



for ages 3 to 18+

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Realising
potential in mathematics
for all

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Finding the Frog





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Editor's Page

I hope you enjoy reading and engaging with this issue of *Equals*, as there is much to share regarding the momentum that has developed over the last year. I think should have really started with '**this different issue**' because the level of response we have had has been wonderful. To fit everything in Math's Talk is taking a break and my feature on measurement has been moved to the next issue. We are also pleased to announce that the 16th June will be known as SEND Saturday - please see the advert on page 24 for more details. This event is a way of resurrecting the support meetings that used to take place when *Equals* was known as *Struggle* and SEND Saturday should be regarded as a small start to something we hope will become a regular event.

The purpose of *Equals* was highlighted by the response of Jane and Rachel for they both got in touch to share some of what they do. Jane is a newly qualified hospital teacher and I look forward to her regular reflections very much. Rachel got in touch after trying the Frog lesson in her school for deaf children and also in addition to this she takes the time to shares some of what she does to help her pupils. **Please get in touch to show and tell the things you do in response to the needs of your learners.** Similarly Louise Gowan did so to share the activities she uses to help her pupils understand ratio.

The last edition on anxiety really struck a cord with many of you and prompted Mark Pepper to reflect

further on this. In a very emotive piece Lyndsey Eggison shares her very personal struggle with mathematics, one that spans several generations. Please read her story thoughtfully and share it widely for this has made me look at the classroom, and indeed staffroom, through new eyes!

Please note that there are two appeals in this edition, one from Cambridge University and the other from us regarding the Harry Hewitt memorial prize. I am really pleased that in the next edition of *Equals* we are able to share the GAIM math's activities with you. GAIM is a lovely resource for use with all pupils because of the range of levels possible within each task, and the diversity of tasks to choose from. Instructions on how to access GAIM will be given in the next edition but I felt it best to let one of the authors, Mundher Adhami, tell the story.

The Summer issue of *Equals* will focus upon resources and activities. Please let us know what resources, or activities, you would not be without in your classroom. Personally I find the context of measurement a great way to develop mathematical thinking and will share a lesson I was able to teach to a Key Stage 4 class at Beacon Hill School in North Tyneside.

Correction to Professor Steve Chinn's article in the previous edition of *Equals*.

On page 32 of the article, it is stated that 'Subitising is the ability to accurately and quickly quantify a

number of randomly organised small circles. Adults should be able to do this for 7 dots.'

In a letter to the editor of *Equals* it is suggested that this statement contains some errors. Firstly, that subitising does not necessarily have to involve randomly organised circles, and that this should more correctly be stated as randomly organised objects. Professor Chinn agrees that there may be some ambiguity in his wording. He was referring to the Dyscalculia Screener developed by Professor

Brian Butterworth, and this Screener uses randomly arranged dots as an assessment of subitising abilities. However, it may be more helpful to refer to the more general 'randomly organised objects'. The number of dots that we would expect adults to efficiently subitise is often stated as 5, rather than the 7 stated by Professor Chinn. Professor Chinn would be happy to correct this figure to 5 although he feels that there is, in reality, a range in which we would expect an adult to efficiently subitise and this is likely to lie between 5 and 7.

Maths Anxiety – Possible Causes and Suggested Remedies

The focus upon anxiety in the last edition of *Equals* struck a cord was a great number of our readers. Mark Pepper was prompted to put 'pen to paper' as he reflected upon the many possible causes of this and a few ways forward.

It is a common experience of many maths teachers to hear a member of her/his class say in an apparently indifferent manner:

"I've always been hopeless at maths".

A common interpretation of these words is that the student is unconcerned about a lack of mathematical ability and in fact sees it as a positive attribute. A far more plausible explanation for the readiness of many students to use such an expression is that they are greatly concerned about their perceived lack of mathematical ability. A particular concern would be that in the near future their weakness

would be "found out". By declaring their weakness at the outset they are pre-empting the unpleasant consequences of being exposed in not being able to answer a maths question that their peers may consider to be fairly basic.

The following statements have all been made to me by students experiencing difficulties with maths:

When I can't understand maths it makes me feel stupid.

I hate having to answer maths questions in class

because it shows the class that I am not clever.
I am really worried about the maths exams because I know that I will do badly.

I panic when I can't do maths in class or in the homework.

I hate maths and find it really boring.

It may be seen from the above that the main causes of anxiety are associated with an inability to do the work and for the inadequacies to be publicly exposed. The belief that there is a strong correlation between mathematical ability and general intelligence further undermines the self image of these learners. The prospect of the preparation and sitting of formal maths exams is likely to generate great anxiety for those students who expect to achieve poorly.

The effect of the exam/testing culture

Students are subjected to a great deal of formal assessment and this has shown a marked increase since the decades immediately succeeding the second world war. In that period students were subjected to two major

formal assessments. At the conclusion of their primary schooling they sat the 11 Plus and towards

the conclusion of their secondary education they will take G.C.S.E. exams. The current position for students is that they are required to take National Curriculum Tests (NCTs) in Years 2 and 6 and G.C.S.E. exams towards the end of secondary schooling. Changes are planned from 2023 such that the statutory requirement of Year 2 NCTs

will be withdrawn. Additionally statutory baseline assessments at the start of a pupil's schooling will be reinstated and a maths table check will take place in Year 4. Hence from 2023 a learner will undergo statutory testing in Years 1,4 and 6 and in Year 11 they will take G.C.S.E.s. Additionally many schools may require them to take the non-statutory Year 2 tests. Teachers are under enormous pressure to obtain satisfactory exam results from their pupils. Hence a culture of teaching to the test is likely to dominate many lessons and regular interim assessments are likely to take place. The effects on learners, particularly those lacking confidence, is likely to considerably increase their feelings of anxiety.

The exam grading system

The fact that within the further education system in Functional Skills courses the grades available cover Levels 1, 2 and 3 and Entry Levels 1,2 and 3 has caused considerable amounts of confusion for some learners. This has occurred when some of the students who have been awarded E2 mistakenly believe that this is the same as Level 2. They show great disappointment when the reality of the grade

is explained to them.

The prospect of the preparation and sitting of formal maths exams is likely to generate great anxiety

A further difficulty arises from the mandatory requirement to give

predicted grades for students in forthcoming G.C.S.E. exams. The teacher is obliged to predict a low grade for lower achievers. The effect of this is commonly to demotivate the student who typically responds with comments such as:

"You think I'm rubbish at maths so why should I continue to work at it?"

How can teachers help to reduce maths anxiety?

At the outset it should be acknowledged that the teacher is powerless to counter some of the roots of anxiety. Both the exam system and the grading system have been imposed on schools. Nevertheless positive action can be taken to try to reduce anxiety that exists in other areas.

Classroom management

It is apparent that many students do not respond well to working on a single activity for an extended period of time. This can lead to a lack of motivation and an increase in feelings of anxiety. This can be avoided by breaking a maths lesson up into distinct sections. When

the Daily Mathematics Lesson was in force, as a key component of the National Numeracy Strategy, the lesson fell into the three parts of:-

mental maths starter, main activity and plenary. It seems sensible to use this format even though it is not an official mandatory requirement. The regular use of mental maths would provide a useful means of informal assessment of the level of mathematical attainment of each student. The teacher could then pose questions to individual students at the appropriate level of difficulty.

The provision of concrete materials

Many students are likely to feel apprehensive when confronted with abstract problems or when encountering an unfamiliar concept. They would perhaps feel more confident if concrete materials were readily made available to them. Hence within

number activities it is helpful to have a variety of resources available such as number lines, number squares, multilink cubes and where appropriate calculators. Within a shape and space context sets of 2D and 3D shapes could be made available.

The use of computers and software

Many students who are disinclined to engage in pen and paper activities are often more amenable to using a computer and software. It is helpful to have this resource readily available as a means of increasing the levels of motivation of the students. A further benefit of the use of software is that it provides an opportunity for individual students to have their work marked with the use of the

software. In this way their results can remain private and the student will have the autonomy to assess which areas require further study.

This approach avoids the public humiliation of learners who have not achieved highly and could also encourage learners to take more risks in the knowledge that any mistakes will only be known to themselves.

Responding to individual learners

It is vitally important to form as empathetic a relationship with the learner as possible. This can develop over a period of time if there is mutual respect and if the teacher is non-judgemental when mistakes are made. Furthermore praise should be a valued reward to be awarded when the student has performed well. It is essential that praise should only be given when it is merited. Students rapidly

At the outset it should be acknowledged that the teacher is powerless to counter some of the roots of anxiety.

recognise the insincerity of frequent praise that is not deserved. The consequence of this is that all praise then lacks credibility.

At the initial encounter with a student it is essential to set work that is well within the capability of the student. The student will then gain confidence from being able to engage competently with the work that has been set. Over a period of time the level of difficulty can gradually be increased.

Summary of approaches aimed at reducing anxiety

Initially set work that is well within the capability of the learner.

Make a wide range of practical resources available in the classroom.

Only use praise when it is warranted and use it to reward a positive attitude and when plenty of effort has been displayed. Do not give praise if the work and amount of effort does not justify it.

Make a laptop and software readily available.

Give opportunities for self- assessment such as the work being marked with use of software.

Finding the Frog

My own involvement in *Equals* began when I tried an idea suggested by Mundher Adhami and it worked! In this piece Rachael Lethbridge shares her reflections upon trying the lesson on Frogs outlined in the last edition. Please get in touch to share your trials of the activities we share – I think this shared reflection on practice is an undervalued form of development.

I have only recently found *Equals* after a colleague introduced me and I have been working my way through the back catalogue. When I read 'Finding the Frog' I was about to start work on transformations with my year 9's. I thought that this would be a nice way to introduce the topic. They can already plot co-ordinates in all four quadrants, so I wanted to see if they would make the link themselves.

I work in a school for the deaf that uses an oral/aural approach. We provide a rich language environment so that our students are given the opportunity to catch up with their hearing peers. This particular group of students are in a Language Enrichment Group (LEGS) and may have splds on top of their hearing impairment. Finding the frog seemed like the perfect activity to promote their use of prepositional language.

Setting up the task took some time as the students are used to sitting in a horseshoe and wondered if I'd gone mad when I asked them to move seats! They sat in pairs facing each other with a barrier to hide their worksheets

but not their faces (so that they could lip read).

The students then took it in turns to describe where they had hidden

the four pictures for their partners to discover. After a few turns we listed the vocabulary used by the group on the white board looking at synonyms and antonyms. One girl suggested the word precise which led to a lovely discussion about it's meaning. On the second round (including a swap of partners for fairness), students were encouraged to be 'more precise'. This required some scaffolding as students demanded their partners to "be precise" and instructions such as "put it at the bottom precisely"! This time in our group discussion the students shared what helped them with accuracy.

They agreed that putting the shape in the corner or the centre was easy to describe but struggled to make the leap I was hoping for. On the board I had written their suggestions of 'not quite in the middle' and 'a little

bit left'. Then one boy (in a lovely twist, it was the boy who struggles the most at school) said 'about 4cm' and we were off! Students were waving their arms around making imaginary grid lines and discussing how big the 'steps' should be.

the students are used to sitting in a horseshoe and wondered if I'd gone mad when I asked them to move seats!

They were amazed when they removed their barriers and the frog was in the same place on both their grids despite hopping in as many different directions as they could think of!

In their next lesson we used the template with the grid lines on. I asked students to all start with the frog in the bottom right hand corner. They then had to move the frog around describing the movements

as they went so that their partner could copy. They were amazed when they removed their barriers and the frog was in the same place on both their

grids despite hopping in as many different directions as they could think of! I set them the challenge of trying to lose their partner, 'make it as hard as you can!' Their ideas included giving out combinations of instructions and speaking quickly (as this was hard for students to follow). They also told me that moving diagonally was really difficult because of all the different ways it can go. I then showed them how writing down the instruction could make it easier and this is how we started learning the conventional format for translations.

I have to admit, changing the style of the lesson from my bread and butter style of model/worksheet/recap was a challenge. The room was chaos for a while as the students tried to understand what I was trying to do.

However, after they had been introduced to the task the second lesson went much smoother. In a week or two, when we look at rotations, I plan to get the frogs and the grids out again. I want to see if the students can identify the different instructions needed.

My very first edition of *Equals*

Rachael Lethbridge has only recently come across *Equals* and our timely focus upon anxiety resonated with her and the very particular group of learners she works with.

I am a trainee teacher of the deaf at a school for deaf children with secondary mathematics training. Children's ability ranges from Entry Level to A level and I have specific responsibility for coordinating the curriculum for our children who have additional needs on top of their hearing impairment. This cohort is increasing year on year as the impact of inclusion in mainstream schools changes the profile of children who look to access our school.

I enjoyed reading the edition on anxiety. Math's anxiety is so common place we often don't acknowledge it. I recognised the methods discussed as being present in my own lessons even if I hadn't deliberately planned then with anxiety in mind.

I find routine works wonders. I start most lessons (regardless of ability range) in the same way. Students enter the classroom, collect a white board and pen, and start on the 10 warm up questions projected on the board. The students know the routine and understand the task so they can get straight into their work, knowing that they have answered these types of questions before. It addresses so many problems like lateness, disruptive behaviour and also anxiety.

The questions themselves are from a range of topics, predominantly number and algebra as they lend themselves to straightforward questions.

The important part is that the questions are easily within the students abilities, something I know they have been taught and were secure in their understanding. These are the skills that typically would be forgotten if they didn't revisit them and you find yourself saying 'but you could do this last week!' Spacing and interleaving is based on the theory that memory retention is better when something is presented more than once with a time delay, rather than consecutively. I include a lot of repetition and a small element of stretch, perhaps one new question a week, to broaden their repertoire without them realising it! It's great for recall and exercising that working memory. I have a bank of 10 questions that I can go to but also like to tweak as I go along if there is a particular skill I want them to revisit. I have included one such example at the end of this piece.

I'm big fan of the counted colouring style worksheets which are freely available online. Not only is the colouring aspect relaxing but students are able to see if they are getting questions right without having to draw attention to themselves. Again this forms part of the routine in my classroom. Students work independently once they have finished their 10 questions on a relevant task of their choice (and they usually choose the counted colouring sheets).

All in all I find the first 20 minutes of my lesson is

the calmest due to these routines. Of course once I start teaching something outside of their comfort zone, that's when the real fun happens!

- [1] Find all the factors of 12
- [2] What is $\frac{1}{5}$ of 50?
- [3] Round 578 to the nearest 100
- [4] Sketch a pair of parallel lines

- [5] $\quad + 7 = 19$ What is the value of \quad ?
- [6] What is the next number in this sequence?
-55, -50, -45, -40, ...
- [7] If $5 \times 42 = 210$ what is 500×42 ?
- [8] $444 - 69$
- [9] 81×70
- [10] $356 \div 4$

A day in the life of a hospital teacher

We begin a new series following Jane as she begins life as a hospital teacher.

How many of you knew that there is such a thing as a school within a hospital? Truthfully, I didn't. That is, until I took up a position as a teacher in The Northern Children's Hospital. The school that I have worked for, in a variety of different roles since 2014, is a special school that provides education for those pupils who have missed education due to physical or mental illness; we also provide education for pregnant schoolgirls and school age mothers, over several different sites.

I am a NQT who has embarked upon a teaching career later in life; I have been blessed with the good fortune to work for a school that have supported me whilst I studied and then offered me a full time permanent teaching position. But, enough about me! What I really wanted to talk about is the role of a hospital teacher and how we navigate all of our roles and responsibilities. I will describe how we adapt lessons and resources to be able to teach very poorly children; how we juggle a teaching day that usually incorporates delivering lessons from

KS1-4, on any subject; how we deliver bespoke and personalised curriculums to children with special educational needs and children who have English as a second language.

I want to use this column to share how we deliver lessons bedside, while parents and medical professionals look on but more importantly, I will discuss how important infection control is and what the teaching and learning looks like with in a children's hospital.

But that as they say is for next time... In my next instalment I will endeavour to describe an average day, however there is rarely any day like any other, which is why I enjoy my job so much.

Jane E (aged 49 $\frac{3}{4}$)

(B.A English Literature, PGCE – Specialist in Learning Difficulties and Disabilities)

NQT

The Northern Children's Hospital

Discussing the effects of the growth zone model when recovering from maths anxiety.

I would like to thank Sue Johnston-Wilder for bringing this article, written by Lyndsey Eggison, to my attention. Lyndsey is passionate about bringing experiences like hers, and the resolution, to the attention of the maths education community.

Following on from the previous issue about maths anxiety, I am concerned about how negative experience is continually having an impact for generations and how it can directly impact the mental wellbeing of a child. I have found myself sharing a version of this article with fellow parents and teachers. Here I use an auto ethnographical case study to identify links between a child's experience of maths in homework and how that affects their experience with their own children, whilst also discussing the methods such as Lee and Johnston-Wilder's (2017)

growth zone model to overcome maths anxiety.

I include a discussion of my own experiences

of developing resilience and the methods used to assist overcoming my maths anxiety and in the long term improving my own child's attainment levels and reducing any potential threats of passing on those maths anxieties.

It can be argued that the mixture of inappropriate curriculum, a need to learn quickly combined with the fact there is only ever one right answer can lead to a learned helplessness (Chinn, 2008; Goodall and Johnston-Wilder, 2015). Chinn (2008:62) argues that if the learned helplessness is left un-assisted

then it can progress into adulthood, and often leave respondents 'powerless, out of control and lacking self esteem'.

My story so far...

Maths! The word just terrified me, let alone even attempting to do maths. When I began my masters degree, I was not sure if it was just a fear of looking stupid or whether I genuinely just couldn't do it. I understand what fear feels like; I am petrified of

snakes! This is a different kind of fear; I break down in tears at the thought of even being near a snake. If someone asked

me to do maths, it's not that I wouldn't attempt to do it. I would just get an uncontrollable fear, breathlessness, apprehension. It would take all my strength to convince myself I can do it.

I was never bad at maths at primary school. I was even given a special yellow slip in year 7 for doing so well in my tests. Mathematics did not come easy; I really had to work at understanding maths and the multitude of complex methods to complete sums. However, I always persevered. I am not sure why I persevered. Williams (2014) may argue that

Maths! The word just terrified me, let alone even attempting to do maths.

it was my optimism in life that helped me develop resilience. Johnston-Wilder and Lee (2010) have noted that there is a particular resilience that can be built when understanding mathematics, partly due to the fact that some students had experienced upset or failure when trying to understand or comprehend mathematical methods. I had experienced traumatic times as a young girl but these times showed me that it doesn't matter how hard things are, there is always a way through. My mom was a strength to be reckoned with; she subconsciously showed me how to be resilient. She had dropped out of school at a young age and as a child I watched her struggle to go back to college whilst working. I think part of the perseverance (Williams, 2014) was that I did not want to mimic her experience. Furthermore, I would say that my personality was that of confidence, optimism, and stubbornness.

Seligman (2007) discussed the idea that optimism is a type of resilience, and that adverse life circumstances can encourage a resilience and optimism that deems certain situations as only temporary. My optimism and realistic view of the world enables me to tap into that resilience and apply it to maths. I felt like I had failed in some way when the trauma happened as a child. I think this gave me a sense of not wanting to fail at anything and that I would not be solely reliant on a system of support. So although I would not say I was innately persevering with maths, I would say that my surroundings and experiences influenced my 'persistence of character' (Williams, 2014:407). Maths in primary school was difficult but not too challenging.

Lee and Johnston-Wilder (2017) depict a growth zone model in which individuals experience when attempting to learn new things or to tackle topics which can cause a sense of anxiety. This growth zone models depicts three zones in which individuals can identify with learning. The comfort zone in which an individual feels safe, the growth zone in which a learner can feel comfortable but yet challenged and make mistakes and be supported, and then the danger zone in which the learner cannot identify a way through it safely. Working within this danger zone can often mean that student may tend to freeze, fight, or flight.

I suppose if it was looked at in terms of Johnston-Wilder's growth zone model, I was always in the green comfort zone, and on occasion the yellow growth zone where it challenged me slightly but it didn't represent that red danger zone where I would find it too much. I also felt very safe in primary school; I was surrounded by teachers who

were close to the family and little homework was given - not like when I started senior school. It wasn't until year 8 and 9

even my calculator became more complicated with lots of symbols on that I wasn't familiar with

in secondary school, aged 14, that maths started to become too complex. Maths moved away from the simple arithmetic that I understood the counting on fingers or using cubes to do multiplication. It became about equations, trigonometry; even my calculator became more complicated with lots of symbols on that I wasn't familiar with. There were many methods and formulas that I needed to understand. I also could say that I was now expected to be an independent learner, in that I was now given homework. I was also more distracted

in secondary school; it wasn't just about playing and having fun, I was constantly reminded how important it was and that I needed to concentrate to get good results. This behaviour is linked to that of a child that possesses empathy which according to Brooks and Goldstein (2003) is linked to that of a resilient learner. This could at times lead me to not grasping the new methods that were taught, so I would seek support from my dad.

Numbers just made me feel very inadequate. I was excelling in all my other subjects at school, even so much to say I was a bit of a swot. I didn't need support from home for those. Most subjects I sat easily within the green

zone. I was prepared to challenge myself, and I had a lot of belief in myself and my ability and if I needed support it was readily available

at home and in school. I didn't excel, however, I coasted through with sufficient enough grades to not be challenged. However with maths, I needed and lacked support. School maths was harder than other subjects. If I was to enter the growth zone with maths I needed support and looked to X as he always seemed so knowledgeable. So when I started to struggle with some of the different methods in maths such as equations and theorems, it's the one time I seemed to feel really stupid. I associate most mathematical problems within the danger zone. The mere thought of having to do any form of maths that is not general addition just sent me to feeling like a child again. However, the trust I feel with Sue makes me feel like I could tackle anything, even though a little anxious at the maths. This is

because as Williams (2014) argue, though lacking confidence, I was persistent. With the security of the growth mindset and the knowledge of why I became maths anxious it has made me realise that it was not that I could not understand maths it was just that I had not received the patience and safe environment in order to develop my abilities and the steps of progression were too high for me.

Until recently I would panic and not think straight. Everything just became a jumbled, stuttery mess. This could be linked to the amygdala alarm system of fight or flight, in which when the amygdala recognises something dangerous, the amygdala

sends messages to the brain which in turn makes the body increase heart and breathing rates, increasing blood supply to the muscles, enhancing reflexes, and

dilating the pupils (Felhaber, 2013). The process of writing this essay has helped me come to understand why I reacted the way I did. When I look back at my experience with maths and attempting maths, I consider who I went to for help - X and my Mom. They were my only real source of support at school. I didn't have an elder sibling or a family member that I could ask. I started off approaching my mother; however I think she was reluctant to help. She would try but she would often say she wasn't very good at maths and point me in X's direction. I was always reluctant to ask X for help as we often would end up rowing over homework, thus leading to avoidance on my part, which could directly impact the attainment levels in maths. This is resonant with the findings of Maloney et al.

we often would end up rowing over homework, thus leading to avoidance on my part, which could directly impact the attainment levels in maths

(2015), in that my anxieties are directly linked with the effects that stem from the relationship between maths and X. However as a child I was not aware of any anxieties X had with maths.

Many adults may have felt anxiety when assisting children with mathematics (Goodall et al. 2016). Speaking to X about his experiences with mathematics he said it was merely avoided at home. X had received quite a stern home education. X did state that he had felt some sort of pressure on achieving at school as his brother and sister had passed the eleven plus to access grammar school whereas he failed and went to a comprehensive school.

Many adults may have felt anxiety when assisting children with mathematics

My issues came from the way X dealt with maths and homework. He did not make me feel secure in my growth zone. I was showing resilience as Goodall and Johnston-Wilder (2015) have depicted. I was willing to ask for support and help to tackle maths but yet was not supported. The problems came when X seemed to get very frustrated with me when I didn't quite understand something the first time he explained. There was also the issue of the feeling of wanting to impress not only him but my teachers. In order to impress my teachers, I felt I had to do everything with the methods they gave me. X thought otherwise. I would often go to him with a new maths problem, such as an equation, and I always remember struggling with the concept of a letter and a number and using them together. It is now clear that Goodall and Johnston-Wilder (2015) depict these feelings as a sense of mathematical helplessness and argue that there are methods in which I can be taught to

help overcome this feeling. They coin this in terms of Mathematical resilience.

After having a coaching session with Sue Johnston-Wilder about the relevance of Algebra in everyday life, it seems clearer to me the purpose and usefulness of equations.

I remember standing upstairs looking at my homework, trying my hardest to complete it but just not understanding it. Williams (2014) discusses this as persistence not confidence. I am persistent with my ability to keep trying but yet lack the confidence in my ability. I would often have conversations with

myself to convince myself that I could do it, and that it wasn't that bad. I could imagine asking X and that he would understand why

I was struggling rather than just shout at me for not understanding. It sounds awful now when I think about it but I would get so worried and anxious. I remember I used to feel hot and my breathing would become so intense. This was a clear indicator that my amygdala was preparing my body for fight or flight (Fehlhaber, 2013) and my frontal lobe trying to override the amygdala in that it was not recognising maths as something that should instil fear. This was when I started to feel like a failure. I would watch X helping my younger sister and she for some reason just always managed to keep him calm. Whenever I approached, his tone and language would just get louder and his posture would change. X would always reiterate to me that he was there to help and that he wants me to do my best. I just felt like it never was possible, especially with Maths. The rest he was just guessing but as far as I was aware

he knew maths, he always seemed so confident and assertive. However, after speaking to X, I now know that his anxieties with maths came from the pressure of him being the younger sibling that did not make it into grammar school like his older siblings. On speaking with X, he too had a strict experience with maths as a child. He would often be compared to an older sibling who excelled at maths. I was the older sibling. Thinking about it now it's as though he had high expectations of my ability based on his experiences with his siblings.

I was put into a danger zone in my learning rather than being encouraged and calming

As a child when I was trying to do best in school and had been shown a method to use, I of course wanted to use that particular method. It was that need of mine to be right but yet to also be good for X which would allow me to avoid further pain - almost a sense of self-agency (Goodall and Johnston-Wilder 2015). So after hours upstairs crying, panicking, and trying my hardest to figure it out, I would give in and go to X with a ready prepared speech. I would tell him that I was stuck on the topic. I would identify to him that we had been shown how to do it and I would provide the example in my text book. I would then say I just needed it explaining so I could try and work it out for myself. I am not sure whether it was because I had worked myself up so much and that I was being difficult with him or whether he too had maths anxiety and was just feeling frustrated with himself. This seems to be more likely in that, when it came to assisting my son with his homework, initially I mirrored X's attitude. I would get angry and shout at my son when he didn't understand or able to explain the mathematical methods he was using.

In contrast to this, X would sit there and ask me in a nice voice how he could help. This would calm me down and I would stupidly think ok he is in good mood this will be ok. So I would proceed to ask him about equations! He would ask the dreaded question 'well which bit are you stuck on?' To which I would reply hesitantly 'All of it' to which he would usually just sigh and pull me in closer to him. This was possibly due to my learned helplessness in that I lacked the faith in my ability of learning or having a good experience with my homework from X (Goodall, and Johnston

-Wilder, 2015). Joyfully he would say let's have a look and would smile. He would ask me to show him what I knew, and when I couldn't do anything he would start to raise his voice. 'YOU MUST KNOW SOMETHING' I would freeze I didn't I just couldn't figure it out. This was apparent that I was now in the red danger zone in the growth zone model depicted by Lee and Johnston-Wilder (2017). This was where I needed support but did not receive it. I would tell him I just don't understand how to work out the value of x. He would try and explain but it was always so complex.

From working with Sue Johnston-Wilder, it is clear that these methods are not down to my overall inability to learn; it was the very fact that I was put into a danger zone in my learning rather than being encouraged and calming. I needed the reassurance of my ability and the fact that I can learn rather than the aggressive tones of X that was unbeknown to me releasing his own experiences and anxieties of maths on to me (Maloney et al. 2015).

Williams (2014) recognised this as a persistent but not confident learner. X always sounded so patronising like I was stupid. I would try and pluck a number out of my head thinking at least I am giving him something. He would then shout NO TRY AGAIN. I could feel my breath starting to increase. I was starting to panic so I blurted out a letter 'NO. AGAIN' he would say. I could feel myself welling up. I would explain that I couldn't understand where he was getting it from as that was not how we did it at school. I always remember him shouting I DONT CARE HOW THEY DO

IT. THIS IS HOW I DO IT AND YOU WILL LEARN'.

It could be said that it was X's maths anxieties,

filtering into his experience of trying to teach me.

This was his way of his amygdala experiencing fight or flight, in which he found it safer to fight (Elliot, 1983). I would tell him it's ok and just try and

back away to which he would tell me to stand still and listen. So I would, yet I still did not understand and told him I would seek alternative help at school.

I respect him for helping. I wanted him to succeed whatever his issue was. As with many other adults,

they may have the knowledge but they do not have the tools or pedagogy knowledge to deliver, thus causing issues in later life. It felt like he had a point to prove making me understand and that I was

frustrating him by not. This was the ritual every time I came to do maths homework. X was great at any

of the art subjects; he had so much patience and time for me and would really help with techniques and break down the task. I used to feel that if he can

be helpful for art why not other subjects? Similar to Heather in Goodall and Johnston-Wilder's (2015)

paper on 'overcoming mathematical helplessness'

I haven't pursued my full teaching qualification for fear of having to sit the maths test

X recalls actually being much more supportive than I remember. He stated that he contacted the school to ask for assistance in primary school and that it was never as severe as I remember.

As time went on I eventually got myself help through school. I just wanted to get through my GCSE and never look at another equation or number again. I signed myself up for extra help after school with a wonderful maths teacher. She was patient with me; she explained things and didn't seem agitated

by my incessant need to ask questions. I didn't need to ask for help, she offered. I did ok in my GCSEs and I obtained

a C. However, I was told that this was because I did well in the problems solving section of the paper not my arithmetic and that I would do well to work on that. I never did really understand. So far in my life I have managed to avoid maths as best as possible. As previously discussed in the essay, this avoidance could be seen as a strategy of safeguarding from fear. Maths made me feel unsafe. My brain has remembered those feelings and associated it with fear (Elliott, 1983). I learnt a lesson on how to deal with those problems and that was to avoid. However the fear of numbers and getting those problems wrong still arises. Like many other people I know of, I haven't pursued my full teaching qualification for fear of having to sit the maths test. I tried it online once and couldn't get past the first question. I now know, through the work of Sue Johnston-Wilder, that this can be addressed as long as I take small steps and ensure I stay within the growth zone with support. I was tempted to ask my partner for assistance but the

thought of having a row with him because of maths was something I didn't want to go through. This is something I feel I have moved forward with in recognition of the work of Goodall, Johnston-Wilder (2015) and Williams (2014).

Transference of my maths anxiety

According to Maloney et al (2015) they suggest that there is evidence linking children's maths attainment to the anxieties that are present in the adult. This is something that can be related to my experience of maths. It can be said that it's like a cycle of anxiety, resilience and attainment, each one somehow influencing and affecting the other. When I became a mother, at the back of my mind was always a fear of how I would deal with homework when the time came, in particular maths. I had this maths anxiety because of the experience I had with my dad. This math anxiety (Ashcraft, 2002) was influencing my relationship with my son before I had even attempted to support. A maths anxious adult can affect a child's mathematical success (Beilock et al, 2010). However, my anxiety hasn't hindered my son; in fact it has done the opposite. We struggled in the beginning when I was in work and did not need to address maths on a daily basis. My negative experience of homework became a negative experience with homework with my son. I had a fear of failure because of the reprimand X would give me for not understanding. I did not reprimand my son for lack of understanding Mine was a lack of patience but also a fear of him failing because I was aware of my anxieties. This process I was going through is driven by my amygdala rather than

the effective cognitive use of my brain Ashcroft (2002:1) states that 'Math anxiety disrupts cognitive processing by compromising ongoing activity in working memory'

Initially my son was not achieving in maths in school; it was extremely frustrating as I did not want him to hate maths because I found myself getting really frustrated with him when it came to homework. We would often argue because of his lack of understanding. I would struggle to understand the maths homework and would expect him to do it the way I understood. This helped me reflect on the experiences of homework with my father, I recognise now that my experiences are possibly similar to what he experienced but yet didn't have the resilience or support I have encountered in later life. I was becoming quite selfish but I would become extremely upset too as I was conscious of the impact this could have on him like my father's attitude to maths with me (Maloney et al, 2015).

University has taught me more resilience.

However once I stepped into the world of academia through my degree, I noticed that his anxieties faded. University has taught me more resilience. I had an end goal to pursue my education. This resilience I picked up by succeeding in my BA which created resilience rather than a barrier to learning (Williams, 2014). I now recognise the importance of safety and support through us co-learning together. I am less hasty and more patient as I would recognise the flight look in his eyes and the heavy panic stricken breathing when it came to working together. I did not want this to be something that he experienced, I wanted him to succeed and enjoy education in particular mathematics.

I am using my pedagogy, knowledge and experience in my role as a teacher and form tutor to apply to my methods when supporting my son at home whilst also building upon my resilience through the knowledge and support from Sue Johnston-Wilder. I was recently asked to support the government's agenda to raise attainment levels in maths by providing a session on numeracy called 'Numeracy Ninjas' This was asked of me after a couple of sessions with Sue Johnston-Wilder. Initially I started to feel that flight feeling come over me, that sense of panic as I was about to find some form of excuse

as to why my form could not do this. However I decided I would embrace it. Sue had taught me that I should keep myself

It is important to understand the impact maths anxiety can have on children in their learning and also how it comes to affect them as adults.

within the comfort of the growth zone where I was a little bit apprehensive but willing to try. I see myself as a role model to the children; my anxieties should not filter through. My resilience and perseverance as a learner is something I want them to take from me. So I spoke with my class, I was honest about my fears with maths and told them that it was ok if they didn't know how to do it, but that I was there to assist and support them and we would learn together. My form is quite a challenging form and for the first time in a long time I felt like we all worked together. In a way they are supporting me; one of the students sat with me giggling and supporting me when I got stuck.

Conclusion

An interrogational effect of mathematics is clear within this essay. Both X and I have experienced some form of trauma or experiences that result

in the amygdala instilling a flight or fight mode. This action often supersedes the natural cognitive reactions that are perceived by teachers. It is the lack of understanding in pedagogy and understanding the emotional aspect of the growth zone that is allowing the continual passing on of maths anxiety. It is important to understand the impact maths anxiety can have on children in their learning and also how it comes to affect them as adults. The different emotions attached to mathematics and the different techniques used by children make it a difficult concept to understand. As a child there

is a blind faith in that an adult will take that responsibility to support and reassure. The inability for a child to sit

safely within the growth zone of Johnston-Wilders Growth zone model is an issue. Children have been given tasks which have made them skip the growth zone in which they feel safe and supported. It can be said that the lack of knowledge by adults across generations into the different pedagogy have negatively impacted the mental wellbeing of a child in particular with mathematics. As a child I blamed myself but with the help of the coaching through Johnston-Wilder and through the auto-ethnographic research of this essay, I now understand that it is in fact a story of a child being let down by an adult. Not just one adult but many adults across different platforms. My family amongst others struggle to recognise the anxieties and the impact of their actions. The school did not support me in my own growth zone but also the wider agencies of governments perhaps tried to raise standards in education policies without truly understanding the consequences.

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Harry Hewitt Memorial Award

This prize is awarded to any pupil who has overcome barriers with mathematics and is now making real progress.

Do you have a pupil, like this, who has struggled but is growing in confidence as they engage with mathematics? Why don't you celebrate their success in *Equals*?

We are offering a prize of a £25 book token to the best entry we receive and the opportunity to have the work published in *Equals*.

Choose a piece of work that both you and your pupil consider successful and send it to *Equals*. Please include:

- the original piece of work, photograph or photocopy,
- an explanation from the teacher of the piece of work and its context and a description of the barriers which the pupil has overcome or is in the process of overcoming.
- the pupil's age, school and the context of the class in which they learn and, if possible, some comments from the pupil about what they are pleased with about this piece of work and/or the learning it shows.

Entries should be sent to Alan Edmiston (edmiston01@btinternet.com) by the end of May 2018.

Simple ratios and practical applications

One of our regular contributors **Louise Gowan** has taken the time to share some of the ideas she has been using to help her pupils understand the importance of ratios.

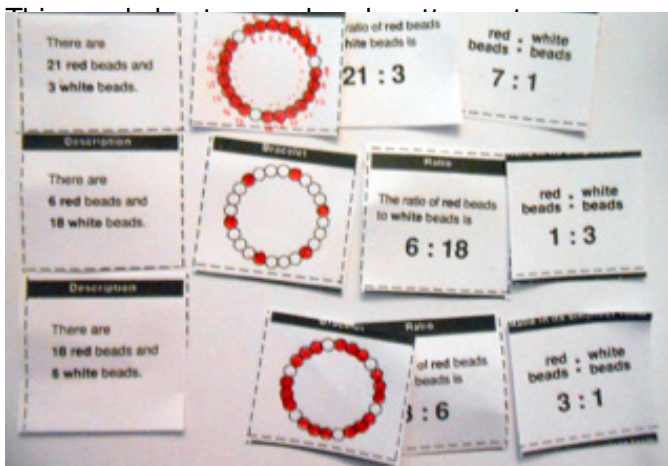
My class starts with a form of Maths circle time. They sit in a semi-circle and I start by giving a pattern verbally - Red, Red, Green, Red, Red, Green which the class then repeat. We then take turns around the circle to do other patterns-Red, Yellow, Red, Yellow...I, 3, 3, 3, 1, 3, 3, 3.

I use large coloured cubes stuck together in sticks to show similar patterns. We look at a few as a group and I then give them out, one each (or one between two) to consider.



I ask each student in turn to show their stick, describe the pattern and say what would come next.

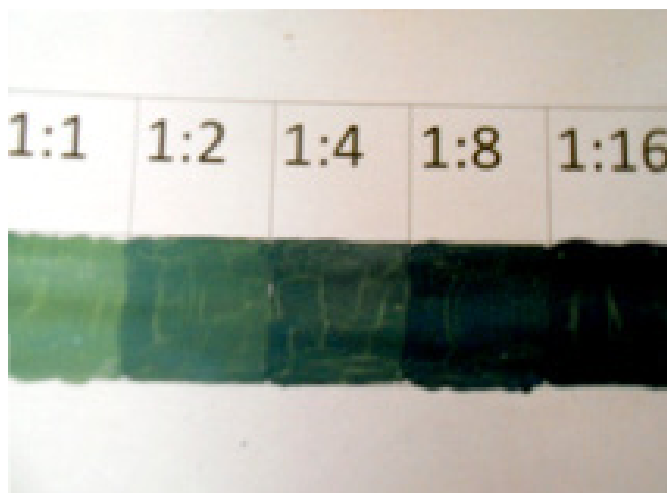
We now go to tables and colour the bead patterns from SMILE worksheet (which I love).



ratios of 1:2, 1:5, 1:10. We then tasted them and made comments on strength and taste and which was best ratio. The measuring, seeing and tasting I think made the ratios more real and making drinks is a familiar concept. Ratios in cooking are a useful way of thinking practically but can get complex quite quickly especially if ingredients are not whole numbers.

Another class measured out blue/yellow powder paints in different ratios and compared results.

Although it was very hard to measure accurately I think that the measuring and comparing made the ratios less abstract and gave another visual representation of ratios.



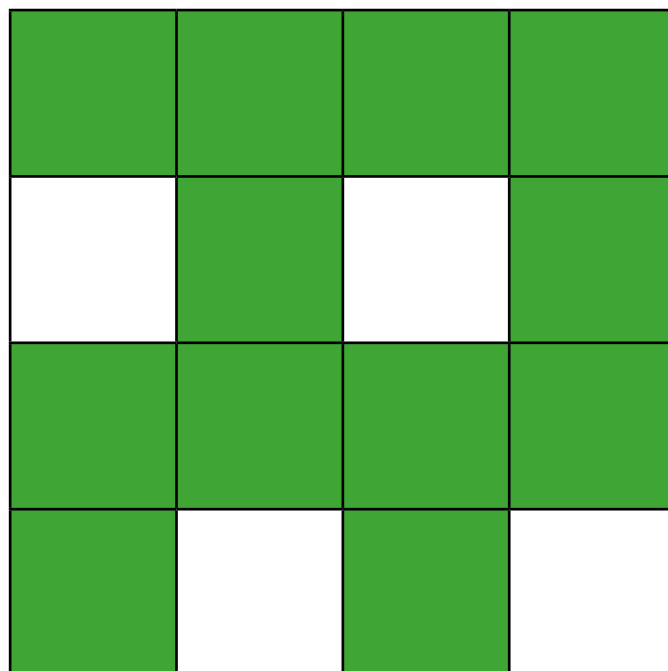
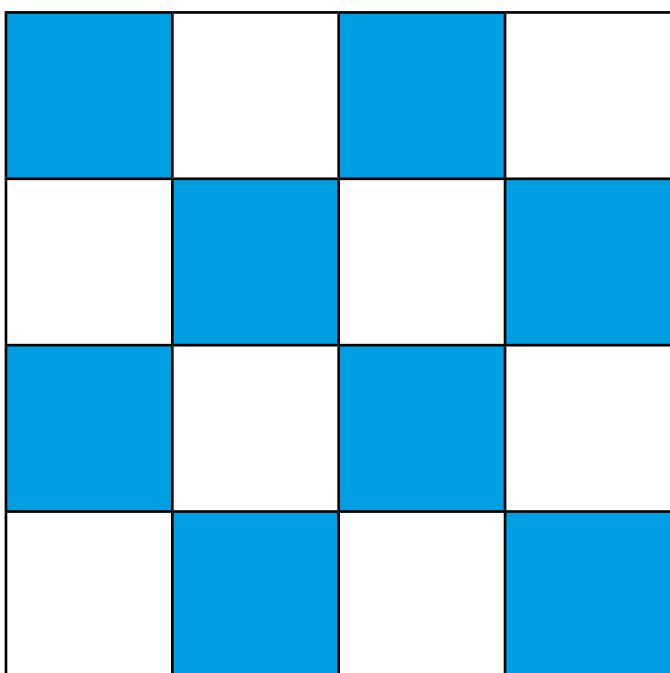
This year I am teaching an Enterprise class and we designed bunting for our Christmas stall, using repeating pattern to complete design, starting with similar verbal repetition activity at the start of the

lesson and with students making different designs before making final choice.

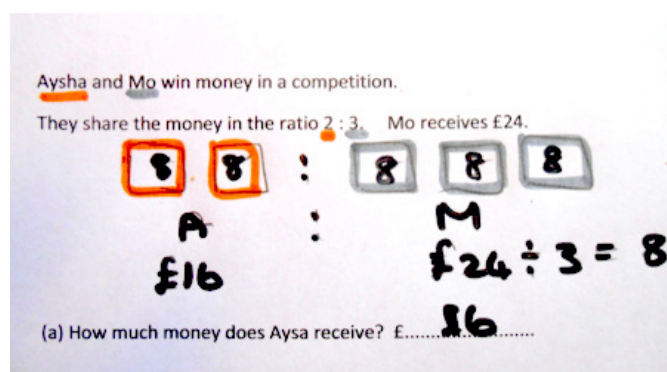


We are now designing mosaic tile, again using repeating patterns.

Student chose colours and I gave a ratio of 1:1 or 1:2 coloured squares to complete patterns then asked students to describe following patterns. Having done placing and sticking squares we then did colouring and work on the computer. We discussed questions such as How many blue squares? How many white? Are there more, less or the same?



I am also doing tutoring for GCSE and encouraging drawing of boxes to show the ratio.



I know that different students find different methods easier. I have always found a visual representation helpful.

Ratio can be a quite difficult concept but I hope that these ideas make more sense of the concept in a simple and practical way.

Not really assessment, rather creative teaching

Mundher Adhami, a past member of the *Equals* team and author of the Thinking Math's or CAME materials, reflects below on a resource that will be made available in the next edition of *Equals*. This piece simply serves to whet your appetite for the resource itself and a longer article that will follow in the Summer edition.

As we start 2018 the pendulum of education policy is set to move. The education pendulum has been swinging between restriction and openness (of what to teach and how to teach in school) every generation or so, seemingly from Noah.

Ofsted is now clearer about the damage that teaching to tests has made and is making. It is no longer coy about the failures of expensive, management-based Strategies and top-down performance measurements. It is calling for creativity and collaboration in the classroom, and for teamwork and team spirit in school management. The words may be different, but the message is clear.

It is a good time for the professionalisation of teaching. So the swing is not back to “anything goes” or “classroom as a secret garden”. That was when spontaneity and freedom in learning are not guided by structure and objectives needed for pupils’ development. Neither by agreed measures

of success by pupils and schools. As civil servants, teachers can and often do provide high quality education at all levels and demand high pay, unashamedly. They are often best placed to decide measures of quality and progress by learners, and measures of effectiveness of teaching based on evidence of proven results.

So the time is ripe for a synthesis of open and focused learning and teaching, of the creative and the structured, of recognising progression and levels of thinking and achievement in flexible ways.

This has been attempted before. At the peak of the last upswing of investigation and problem-solving drives in teaching in the 1970s and 1980s a brave project at King College was supported by the legendary ILEA, the Inner London Education Authority. It is worth looking up in Google, never mind the seemingly restrictive title of Graded Assessment in Math's Education or GAIM.



Please Help Us to Understand Mathematical Ability

I am contacting you to invite you to a study that looks at the genetics associated with mathematical ability and whether there may be a link with autism. All participants will be entered into a prize draw where you have the opportunity to win 1 of 5 £200 gift vouchers.

We welcome all adults (over 16 years old) WITH a diagnosis of an autism spectrum condition who are pursuing or have completed a degree in mathematics, physics, computer science or engineering to take part in our study. All we will require from you is a saliva sample (using a kit sent and returned by post) and for you to answer some web-based questions.

If you would like to help our research please visit our website:

<https://maths.autismresearchcentre.net>.

For additional information you can email the team at maths@medschl.cam.ac.uk

Thank you very much for considering this request.

Professor Simon Baron-Cohen, University of Cambridge



SEND Saturday

We are pleased to announce that Saturday 16th June 2018 will be known as **SEND Saturday**.

You are invited to this unique, and free, event that aims to support you and your pupils. Come along and network, hear what others are doing and listen to some inspirational speakers. The morning will include talks, workshops and hands on sessions so you can gain as much practical help as possible. At this early stage it is not possible to provide names of speakers other than Alan Edmiston, Pete Jarrett and Mark Pepper from the *Equals* editorial team.

SEND Saturday will take place at the Institute of Education and although free places are limited to 20. To book your place, to get involved or simply to find out more contact Alan: edmiston01@btinternet.com