

Mathematical Resilience Conference Programme

4th – 5th March 2016

Hosted at Scarman House, University of Warwick Conference Centre

Friday March 4th 2016: Morning session

9-10am	Registration			
10-11am	<p>Welcome: setting the scene</p> <p>Mathematical resilience and Teaching for Mathematical Resilience</p> <p>Parenting for Mathematical Resilience</p> <p>Coaching for Mathematical Resilience</p>	<p><i>Sue Johnston-Wilder</i></p> <p><i>Clare Lee</i></p> <p><i>Janet Goodall</i></p> <p><i>Phil Dent</i></p>		
11am	Coffee			
	Concurrent session 1 (30 minute presentations)			
	Venue:	Session Chair: Clare Lee	Venue:	Session Chair: David Sheffield
11.20-12.50	<p>Alison Barnes – Perseverance in Mathematical reasoning</p> <p>Sandra Quinn – Building Resilience through a growth mindset</p> <p>Steve Russ and Heng Chonchaiya – Blending Classroom and Computing Activities for Mathematical Resilience by Making Construals</p>	Teaching for mathematical resilience	<p>Sue Johnston-Wilder – Coaching for Mathematical Resilience</p> <p>Sarah Richards – Developing growth Mindsets</p> <p>Joyce Nyama – Students' perceptions of mathematical resilience</p>	Coaching for Mathematical Resilience
13.00	Lunch			

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Friday March 4th 2016: Afternoon session

	Concurrent session 2			
	Venue:	Session Chair: Sue Johnston-Wilder	Venue:	Session Chair: Tom Hunt
14.00-15.30	Andrew Croft - Talking to build mathematical resilience Eleanor Willard - Number sense processing in Adolescents affects on attitude Gaye Williams - Building Resilience to Improve Mathematical Problem Solving	Teaching for mathematical resilience	Meena Kotecha –Addressing Mathematics and Statistics Anxiety in Non-specialist University Students Janine Brindley – Developing Mathematical Resilience with Student Teachers	Teaching for Mathematical Resilience - Beyond School
15.30	Tea			
	Plenary sessions in the Main Lecture Theatre session chair: Clare Lee			
15.50 – 16.00	From the Union point of View	<i>Justine Mercer, UCU</i>		
16.00-16.30	Resourcefulness for mathematical resilience?	<i>Dr Els De Geest, National Numeracy</i>		
	End of Day 1			
7pm	Conference Dinner in the Lakeside Restaurant			

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Saturday 5th March 2016: Morning Session

8:30	Registration for day delegates			
	Plenary session		Session Chair: Sue Johnston-Wilder	
9.00	Mathematical Resilience and related constructs around the World		Gaye Williams, Deakin University, Australia	
	Concurrent Session 3			
	Venue:	Session Chair: Clare Lee	Venue:	Session Chair: Meena Kotecha
9.45	Update on Teacher Toolkit for mathematical resilience	Mark Leadbeater		Shirley Conran, Maths Action
	Concurrent Session 4			
	Venue:	Session Chair: Steve Pardoe	Venue:	Session Chair: Jane Marsh
10.10	Seliat Agboola – The Maths Pit Peter Gilbride – Improving the Resilience of Students, Staff and Parents	Teaching and parenting for mathematical resilience	Tom Hunt and David Sheffield	Brief Interventions for Maths Anxiety
11.10	Coffee			
	Concurrent session 5			
	Venue:	Session Chair: Els de Geest	Venue:	Session Chair: Karen Walker
11.30	Tim Jay - Workshops for parents of primary age pupils Katie Baker - Teaching parenting for Mathematical Resilience Rosemary Russell - Parenting for Mathematical Resilience – how do we engage parents?	Parenting for mathematical resilience	Steve Pardoe/Jane Marsh The challenge of Mathematical Resilience in Further Education Marie Szyndler – Why do need to change the Mathematics Culture in Schools?	Working to develop Mathematical Resilience in Further Education
13.00	Lunch			

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Saturday 5th March 2016: Afternoon Session

	Concurrent session 6			
	Venue: Session Chair: Meena Kotecha	Session Chair: Mark Leadbetter	Venue:	Session Chair: Sue Johnston-Wilder
13:45	Clare Lee – how do people develop mathematics anxiety? Chris Chisholm – Strategies for developing Mathematical Resilience	Developing mathematical resilience	Gaye Williams - Identifying Resilience Through Talk and Actions Shirley Conran, Maths Action	Action for Mathematical Resilience
	Plenary Sessions in the Session chair: Clare Lee			
14:45			<i>Steve Chinn</i>	
15.45 – 15.50	Tea			
16:00	Plenary and question time		<i>Tim Jay, Janet Goodall, Steve Chinn</i>	
16:30	End of Day 2			

Contributors and Abstracts

Ordered by first name

Alison Barnes, University of Brighton

Perseverance in mathematical reasoning: exploration of the 'difficulties' experienced by a group of children in year 6

This presentation explores the nature of 'difficulties' encountered by a group of 10-11 year old children in persevering in mathematical reasoning. Three vignettes illustrate how the children did not appear to experience barriers to persevering in mathematical reasoning as difficulties. Moreover, whilst the children appeared to exhibit general perseverance behaviours, these did not necessarily result in perseverance towards a line of mathematical reasoning. The presentation considers the implications of these findings.

The data arose from a small-scale study that sought interventions to improve children's perseverance in mathematical reasoning. The research took place in two year 6 classes in different schools. In each school, four children, selected by the class teacher based on their limited capacity to persevere in mathematical reasoning, formed the study group.

Andrew Croft

It is generally acknowledged that increased abilities in effective mathematical verbal communication improve conceptual understanding, self-efficacy and mathematical resilience. (Boaler, J. 2009; Johnston-Wilder, S. & Lee, C. 2010). We (classteam and I) felt we were not effectively targeting our (KS3/4) students' mathematical talking skills, which was forming a barrier to developing their mathematical resilience.

We embarked on a six month Action Research study to increase effective mathematical verbal communication in our classroom. Communication was evaluated using the traditional transmission model; social interactional approaches; knowledge of language acquisition (Sundberg's (2008) VB-MAPP extensions of Skinner's Verbal behaviour research in particular); critical theory and through research on dialogic talk (Neil Mercer's research in particular). Separate focus groups with students, teaching staff and support staff identified barriers to verbal communication and strategies to promote effective classroom talk. The class team noticed initially that classroom talk was not mathematical unless it was requested/assessed. Skinner's theories argued that tacts (nouns) and mands (requests) are developed prior to intrapersonal skills, so games and activities that required the use of the targeted mathematical vocabulary to succeed helped to build the students' skills. As time progressed, we began to see evidence of the class structures moving away from the traditional 'IRF' exchanges to increased discussion. Flatter power structures (e.g. arranging for manipulatives to be freely available and increased choice when choosing work) contributed to situations where student talk was valued more highly. Other barriers (such as 'bubble factor', paucity of experience, fixed views on 'what Maths is') were mitigated with strategies such as more defined visual and tactile scaffolding, time to think, humour. I feel that this is a starting point for us in nurturing mathematical resilience within our students. Exploring socially and culturally relevant ways of exploring the value of Maths with them is our next step.

Chris Chisholm, Assistant Principal, Hind Leys College

As a teacher of GCSE Mathematics who mostly work with students on the C/D borderline and below I am always looking for different ways of helping them gain the mathematical understanding to achieve a 'Good Pass' and have the skills required to support them in their future studies and careers. Analysis of my classes' papers have found that these students struggle mostly on the problem solving style questions. To help me understand more the barriers encountered by these students when working on this style of questions and what can be done to overcome these barriers I

am currently working on an action research project as part of my Doctorate in Education. Initial analysis has shown that fear of failure and lack of confidence in how to proceed are two of the main barriers to them attempting to work through this style of question. During the action research I have used the ideas of Guy Claxton to have two learning objective each lessons; one related to the mathematical content and the other related to the development of resilience. In the early stages of the research, it became clear that supporting students in developing a toolbox of strategies to use when they became stuck would be a good way of overcoming one of the main barriers I had identified. I found that simple strategies such as having a 'stuck poster' that they have developed themselves displayed on the wall allowed them to approach difficulties with more confidence.

Clare Lee, Open University

Developing Mathematical Anxiety - what the stories of six women tell us.

In this paper I will review the narratives of six professional women who have developed and overcome mathematics anxiety to gain insights into how anxiety develops and how it is mitigated

David Sheffield and Tom Hunt, University of Derby

Brief interventions to help cope with maths anxiety

In our presentation, we will review evidence that brief interventions can help children and adults with high maths anxiety. We will also describe our work on brief interventions. We will discuss how maths anxiety influences calculation processes along with how systematic desensitization and writing interventions can alleviate anxiety and improve self-efficacy and maths performance. Finally, we will discuss how these interventions may be integrated into curricula.

Eleanor Willard, Leeds Beckett University

This research is part of a three year project which focuses on the psychological effects of having issues with number sense processing in adolescents. Research suggests that this processing problem can affect their achievement in mathematics (Halberda 2008, Libertus 2011, Starr 2013), and can potentially therefore affect their psychological well-being. The research considers the perspectives of secondary age children with number sense difficulties and how these feelings compare with students who do not experience such problems. A struggle in the mathematics classroom brought about by processing difficulties may lead to far-reaching effects in many areas of life. Work on other learning disabilities such as dyslexia (e.g. Gunnell Ingesson, 2007) indicates this may be so. Q sort methodology was used to explore attitudes and aspirations of those highlighted to have number processing issues, those who have difficulties with mathematics but no processing issues and a group who were competent at mathematics. Students were identified initially by screening Key stage 3 students (n=375) at a school in the UK using a dyscalculia screener. The subsequent Q sorts were conducted on 36 students in total. Findings suggest that there are both optimistic and negative outlooks and attitudes from students who have mathematical difficulties, and that those who have problems processing mathematics are most likely to have a pessimistic viewpoint towards mathematics learning and their future. There are also effects from their mind-set and their perceived ability level as compared to their peers within their classes. However, it is also noteworthy that there were also negative attitudes expressed from mathematics competent students. This indicates that good ability is no guarantee of confidence and positivity towards mathematics.

Els de Geest, National Numeracy

Resourcefulness for mathematical resilience?

Gaye Williams, Deakin University, Australia

Mathematical Resilience and Related Constructs Around the World

Resilience has been recognized as crucial to well being, quality mathematics learning, and the inclination to problem solve mathematically. Various terms have been used for resilience associated with learning including academic resilience, mathematical resilience, optimism, and optimistic problem-solving orientation. Resilience has been theoretically framed psychologically, socially, cognitively, and as a multi-faceted theoretical construct. Terms such as 'self-efficacy', 'confidence', 'persistence', and 'perseverance', have been employed when describing resilience, and features of 'telling identities', and 'flexible mindsets', and characteristics of motivation have been identified as fitting in different ways with resilience constructs. Gaye draws on illustrations from her own research in comparing and contrasting various constructs, and linking them *where she can see how to do so*, to her own theoretical perspective: 'optimistic mathematical problem-solving activity'. She also ponders over constructs she has not yet been able to link. This plenary address is intended to stimulate discussion about interrelationships between the many constructs that have been formulated and applied to resilient mathematical activity. Gaye's intended purpose is that, in doing so, we can extend our understandings of the role of resilience in mathematics education and increase the likelihood that we can position resilience at the forefront when factors affecting mathematics learning are under focus.

Resilience building occurred during a three-year longitudinal study of the role of resilience in collaborative problem-solving in mathematics, as students progressed through upper elementary school in two Australian schools. Resilience-building situations were identified and reflected upon to identify influences upon them. The researcher (Williams, 2014), who team taught with each class teacher, was the primary implementer of the unfamiliar challenging problems, and is considered to be the teacher practitioner for the purposes of this paper. The Engaged to Learn Approach employed was developed by her as a teacher (Barnes, 2000) and refined through her research. It involves cycles of small group brainstorming and whole class feedback as the class builds a 'patchwork' of mathematical understandings whilst working with complex problem-solving tasks. Deep mathematical understandings have been developed employing this approach in elementary and secondary schools. The practitioner's (as researchers) video-stimulated post-lesson interviews with students, and class teachers, supported her reflection which was theoretically framed by her intention to build resilience (optimism) (Seligman, 1995) during flow situations (Csikszentmihalyi, 1992). Flow is a state of high positive affect during creative activity that Seligman associated with resilience building. Elements of the Engaged to Learn Approach were found to enable students to draw idiosyncratically on the ideas of others in the class during their process of entering flow and creatively developing mathematical insights (successes) as a result.

Gaye Williams, Deakin University, Australia

Building Resilience to Improve Mathematical Problem Solving

This paper explores the question: "Can the Engaged to Learn Approach to learning mathematics build resilience, and does problem solving capacity improve as a result?" This question is examined using a subset of data from a three-year longitudinal video-stimulated post-lesson interview study of students as they progressed through upper elementary school undertaking mathematical problem solving through this approach. Case studies of students who became more resilient over time were developed. It was found that student problem-solving capacity improved and that 'just doing the

tasks' was reported by students as key to their changed orientation to mathematics. This study contributes to the body of knowledge on the need to attend to psychological factors to support improvement in mathematics learning.

Gaye Williams, Deakin University, Australia

Workshop Title: Identifying Resilience Through Talk and Actions

Participants will be introduced to a framework for identifying resilience (optimism Seligman, 1995) through analysis of student and teacher talk and their mathematical and pedagogical problem solving actions (respectively). Participants will identify indicators of resilience or lack of resilience by using this framework to examine the 'talk' of their children, their students, other teachers, or even their own self-talk,. Student and teacher interviews will be analysed to identify optimistic and non-optimistic indicators, and student problem solving activity will be interrogated to gain insights into the role of optimism in group activity. The workshop will culminate in a discussion of key ideas participants take away from the workshop and how they might be useful to them in the future.

Katie Baker, Edukate

This paper details the author's experiences promoting parenting for Mathematical Resilience (MR) as a self employed, self-motivated mathematics ambassador. Its' focus is a pilot course, run in Spring 2015, incorporating the teaching of parenting for MR into an existing course. The pilot involved teaching a group of four parents' of students in Year 1 techniques their children would learn in school, in parallel with principles of parenting for MR. In a conscious attempt to move away from the formal and often intimidating atmosphere of many classes for parents, the course took place in the participants' homes including coffee, cake and discussion as well as more traditional elements in which parents were required to use techniques their children would be using. An online community was also established. The participants and their children were assessed pre and post course using the Betz Maths Anxiety (MA) Scale, the Kooken MR Scale and an adaptation of this scale devised by the author for use with children. Parents also completed questionnaires on mathematical interactions with their children. The data showed an improvement in the MR scores of all the parents with a mean improvement of 14.5%. Particular improvement was shown in the area of Growth (19%). Reported interactions with their children showed a 41% increase, of particular note was the fact that they recorded more conversations around mathematics that did not centre purely on homework. The MR scores of the children showed an improvement of 9.5% although causality could not be proven, as no control group was available. The pilot was on a very small scale and thus conclusions are tentative but data and participant feedback suggest that the course has promise as an effective way to teach parenting for MR. The paper discusses which aspects were successful and how they could be developed.

Janet Goodall

Parenting for Mathematical Resilience

Janine Brindley, University of Warwick Post-Graduate Student

A review of research about developing student teachers' awareness of mathematical resilient teaching approaches to promote mathematical resilience in their learners

Research in developing mathematical resilience is in its infancy. The focus for many is either developing personal mathematical resilience or giving coaches the voice, skills and belief that they can support others in their mathematical journey without the need to develop their own mathematical knowledge. This research focused on student teachers of mathematics. To introduce them to the

pragmatic construct “mathematical resilience”, as described by Johnston-Wilder and Lee (2010) and open a collaborative working group to develop teaching approaches that can be employed in the classroom to support learners to develop mathematical resilience.

The aims of the course the student teachers were offered were to:

- Develop personal mathematical resilience,
- Develop empathy towards others’ reactions to mathematics,
- Develop and use mathematical resilient teaching approaches
- Report back on the impact mathematical teaching approaches had on their pupils.

This research was successful in highlighting;

- Teachers need time to develop teaching approaches to support developing mathematical resilience in their learners
- Teachers need to acknowledge and understand what affective factors influence learning and be able to take action to support learners in overcoming the negative effects of these factors,
- Teachers need time to develop belief in the potential for change in their learners

Joyce Nyama

Investigating the role of Q Methodology in understanding students’ perception of their mathematical resilience

My research uses Q Methodology to explore the construct of mathematical resilience. It seeks to investigate the role of Q Methodology in understanding student’s perception of their mathematical resilience-mathematical resilience as lived in their own shoes.

I am a secondary school teacher of mathematics whose research interests are on ways that we can help/alleviate negative experiences in the mathematical learning journey which would help our students be more successful.

Work by Johnston-Wilder & Lee (2010) as well as Kookken et al (2015) were major influences for my choice of construct. My choice of methodology was influenced, initially, by Brown (1980)’s work on the study of subjectivity and more recently by Stephenson (1953)’s book ‘The study of behaviour’.

I will share my experience so far from a pilot study I carried out using Q Methodology to gain a deeper understanding of students’ views on their mathematical learning journey in general but mathematical resilience in particular. The pilot involved a group of Year 10 students completing a sorting task, q sort, in line with a q methodology technique and an analysis using the PQMethod software, a specialist software package for q methodology analysis. The analysis generated ‘factors’ that described an individual’s student’s view of their mathematical learning journey. This pilot study gives a snippet of the usefulness of Q Methodology in studying mathematical resilience.

Marie Szyndler, Foxford School

Why we need to change the maths culture in schools?

This session will explore the issue of the recruitment of maths teachers over the last 50 years including tried, tested and failed strategies! The increasing pressures on maths teachers with changes to specifications, performance tables and the Ofsted framework and how this translates to classroom practice. Most importantly the impact of these changes on students, anxiety, resilience and the urgent action needed to support children to become numerate and mathematically resilient. The challenge then is how we make this a reality given the issues schools face, but keeping at the heart of the matter why we need to change our approach to maths and numeracy.

Mark Leadbeater

Towards a Classroom Toolkit for Mathematics Resilience

How can we use the ideas and language of Mathematical Resilience in the classroom? How can we encourage students to understand and accept that struggle is an essential part of learning? How can we enable them to recognise the difference between the ‘struggle zone’ and panic? Is it ever appropriate to be in the Comfort Zone during a Mathematics lesson? How does Resilience relate to Mastery?

I am a secondary school Mathematics Teacher and, following attendance at a training day and the Shard Symposium on Mathematical Resilience, I have been trialling various ideas and approaches to encourage Mathematical Resilience in my classroom and with other members of my department. I would like to lead a practical session at the conference in which classroom practitioners can share their experiences with the intention of developing a Mathematical Resilience Toolkit. This might include

- designing display work
- discussing the language we might use when talking about Mathematical Resilience
- developing activities that will help students (and their teachers) to explore the far reaches of the Struggle Zone.

Meena Kotecha, London School of Economics

Addressing Mathematics and statistics anxiety in non-specialist university students

I would argue that it is a challenge all academics involved with delivering courses related to these disciplines face to a certain degree. “Mathematics and statistics anxiety” is one of the main issues in these student cohorts, which obstructs their engagement with the courses. I would like to share some of the features of a teaching practice developed during my longitudinal interdisciplinary study conducted to understand and address this challenge. Applicability of these features is not limited to teaching mathematics and statistics; educators from all related disciplines should be able to apply the proposed techniques to their respective areas such as operational research methods. Furthermore, it should be of interest to educators from disciplines such as social sciences, as well as researchers and all interested in the theme.

Peter Gilbride, Midlands Academy’s Trust

I work for a trust where maths is historically an issue and am working to improve the resilience of students, staff and parents in order to raise the profile of maths.

Rosemary Russell, AR & RR Education Ltd

Parenting for mathematical resilience: how do we engage with parents?

Title: Abstract: Russell’s research (Russell, 2002) found parents were struggling in various ways to support their children’s learning of mathematics. Parents’ desire to help their children is a powerful motivator for many adults to engage with educators and this presents an opportunity to prevent harmful attitudes to mathematics being passed on to the next generation. Developed over thirty years, Russell has designed a Maths for Parents course to attempt to meet these needs. Results following the course have been encouraging. There has been an improved attitude to mathematics from some participants when comparing pre and post – course questionnaire responses (Russell, 2014). This paper looks at the Maths for Parents course, and lessons to be learnt for practitioners when giving support to parents in helping their children with mathematics and developing mathematical resilience in parents. The paper reports on the latest developments in making the course available. REFERENCES Russell, R. A. (2002). Parents Helping Their Children With Mathematics. Bristol: University PhD Thesis. Russell, R. (2014) ‘So Chuffed’, Blog Maths 4 Mums and

Dads, July 2014 http://maths4mumsndads.blogspot.co.uk/2014/07/so-chuffed_18.html

Sandra Quinn, Trinity School, Carlisle.

Presentation on strategies being used and developed on building resilience through the language and behaviours associated with a growth mindset in lower middle ability students in Key Stage 3

Sarah Richards, Abingdon and Whitney College

Practitioner research on developing growth mind sets with GCSE re-sit students.

Many GCSE maths resit students at our college have a poor relationship with maths. Their school experiences have left them dispirited and with the belief that they can't do maths. We decided to investigate the impact of challenging their beliefs. Our intervention was inspired by the Jo Boaler (Stanford University) MOOC, 'How to Learn Math for Students'; The students were explicitly taught about brain plasticity and that mistakes, challenging oneself, struggle and perseverance were a vital part of learning. It was also stressed that it was important to work thoughtfully rather than quickly. Attitudinal surveys applied pre and post course indicated that most felt more positive about maths and confident in their abilities at the end of the year. It is likely that this new found faith in themselves and hard work is quite fragile. Students often said that they had worked hard but had still failed. This may have been due to an over dependence on memorisation and other inefficient strategies. It is not sufficient to develop a growth mind set unless the students are concomitantly developing skills and beneficial working practices.

Seliat Agboola

The Math Pit

I would like to present an action research project I am currently working on implementing in the classroom. It is called The Math Pit and more information can be found on this website: www.themathpit.org The overarching aim of this project is to help students develop mathematical resilience and embrace challenge. In brief the whole initiative has three components to it: - classroom activity, interschool competition and bespoke mentoring. Classroom activity: The Math Pit is a collaborative real world mathematical challenge which requires pupils to dig themselves out of a learning pit autonomously. Pupils are put in a challenging, unfamiliar situation in which they must 'strategise' to solve a real world mathematical problem – thus getting themselves out of 'the pit'. Pupils are assigned personal roles: facilitator, recorder, verifier and resource manager. Some areas of research that I have drawn on: Metacognition, connectionist teaching, self-efficacy (Bandura mainly). I am now conducting an interschool action research project after investigating the pedagogy within my classroom. I would welcome the opportunity to discuss and share, critique the work that I am doing.

Steve Chinn, University of Derby

Steve Pardoe WMCETT and Jane Marsh EMCETT (FE) with Karen Walker

Applying mathematical resilience in the Further Education Sector

Since 2013, educational policy in England has dictated that all young people should continue to study mathematics until the age of 19, with a specific emphasis on the achievement of a high grade (A*-C) at GCSE. For many young people entering vocational training programmes in FE colleges and other training providers, this has necessitated revisiting a subject with which they have a history of failure, and which they often see as abstract, difficult and meaningless – in many cases provoking anxiety that can manifest itself as disengagement and disruptive behaviour. At the same time FE

colleges and training providers themselves face shortages of maths teachers, which has led to a need to rapidly up-skill or re-skill teachers of other subjects – many of who need to develop their own mathematical resilience. Paradoxically, this may make them best positioned to help students' overcome their barriers.

This paper argues that the ideas and approaches of mathematical resilience provide a model well suited to the unique challenges currently facing FE students and staff in England. It goes on to describe an initial attempt to introduce and develop teaching for mathematical resilience through a CPD programme for maths teachers and maths trainers in the sector, and how this might be evaluated and extended in the future. As part of the ETF maths support programme 2015/16 for the FE and skills sector we are delivering pilot courses in maths resilience training. The paper will discuss the nature of the course and how it addresses the specific issues which apply in this sector (to include - non subject-specialist tutors and assessors, working with learners who have 'failed' during their school years); immediate feedback from participants, case studies of tutors in the sector and any impact measures which can be included by the time of the conference.

CPD for teachers in the FE and Skills sector delivering maths learning to young adults has generally focused on cognitive approaches – using active and collaborative teaching methods to develop and extend the subject knowledge of the workforce and to model techniques to involve learners and deepen their conceptual understanding. Since December 2015 we have been piloting CPD courses across the Midlands to complement this by focusing on the affective domain. These one day and four day maths resilience courses will be the focus of our presentation at the conference. Our contribution will be to:-

- Provide detail on the content and structure of the CPD courses we have been offering
- Reflect on the feedback we have received from participants
- Examine how the work is being extended through the creation of small groups of tutors undertaking action research with their own learners in their own organisations
- Consider what the next steps may be in the FE and Skills sector.

Steve Russ, University of Warwick, and Heng Chonchaiya, Burapha University, Thailand

Blending Classroom and Computing Activities for Mathematical Resilience by Making Construals

Experience shows that practical classroom activities can be more effective than abstract mathematical exercises in enhancing students' mathematical skills and developing their mathematical resilience. Motivation and engagement are also promoted by learning mathematical concepts that relate to familiar activities, such as playing noughts-and-crosses or shopping. However, classroom activities typically take a great deal of time and effort to prepare and are hard to adapt. To address these limitations, some practitioners turn to electronic support. That said, conventional software development is problematic because it requires special expertise, and also requires a large investment in time and effort. Even after building up a collection of electronic resources, to add or adapt activities may entail redesigning from scratch. In this talk, we shall introduce an alternative approach to creating electronic learning resources based on 'making construals'. We shall demonstrate that by making a construal of a single topic, such as 'giving change', or Donald Michie's Matchbox Educable Noughts and Crosses Engine (MENACE), we can readily derive interesting related classroom activities for primary and secondary mathematics education. These can introduce abstract mathematical concepts, such as pattern recognition, statistical analysis, understanding symmetry and motivate these with reference to more practical topics, such as game design, game-playing strategies and machine learning.

See <http://www.construit.org/> and also

http://blogs.warwick.ac.uk/maths_resilience/entry/marys_paper_now/

Sue Johnston-Wilder, University of Warwick

Developing coaches for mathematical resilience

This paper reviews the evidence that adults and older learners with mathematics anxiety can learn to manage their own anxiety and to coach peers and other learners in managing the negative emotions and risks which many people face when learning or being required to use mathematics.

When adults develop their own personal mathematical resilience in a safe and collaborative environment, reflecting on and managing their own reactions to mathematics, they can become positioned to enable others to approach learning mathematics resiliently and to find the resources to overcome barriers to learning and using mathematics.

The paper is exemplified using two courses that have been developed and piloted with The Progression Trust and ASDAN.

See also

http://www2.warwick.ac.uk/study/outreach/activities/partnerships/heat/stem/maths_resilience/

Tim Jay, University of Sheffield

This paper will report and discuss our experience of leading workshops for parents of 7-9 year old children in four primary schools. These were carried out as part of the Everyday Maths Project, funded by the Nuffield Foundation. The aim of these workshops was to empower parents to explore ways of sharing everyday mathematical talk and activity with their children out-of-school, in order to support their children's mathematics learning. This built on previous research showing that parents often find it difficult to engage children in mathematics tasks set by teachers, including homework (e.g. Peters et al. 2008; Jay et al. 2013).

The workshops encouraged parents to 'find the maths' in their everyday lives, and to explore ways of sharing this with their children. Discussions during the workshop sessions were audio recorded, and transcribed for analysis. This paper focuses on a particular feature of our analysis, where we observed some parents undergoing a transition from a school-centred conception of mathematics to a home-centred conception. Alongside this transition we observed evidence of increasing agency in parents' discussions of mathematics.

We argue that parental engagement (as opposed to parental involvement; Goodall & Montgomery, 2014) in children's mathematics learning can be limited by school-centred conceptions of 'mathematics'. We suggest that the workshops provided a route towards 'parenting for mathematical resilience' as they encouraged the development of parents' sense of ownership and agency with regard to mathematics thinking and learning.