



British Society for  
Research into  
Learning Mathematics

**BSRLM SUMMER DAY CONFERENCE 2024**

**SESSION HANDBOOK**

**LOUGHBOROUGH UNIVERSITY**

**Friday 7<sup>th</sup> June 2024**

## Plenary Presentation: Professor Matthew Inglis



Matthew Inglis is a Professor of Mathematical Cognition and co-director of the Centre for Mathematical Cognition at Loughborough University. His research aims to understand the cognitive processes involved in numerical thinking, logical reasoning, and mathematical practice. This work has been widely published across both psychology and education journals. Matthew was educated at the University of Warwick, where he obtained a BSc Mathematics, and an MSc and PhD in education. Following a period as a Research Fellow in the Learning Sciences Research Institute at the University of Nottingham, he moved to Loughborough as a lecturer in 2008.

### ***British Education Research, its Quality, and its Assessment***

In this talk I will report the results of a study where colleagues and I analysed the full text of all journal articles returned to the education subpanel of the 2021 Research Excellence Framework (REF2021). We identified 35 topics that collectively summarise the journal articles that research units selected for submission. The topics which units wrote about in their submitted articles collectively explained a large proportion – 84.1% – of the variance in the quality assessments they received from the REF’s expert peer review process. Interestingly, there were strong associations between what the subpanel perceived to be excellent research and the adoption of particular research methods or approaches. To check the wider applicability of the method we applied the model to REF2014 submissions, finding that our 2021 model could successfully predict the scores assigned by the REF2014 subpanel. Implications for mathematics education will be discussed. I hope these results will promote a discussion about the notion of research quality, and its assessment, in our community.

## Research papers, workshops and working groups

[Where there are multiple authors, \* is used to identify presenters]

Alcock, Lara; Sa, Rentuya

[PRESENTATION]



### ***Conditionals and implications in introduction-to-proof textbooks***

Mathematics uses conditionals – sentences of the form 'if A then B' – to express theorems and to justify steps in deductive arguments. But the material conditional, as used in mathematics, has peculiarities in relation to natural language, and the distinctions between propositional conditionals, universal conditionals and implications are not always clear. How are these issues dealt with in introduction-to-proof textbooks? We present a theoretically driven qualitative analysis of 16 textbooks commonly recommended at UK and US universities. We report on how these explain conditionals/implications, how they deal with the material conditional, and what commentary they offer on related language and reasoning. We then analyse three sources of ambiguity that might leave a student confused, relating our analysis to the semantics and pragmatics of the conditional in natural language and in mathematics.

Birkhead, Amy

[PRESENTATION]



### ***Agency and belonging: Analysis of the professional identity tensions of early career mathematics teachers***

In this presentation, I draw from a narrative inquiry in which early career teachers' stories of navigating tensions were used to understand their emerging identities as mathematics teachers. Tensions are common for new teachers, as their attempts to make decisions aligned with their own beliefs and values about the teaching of mathematics are facilitated or hindered by their school's culture, expectations, and accountability measures. I will share my approach to analysing their stories to illustrate the ways in which early career teachers make sense of any tensions and find ways to enact their agency. My approach attends to both thematic and structural analysis, including the linguistic and rhetorical form of the narratives. It also makes use of Clandinin and Connelly's three-dimensional narrative inquiry space, defined by sociality (the dialectic between the personal and social), temporality (past, present, and future imaginings), and place (in which experiences are lived and told). Analysis of these stories demonstrates that such tensions can result in a decline in a teacher's commitment to the school or to the teaching profession. A better understanding of the experiences of recently qualified teachers is of particular importance given the long-standing shortage of appropriately qualified mathematics teachers in secondary schools.

Bretscher, Nicola; Adler, Jill; Clark, Tim; Ghosh, Suman; Saunders, Piers

[PRESENTATION]



### *Investigating the use of mathematics teaching framework as a tool for developing a shared language in initial teacher education*

Our aim is to investigate how introducing a framework for teaching mathematics into the UCL PGCE Secondary mathematics programme supports student teachers' progress across the academic year. The purpose of introducing such a framework is to make more explicit and transparent (Lave & Wenger, 1991; Wenger, 1998) elements of mathematics teaching which the tutor team believe, based on our understanding of mathematics education research, are central to improving the quality of student teachers' instructional practices. By making these elements more explicit and usable, we expect the framework to provide a useful tool for negotiating meaning about what counts as 'good mathematics teaching' between tutors and students. Hence this project aims to investigate how the framework serves as a tool for developing a shared language between tutors and student teachers about mathematics teaching. Drawing on notions of situated abstraction and tool transparency, we will discuss initial findings based on analysis of course artefacts from two telling cases selected to illuminate whether and how they use elements of the framework to describe their mathematics teaching.

Coles, Alf; Sherman, Jen; Townsend, Vivien; Dale, Chris

[PRESENTATION]



### *Primary mastery specialism: from training to the classroom*

The NCETM, in collaboration with the University of Bristol, are engaged in an on-going project to evaluate the impact of Primary Mastery Specialist training, on the teachers who attend and also on their students. We aim to understand more about how messages around Mastery are understood by teachers, how they are operationalized in their classrooms, and any impact on students and on those teachers' work leading groups of teachers in their own schools. In this session, we will set out the methodology behind the study, drawing on Prediger's "three tetrahedron model" of professional development, to conceptualise the complex relationships between the activities taking place during Mastery training and the activities taking place in teachers' lessons. We will then offer a snapshot of our data, drawing out themes from the first residential training (which include the use of interactive whole class teaching, representations of mathematics and fluency) and how they manifested in the classrooms of the teachers on the training. We will end with our ideas on what next for our analysis and hope to gather thoughts on this from the audience.

Drury, Helen; Lloyd, Cheryl

[PRESENTATION]



***Excellence and equity in maths education: Maths Excellence Fund objectives, activities and evaluation approach***

The Maths Excellence Fund has been established to improve student attainment and progression in maths, increasing the number of students who are on track to succeed in A-level maths and beyond. Informed by the 2023 Maths Excellence Pathways report, it has a particular focus on high potential students from disadvantaged backgrounds, for whom studying maths can unlock significant opportunities. The Fund is supporting programmes that will be led by schools, universities and charities. Each programme will be independently evaluated to better understand which activities might improve student attainment and progress in maths, and to replicate best practice models. This session provides an overview of the first round of funding, focusing on its objectives, activities, and evaluation plans to promote mathematics excellence and equity in education, including understanding which activities can best support attainment and progress in maths.

Francome, Tom

[PRESENTATION]



***The nature of practising in mathematics***

Most teachers appreciate the value of practising but what do we know about effective practising in mathematics? In this session, I will talk about my doctoral research exploring the nature of practising in mathematics. I explored mathematics teachers' views on practising by analysing questionnaires, teacher interviews, and the practice tasks teachers used. From this, I identified four key findings regarding how teachers choose and use practice tasks. First, teachers tended to choose tasks that gradually increase in difficulty but often feel pressured and dissatisfied with their choices. Second, teachers often sourced practice tasks online so they were not necessarily part of a coherent journey considering beneficial strategies such as spacing, variation, and interleaving. Third, knowing the effective practice types is insufficient; translational research is needed to support teachers in understanding when, how, and why to use different forms of practice. Fourth, less choice and more support and guidance seemed effective when the shared material was sufficiently high-quality. I discuss some implications for research and practice.

Hall, Elizabeth

[PRESENTATION]



***Identification of active goal (in-the-moment motivation) formation during KS2 mathematics lessons.***

When considering general motivation in primary mathematics lessons a historical focus has been on long-term cognitive goals. However, there is growing evidence of the presence of active goal, or in-the-moment motivation, during the course of a mathematics lesson. It is recognised that teachers facilitate learning throughout the course of a lesson often by means of small steps. These small steps create a series of tasks, each with a distinct goal. This implies the teacher intends a set of small changeable active goals which pupils have the potential to adopt. However, there is potential an active goal formed by a pupil may diverge from the teacher's intended active goal. This study aims to understand the range of pupil active goals and reasons for pupil active goal formation within upper KS2. It uses the affective domain as a vehicle to explore the interplay between cognition, affect and conation. This case study focuses on two year 5 classes within one primary school in SE England. In this presentation I will share how pupils' affective behaviour was identified and then discussed with pupils and teachers in video stimulated recall interviews to aid active goal identification. The methodology demonstrates the complex nature of understanding active goal formation.

Boylan, Mark; Adams, Gill; Jacques, Laurie; Birkhead, Amy

[WORKING GROUP]



***Mathematics education, research and policy***

Policy is important to mathematics education and mathematics education research. Political interest in pedagogy and assessment shapes mathematics education, an area of considerable or even critical policy interest. Mathematics education and mathematics education research are also important in shaping education policy. Internationally, research on mathematics education and policy has recently become an area of interest in relation to the challenge of scaling and implementing mathematics education research findings in practice, as well as more general critical evaluations of mathematics education and related policies. However, research on the relationship between mathematics education and policy is relatively rare and, in our view, a more theorised understanding of the policy - mathematics education nexus is needed, including the relationship between mathematics education research and policy. This is a new working group. We welcome those who are interested in contributing to discussions centred around the intersection between policy and mathematics education. We will use this first meeting as an opportunity share our individual interests in mathematics education research and policy and to develop an agenda for the working group. We will provide some initial stimuli for discussion. Please note our focus is not on BSRLM's relationship to policy and policy debates or on critiquing any current policies of any UK national governments.

Jagdev, Manjinder Kaur

[PRESENTATION]



*Critical mathematics education for student teachers*

In this session, I share my research as part of my doctorate work at York St. John University, about critical mathematics education and social justice themes. As a former secondary school mathematics teacher for 10 years and now a teacher educator for almost 20 years, I outline the impact of my work, on the themes of diversity and inclusion, providing examples of activities with student teachers' and pupils' responses. I outline relevant academic literature and practices. The methodology, my positionality, and elements of participatory action research, are highlighted. The sample and participant recruitment are explained. Methods, in terms of lesson observations, student teachers' critical reflections, interviews, and discussion feedback, are detailed. Ethical issues, power dynamics and researcher bias are considered. I share five co-created classroom mathematics activities. Activities created by student teachers including a secondary school mathematics lesson on climate change, Year 2 Primary undergraduate student teachers' lesson ideas, and cross-curricular lesson ideas from Secondary PGCE student teachers are outlined. These include themes of racial and climate justice. Next steps, including interviews, thematic analysis, findings, and implications for practice are considered. This work with student teachers, their school-based mentors, pupils, and mathematics teachers, is impactful across the community of Yorkshire primary and secondary schools and beyond.

McIvor, Nick

[PRESENTATION]



*How expert mathematics teachers improvise: towards a theoretical framework that might be useful to classroom practitioners*

There is good deal of published evidence to support the claim that an ability to change direction mid-lesson is a characteristic of many accomplished classroom practitioners, for example, Schoenfeld (2011) places a high premium on the 'adaptive expertise' of skilled mathematics teachers and a good deal of the recent work on noticing seems to be making a similar assumption. What is less clear are the mechanisms at work— what are these expert practitioners doing when they improvise? Cognitivist approaches tend to position improvisation as an outcome of the highly interconnected schemata of expert teachers, while others assign greater importance to observable behaviours. This presentation starts from latter, behaviour-focused perspective, describing improvisation in terms drawn from the theatre before going on to argue that this is compatible with many of the insights from cognitively framed research. It suggests that a relatively small number of easily-explained, teachable skills might permit competent classroom practitioners to move towards expertise without having to grapple with complex theory.

Millington, Graham

[WORKING GROUP]



***Identifying the nature of research that seeks to test the efficacy of Richard Skemp's 'Relational Understanding'***

In this workshop I will present a mathematics scheme (developed over many years in the classroom) which is informed by Richard Skemp's classic paper 'Relational Understanding and Instrumental Understanding (1976). The delegates will be asked to offer their reactions to the scheme and to help evolve a research methodology which could determine the efficacy of the scheme. The session will be about generating through discussion practical ideas which can be taken forward - as well as pointing out possible difficulties.

Norris, Jennifer

[PRESENTATION]



***Mathematics participation at advanced level in England: Exploring national data through pipeline, pathway, and portfolio metaphors***

While the importance of continued mathematics study for 16-18 year olds in England is widely agreed, the means of raising mathematics participation remains a matter of much debate. Metaphor theory suggests that the metaphorical language we use to understand abstract concepts inevitably highlights some aspects while obscuring others. Hence, I am seeking to explore what aspects of post-16 mathematics participation are highlighted and hidden from the perspectives of three distinct metaphors: the mathematics pipeline, qualification pathways, and portfolios of mathematical competences. National participation data from the National Pupil Database is analysed for students in England that took one or more A level qualifications between 2015/16 and 2020/21 (n = 797,000). The results show substantial differences in the number of A level students that count as participating in post-16 mathematics depending on the metaphor used, from 32% in the mathematics pipeline, to 41% in mathematics pathways, and 84% in mathematical portfolios. In addition, the different metaphors draw attention to different problems of participation, and therefore suggest different solutions. I therefore argue that awareness of multiple metaphors is crucial to future policy making.



Noyes, Andrew; Brignell, Chris; North, Marc; Gripton, Cath; Wake, Geoff

[PRESENTATION]



***The Observatory for Mathematical Education: an introduction***

In November 2023, we announced the establishment of the Observatory for Mathematical Education based at the University of Nottingham. The Observatory is taking a programmatic approach to researching the mathematics education system in England, combining 1) trend analysis using national administrative data (e.g. NPD-ILR-HESA, LEO) and established panel surveys, 2) three national longitudinal cohort studies, in primary and secondary schools and in post-compulsory education, and 3) a range of shorter-term interventions, evaluations and implementation research projects. We are currently building a team of researchers and an operational support team and working on the complex research design and operational challenges of undertaking a decade-long programme of research. In this session, we will introduce the OME: its vision and ambitions; the overarching research design for aspects of the core research programme; progress with design of some of the research instruments; the challenges of sampling and recruitment; and some of the practical challenges of set up.

Proshkin, Volodymyr; Foster, Colin

[PRESENTATION]



***The challenges faced by Ukrainian students in learning mathematics in UK schools***

We present the experiences of Ukrainian refugees studying in UK schools, focusing particularly on their mathematics learning. Based on interviews with students and their parents and a questionnaire of mathematics teachers who have experience teaching Ukrainian students, we have identified the main challenges that Ukrainian students face when learning mathematics in UK schools. These challenges can be divided into the following types: linguistic, motivational, social-emotional, purely mathematical, and organizational. A detailed discussion of these challenges will help develop guidance for students and teachers to minimize them.

Rumbelow, Michael

[PRESENTATION]



***Flawed crystals: exploring information entropy as a way of understanding mathematical block play***

In information theory, as encoded information replicates and spreads over time information is lost, a process comparable to entropic dissipation of heat in physics. E.g. formation of a crystal introduces structural symmetries which are replicated as it grows, carrying structural information outwards from the seed crystal, a process which tends eventually to lose information, producing destabilising flaws. England (2020) suggests that more complex, dynamic systems, such as living organisms, encode information about their structure in their DNA, enabling them to replicate and spread more efficiently, transforming over time to better attune to environmental drivers and encode more information, ultimately dissipating this information in an irreversible change of state. In my doctoral study of Kindergarten block play I have observed young children making symmetrical and/or representational structures from interlocking cubes stored loosely in a tub, apparently encoding information with blocks, and then at the end of the play session dismantling the structures and returning them to the tub. I will explore whether theories of information entropy may offer a way of understanding how children learn mathematics through block play, by gradually encoding information in their environment with increasing efficiency. This calls attention to specific drivers in the environment which may resonate with children's activity with blocks at different phases of their growth and education.

Saad, Usama; Lortie-Forgues, Hugues

[PRESENTATION]



***Exploring Teachers' Expectations Regarding the Impact of Changing the Word Problems Representation on EAL Learners' Performance***

Pictorial representations are often used in mathematics learning and assessment. In this study, we investigated teachers' expectations regarding the performance of English as an Additional Language (EAL) learners when mathematical word problems are presented in either a word-only format or a word-with-integrated-pictures format. To explore this question, we recruited 308 UK teachers and asked them to evaluate 22 pairs of mathematical word problems. Each pair consisted of the same problem presented in two formats: one in a word-only version, and the other integrating words with pictures. Teachers were asked to judge which format they thought would be easier for EAL learners to solve. Problems were adapted from past GCSE exams (2017-2021) and from past research (Hoogland et al., 2018). We then compared the teachers' judgments to the actual performance of 118 EAL learners. While teachers consistently expected that EAL learners would perform better on the word-with-integrated-pictures format, we found no such evidence in our sample of EAL learners. Rather, the performance of EAL learners varied substantially—sometimes achieving higher performance with the word-with-integrated-pictures format, but at other times performing better with word-only problems. In the

presentation, we will discuss why this may have been the case, as well as the implications of our findings for teachers and test developers.

**Sheard, Simon**

[PRESENTATION]



### ***Manipulatives: practicality, pedagogy or preference?***

Manipulatives (concrete resources) are used widely in English primary classrooms, due partly to the emphasis by Maths Hubs using the Teaching for Mastery (TfM) approach as well as promotion within commercial schemes of learning. Has the influx of two-sided counters into our classrooms encouraged primary teachers to consider the pedagogical principles behind using these tools? Or is it the case that a manipulative in a scheme which is also available in the cupboard is rationale enough for its use in a lesson? Personal preference can also play a large role in selecting manipulatives with factors such as perceptual richness or the perceived versatility of a particular resource becoming important. This presentation and interactive discussion will explore if there is a need to redress this balance towards a more pedagogically-informed approach.

**Sinclair, Ben**

[PRESENTATION]



### ***Addressing mathematics anxiety by promoting mathematical resilience: A case study in Educational Design Research***

Mathematics anxiety has been a long-studied phenomena but with very few practical solutions on offer. The amassed knowledge has allowed for increasing precision when predicting mathematics anxiety in groups of interest, but it's yet to help influence and address these unhelpful behaviours. This presentation will discuss the development and research of an online course, Maths ACTive, that has been developed to address mathematics anxiety by teaching secondary students mathematical resilience skills. By incorporating techniques from Acceptance and Commitment Training, students are taught how to deal with affective difficulties in mathematics: what to do when they get stuck or make mistakes; how to deal with feeling 'stupid'; and how mathematics can be important in doing what matters to them. The course has been developed and evaluated using Educational Design Research – a broad framework that offers both researchers and practitioners a means for addressing complex educational issues in authentic settings. The value and challenges of such an approach will be shared, along with the best practices, common misconceptions, and preliminary findings. Together, a unified model for researching and addressing mathematics anxiety is proposed.

Stacey, Jennifer

[PRESENTATION]



### ***Adults studying GCSE mathematics in FE: Self-efficacy, anxiety and examination grades***

This presentation summarises the main findings arising from research for a doctorate in education, completed this year. The aims of the research were to examine the perceptions of adult learners (19+) in Further Education in terms of their self-efficacy and anxiety and establish whether those perceptions altered over the duration of the course. In addition, I was interested in investigating whether there were links between the levels of self-efficacy and anxiety in terms of the grades achieved in the end of year GCSE mathematics examinations. The data were collected in a mixed methods study, and thematic analysis was used to investigate research strands. The qualitative findings from twenty-one participants showed that self-efficacy was more of a marker for successful grades than anxiety, but that, as judged by the median values for the group, participants could have high self-efficacy and low anxiety, but not pass, and low self-efficacy and high anxiety, and pass. Analysis by gender, age and first language challenged stereotypical assumptions that might be made by both teachers and other learners in adult classrooms, as a result of other large-scale research with students on more traditional pathways in education. In addition, I suggest that research questionnaires developed in non-FE contexts may be unsuitable and incomplete in an FE context, which includes insights such as that word problems emerged as equally or more challenging for participants than algebra.

Taha, Samah; Kinnear, George; Iannone, Paola

[PRESENTATION]



### ***Perceptions of Effective Formative Feedback: A comparative Analysis Between Undergraduate Students and Mathematics Lecturers***

Feedback is crucial in higher education mathematics, especially in formative e-assessment. As education increasingly integrates technology, focusing on e-assessment becomes essential. This raises the question: What feedback should mathematics lecturers provide within e-assessment to support student learning? Despite significant investment in feedback generation, research in this field is lacking, and conflicting views persist on feedback effectiveness. Students express dissatisfaction with feedback quality, while academics often believe their feedback is timely and informative. In this presentation, we examine whether mathematics lecturers and undergraduate students agree on e-assessment feedback quality. We collected 23 feedback samples from mathematics lecturers, students, created by artificial intelligence (ChatGPT), and appearing in research articles. Using comparative judgment, we analyzed 220 paired comparisons from both mathematicians and undergraduate students. Our findings indicate that both groups can reliably assess the quality of mathematical feedback, with a significant level of agreement between them. Furthermore, comparative judgment exhibited substantial consistency across the two cohorts. We discuss the implications of our findings and propose that comparative judgment offers a promising technique for exploring feedback quality in mathematics higher education formative e-assessment.

Tasara, Innocent

[PRESENTATION]



### *The generative power of calculus symbolism*

Calculus symbolism is a powerful communication mediator in calculus discourse. The generative power of symbolic mediation allows teachers and students to move between representations. However, teachers should be aware of potential ambiguity inherent in some of the symbols they use in teaching differential calculus. Nevertheless, this symbolic ambiguity can be a valuable discursive resource in calculus discourse, especially for learning, as it presents students with interesting tensions that could be opportunities for discussion and further exploration of mathematics. This paper draws from a study investigating how mathematics teachers in English schools introduce elementary differential calculus. The study examines the commognitive constructs in the teachers' pedagogical calculus discourse. Interviews with the teachers and observation of their introductory lessons on the derivative were used to collect qualitative data, and a commognitive thematic discourse analysis was used to deconstruct the teachers' pedagogical calculus discourse on the derivative. This paper reports on some inconsistency and ambiguity with calculus symbolism found in the teachers' pedagogical calculus discourse, particularly in the transition between gradient (for straight-line graphs) and the gradient function (for curves). Understanding how teachers construct the definition of the derivative is crucial to uncovering more meaningful and effective ways to help students understand differential calculus.

Tate, Brook

[PRESENTATION]



### *Multicolour Maths - using colour and art to learn number and overcome maths anxiety*

Discovering the beauty of mathematics helps develop a deep appreciation for the subject. However, it requires a firm grasp of the foundations in order to see the patterns in the written form. By combining ten colours with simple shapes, the Multicolour Maths method utilises our natural ability to recognise pattern, manipulate images in our imagination and recall information in a new and creative way. Being trialled in classrooms in the UK and India, the method has proven to engage students of all ages and abilities. Calculations can be drawn, painted or sculpted and can be read in any direction. The method is intended to work alongside the national curriculum and, unlike other maths support programmes such as Numicon, it provides unlimited possibilities of learning through creation and play, and can be utilised for EYFS and greater depth learners. The method enables even the simplest of calculations to feel like a significant achievement, establishing a love and appreciation for mathematics as a universal language. It can be also be used to engage those with little or no grasp of number values, purely by creating beautiful artwork. For a long time I have suffered from a severe fear of maths, but since discovering how to calculate in colour, I can honestly say I connect with maths in much the same way I connect with poetry, art and music. I would love to share this method at the BSRLM conference. You can see more about the

method at [www.brooktate.com/multicolour-math](http://www.brooktate.com/multicolour-math). You can see more of my painting, writing and musical theatre work at [www.brooktate.com](http://www.brooktate.com) / Instagram: @brooktate

Wang, Linda; Dawson, Jeremy

[WORKSHOP]

### *Developing lesson planning skills for trainee teachers*



Lesson planning is the key to effective teaching. Early career teachers (ECTs) face the challenges of how to plan effective mathematics lesson(s), especially with different contextual background in their placement school. In this workshop, we introduce the Causal Connectivity Framework (CCF) which is proposed as an approach that recognises the power of reasoning in how the journey of teaching and learning unfolds, and makes the logical process explicit to teachers, pupils and trainees themselves. In this way, the foci of lesson planning turn the priority toward (1) deepening trainees' subject knowledge and curriculum knowledge; (2) trainee's understanding of how to organise activities in the classroom tailored to particular groups of pupils and local circumstances. We particularly welcome your suggestions on implementation of the framework, and your insights on supporting trainees' lesson planning.

Woollacott, Bethany; Alcock, Lara; Inglis, Matthew

[PRESENTATION]

### *Identifying key information: skill or design feature?*



Although mathematics textbook research has become more established in recent years, there is still relatively little on how students read textbooks or on the impact of textbook design. In particular, research has yet to study the way highlighting key information affects learning, despite such highlighting being commonplace in school-level textbooks. Indeed, such highlighting could hinder learning: evidence from other domains suggests that identifying key information is an expert skill that we might wish to develop. In this study, we investigated whether highlights help or hinder learning, exploring how students perceived and read highlighted key information in their mathematics textbooks. In Study 1, we selected 16 expositions from a mathematics textbook and, using comparative judgement, asked 60 18 year-old students to compare pairs of explanations, deciding which explanation they thought 'better'. When key information was highlighted, students preferred expositions with higher proportions of highlighted key information. In Study 2, we asked 33 18 year-old students to read the same expositions whilst recording their eye movements. Students spent less time looking at highlighted key information than at unhighlighted text. At the conference, we will discuss the significance of these findings and whether they should impact mathematics textbook design.

Wright, Pete; Jagdev, Manjinder Kaur; Mio, Cristina; Hilton, Caroline

[WORKING GROUP]



***Critical Mathematics Education (CME) Working Group discussion: ‘How can mathematics teacher educators promote socially just pedagogies and practices amongst practitioners?’***

This working group discussion is for all those interested in promoting socially just pedagogies (not just teacher educators). Over the coming year, members of the Teaching Maths for Social Justice Network (TMSJN: [www.mathsocialjustice.org](http://www.mathsocialjustice.org)) will be developing workshops aimed at promoting socially just pedagogies and practices amongst student teachers and experienced practitioners. This session is an opportunity to discuss what the focus and content of such workshops might look like. The CME Working Group (launched in November 2015) is open to all and aims to promote research that brings about positive social change through mathematics education. CME aims to identify and challenge ways in which mathematics is commonly used to maintain the status quo and reproduce inequities in society. It proposes an alternative and empowering conceptualisation of mathematics, which enables people to better understand their social, political and economic situations, and to advocate and bring about changes leading to a more just and equitable society.

Xenidou-Dervou, Iro; Rossi, Serena; Moeller, Korbinian; Jay, Tim

[PRESENTATION]



***Early numeracy predicts children’s financial literacy skills***

Financial literacy impacts individuals’ financial decision-making, overall well-being and societal outcomes. Research suggests that the age at which individuals start learning about money and finance is a strong indicator of their future financial well-being (OECD, 2017). We developed a measure of assessing young children’s emergent understanding of money and finance (Jay et al. 2022), Arlo’s Adventures, which uses an innovative comic-strip-based interview format. In this study, we assessed 382 children’s (aged 4 to 6 years of age) financial literacy and numeracy skills. First, we used Exploratory Factor Analysis to examine the factor structure of Arlo’s Adventures. Results showed that five latent factors underpinned the financial literacy data: 1) Transaction Methods, 2) Getting money and making money decisions, 3) Saving money, 4) Knowing where money comes from and 5) Spending money. We then conducted Structural Equation Modelling (SEM) analyses to examine the relationship between numeracy and financial literacy. The SEM model demonstrated a very good fit to the data (CFI = 0.99, TLI = 0.98, RMSEA = 0.059 [90% CI = 0.029, 0.088], SRMR = 0.033), and revealed that children’s numeracy skills significantly predict their financial literacy skills ( $R^2 = 0.31$ ). This study’s findings demonstrate the validity of the newly developed assessment tool for children’s financial literacy skills and underscore the role of early numeracy in fostering children’s emergent financial literacy.