyond is widespread. This indicates that a great many students are at a considerable disadvantage when taking the non-calculator paper. If calculators were permitted for all of the maths GCSE papers then this difficulty would disappear. Whilst the current exam system persists it is essential that all of the students are encouraged to develop a reasonable level of achievement for number fact recall.

Summary of main findings

It is only as a consequence of working with Jim that I have realised that students with poor number fact recall are at a massive disadvantage when taking the GCSE non-calculator paper.

That enabling a student to become more proficient within number fact recall can be a protracted process.

That an effective teaching strategy is to encourage the student to memorise all the squares of numbers from 2 to 10 and then use derived facts.

There appears to be a high correlation between poor number fact recall and heightened levels of anxiety.

Metacognition

There are two pieces in this section that focus upon the often misunderstood term – metacognition. In the first Alan interviews Kirsty Mulholland, maths specialist for the EEF, on her work supporting learning in mathematics. In the second article Wendy Skelton of Fountains High School outlines just what they are doing across the school to develop this most important of skills.

Thinking about my thinking concerning metacognition

I was first introduced to metacognition in 1992 as part of some science training I was involved in. That was very early in my teaching career and so it is something that has always been part of my professional landscape and vocabulary. The concept has always fascinated me and I have found the term cropping up with ever increasing frequency over the thirty years since my first exposure. It now seems very mainstream and often we use it without realising that we may not actually have a common or shared understanding.

The very idea of thinking about your thinking in itself can be confusing. I have always wondered how can you think about your thinking when you are thinking? This ambiguity actually serves to add to its appeal for me. Any teacher who is serious about this concept will find that they face a struggle to develop a meaningful, professional, vocabulary to describe what they mean by the term metacognition. Navigating both the meaning of the word and the practice of it in the classroom can be a very tricky path to tread.

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When I heard that the Maths Hubs were exploring metacognition and problem solving I was naturally keen to find out more. A few questions brought me to Kirstin Mulholland's door. Kirstin is a Lecturer in Education at Northumbria University and LLME for the Great North Maths Hub. Kirstin also works for the Education Endowment Foundation (EEF) as their Maths Content Specialist.

I arranged to meet with Kirstin to find out more about her work and spent the most wonderful 45 minutes in conversation with her. So much of what she said resonated with me and I was easily able to share my own metacognition anecdotes in response to hers. So the bulk of the rest of this piece will contain my own reflections on metacognition as triggered by Kirstin. If what is contained in this article resonates with you then

please send us your own thoughts and ideas concerning metacognition.

In her work, Kirstin draws upon the extensive research evidence the EEF now has and the many guidance reports that have been produced to help schools develop a research informed pedagogy. Following covid and the damage that has been done to learning she felt there was a need to support schools to help their pupils become more independent and resilient especially when it comes to solving problems in mathematics. Kirstin has always been interested in metacognition and this is in part due to Professor Steve Higgins, one of her lecturers at Newcastle University during her own initial teacher education and later post-graduate studies, who has written extensively on the subject.

At the heart of this is the fact that learning is invisible; it happens inside our heads and is rarely seen in many classrooms.

Kirstin was clear as she spoke that both metacognition and oracy are core components of a pedagogy that supports and develops thinking. She has always been fascinated by why children guess in mathematics and how it can be viewed as a subject where you are either right or wrong. Research by Picker and Berry had a profound impact upon her as the drawings of mathematicians produced in this project revealed pupils' perceptions of mathematicians as very intimidating figures, sometimes in possession of special magical mathematical powers that others simply don't have.

Part of her work is guided by the fact that, although a helpful term, metacognition is generally poorly understood. This is very similar to the term dyscalculia that I wrote about in the last edition. We have all heard the word but do we actually know what it means and do we have a shared language to articulate our own beliefs concerning metacognition.

At the heart of this is the fact that learning is invisible; it happens inside our heads and is rarely seen in many classrooms. Children simply are not encouraged to talk about their thinking, yet if we as teachers model our own thinking and begin to make our own learning visible, then so will those we teach. If we do this, we will show our children that learning is achievable and the spin off in terms of motivated classes of children cannot be underestimated.

Kirstin has been exploring a range of teaching strategies that can be used to develop metacognition. The first stage involves the development of metacognitive talk in the maths classroom and involves three main strategies or techniques;

1. Think aloud,
2. Debriefing,
3. Using worked examples.

In the following blog posts Kirstin is able to expand each strategy in greater depth:

EEF blog: Thinking Aloud to support mathematical problem-solving | EEF (educationendowmentfoundation.org.uk)
This blog looks at how teachers can use the

Think Aloud approach to model metacognition for pupils. It includes the question prompt tool with example questions relating to the metacognitive cycle that I mentioned as being useful. The key to this strategy is that the teacher must model their thinking and give reasons for the decisions they make. Children are just beginning their learning journey yet we are far along it and so they can benefit from hearing our thinking.

EEF blog: Using the debrief to support structured reflection on… | EEF (educationendowmentfoundation.org.uk)

This blog looks at questioning to elicit explanations of reasoning from pupils. This strategy involves looking back, picking out what helped, what worked and what you would differently next time as a way of informing future actions.

EEF blog: Using worked examples to support mathematical… | EEF (educationendowmentfoundation.org.uk)

This is the latest blog for the final strategy - using worked examples to discuss and compare multiple approaches to problem solving. Here we can present children with alternative strategies to explore and critique, adding to the bank of strategies that they can then draw upon in their subsequent independent work.

Reflecting upon our conversation, I realised that what Kirstin did was to help me to think about my own practice and how I try to do what she was sharing. What happened all the way through our conversation was that 'I do that too' and this is great confirmation. As she spoke, so many anecdotes from my own teaching came to mind and I will share two of them here as practical examples of how I build time for metacognition into my own classroom practice.

Personally, to make 'thinking aloud' as Kirstin described I use the following thinking stem sentences to show and model how we can describe our thinking. I adapted this from something a colleague called Stuart Twiss developed and shared with me in the 90's and I call them metacognitive prompts. In one school I piloted this with one year 7 class and I made sure they all stuck the 'Thinking about your thinking' sheet into the back of their books. I used these during plenaries in problem solving lessons, when I would invite pairs of pupils to discuss the sheet before asking them to say something red, or blue or green. What worked best, however, with this class was to use them as homework tasks. If we had been working on something interesting or challenging I would ask them to go home and discuss it with someone at home before writing answers to five of the sentence starters. When marking this work, I found I could begin a personal dialogue with individual pupils in their books that was specific to them and their thinking and that they would often ask questions in their books that they would never share with the rest of the class.

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Thinking about your thinking

At first we thought...

Then we realised.....

It was hard to..... It was easy to…

Other people helped us when they....

We had a problem with....

It got sorted when .....

We are still thinking about…

We want to know more about…..

If I had to do this again we would….

A particular lesson on solving equations really resonated with me when Kirstin shared her thinking on the importance of worked examples. There is a Thinking Maths or CAME lesson I use in KS 3 and 4 called 'Expressions and Equations'. What I like about the lesson is it gives you the opportunity to provide them with specific examples of two alternative ways to solve the following equation: 2x + 4 = x + 12. Both the balancing and the splitting method are presented to the children and discussed as different routes to solve the equation. I particularly like how it affords me the opportunity to share my thinking on why I prefer the balancing method but more than that it highlights to the students that there is no right way to do this and it allows them to voice their own preferences and the methods they find that help them.

Balancing method

2x + 4 = x + 12

2x + 4 = x + 4 + 8

2 x = x + 8

Splitting method

2x + 4 = x + 12

2x + 4 – 4 = x + 12 – 4

2 x = x + 8

As the end of the interview drew near, we both agreed that all of the things we spoke about take time, for they are learned behaviour that must be valued as part of the process of learning. In classrooms where task completion and moving on too quickly dominate, then children will not be nurtured to become reflective and metacognitive learners. We both turned to the idea of fast verses slow (or measured) thinking and the analogy of the tortoise verses the hare came to both of us. The classrooms we are seeking to promote are ones where the pupils develop an understanding of themselves as learners and in the process we will provide them with a foundation to support independence and resilience – skills that are needed in a school and beyond.

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I will leave the last words to Kirstin who reflected that her real passion as a teacher was to spend time with engaged and motivated learners where the following is regularly heard, "I've got another way to do this, Miss!"

Developing metacognition at Fountains School

Wendy Skelton was part of the same group as Helen and right from day one she was keen to share her schools learning journey. Wendy was able to speak very clearly and passionately about the things they are doing to support their pupils. It became clear they were seeking to use metacognition to support all of their learners to reach their potential. Knowing this I asked her to outline what they are doing to develop this aspect of learning.

As a school, our aim is for ALL students to develop their skills and aptitudes, including thinking skills.

Our school's mission is 'For everyone to reach their full potential'. As a school, our aim is for ALL students to develop their skills and aptitudes, including thinking skills. The EEF (Education Endowment Fund) a research informed organisation, identifies metacognition and self-regulation as a high impact tool for low-cost equating to approximately £12.50 per student per year, which for us is £7500 over 3 years. As a school we have, in recent years, developed and implemented a GRIT (genuine, resilient, independent and tenacious) curriculum that develops students understanding of emotional literacy; how the brain works, emotional vocabulary and strategies to develop self-regulation. Our natural next step was to employ and embed a way for students to exhibit and use these GRIT skills in relation to their academic learning, improving their agency and independence for learning, alongside metacognitive strategies and tools for learning. We baselined our current position by surveying all stakeholders and discovered that though we received a positive response regarding developing students thinking skills, there was a lack of clear vision, structure and monitoring, in essence a lack of whole school approach as well as staff feeling they had limited knowledge of and CPD on metacognition.

As a school we have, in recent years, developed and implemented a GRIT (genuine, resilient, independent and tenacious) curriculum.

We looked into a number of training providers on metacognition and bought into 'Thinking Matters' who are providing us with 3 years training on 'What is metacognition?', 'What are thinking skills and tools?' and 'How can we embed the use of them within our curriculum?' so that students can utilise them effectively within their individual learning journeys. Staff and students use a range of tools including 'thinking frames', questioning techniques such as Bloom's Taxonomy, Q Matrix and De Bono's hats alongside developing the 16 positive 'habits of mind' to help students frame and access their learning in such a way that independence is increased, alongside agency and development of critical thinking skills. For example, students are guided towards or are able to choose a specific thinking frame that best suits the completion of a specific task such as a categorising frame to sort 2D/3D shapes or a 'connecting' frame to connect percentages, decimals and fractions with the same value.

We are now 18 months into a 3-year process of training and implementation. The strategies and tools are being embedded into daily lessons, with students becoming increasingly familiar with specific tools and strategies. The use of consistent tools has resulted in an increase in student's independence in task completion. Increased questioning by staff and the development of students own questioning skills has led to greater depth and agency when exploring new topics and concepts, in turn resulting in greater understanding and increased ability to apply new learning to a range of scenarios.

We will be hearing more from Wendy as the school approaches the end of their journey which is something that I am really looking forward to. If you have any questions for Wendy please forward them to me at Equals and I will pass them on. If you are engaged in a similar journey to Fountains School then get in touch to share your story.

What the green paper means to me

Kathryn Wharton-Dixon **a mathematics & SEND class teacher and Senior Leader shares some thoughts on what the recent green paper means to her.**

I work in a specialist setting, and this is the time of year where, within my current role, I work closely with families organising transition to post-16. It is very often a challenging time; a stark reminder that the number of young people requiring specialist post-16 education far outnumbers the places available in our area.

As I spend time supporting families who once again find themselves at odds with the system, it feels like an apt point to reflect upon some of the recommendations and observations which came out of the Green Paper and the implications and reflections on education, specifically mathematics education.

As a leader in a special school, I am mindful that the need for mainstream environments to be able to support young people with SEND is becoming increasingly essential as the number of specialist placements are simply insufficient to meet demand. As outlined in the paper, the types of diagnosis and needs being identified has shifted, with an increase in SEMH and decrease of MLD and most notably, ASC diagnosis rising to 30% amongst those young people with EHCPs. The increase in SEND which does not have the main area of need as cognition and learning means that there is a growing number of pupils requiring support but who may be at, or perhaps

The need for mainstream environments to be able to support young people with SEND is becoming increasingly essential.

should be at or close to, age-related expectations. The current system appears ill-equipped to support these young people. Improving education for these pupils takes more than what I would characterise as traditional differentiation. Supporting learners with complex needs requires resourcing, expertise, genuine investment in staff, systems and infrastructure and unfortunately, funding across all sectors is sparse. Though the high needs funding, as reported in the Green Paper, has risen by 40% in 3 years, it is hard to see where this money has gone when you are working on the ground. As the paper states, value for money is questionable and from my experience, as the number of pupils who fall out of the system entirely (through exclusion or lack of appropriate placement) increases, so does the cost of the packages to support their education. It is eye watering, the money which is spent on a growing number of costly independent provisions which are opening up to meet demand. It remains a challenge, or a postcode lottery as to the ability to access funding streams within mainstream provisions. When you consider the funding disparity and irregularity of access to funding between mainstream and specialist provisions, it is no wonder that the global picture appears that mainstream schools are struggling to provide ongoing, effective intervention and support. My observation is we are seeing increasing numbers of pupils, who would have historically coped in mainstream environments, being referred into special education by virtue of the decimation of equitable access to funding support and services.

Supporting learners with complex needs requires resourcing, expertise, genuine investment in staff, systems and infrastructure.

The difference between the two systems is not limited to the access to funding and resources. It is compounded by mainstreams having to work within a system which has moved rapidly towards terminal examinations. To be successful in this style of assessment, children must draw upon particular sets of cognitive, social, emotional and physical skills which many young people with SEND find challenging. Combine this with the increased testing regimes in primary and change in breadth of allowable qualifications within progress measures for mainstream schools – is it any wonder that we are not seeing outcomes for those with SEND making any real improvements?

If I circle back to my point regarding cognition and learning, and focus more specifically on mathematics education. It is noticeable in my experience (11-16 Specialist Setting), that despite a year on year increase in the raw-score numeracy ages of pupils on intake, there has been decrease in the number of pupils able to access GCSE examinations since the change of specification and restriction to only terminal examination back in 2017. Now I find myself trying to manage the level of damage the system inflicts on our young people and their families; a system designed to encourage both child and parent to measure their success by their ability to perform at a

It is eye watering, the money which is spent on a growing number of costly independent provisions which are opening up to meet demand.

single moment in time. As is inevitable with this kind of assessment, it results in a decreased perception of their ability to do mathematics; their relationship to the subject is changed by the nature of the assessment of it. To be nostalgic and think back to the days of modular courses and even coursework! It seems like another world but begs the question, that given our increased understanding of SEND, and a number of government-led agendas, demonstrating seemingly a desire to be inclusive; how and why are we operating in a less inclusive system than that of 10 years ago?

This shift in assessment and progress measures in place within mainstream education, also serves a growing divide between the curriculums taught in mainstream and specialist settings. Interestingly, now the examination of the subject has changed and become less accessible, I have been faced with an increased number of debates around the content of the mathematics curriculum which should be taught in specialist settings. As a subject specialist, rather unsurprisingly, I believe and advocate for all aspects of mathematics be taught to all pupils, regardless of their SEND. Working within the less prescriptive specialist sector, where there is no obligation to teach the national curriculum, means that my approach to teaching these topics remains one which is focused firmly on a stage, not age approach. I would never advocate teaching a topic to pupils who were not mathematically capable of understanding the concepts. However I do believe that ensuring all pupils have access to an ambitious curriculum is at the heart of inclusive and equitable education. Not a popular belief perhaps amongst some, who frequently wish me to justify the teaching of aspects of the subject by asking me to cite "real life" examples of its use. How often have I been asked "but when will I ever use algebra"? I used to engage in these debates with gusto, finding myself determined to find examples of when a person may use any maths being questioned – however obscure my example might be. However, I now find myself preferring a more assured position of deferring to the skills with which the act of thinking mathematically brings to the table. For example, the advantages to executive functioning (which so many young people with SEND find difficult), reasoning, justifying (self-advocating), communicating, conjecturing, risk taking, questioning, critical thinking, resilience building… I could go on! Seeing myself as a mathematician is to attribute qualities about the way I approach solving problems as opposed to specific computational abilities or knowledge which I can remember and this is what I want my pupils to see in themselves. But despite all this, in my experience, the mathematics curriculum frequently falls victim to a need to validate the content as being useful "everyday". I note, rather flippantly, that I seldom hear such requests levelled at other subject teachers. Rarely have I heard a history teacher asked to justify why children learn about Henry VIII. My point is that the freedom afforded to special schools with respect to their curriculum means that mathematics is not only vulnerable to this interrogation, but particularly susceptible to leaders (who often fail to have a full understanding of the interconnectivity

As a subject specialist, rather unsurprisingly, I believe and advocate for all aspects of mathematics be taught to all pupils, regardless of their SEND.

of the subject) concluding they can remove "unnecessary" elements of the subject or choosing to water down key components, in the name of achieving "functionality" or making maths more engaging. A child within this system will not be able to take a GCSE because they are not given the opportune diet to do so.

Meanwhile, back in mainstream schools, teachers are grappling with being locked into age-related not stage-related, linear teaching schemes. These teachers, who can plainly see the need for a more accessible, stage related starting point for learners with SEND, are unable to do so. These children will invariably end their secondary journey by taking the GCSE. Whether they are able to pass however, is another question.

So neither of these approaches serve to teach mathematics effectively or give pupils the best chance to gain the qualifications which may improve their future opportunities. My observations of the systemic issues are intensified further by a lack of teacher training in supporting pupils with SEN. The paper states that in 2019, 41% of teachers reported that there is appropriate training in place for all teachers in supporting pupils receiving SEN Support. Thus, over half of teachers do not feel adequately trained to support 15.8% of the pupils that they teach.

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Interesting that a solution suggested within the green paper for much of the wider difficulties, lies within having more integrative services across health, education and social care. I wholeheartedly agree that having a better connected approach is imperative. But for us as maths teachers, I think there is a message to be taken about what we could do as a community – to work in a more integrative way across sectors. Having had the pleasure of working alongside and between both mainstream and secondary colleagues, I can see how this connected way of working can be part of the solution. I strongly argue that we need to look for deeper collaboration between the two sectors which results in improvements in teacher training and professional development opportunities. Ensuring that we involve and engage special schools within the mainstream mathematical community is a vital part of ensuring that all pupils have access to a broad and ambitious mathematical education, underpinned by the best mathematical and SEND pedagogy. I have had many conversations with colleagues in special schools who feel alienated at conferences and courses because they cannot see their own classroom experience within the one being explored. It becomes easy then to dismiss the content as irrelevant or inaccessible. The conversation is shut down rather than digging into the difficult business of exploration. And it is difficult conversation. I have often been the only person from a special school at events/gatherings/meetings and have at times felt like the unwanted dissident in the room saying "but have we thought about what this would look like if <insert any number of SEND characteristics>". Learning ways to incorporate the best mathematical pedagogy with SEND pedagogy is a complicated and somewhat messy challenge. We are likely to make mistakes along

the way! Assess-plan-do-review; the graduated response cycle, relies on constant reflection and refinement and when you are a teacher who just wishes to find the most effective way to teach something, this imperfect approach can feel frustrating and messy. Which is where we can find comfort and assistance from collaboration between communities. Subject specialist mainstream teachers able to support with subject knowledge and special needs teachers bringing the expertise for SEND. The task is to find sustainable spaces and opportunities for this cross-pollination of practice to happen.

Ultimately the paper shines a much needed light on the continued difficulties which face young people with SEND and their families who are trying to navigate the system. The reformed system, introduced in 2014, was designed to improve educational outcomes. However, from the lived experience of those I meet, it has made it more difficult to access good quality, early intervention and support unless you have an EHCP. The paper refers to the increased numbers of EHCPs. These were designed to be the last resort for supporting pupils with SEND and were never intended to replace earlier interventions. However, lack of funding, proper resourcing and training for those on the front line of delivery has resulted in schools and families relying on EHCPs to be able to access vital services and support. The net result is a specialist sector which is full to bursting as it struggles to cope with the increasing number of referrals and a mainstream sector floundering to meet these children's needs under intense and competing pressures, restrictions and expectations. Therefore what is also striking, is the importance of the work we, as individual teachers do to develop practice at classroom level. Quality first teaching remains at the heart of meeting the educational needs of young people with SEND, regardless of the setting within which we teach. As a teacher reading the paper, it is hard not to feel despondent at the statistics and overall picture. I know that I am not able to change the system and despite many welcome recommendations within the paper, there may be no meaningful change to the system for some time yet to come. So what can I do? How can I help with solving the problem? For my part, I know that focusing on my pupils and working for better outcomes for them is something both within my control and actionable. I am left feeling that now more than ever, I need to continue to challenge myself; to make small changes, be brave in my practice and try new ideas. To share with others; collaborate with the mathematics and SEND community, listen and reflect on ways to improve outcomes for the pupils which I encounter. Ultimately, each individual teacher's continued development of inclusive practices is not only needed, but becoming invaluable, critical even, as we collectively wrestle a system stretched to capacity.

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Little by little, one travels far

Peter Jarrett **gives a really interesting insight into a recent presentation on dyscalculia to an All Party Parliamentary Group!**

"Little by little, one travels far"
J.R.R. Tolkien

2022 is the 10th Anniversary of the BDA Dyscalculia Committee. At times it feels like nothing has happened in those 10 years and that low attainers in mathematics are some amorphous blob of around 30% of the population that are just bad at maths, dyscalculia is poorly understood and rarely recognised, and all anyone talks about is dyslexia – but not the impact that dyslexia can have on maths learning.

And then – suddenly, there is some movement, a feeling that there is a glimmer of progress, however small. The first date in the calendar was the 16th of March 2022. It was a pretty busy news day, as many are these days. But tucked away amongst the highlights, Dyscalculia and Maths Learning Difficulties were discussed within Parliament, at the Dyslexia and Other SpLD's All Party Parliamentary Group, the first time the dyscalculia community has had the opportunity for this level of exposure to policy makers.

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The hope had been to hold the event in Parliament, but for a variety of reasons that was not possible. We settled for an online event. Normally around 50 to 70 people attend this event. 140 turned up for the APPG on Dyscalculia, both a message and a record attendance. A parliamentarian called Matt Hancock MP asked if he could speak first about his private members bill about universal screening and teacher training around dyslexia. This is a good thing; we should be supportive. However, the point was passionately made that any universal screening should also include maths learning difficulties. As a side note, this is something that has been followed up with Matt Hancock MP. He has assured me that he recognises the need to offer the same for maths learning difficulties, but his initial focus is on dyslexia (authors note: because dyslexia is all anyone talks about).

The intent for the presentation at the APPG was to draw attention to the complex impacts of dyscalculia and maths learning difficulties across the life course.

Dr Steve Chinn provided an overview of dyscalculia, of wider maths learning difficulties, and maths anxiety. Steve's depth of knowledge and pragmatic approach to conceptualising dyscalculia provided an opportunity to recognise "the word 'definition' in psychology rarely quantifies precisely". This warning of fuzziness because of the heterogeneity of humans and the complex systems involved in arithmetic and mathematics can create difficulties when looking

for an approach to strategy and policy. However, Steve points out that maths is developmental, and a failure to 'get' foundational knowledge, or to commit to long term memory will lead to years of failure.

Steve then made two vital observations that underpin what meaningful interventions should look like.

What works for the 'outliers' will often be of benefit to many more learners. This has implications for intervention and for prevention, and could reduce the number of pupils who need small group or individual help.

Intervention for older students will almost certainly need to go back to the basics, and be presented in an age appropriate way. Just what the content of the intervention is will depend on diagnosis and then there will need to be an ongoing diagnostic approach as teaching progresses.

Steve went on to talk about the value of visualisation in supporting embedding in long term memory and building understanding.

Steve's final words of wisdom:

Train teachers to teach maths as it is to learners as they are.

The second speaker was Adele Tracey, a Team GB athlete and the current GB Indoor 1500m champion. Adele also works as a successful mark-up artist. Adele has dyslexia and dyscalculia and is an ambassador for the British Dyslexia Association.

It is essential, and common sense, to listen to people with a condition such as dyscalculia. It is increasingly common for people in the public eye, those whose voice is most listened to, to identify as dyslexic. We are not yet there with dyscalculia.

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Adele explained how her difficulties with numbers percolate through every aspect of her life. This goes as far as challenging her understanding of distances and therefore time intervals within her training – in her words it is always there. It impacts on her conceptualisation of time and her organisational abilities, which as an athlete are large parts of her daily existence. It creates anxiety, requires deep thinking for the easiest tasks, and amplifies a feeling of difference.

For Adele, it is important that dyscalculia and specific learners in general are better understood. She is exactly the type of advocate that is needed, successful, articulate, and passionate. Where Adele succeeds is making her difficulties very relevant to everyone's life although she recognises that other abilities have bestowed an element of privilege upon her.

Since the APPG there has been a very positive determination amongst adults with Dyscalculia to advocate for themselves and to support others who have similar difficulties to manage both the emotional side of managing difference, but 'life hacks' that help. A recent article by Rhodri Marsden in The I explains this well What

is dyscalculia? Why a blind spot for maths can be as problematic as dyslexia and the disability explained (inews.co.uk). Two of the interviewees, Pete Cherry and Emily Gee have been active campaigners for better understanding and support of people with dyscalculia and work closely with organisations such as The Dyscalculia Network Homepage (dyscalculianetwork.com).

I was very honoured to deliver the final presentation. The intent was to make the link between the lack of awareness of dyscalculia and the apparent deeper understanding of the causes behind low numeracy in the UK. The Government has announced the £560 million Multiply programme focusing on low attaining adults. According to the UK government, 17m adults in England - half of the working-age population - have everyday maths skills roughly equivalent to those expected of a primary school child. Low numeracy costs the UK economy £20.2 billion, about 1.3% of GDP – ironically, the evidence for the impact of low numeracy is number heavy – it is hard for many to conceptualise the magnitude of the numbers involved.

But what do we actually know about these people? As Steve Chinn pointed out, the barriers to mathematics learning are complex and are on a spectrum – or, I would argue, several spectrums – numbersense, executive function, environment, confidence, literacy and return on investment from study. Matt Hancock MP advocated for the screening of dyslexia as soon as reasonable in schools. Why not then screening for numeracy difficulties at the same time? The widely accepted view is that dyscalculia impacts between 5 and 7% of the population, the equivalent of the population of Greater Manchester and Lancashire, and that wider maths learning difficulties may impact up to 15% of the population. The ability to use well meant and appropriate screening tools and then to apply well meant and appropriate interventions will not only benefit those with specific learning difficulties but also the wider range of low attaining learners. After all, as we all know:

Good SEND Teaching is good teaching!
Our recommendations to the policy makers that were at the event were:

- Establish official recognition for dyscalculia. Official government recognition would help policymakers, parents, and schools act. It cannot be left to non-governmental bodies. The US and Italy have laws requiring intervention for dyscalculia.
- Promote the use of reliable screening tools and interventions in education and the workplace.
- Train teachers, other education professionals, and parents in what dyscalculia is and what it is not, and how to support it, especially using concrete manipulatives, a focus on foundational concepts, and the procedural skills using formal representations of arithmetic.
- Ensure that dyscalculia is considered when developing initiatives around adult numeracy, financial literacy and skills development.

It appears that we have been well received – we might not yet be at the top table with regards to policy, but we are beginning to have conversations that are positive. “Little by little, one travels far!”

Personal Pathways – part 1

Ken has kindly agreed to share what he does to enable all pupils in his school to have access to a GCSE qualification.

I met up with Ken again last week, in fact he called at my house with something to share. One of the schools on my Specials Schools and Alternative Provision course for the Origin Maths Hub has a new maths lead who asked for help. He was seeking to revamp their examination structure within KS4 and Ken came to the rescue!

This article is going to be split over the next two editions of *Equals* and I offer this in the hope that others will:

1. Find it helpful and,
2. Share how they navigate the qualifications minefield at GCSE level for their pupils.

Ken has developed a pathway that enables any staff in his Trust to guide their students towards the best mathematics qualification for all of their students. The next two pages show part of the documentation Ken creates for each KS4 pupil. Not only is this informative but it provides a clear route to enable staff to see where the child is starting from and the steps they need to take to get there. This is important given the erratic nature of the attendance of some students.

Personalised Pupil Maths Learning Plan

Name: Pupil A

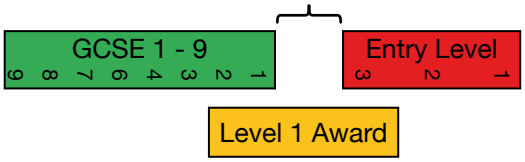
Current Working Pathway	Year 11 Pathway 4

Qualifications	Achievement
AQA GCSE Entry Level Certificate	Entry Level 3 Achieved
Edexcel Level 1 Award in Number & Measure	Achieved
OCR GCSE Maths	Working Towards
Edexcel Functional Skills Entry Level 1	
Edexcel Functional Skills Entry Level 2	
Edexcel Functional Skills Entry Level 3	
Edexcel Functional Skills Level 1	
Edexcel Functional Skills Level 2	
Optional Maths Curriculum	
GCSE Statistics	
Edexcel Level 1 Award in Statistical Methods	

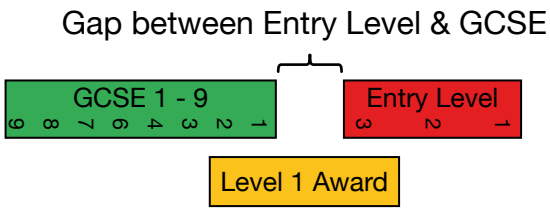
Intervention	
IDL Numeracy Intervention	

Pathways

Gap between Entry Level & GCSE



As you can see Ken has carefully considered the routes they offer their students that reflect both where they are starting from and the range of qualifications they could potentially gain. I particularly liked the way he uses the Level 1 Award as a bridge between Entry Level and GCSE Maths. I find the clarity reassuring and I know staff who work in Ken's Trust who really value his work, especially in Year 11 and the fact is in AP that without such signposting it is very to become lost looking for the best way forward.



I think the different pathways highlight the importance of needing to be flexible and adapting where necessary. It's certainly not a one size fits all approach as the most consistent thing you can rely on in a PRU model AP is the inconsistency. Being prepared for this inconsistency, whether it be in attendance, engagement, behaviour etc is crucial.

What do you think of what Ken has done? Please get in touch to let us know if you find this helpful. In Personal Pathways – Part 2 I will illustrate how Ken uses baseline testing and links the pathways to the edexcel GCSE statements of attainment.