

Change your Mind about Maths



To reduce Maths Anxiety in GCSE Maths resit students by empowering teachers to investigate and tackle Maths Resilience.

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Working in partnership with the Education and Training Foundation to deliver this programme.

About CfEM

Centres for Excellence in Maths (CfEM) is a five-year national improvement programme aimed at delivering sustained improvements in maths outcomes for 16–19-year-olds, up to Level 2, in post-16 settings.

Funded by the Department for Education and delivered by the Education and Training Foundation, the programme is exploring what works for teachers and students, embedding related CPD and good practice, and building networks of maths professionals in colleges.

Summary

Students who experience stress and anxiety towards mathematics, or repeated failure to achieve desired outcomes, or who develop feelings of being of inferior intelligence when engaging with mathematics, often form negative attitudes towards mathematics. These negative attitudes can lead to avoidance or lack of motivation to engage with mathematics. We need to build the Maths Resilience in our students to help them move forward successfully.

This action research project is a collaborative CPD program aimed at empowering teachers to tackle Maths Anxiety and build Maths Resilience and provides a Take Away Toolkit of Strategies for students to improve their Maths learning.

It aims to Change their MIND about Maths learning!

All 13 Maths teachers at the college were invited to participate, and they were surveyed before and after the training sessions. All teachers did something to engage and motivate students in an attempt to address anxiety. All efforts were valid, all with some effectiveness, but did not necessarily reach all our learners.

All staff welcomed the CPD package and liked the practical resources offered. For some more experienced staff, aspects were useful reminders. For others they were new and fresh. They especially liked the specificity of the maths resources as they related directly to our GCSE resit students.

The plan to provide hard copy of the resources was particularly welcomed. As was the ongoing support offered by strategy posters.

The interventions will be delivered by all staff to all our GCSE Maths resit students in September 2021 and it is planned for the students' attitudes, both before and after interventions, to be surveyed in order to assess impact.

Furthermore, some members of the team have expressed an interest in conducting their own Action research as a form of CPD.

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Background

Introduction

Warwickshire College Group has seven sites across two counties, with over 1000 students resitting GCSE Maths having not achieved the magic grade 4 result. We are a team of 13 staff with a broad range of experience, and journey into the profession. The GCSE Maths course is delivered in 1.5-hour lessons once a week.

Due to the Covid-19 lockdown, we taught totally remotely since March 2020, so did not actually see students or each other throughout the 2020/21 academic year in which this project took place.

Action Research Focus

Ultimate main aim of this research is to improve the Motivation & Engagement of our resit students. Can we give our students a fresh way to approach their Maths learning?
Can we change their MIND about Maths learning?

In 2020/21 the project became a collaborative CPD program and the ultimate plan was to produce a Take Away Toolkit of strategies to improve Maths Resilience in students throughout the academic year. The interventions are not intended to be just a one off hit in September, they are designed to be sustainable and constantly referred to throughout the year.

A series of classroom interventions were shared with the maths teachers, which they modify as a team in order to deliver to all learners at the beginning of the academic year, and beyond.

The ultimate aim is to reveal to Students, that they can progress in Maths, by understanding;

- The Power of their Mind;
- How they can tap into that Power
- Strategies for ongoing Support

Why Choose this Focus

The existence of Maths Anxiety and its ability to thwart progress in Maths learning is widely accepted and backed up by plenty of evidence (see literature review).

GCSE Students in FE often lack confidence in their Maths ability and many have fallen off the Maths bike so many times it is tough for them to get back on again and again!

The interventions used in this project are based upon works by Carole Dweck, Jo Boaler and Sue Johnston-Wilder amongst others, and are a mixture of adaptation, innovation and invention.

They are an attempt to help all students develop a more resilient approach to their learning and the struggles they often experience when learning Maths in particular.

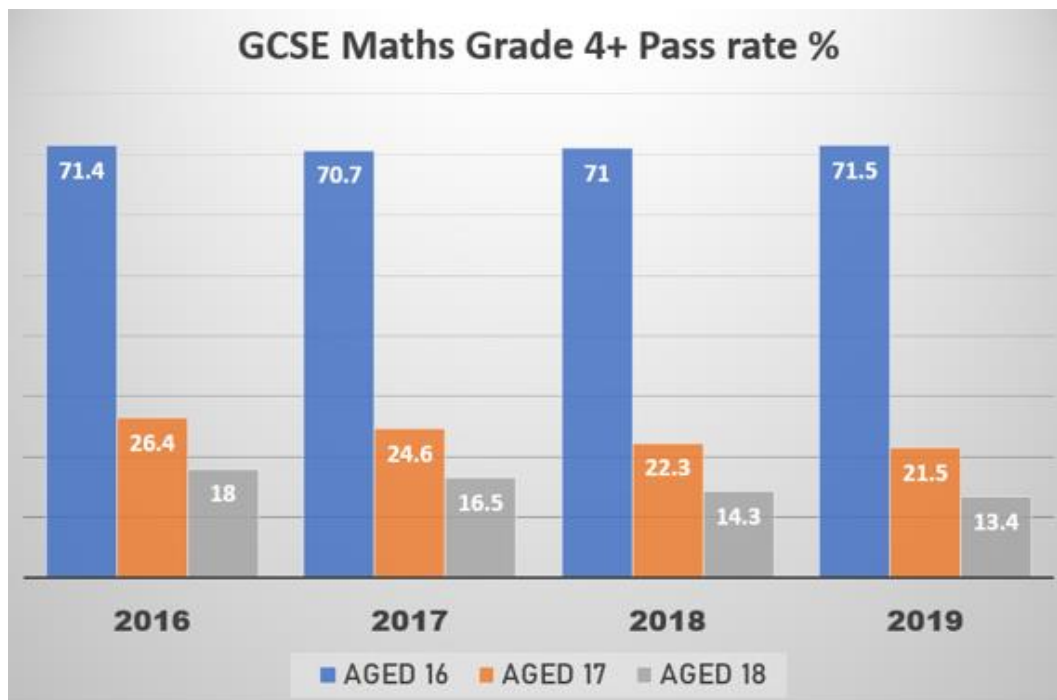
This Action Research project is not intended to be a one size fits all program; it wants to be considered as an ongoing pedagogical experience.

It was intended to inspire FE Maths practitioners to develop their pedagogical skills through their own Action Research.

Literature Review

Introduction

Since the introduction of compulsory GCSE Maths resits in 2013, the pass rates for students aged 17 and older are low and declining. (See Fig 1) There are many reasons cited for this trend, and many potential barriers to success, however, this review will focus on the existence of Maths Anxiety and how this can be addressed by building Maths resilience.



Source <https://www.gov.uk/government/news/guide-to-gcse-results-for-england-2017> to 2019

Figure 1

This review will look at some of the studies which discuss the existence and prevalence of Maths Anxiety, and how students benefit from becoming more Maths Resilient. Also, we will look at some of the recommendations from the recent Mathematics in Further Education Colleges Report Oct 2020 [MiFEC Report](#) regarding CPD for mathematics teachers in FE, and what can be gained from encouraging FE Maths teachers to engage in collaborative action research.

Defining Maths Anxiety

Maths Anxiety has been recognised, discussed and researched for over sixty years. Dowker, Sarker & Looi (2016) explore at length the history of studies about Maths Anxiety; its existence, potential causes, prevalence, and assessment methods. As early as 1957, Dreger & Aiken referred to the same reaction as number anxiety.

They concluded that most studies agree maths anxiety has both an emotional and cognitive dimension. The cognitive aspect relates to the worry surrounding mathematical performance, and possible failure, and the emotional label is more about nervousness and tension in testing situations. Whether maths anxiety causes mathematical difficulties, or visa-versa remains unclear. But what is generally agreed is that Maths Anxiety will have a detrimental impact on Maths performance, especially tasks that require working memory.

Cambridge Mathematics Espresso (May 2017) sums up the issue clearly. (Figure 2)

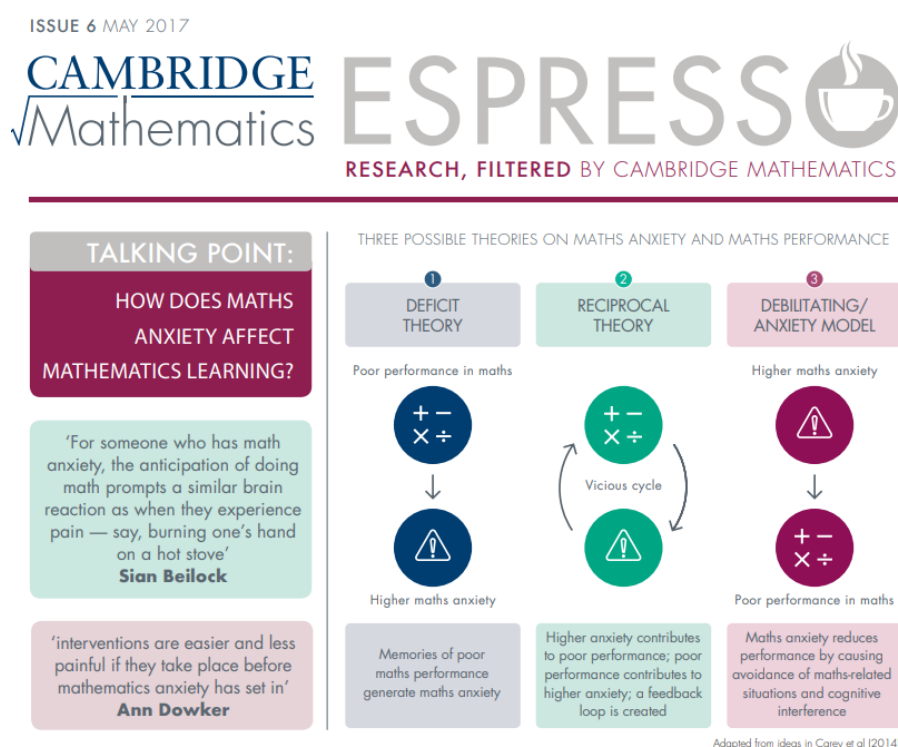


Figure 2

A widely used definition of Maths Anxiety comes from Ashcraft (2002*);

“A feeling of tension, apprehension, or fear that interferes with mathematical performance”.

Defining Maths Resilience

Even the most intelligent student will be challenged by some aspect of Maths at some point. It is what they do when faced with this challenge that determines their resilience. They need the confidence to persevere, to keep trying, and know when to get help. In their research paper, Clare Lee and Sue Johnston-Wilder (2010), use this definition.

“Mathematical resilience describes that quality by which some learners approach mathematics with agency, persistence and a willingness to discuss, reflect and research.”

They go on to identify activities which they used in secondary schools to help students become more maths resilient. Some of these approaches will be explored later in this Action Research project.

How Common is Maths Anxiety amongst Students?

Understanding Maths Anxiety – Investigating the experiences of UK primary & Secondary students (Carey, Devine, Hill, Dowker, McLellan & Szucs (2019), reports on the research conducted with 1800 students in the UK to screen for Maths anxiety (MA), test anxiety and general anxiety, and also measure their mathematical performance. Interviews were used to gain a deeper understanding of the cognitive ability and emotional feelings towards mathematics.

They modified a reliable tool to measure Maths Anxiety in the age range, and found that it proved to be distinct from other forms of anxiety. They also concluded that whilst Maths Anxiety and mathematical performance are linked, Maths Anxiety does not necessarily result from low

maths ability. But it can reduce maths performance over time in a vicious cycle. Furthermore, they found that teachers' and parents' own Maths Anxiety can influence that of the student, and that Maths Anxiety can begin as young as age 9 and tends to increase into adolescence.

Their report recommends that teachers should be trained to recognise how students 'feel' about maths, not just how they perform. Indeed, high performing students can still have Maths Anxiety.

The main limitation of the article is that the sample were aged 8-13 years old. However, the research has supported previous studies in a number of ways, and therefore cements further the notion of Maths Anxiety being real and distinct from other forms of anxiety.

They also concluded that Maths Anxiety increases into adolescence, and possibly therefore beyond into FE which suggests that the proportion of FE students with Maths Anxiety will be even higher than in years 7/8.

In this study the students perceived 'reasons' (or origins) and feelings of Anxiety towards Maths are similar to those we hear in FE: maths is hard; poor marks in tests; negative comparisons to peers and siblings; fear of ridicule; poor teacher explanation; different methods causing confusion; pressure to do well; but changing to a 'better' teacher helped alleviate Maths Anxiety

Improving student experience in the classroom, and not just perpetuating their anxiety, thus reducing the pressure may help to lessen Maths Anxiety and improve performance. These researchers' Maths Anxiety scale is a really valuable tool and could easily be adapted for post 16 year old students in FE.

In their study *Overcoming Mathematical Helplessness and Developing Mathematical Resilience in Parents: An Illustrative Case Study*, Goodall & Johnston-Wilder (2015) believe Maths Anxiety and 'learned helplessness' - in children, and in the adults around them, prevents significant improvements in attainment outcomes.

Their study suggests the development of "mathematical resilience" in both child and adult will go some way to overcome these negative experiences and improve the learning of mathematics. They recommended the Growth Model to shift from Maths Anxiety to Maths Resilience in any community.

Drawing on previous works, they explain the link between Maths Anxiety and Learned helplessness and how they manifest themselves. The paper is focused on two people and the emphasis is on the interactions between them and the concepts of learned helplessness and Maths Anxiety, and the impact of Maths Resilience intervention (in 3 sessions). They use a case study to illustrate their findings and suggest more research is required. Obviously, this is a single case study, with a mother/daughter dyad, so would need to be more widely researched. However, the existence and prevalence of Maths Anxiety and Learned Helplessness in families has been cited from a wider range of studies. Perhaps there is a benefit to develop Maths Resilience, not just in parents, but in other adults in the learning community.

Much of the Maths Anxiety in students as they reach FE college has been there a while, however the Maths Resilience intervention certainly impacted a mum in her late twenties, so maybe it is not too late for our FE students. Using the Growth Model has been effective, and if delivered well, we can help FE students overcome their negative experiences.

'We recommend that schools recognize the possibility of formative effects of mathematical resilience for parents as well as children, and seek to support development of this resilience within their local communities'. College is a community.

Mathematics in Further Education Colleges –Noyes A, Dalby D. October 2020

This report, known as The MIFEC project (2017-20), is the latest and most in-depth analysis of the state of GCSE mathematics education in FE colleges. The authors looked at 32 FE Colleges during 2017-2019, and make twenty recommendations covering all aspects of national and college policy and practice.

Of particular interest is the research into the CPD of FE Mathematics teachers, whereby it concluded

1. the use of college-based professional learning communities and practitioner research for classroom improvement would be beneficial.
2. the amount of mathematics-specific CPD provided was generally low. CPD often focused on college policies, new procedures or general pedagogy rather than mathematics.

Recommendation 9: An individual entitlement to high-quality, mathematics specific continuing professional development should be defined and adopted nationally.

3. CPD providers have little or no experience of the FE sector and, are often in a transmission style, and remote from classroom practice. They rarely have a positive impact on post-16 GCSE retake students.

4. Active teacher participation in knowledge development linked to practice is more likely to have a positive impact.

5. Teachers often found the informal sharing of practice with colleagues more helpful for their development than formal CPD sessions.

Recommendation 12: Guidance on effective CPD models, such as the development of professional learning communities and practitioner (action) research, should be provided in order to build capacity in the workforce for sustainable self-improvement.

6. Teachers worked hard to address poor student motivation & engagement, as well as low confidence and anxiety. They identified this as key area for PD and want better evidence of 'what works.' They want effective strategies for dealing with attitudinal and behavioural issues.

Recommendation 14: Teaching and learning approaches that address the specific contexts, constraints and affective issues in FE need to be researched, developed and widely disseminated across the sector.

It comes as no surprise that there are issues with student motivation and engagement since the introduction of compulsory resits in GCSE Maths and English in 2014. And PD to help overcome these barriers is essential. The report suggests that the expertise to deliver some aspects of PD already exists within the colleges themselves, and that adopting practitioner (action) research style CPD is highly desirable.

Conclusion

Using practitioner led action research to develop and equip staff with a toolbox of strategies to improve Maths Resilience amongst our students would be a good start to address some of the recommendations presented by the authors.

This Action Research project intends to begin to address aspects of these recommendations in an organic and collaborative way. It is not intended to be a one size fits all program, it wants to be considered as an ongoing pedagogical experience, which can grow. It will require resources (human and time) to be effective so relies heavily on the support of the main stakeholders in the college community and especially the Senior Leadership Team.

Methods

Overview

The original intervention resources used in this research were developed in 2019 and intended to present to students. However, the Action Research was somewhat muzzled by the pandemic, remote learning and other circumstances, but the interventions were ready. With the growing inevitability of not meeting any students face-to-face again, we decided to amend our delivery model.

We were further encouraged by the recent findings of the MiFEC report surrounding the need to have more bespoke CPD for FE Maths teachers, and their recommendation to increase Action Research participation as a vehicle for CPD.

All Maths teachers were surveyed about their knowledge and understanding of both Maths Anxiety and Maths Resilience. In addition, they were asked about student behaviours and what strategies they used to help build more Mathematical confidence in their students. The survey also aimed to identify the current position of our FE Maths specialists with regards to their own potential anxiety in the classroom.

The suggested interventions were then shared via online meetings with all the Maths teachers over three sessions. There was a collaborative brief that all participants would review & discuss the materials and agree the final set of interventions and materials which will be used with all our students in September 2021.

Staff feedback was monitored informally during each session and asked more formally in a questionnaire on an individual basis after each meeting.

The final cycle will be from September 2021 for the cross-college delivery of the interventions by all Maths Staff to all students in the early weeks of the Autumn term. The original student survey from 2019 will be done before and after the interventions.

Results and Key Findings

Initial Maths Teacher Survey

The initial staff questionnaire was circulated amongst the 13 Maths teachers. There were 9 responses.

All staff were familiar with the term Maths Anxiety. The common descriptions they used to were; 'fear of maths'; 'negative emotional reaction to maths'; 'self-doubt'; lack of confidence'.

When asked about the term Math Resilience, all staff were able to offer some clarification of what it referred to. They mainly mentioned; perseverance; effort; willingness (to have a go); positivity; overcome barriers; learning from mistakes and persistence.

When asked about their knowledge and understanding of the work by Jo Boaler (mathematical Mindsets), 5 out of 9 had never heard of her or her work. 3 recognised the name but were not familiar with her work. One person said they knew her work and confidently used her strategies with their learners.

Sue Johnston-Wilder and her work on Mathematical Resilience and the Growth Zone Model, was less well known to the staff. 3 out of 9 had heard of her and her work. One of the three confidently used her strategies with learners. Interestingly this was not the same person who used Jo Boaler's strategies.

All 9 teachers did something to engage and motivate students in an attempt to address their Maths Anxiety and lack of confidence. There were similarities in how they verbally addressed it within their pedagogical styles, but it was quite hit and miss, and not prescribed, robust or rigorous.

Common themes and phrases were Patience, Sensitivity, Positivity, Praise, Fun, Encourage Mistakes, break work into smaller chunks. Some staff used differentiation; 121 chats and occasional general reassurances during expositions. All valid, all with some effectiveness, but not ensuring all students had the same experience and not necessarily reaching all our learners.

Teachers were asked about what behaviours their learners used as avoidance strategies as opposed to general 'bad' behaviour. The main behaviours observed were, 'automatically saying "I don't know", before even trying', 'not completing homework' and 'claiming they don't know where to start. Other comments worthy of a mention were; 'not seeing a purpose for Maths in real life'; 'behaving as the 'class clown"; and the polar opposite – 'sitting quietly pretending they were working so as not to be noticed'. Many said students blamed others (previous teachers, schools etc) for not knowing enough Maths to pass. Along with not having had enough support in school and at home with their learning.

Finally, the potential Maths Anxiety of staff was explored. The highest scoring situations that may cause them to feel anxious was when they were observed teaching by management or colleagues. This was closely followed by teaching learners at a higher grade than usual. One respondent said they would be anxious about making a mistake, or being asked questions on the spot in lessons. This was a fairly inexperienced member of the team so not unexpected. Overall, most were confident in the teaching but would feel anxious being observed.

Although most teachers had not heard of the work by Jo Boaler and Sue Johnstone-Wilder, they were familiar with the terms Maths Anxiety and Maths Resilience.

Most recognised and suggested possible avoidance behaviours and strategies that learners can present. All agreed it was difficult to distinguish from just 'bad behaviour'. They also agreed a student's state of mind (anxious, negative, positive, etc) had a significant impact on their learning attitudes and outcomes.

Post CPD Feedback

The First CPD session was attended by 10 members of the team, and 9 gave feedback. They all liked how the brain behaves like a muscle, and being reminded of the learning styles and getting students to bond through discussion. Also, the plan to use the resources during induction week was especially welcomed.

Two people felt there should have been greater depth about anxiety and resilience, however the sessions were only 45 minutes so time did not allow that. I pointed them towards additional reading and explained the presentations were designed for delivery to students. One also wanted more strategies to overcome Maths Anxiety however these followed in the subsequent sessions.

Overall 6 out of 9 said they would recommend the training to colleagues, whilst the other two attendees said 'Maybe'. They were asked to rate the training from 1=Excellent to 5=Poor. 6/9 scored 1 or 2, and there was a 3 and 4 score as well.

Eleven people attended the Second CPD session, and 4 of them completed the feedback form. They all liked the Positive Mindset posters and the use of the word 'Yet', as well as the Strategy Posters to help with problem solving. One mentioned the Penguin task as a useful take away task. They all found the training helpful and would recommend it to colleagues. Three of four rated the training as excellent, and one person said it would be improved by having a case study of learners to follow to see if their attitude changed towards Maths. This comment is probably not really relating to the training session.

The Third and final CPD session had 12 out of the 14 members of the Maths team attending, and 8 of them provided feedback. They all liked the Growth Zone activities and resources and said they would be useful. 6/8 felt there were no aspects that were not useful. One person felt the presentation should be more interactive however I explained my tech skills were not that advanced. And another person said they wanted more tools about how students could overcome Maths Anxiety. I explained the limits of the project and that I could not include everything. 6/8 people rated the training as excellent with the other two rating it as average. 7/8 said they would recommend the training session.

Conclusion

The collaborative nature of the sessions worked well with most people making contributions about elements to improve. It would have been better had we got together in real life. Working largely alone, with recently acquired (& limited) remote teaching skills I fear the delivery was somewhat lacklustre! However, the Take Away Interventions were very well received, and the general consensus was positive, and the collective decision to use the interventions during the first few weeks of the new year has been widely welcomed.

It was felt that being involved in the development is certainly better than having something imposed.

Our more experienced teachers felt it was good to be 'reminded' of the learning styles and liked the idea of making them more explicit and related to Maths learning. I was made aware of a VAK learning styles resource the college used to use with students, so we will be adding that to the tool kit. Less experienced colleagues liked all aspects of the interventions and sessions

The continued use throughout the year was also very much welcomed as well as the cross collegiate approach (we are 7 sites after all).

All staff liked that the interventions were specifically designed for our GCSE Resit students especially the step-by-step use of strategy posters on Maths questions

So far three members of the team have declared an interest in doing Action Research next year

Recommendations

The aim to deliver the interventions to address Maths Anxiety using a diagnosis and growth model to all resit students in September has been accepted. The Take Away package will be printed and distributed to all Maths staff.

We will possibly extend to Network Colleges but this is yet to be confirmed.

It is planned for a new Action Research team to survey all Students at beginning and after the interventions and report on the findings in 2021/22.

Warwickshire College Group are already embracing Action Research as a form of individual CPD and offer it as an alternative to classroom observations. The Maths department can lead the way by expanding this year's research to become GROUP Action Research and improve Teaching and Learning as a result.

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Appendices

Appendix 1 FE Teacher Survey Baseline Questionnaire

Appendix 2 CPD Session Feedback Form

Appendix 3 CPD SESSION 1 – OUR AMAZING BRAIN - Presentation Summary

Appendix 4 CPD SESSION 1 – OUR AMAZING BRAIN - Learning Styles Handouts

Appendix 5 CPD SESSION 1 – OUR AMAZING BRAIN - Learning styles questionnaire

Appendix 6 CPD SESSION 2 – THE POWER OF YET! - Presentation Summary

Appendix 7 CPD SESSION 2 – THE POWER OF YET! – Penguin Instructions

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Appendix 14 CPD SESSION 3 – GET OUT OF THE BORING ZONE! – Target

Appendix 1 FE Teacher Survey Baseline Questionnaire

FE Teacher Survey Baseline Questionnaire

This survey aims to identify the current position of our FE Maths specialists with regards to their awareness of maths anxiety issues.

The aim is to move forward to help teachers to:

- develop awareness and understanding that maths anxiety is acquired, disabling and treatable.
- begin to develop a new mindset about learners, the barriers they face and their potential.
- develop knowledge and understanding about the impact of maths anxiety and student habits of self-preservation on progress with maths.
- acquire tools and strategies which lead learners from helplessness to resilience, motivation and engagement in mathematics.

QUESTION 1

Have you heard of the term Maths Anxiety? Yes / No

If Yes, what do you understand it to be?

--

QUESTION 2

Have you heard of the term Maths Resilience? Yes /No

If Yes, what do you understand it to be?

--

QUESTION 3

Have you heard of/ read any work by Jo Boaler Mathematical Mindsets?

☐	Never heard of her
☐	Recognise the name but not her work
☐	Have heard about her but not read much of her work
☐	Am aware of her work but don't really use it in practice
☐	Am aware of her work and sometimes use her strategies in lessons
☐	Am aware and confidently use the strategies with learners

Please elaborate further if you wish

--

QUESTION 4

Have you heard of Sue Johnston-Wilder's work on The Growth Zone Model?

	Never heard of her
	Recognise the name but not her work
	Have heard about her but not read much of her work
	Am aware of her work but don't really use it in practice
	Am aware of her work and sometimes use her strategies in lessons
	Am aware and confidently use the strategies with learners

Please elaborate further if you wish

--

QUESTION 5

What strategies do you currently use to help students to overcome their lack of confidence / maths anxiety in your lessons?

--

QUESTION 6

Which of these behaviours have you observed in students during their maths lessons which you believe are avoidance strategies rather than general poor behaviour?

1	rarely
2	sometimes
3	often
4	always

Please indicate their prevalence using the scale of 1 to 4

1	not starting work	
2	spending too much time on easy questions	
3	automatically responding 'I don't know' to spoken questions	
4	claiming they don't know where to start	
5	saying the first number that comes to mind	
6	not showing working out	
7	not completing or doing minimal homework	
8	lack of confidence	
9	saying, 'it's probably wrong'.	
10	making excuses about their previous results and blaming someone/thing else	

What other behaviours have you observed that you believe are more about students' anxiety/confidence towards maths than laziness/general behaviour?

--

QUESTION 7

As teachers we may sometimes feel a little anxious in class, please answer these questions using the scale of 1 to 4

1	never
2	sometimes
3	often
4	always

1	I worry about making mistakes in front of my class	
2	I would be nervous teaching maths to students at a higher grade than I am used to teaching	
3	I would feel uncomfortable if another teacher observed me teaching a maths lesson	
4	When I am teaching, I avoid maths concepts I don't feel comfortable with	
5	I would feel uncomfortable if a student asked me to explain why an advanced maths strategy works	
6	It makes me nervous to solve maths problems in front of my class if I haven't already figured out the solution	
7	I worry about not being able to answer students' questions about maths on the spot	
8	I would be anxious if my principle observed my class during a maths lesson	

Adapted from *The Construct Validation of the Math Anxiety Scale for Teachers*, Ganley C M, Schoen RC 2019 DOI: 10.1177/233285841983970

Appendix 2 CPD Session Feedback Form

CPD1 Feedback

Please complete and submit before the end of the session.

***Required**

Email *

Your email address

1). The 3 most useful aspects of the training session for me were: *

Your answer

2). How you are going to use above stated 3 aspects in connection to your day to day job. *

Your answer

3). The least useful aspect(s) of the training session for me were:- *

Your answer

4), Please give your suggestions for improving the training session.

Your answer

5. Would you recommend this training to colleagues? *

- ☐ Yes
- ☐ No
- ☐ Maybe

Overall Rating of the Program *

	1	2	3	4	5	
Excellent	☐	☐	☐	☐	☐	Poor

Please make any further comments here.

Your answer

Submit

Never submit passwords through Google Forms.

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Appendix 3 CPD SESSION 1 – OUR AMAZING BRAIN - Presentation Summary

How do we learn?



Our Amazing Brain?

Think of one thing you *can do now* that you couldn't always do

When did you learn to do it?

How did you learn to do it?



... discuss & share with each other?

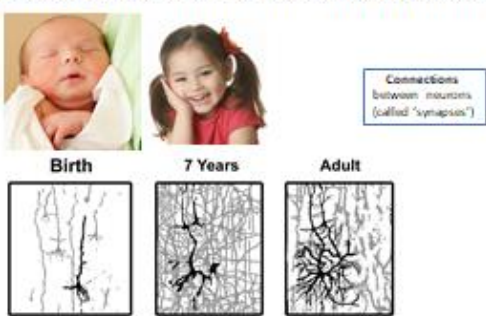
...how did your brain learn to do this?
What actually happened in your head?



It's all thanks to these guys...
NEURONS

100 BILLION of them!
same amount now as when you were born
... so what changes?

There is the potential for QUADRILLIONS of different connections between the Neurons



Connections between neurons (called "synapses")

Birth 7 Years Adult

What you can do to get Smarter...

When you learn new things, these tiny connections multiply and get **stronger**



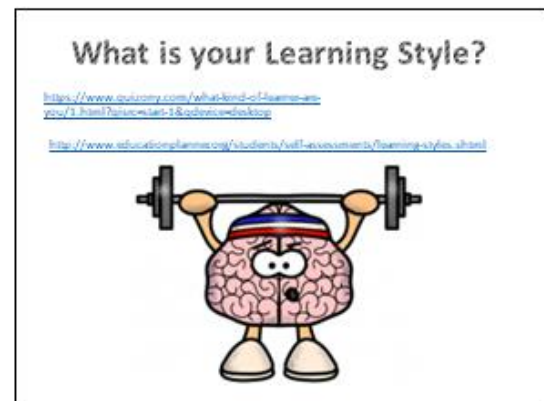
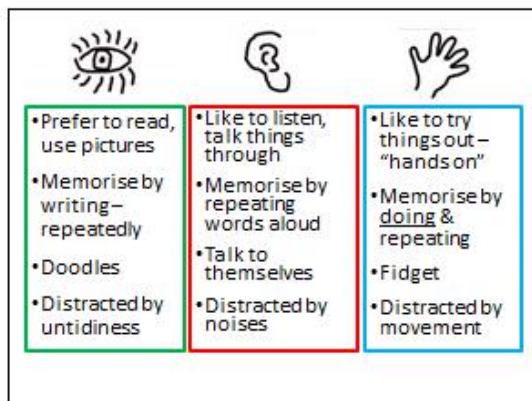
The more you practice and exercise your brain, the **stronger** it becomes

Things that were once impossible to do become easier

A Stronger Smarter Brain!

See if you can read the next slide....

7H15 M3554G3 53RV35 7O PR0V3
H0W 0UR M1ND5 C4N D0 4M4Z1NG
7H1NG5! 1MPR3551V3 7H1NG5! 1N
7H3 B3G1NN1NG 17 WA5 H4RD BU7
N0W, 0N 7H15 LIN3 Y0UR M1ND 1S
R34D1NG 17 4U70M471C4LLY W17H
0U7 3V3N 7H1NK1NG 4B0U7 17, B3
PROUD! ONLY C3R741N P30PL3 C4N
R3AD 7H15.



Appendix 4 CPD SESSION 1 – OUR AMAZING BRAIN - Learning Styles Handouts

Auditory Learners

What you need to know:

- you usually trust what you hear
- you can be a bit of a chatterbox
- you are a real bonus at a party
- you find it easier to take verbal instructions
- you enjoy classroom discussions
- auditory learners often have a good way with words
- you don't mind background noise
- 32% of learners are strongly auditory

What sort of teacher is best for you?

One who....

- teaches through role play
- allows classroom discussion
- encourages group work
- respects your need to ask questions
- reads passages aloud
- makes you recite things to increase your recall
- tells you lots of interesting facts related to what you're learning
- does not need absolute silence in the classroom

Creative things you like to do:

tell jokes	tell stories
create music	debate
sing	discuss



Danger signs for you:

- no opportunity to discuss things
- being scared to ask questions
- working continuously on your own
- not reading books or instructions before you start something new

Some phrases you are likely to use:

- "I hear what you're saying"
- "That sounds brilliant!"
- "Listen I have something to tell you"
- "I'm telling you"
- "Something tells me that's wrong"

Increase your learning power:

- repeat everything
- take part in class discussion
- ask questions
- tape information and listen to it
- have background music on while you study
- discuss homework and projects with friend
- make up songs, rhymes and raps to help you remember things
- get someone to ask you questions if you are studying for a test

Kinaesthetic Learners

What you need to know:

- you like to feel or touch things
- you have a good long-term memory
- you tend to talk at a slower pace
- learning for you has got to be active
- you tend to jump right in and try a task on your own. Making mistakes is part of the learning process for you
- clothes need to be warm and comfortable
- 34% of learners are strongly kinaesthetic

What sort of teacher is best for you?

One who....

- encourages good note-taking
- allows regular, short breaks every 15-20 minutes, so you can move around without disturbing others
- uses Post-Its and flash cards for noting and sorting ideas
- encourages learning by doing, not just sitting

Creative things you like to do:

modelling	drama
making things	dance
sports	gardening



Danger signs for you:

- being asked to sit still for too long
- reciting information in order to learn
- feeling uncomfortable in your surroundings
- a teacher who talks too quickly
- not getting an opportunity to become physically involved in what you're doing

Some phrases you are likely to use:

- "I don't feel good about this"
- "Let's keep in touch"
- "I was really moved by the film"
- "It's a weight off my mind"
- "Do you follow me?"

Increase your learning power:

- be comfortable when you work
- break up your study time and move around
- volunteer for demonstrations, role-play and learning activities
- develop good note-taking skills
- write out the word to know if it feels right, when working on spellings
- draw images, numbers and diagrams on paper that are connected with the learning

Visual Learners

What you need to know:

- you usually remember faces, but maybe not names
- you will recognise places, but maybe not names of towns or streets
- you may talk quickly
- making pictures in your head is easy for you (imagining or visualising)
- you prefer your clothes to be colourful, fashionable and coordinated
- 29% of learners are strongly visual

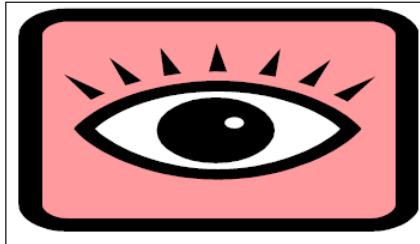
What sort of teacher is best for you?

One who.....

- uses pictures
- draws on the board
- uses a video
- asks you to visualise (picture) a scene, or successful outcome to a lesson
- gives you time to sketch out ideas
- allows time for note-taking
- encourages use of coloured pens
- likes to have a colourful classroom

Creative things you like to do:

doodle draw paint
write trace design
take photos



Danger signs for you:

- sitting near a window - you may be distracted
- being accused of daydreaming
- teachers who teach mostly by talking
- teachers and others who speak more slowly than you
- studying with the radio or TV on

Some phrases you are likely to use:

- "How does that look?"
- "I see what you mean"
- "That looks right to me"
- "Do I make myself clear?"
- "I can see where you're coming from"

Increase your learning power:

- write down information
- use Post-Its
- use coloured pens, highlighters and unlined paper
- use spider charts or mind maps
- watch a video or demonstration
- use a computer
- make mental movies of important facts or visualise spelling in your heads
- use drawings and visual aids

Appendix 5 CPD SESSION 1 – OUR AMAZING BRAIN

Learning styles questionnaire

		Yes	No
1	When you are describing a party to a friend do you describe the music, the sounds and the noise?		
2	Do you use your hands when you speak?		
3	Do you prefer the radio or TV to keep up with the news/sport rather than reading a newspaper?		
4	When you use a computer do you find the visual prompts useful e.g. the icons/pictures in the tool bar, highlights and underlines etc		
5	When you have to take down information, do you prefer drawing diagrams and pictures than writing notes?		
6	When you play noughts and crosses or draughts can you picture the 'O' and 'X' counters in different positions?		
7	Do you like to take things apart and repair them?		
8	When you are trying to remember the spelling of a new word, do you tend to jot it down a few times in different ways until you find the one that looks right?		
9	When you are learning something new, do you like spoken instructions?		
10	Do you like making things?		
11	When using a computer, do you find the bleeps and sounds useful to tell you that you have done something wrong or have finished something?		
12	When you revise or study or are learning something new, do you like to use diagrams and pictures?		
13	Are you quick and efficient at copying things down?		
14	If something is said to you, do you usually remember it, without it being repeated?		
15	In your spare time do you like doing something physically active? e.g. sport, walking		
16	In your spare time do you like to listen to music?		
17	When you visit a museum or are looking at a shop display, do you prefer to look around peacefully on your own?		
18	Do you find it easier to remember people's names than their faces?		
19	When you spell do you usually have to write it down?		
20	Do you like to be able to move around when you are working?		
21	Do you learn to spell new words by saying the words out loud?		

22	When describing a party do you describe what people looked like, what they were wearing?		
23	When starting a new task, do you like to get on and do something straight away?		
24	Do you learn well by watching someone demonstrate a particular skill?		
25	Do you find it easier to remember people's faces than their names?		
26	Does saying things out loud help you to learn?		
27	Do you like demonstrating and showing things to others?		
28	Do you enjoy discussions and hearing other people's views?		
29	When you do a practical task, do you follow the diagrams?		
30	Do you like role-playing and acting things out?		
31	Do you prefer to go out and about to find information rather than sitting in a library?		
32	When you visit a museum or are looking at a shop display, do you enjoy talking about the items on display and listening to the comments of others?		
33	Do you find it easy to follow a map?		
34	Do you feel the best way to appreciate a display is to touch it?		
35	When you read a story or a magazine do you picture the scene in your mind?		
36	Do you tend to hum or talk to yourself when completing a task?		
37	Do you look at pictures in a magazine before buying new clothes?		
38	When you are planning a new journey, do you like to talk to someone to find out where to go?		
39	Do you find it difficult to stay still for long and prefer to be active?		

Appendix 6 CPD SESSION 2 – THE POWER OF YET! - Presentation Summary



Last week we learned how we can **grow** our brains

It's just a matter of... **Practising** enough!

Comic strip panels:

- Panel 1: (How do you do math so well?)
- Panel 2: Practice.
- Panel 3: It must be an innate gift. A gift from God.
- Panel 4: It's practice.
- Panel 5: I'll never understand how some people are so talented. A mystery.
- Panel 6: Practice.

© Sarah Anderson

The Power of Yet!!

Today we are going to look at;

- ❖ choosing the right **MINDSET**
- ❖ the Power of **YET**
- ❖ Strategies to get **UNSTUCK**

Origami Penguin Challenge

Your challenge is to create an origami penguin from the sheet of paper in front you. Good luck!

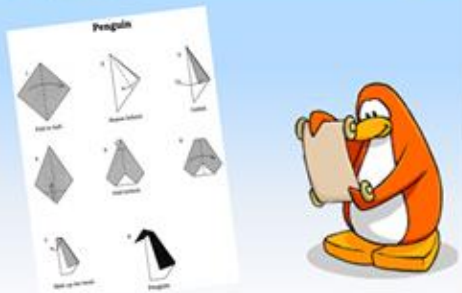
Origami Penguin Challenge

Images showing two completed origami penguins and a crumpled piece of paper with a question mark.

Origami Penguin Challenge

- Did you give up immediately?
- Did you try and then give up?
- Did you expect to fail?
- Did you expect to succeed?

Try again.... this time you'll have instructions.



The image shows a set of origami instructions for a penguin, numbered 1 through 10. To the right of the instructions is a cartoon illustration of an orange penguin holding a large scroll.

Origami Penguin Challenge

How did you do this time?
 Did you give up immediately?
 Did you try and then give up?
 Did you expect to fail?
 Did you expect to...
What changed?

Want to try another one???

Origami Penguin Challenge

I want your penguin to be a reminder to you that, **over time** and with a **bit of help** and a **positive attitude**, everyone can achieve **success**.



- ✓ I can learn anything I want to
- ✓ If I struggle, I will persevere
- ✓ I want to challenge myself
- ✓ When I fail, I learn
- ✓ Tell me I try hard



- ❖ I'm either good at it, or I'm not!
- ❖ If I get stuck, I give up!
- ❖ I don't like to be challenged
- ❖ When I fail, I'm no good
- ❖ Tell me I am smart

Growth mindset - you make it easier for yourself to learn

Fixed mindset - you make it harder for yourself to learn



The image shows the cover of a book titled "DON'T BE AFRAID TO FAIL. BE AFRAID NOT TO TRY" by MICHAEL JORDAN. The cover features a close-up photo of a golden retriever's face.

In your groups, share your own experiences of having a Growth & Fixed Mindset.



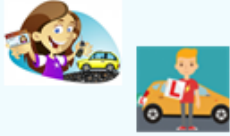



Then, as a group, decide which of the statements fit each mindset

Growth Mindset or Fixed Mindset?

Growth Mindset.
Fixed Mindset.

1. "I'm just not good at Maths"
2. "I can't do it"
3. "I just have to try harder"
4. "I can't do it yet"
5. "I probably mess up, so I won't do it"
6. "I'll give it a try. I guess I'll learn from my mistakes"
7. "School was just too hard for me, I didn't like it"
8. "I don't put my hand up because I might be wrong"
9. "I like answering the questions. I know the answer to"
10. "I didn't do well this time so I'll try revising a different way next time"
11. "It doesn't make sense to revise. I did last time and got a bad mark"
12. "Feedback makes me think how to improve, rather than upsetting me"
13. "I care more about the comments the teacher writes than the grade"
14. "I get annoyed if there is a comment from the teacher but no level"




Choosing a Growth Mindset The Power of Yet!

Remember this from last week.

7H15 M3554G3 53RV35 70 PR0V3 H0W 0UR
M1ND5 C4N D0 4M4Z1NG 7H1NG5! 1MPR3551V3
7H1NG5! 1N 7H3 B3G1NN1NG 17 W45 H4RD BU7
N0W, 0N 7H15 L1N3 Y0UR M1ND 1S R34D1NG 17
4U70M471C4LLY W17H 0U7 3V3N 7H1NK1NG
4B0U7 17, B3 PROUD! ONLY C3R741N P30PL3
C4N R3AD 7H15.

How did you feel at first?

What happened as you continued?

Would you try another one more confidently?

Will you **CHOOSE** a Growth Mindset?

Will you **TRY** to read it?

Olny srmat poelpe wliil try to raed tihs.

I cdnuolt blvelee taht I cluod aulacit... I was rdanieg.

Bcauee of the phae... Uinervtsiy, it deosin...

m. Tihis is b... mnd deos not raed ervey lteter by listlef, bus... wrod as a wlohe. Amzanig huh!!?

Yaeh! and I awlyas tghuhot speling was ipmorantt!

Did you TRY?... you succeeded!

Were you nearly there... success!

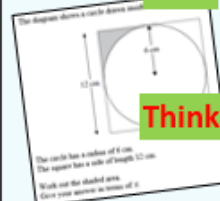
I can't do it YET!

That's the Power of Yet!

How does The Power of YET work in Maths?

It looks too difficult, I can't do it. **YET!**

There are too many words, I can't do it. **YET!**



Ann, Bettie and Carol are sisters driving home from work to points A, B and C respectively. Carol travels at 56mph and works 32 miles away. Bettie works 19 miles away and drives at 42mph and Ann drives at 48mph. All leave at the same time. Who will get home first?

Think YET!!!

Think, How can I get **UNSTUCK**?

Strategies to get UNSTUCK

What will help me?

I'll have a go, and show all my workings?

What DO I know?

Is my method working? Shall I try something different?

What am I being asked to do?

Check my answer. Does it make sense?



THE POWER OF YET! Strategies

Soap powder is sold in three sizes of box. A 2 kg box of soap powder costs £1.89. A 5 kg box of soap powder costs £4.30. A 9 kg box of soap powder costs £8.46. Which size of box of soap powder is the best value for money? You must show how you get your answer.

What am I being asked to do? **most powder for my money**

What DO I know? **cost and weight per box**

What will help me? **maybe draw a piccy!**

I'll have a go!

Box Size	Weight (kg)	Cost (£)	Cost per kg (£/kg)
2 kg	2	1.89	$1.89 \div 2 = 0.945$
5 kg	5	4.30	$4.30 \div 5 = 0.86$
9 kg	9	8.46	$8.46 \div 9 = 0.94$

Is my method working? **Does it make sense?**

Ann, Bettie and Carol are sisters. They are driving home from work from points A, B and C respectively. Carol travels at 56mph and works 32 miles away, Bettie works 19 miles away and drives at 42mph and Ann drives at 51mph, and her office is 28 miles from home. If they all leave at the same time from work who will get home first?

What am I being asked to do? Who takes least time

What DO I know? All of their distances and speeds

What will help me? The formulae for time, distance & speed

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Maybe hi-light the information and put in a table or a diagram

	Ann	Bettie	Carol
Distance	28	19	32
Speed	51 mph	42 mph	56 mph

I'll have a go!

$$\frac{28}{51} = 0.549$$

$$\frac{19}{42} = 0.452$$

$$\frac{32}{56} = 0.571$$



We all have a Mathematical **Toolbox** full of skills.

We have to choose the correct tool for the job.



What **TOOLS** will get you **UNSTUCK**

USE YOUR TOOL BOX



Highlight important words or numbers



If it's tricky, draw a piccy!



Draw a bar model

Develop **THE POWER OF YET!**

USE YOUR TOOL BOX



Work backwards



Organise information in a table



Look for a pattern



Develop **THE POWER OF YET!**

USE YOUR TOOL BOX



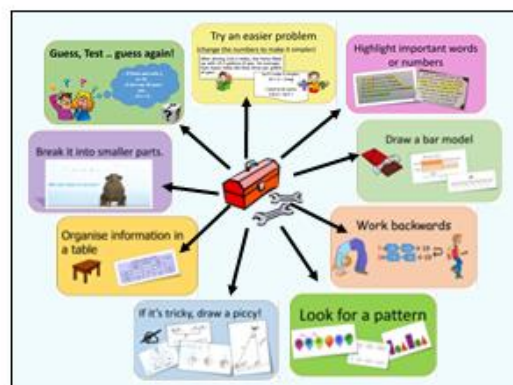
Try an easier problem
(change the numbers to make it simpler)

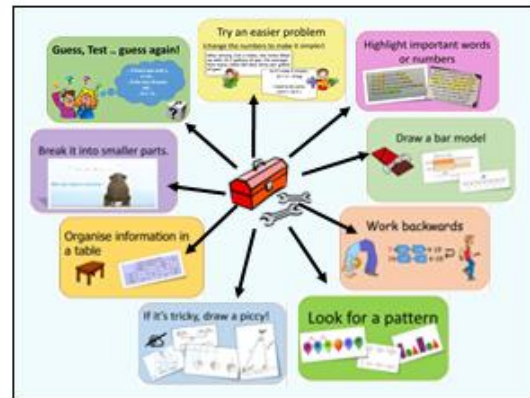


Break it into smaller parts.



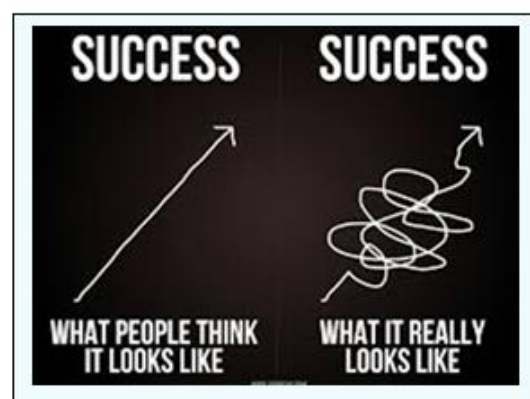
Guess, Test .. guess again!



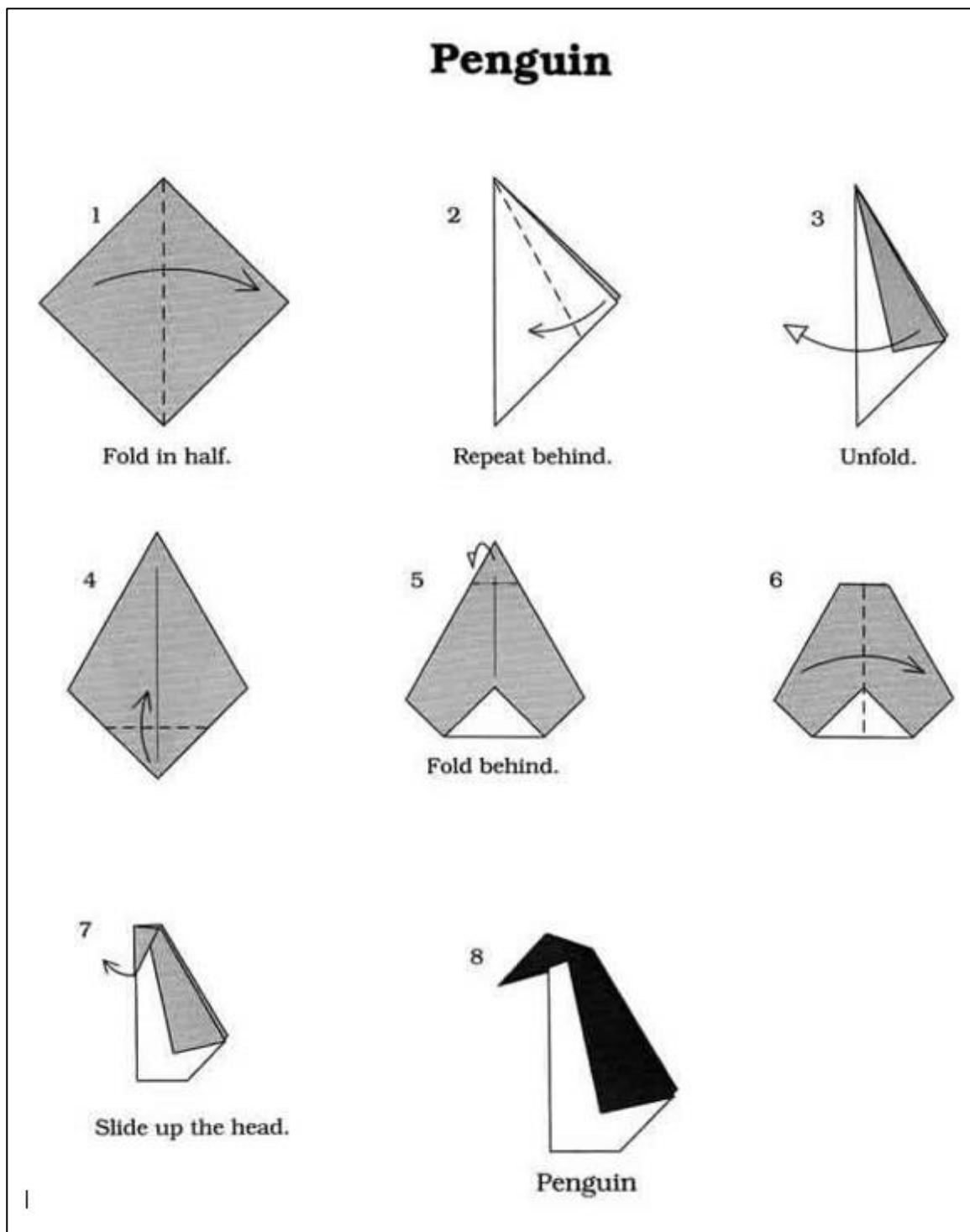


First
Attempt
In
Learning

Sometimes what we call
"failure"
 is really just that necessary struggle
 called learning.



Appendix 7 CPD SESSION 2 – THE POWER OF YET! – Penguin Instructions



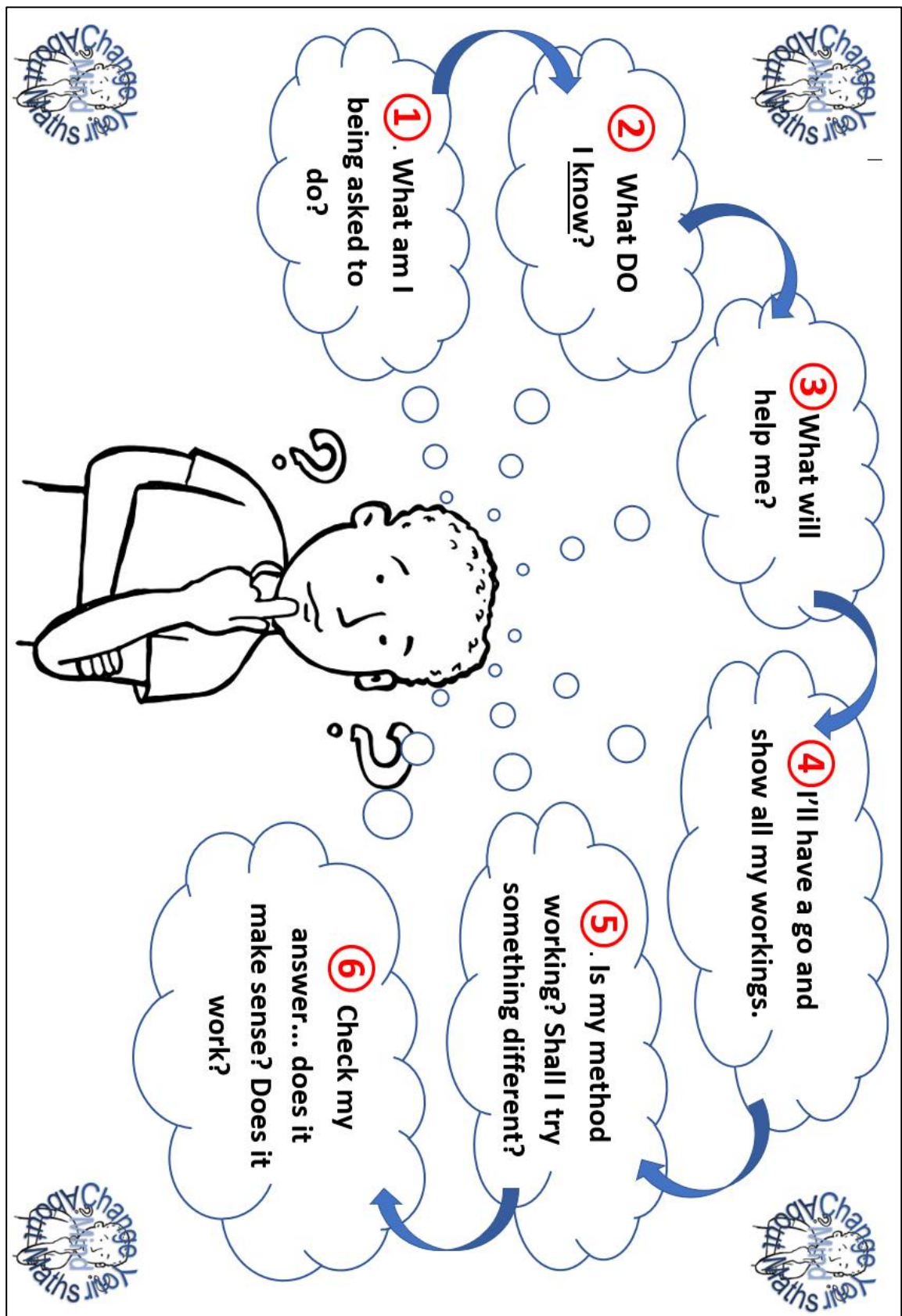
Growth Mindset or Fixed Mindset?

Discuss

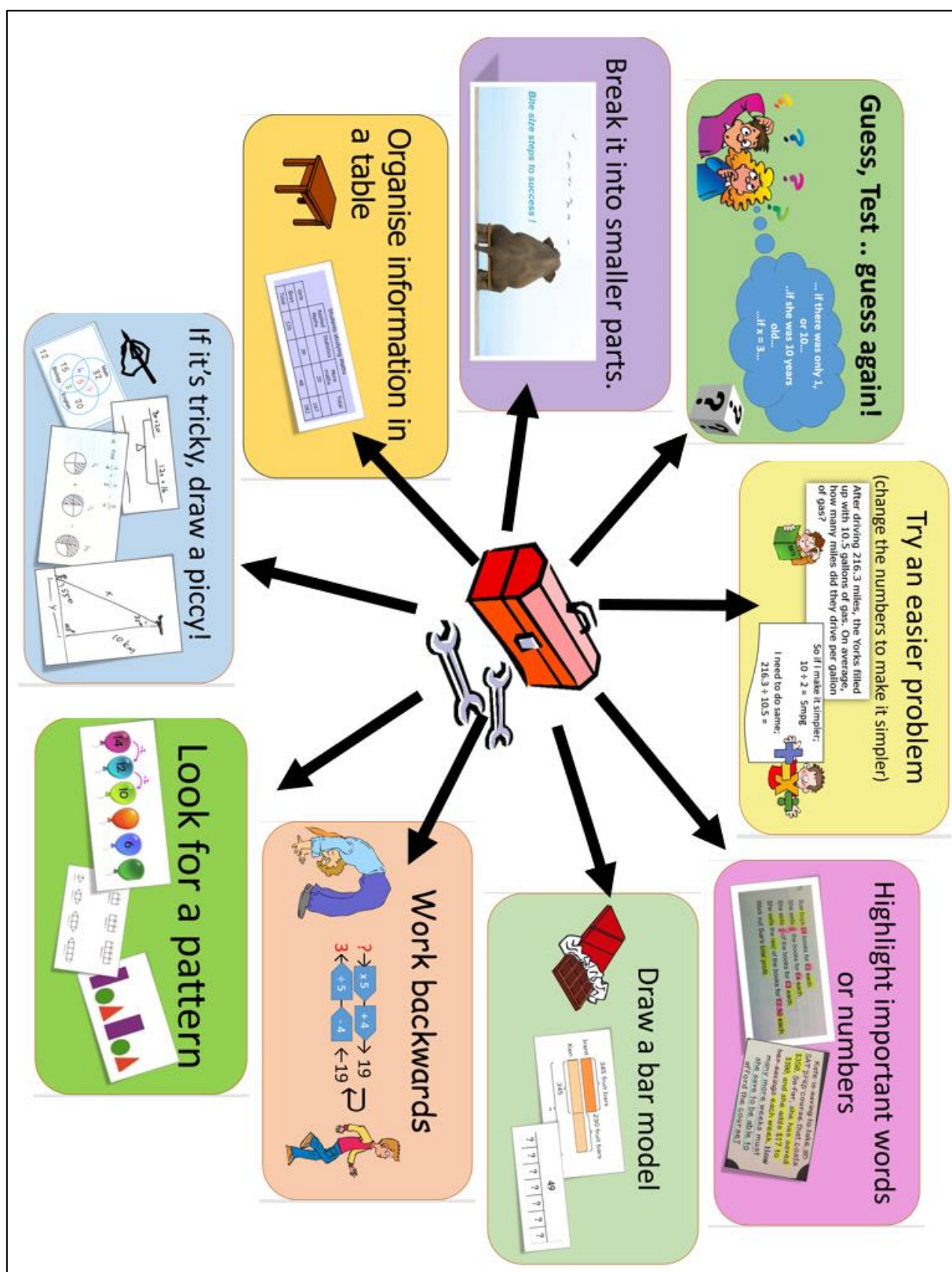
Write 'G' by those which you think show someone with a Growth Mindset.
Write 'F' by those you think shows someone with a Fixed Mindset.

1. "I'm just not good at Maths"
2. "I can't do it"
3. "I just have to try harder"
4. "I can't do it yet"
5. "I'll probably mess up, so I won't do it"
6. "I'll give it a try. I guess I'll learn from my mistakes"
7. "School was just too hard for me, I didn't like it"
8. "I don't put my hand up because I might be wrong"
9. "I like answering the questions I know the answer to"
10. "I didn't do well this time so I'll try revising a different way next time"
11. "It doesn't make sense to revise. I did last time and got a bad mark"
12. "Feedback makes me think how to improve, rather than upsetting me"
13. "I care more about the comments the teacher writes than the grade"
14. "I get annoyed if there is a comment from the teacher but no level"





Appendix 10 CPD SESSION 2 – THE POWER OF YET! – Tool Box Strategy Poster



Appendix 11 CPD SESSION 3 – GET OUT OF THE BORING ZONE! – Presentation Summary

So far we have seen how we can **grow** our brains through **practising...**

And how choosing the right **mindset** and **strategies** we can improve our performance in maths!!!



How do you feel about Maths?

Comfortable?

Somewhere in between?

Panicky!!!?



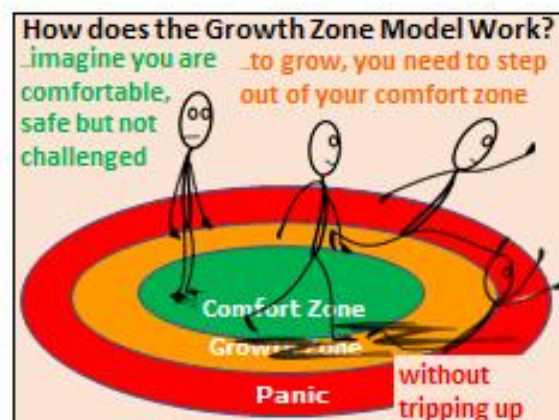
Get out of the BORING Zone!!

Today we are going to look at;

- ❖ Understanding the **Growth Zone Model**
- ❖ How to make **Progress**
- ❖ Why **Struggling** is good for you!



How do you feel about Maths?

Comfort Zone



safe, easy, comfortable, repetitive.
Not much happens here!

- : The comfort zone is where many of us operate.
- : It's where the skills we've already acquired sit.
- : Whilst it is comfortable, we can't make progress here, because it consists of the things we can already do easily.

Use this Zone to build confidence & practice, but don't stay too long!! It can be BORING!!

Over to you...

1. Work in pairs.
1. Read the card,
1. Discuss, What zone this would put YOU in?



Panic Zone

Anxious, stressed, afraid, frustrated
Fight or Flight or Freeze!



- : Have you ever become so anxious you can no longer think, you've probably hit the **Panic Zone!**
- : In the panic zone activities seem so tough that we don't even know how to approach them.
- : You feel uncomfortable and possibly discouraged.
- : You can't make progress in the panic zone, because what is being asked is out of reach **AT THE MOMENT**.
- : Little or no learning can take place.



Comfort Zone: safe, easy, comfortable, repetitive. The comfort zone is where many of us operate. Nothing much happens here. Whilst the comfort zone is comfortable, we can't make progress or build skills in the comfort zone as it consists of the things we can already do easily.

Growth Zone: Learning with good challenge, exciting opportunities, supported and still safe. The growth zone is where we learn new skills and build confidence. It's where we stretch ourselves and learn to cope with challenges. It's where we make progress and build skills in the comfort zone as it consists of the things we can already do easily.

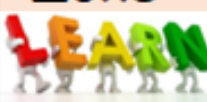
Panic Zone: Anxious, stressed, afraid, frustrated. Fight or Flight or Freeze! In the panic zone activities seem so tough that we don't even know how to approach them. You feel uncomfortable and possibly discouraged. You can't make progress in the panic zone, because what is being asked is out of reach AT THE MOMENT. Little or no learning can take place.

Growth Zone

Where the magic happens!

Learning with good challenge, exciting opportunities, supported and **still safe**.

The Learning Zone
 : Make progress by choosing tasks in the **learning zone**.



- : Skills that are just out of reach are in the **learning zone**; not too hard or too easy.
- : Safe to make mistakes, get stuck, get support
- : Should make you a bit tired.



Comfort Zone: safe, easy, comfortable, repetitive. The comfort zone is where many of us operate. Nothing much happens here. Whilst the comfort zone is comfortable, we can't make progress or build skills in the comfort zone as it consists of the things we can already do easily.

Growth Zone: Learning with good challenge, exciting opportunities, supported and still safe. The growth zone is where we learn new skills and build confidence. It's where we stretch ourselves and learn to cope with challenges. It's where we make progress and build skills in the comfort zone as it consists of the things we can already do easily.

Panic Zone: Anxious, stressed, afraid, frustrated. Fight or Flight or Freeze! In the panic zone activities seem so tough that we don't even know how to approach them. You feel uncomfortable and possibly discouraged. You can't make progress in the panic zone, because what is being asked is out of reach AT THE MOMENT. Little or no learning can take place.

You need to take baby steps to **PROGRESS**

You will need to **STRUGGLE** a little, to **LEARN**



Which Zone Are You In?



Use the Cards to let me know!

You will need to **STRUGGLE** a bit to really **LEARN**



Working in pairs, can you decide in which zone these comments belong?

A teacher's job is not to make work easy. It is to make it difficult. If you are not challenged, you do not make mistakes. If you do not make mistakes, feedback is useless.

John Hattie

Appendix 12 CPD SESSION 3 – GET OUT OF THE BORING ZONE! – Summary Handout

	Comfort Zone: safe, easy, comfortable, boring, repetitive. The comfort zone is where many of us operate. Nothing much happens here. While the comfort zone is by definition the most 'comfortable', we can't make progress or build skills in the comfort zone since it consists of the abilities we can already do easily.
Growth Zone: Where the learning happens! good challenge, exciting opportunities, supported and still safe You can only make progress by choosing activities in the learning zone. The skills and abilities that are just out of reach are in the learning zone; they're neither so far away that we panic nor close enough where they're too easy.	
	Panic Zone: Anxious, stressed, afraid, frustrated. Fight or Flight or Freeze! If you've ever become so anxious you can no longer think, you've probably run into the panic zone. Activities in the panic zone are so tough that we don't even know where to start. You feel uncomfortable and discouraged. Like the comfort zone, we can't make progress in the panic zone. You may be in the panic zone when attempting something dangerous, or far beyond your reach.

Appendix 13 CPD SESSION 3 – GET OUT OF THE BORING ZONE! – Situation Cards

I forget my password.	I am doing something for the first time.
I do something wrong.	I have an argument with a friend.
I am taking a maths test.	I lose a game/competition.
I lose my phone.	I am going for an interview.
I have to hold a spider.	I am learning to drive.
I trip up and fall over in front of people.	I make a mistake in a lesson.
I am chatting with my friends.	I plan a holiday with my friends.
I spend time on my phone in my bedroom.	I have to enter a room full of strangers alone.
I don't understand what the teacher has asked me to do.	I have to sit next to someone I don't know.

without a calculator, work out 0.67×0.49	without a calculator, work out 10×8
without a calculator, work out 0.2×0.4	without a calculator, work out 800×4000
without a calculator, work out $\frac{5}{8} + \frac{7}{3}$	without a calculator, work out $\frac{3}{4} \times \frac{2}{3}$
Wordy questions with lots of numbers.	Questions about graphs
Find 86.7% of £564.34	Simplify, $m+m+m+m+m$
Solve $a + 5 = 11$	Solve $3a - 9 = 12$
Solve $5a - 37 < -12$	A circle has a diameter of 10 cm, find the Area.
Write 76 000 000 in Standard form	Work out an estimate for the value of $(0.49 \times 0.61)^2$
Evaluate $6 + 4 \times 3 =$	Work out $5 - 2 \times (8 - 5)$

Appendix 14 CPD SESSION 3 – GET OUT OF THE BORING ZONE! – Target

