



British Society for  
Research into  
Learning Mathematics

**BSRLM SPRING DAY CONFERENCE  
(ONLINE) 2025**

**SESSION HANDBOOK**

**Saturday 1<sup>st</sup> March 2025**

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## Plenary Presentation

**Professor Richard Barwell**

### ***Touch wood: What does mathematics teach us about the forest?***



Richard Barwell is Professor of Mathematics Education and former Dean of the Faculty of Education, University of Ottawa, Canada. His research interests include language, language diversity and discourse in mathematics classrooms, critical mathematics education, and the role of mathematics education in the ecosystem crisis facing planet Earth. He is an Associate Editor of *Educational Studies in Mathematics*, a former editor of *For the Learning of Mathematics*, and a former member of the BSRLM Executive.

#### **Abstract:**

'Trees' was, apparently, one of the first words I uttered and some of my earliest memories of growing up in Hampshire are of trees and forests. Now I live in Canada, a land of immense forests, presently covered in a thick magical carpet of snow (as well as a vast forestry industry). Trees, though, are in trouble: outbreaks of diseases and pests, global heating, forest fires, deforestation, air pollution, urban sprawl all damage or eliminate trees. I take our relationship with trees as illustrative of our relationship with all species. What part do mathematics play in this relationship? What is it we teach about trees when we teach mathematics? How might it be different? In this presentation, I draw on my thinking about critical mathematics education, biodiversity and dialogic theory to offer a tentative response to this question. I argue that when we teach mathematics, we teach a particular way of relating to the world, resulting in what I call a mathematical consciousness that entails an unhealthy relationship with our ecosystem, including trees and forests. To illustrate these ideas, I make use of various kinds of texts and consider some possible ways to promote a less hubristic mathematical consciousness.

## Research papers, workshops, and working groups

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

**Aantjes, Max**

**[PRESENTATION]**

***Proof and social justice? A philosophical and sociological argument to teach a critical understanding of proof across attainment groups in secondary school***



Recent debates in the philosophy and sociology of mathematics education have revealed 'inevitable' ethical dilemmas in the teaching of formal mathematical proof. Present proposals for addressing these dilemmas focus on introducing formal-proof values and norms whilst continuing to recognise other values and norms students may bring to the classroom. In this presentation, I will argue that this proposal seems incomplete; there is an opportunity to facilitate critical reflection on the affordances and limitations of different values and norms. Drawing on Ole Skovsmose's notion of 'formatting power' and noting the omnipresence of proof-generated theorems across the secondary curriculum, I will argue that it seems ethically desirable to foster opportunities for all students to appraise and critique formal-proof values and norms. Building on Andreas Stylianides' definition of proof tasks in classrooms, I will argue such a critical reflection seems both possible and accessible for all. Finally, comparing findings from different studies that seek to map teachers' Practical Rationality, I will show that these opportunities appear systematically stifled. Having shown critical reflection on formal proof-values and norms appears ethically desirable, potentially accessible for all and systematically stifled, I will conclude that sociological studies are in order that focus on how critical reflection on proof values and norms could be promoted across different groups of students.

**Atregeno, Mariel**

**[WORKSHOP]**

***Teaching and Learning Mathematics Through Mathematical Inquiry and Mathematical Modelling***



This workshop explores mathematical inquiry and mathematical modelling and their importance in the teaching and learning of mathematics. It will present some actual samples from middle school and secondary school mathematics where we will unpack the quality of thinking and skills being developed by inquiry and modelling. Through this workshop, it is aimed that the participants can gain or further their knowledge on the roles of inquiry and modelling in developing mathematical thinking skills in the learners, and be inspired to regularly employ them in their mathematics classes. Participants will do sample inquiry and modelling during the workshop.

Educators have been constantly curious about how mathematics can be made accessible to the learners. A lot of learners struggle to see the beauty and usefulness of mathematics to their lives and the world around them. Some of them would usually just see mathematics as a discipline that deals with numbers and calculations. Certainly, this is not the case, as mathematics is, in fact, rich in offering many opportunities for students to think creatively and critically, communicate effectively, see and solve problems from at least one perspective and approach, reflect and make informed decisions. Mathematical inquiry and mathematical modelling are modes that can bring such thinking and skills as mathematics is explored and applied.

**Baldry, Fay\***; Godfrey, Alison; Syyeda Farhat; Harvey-Ashenhurst, Ben

[WORKSHOP]



***Understanding teacher professional learning through a lens of classroom observation.***

Prior research into teacher professional development (PD) has contributed a range of theoretical models to explicate teacher learning. Many have components related to four notions: knowledge and beliefs; PD activity; classroom practice; students. This study takes the stance that teacher professional learning is incremental, based on multiple professional interactions and reflections on their own experiences. In England, Maths Hubs have had government funding for 10 years to provide PD for teachers, with the NCETM version of 'Teaching for Mastery' the pedagogical approach advocated. With the hub network claiming they work with over 50% of schools, one aim of this study is to understand the influence of this funded programme. However, a second key focus is the type of data collected; many studies have relied on self-reporting, with less evidence from classrooms and students. In this study we have worked with three primary schools, interviewing 13 teachers before and after observing their lessons. This data is complimented by interviews with the 3 maths leads and short discussions with about 50 pupils. Through triangulation of this evidence, we are exploring the relationships between the teachers' wider professional environment, their classroom practice and student experience.

This workshop will present an overview of one teacher and extracts from their lesson, offering those present the opportunity to contribute their interpretation of the evidence presented.

**Coles, Alf**

[WORKSHOP]



***Mathematics Education in Prisons***

Prison education is almost a forgotten area in research in mathematics education. In this workshop, I will first describe my experiences over the last 18 months, engaging in outreach work in a prison. The aim of this work has been (a) to explore possibilities for university/prison partnership (b) to support the uptake of level 3 qualifications in prison (c) to explore new curriculum approaches. The workshop will then move into discussion about further potential lines of development, for working in prison - your ideas - how others could get involved - and possibilities for research.

**Crisan, Cosette\*; Thalia, Thamsir; Mavrikis, Manolis**

**[PRESENTATION]**



### ***Learning and Teaching Mathematical Modelling with AI and Computational Tools: Insights from a Pilot with Wolfram notebooks***

In this presentation, I will discuss key findings from a study that examines teachers' perceptions and experiences of using Wolfram Alpha Notebook (WAN) and chat-enabled functionalities that utilise Generative AI (GenAI) into mathematical modeling instruction. Grounded in the Technological Pedagogical Content and Contextual Knowledge (TPACK-XK) framework and Blum and Leiß's extended mathematical modeling cycle, this study engaged eight mathematics teachers through a mixed-methods design. Participants attended structured webinars introducing WAN's capabilities, including natural language processing for real-time problem-solving, dynamic data visualisation, and step-by-step guidance through modelling phases. Webinar topic ranged from navigation tool's core functionalities to hands-on activity simulating real-world problem-solving scenarios. Data collection included surveys, focus group discussions, and thematic analysis of challenges and potential AI implementation in Indonesian mathematics classrooms. Findings revealed a marked shift from initial scepticism to confidence in leveraging WAN for obtaining timely data, delivering personalized feedback, promoting interactive learning, and designing student-centered modeling tasks. However, challenges persisted, including infrastructure gaps, concerns regarding over-reliance on AI tools, and the need for training in prompt engineering to optimise outputs. This presentation will propose targeted professional development, AI literacy programs, curriculum design adaptations, and policy recommendations to foster sustainable and inclusive AI integration in mathematics education.

**Çaylan Ergene, Büşra\*; Ergene, Ozkan; Kontorovich, Igor**

**[PRESENTATION]**



### ***Analyzing the Validity of ChatGPT's Solutions to Statistical Problems***

This study examined the problems posed by pre-service teachers and the solutions to these problems provided by pre-service teachers and ChatGPT. Each of the fifty-four pre-service teachers posed and solved three statistical problems and then entered these problems into ChatGPT. We first analysed each problem in terms of the statistical concepts in the focus and their contexts. Following this, a thorough evaluation of the submitted problems and solutions was conducted, leading to the conclusion that all the collected problems were well-formulated and solvable, with all the pre-service teachers' solutions being mathematically valid. Subsequently, an analysis was conducted on the ChatGPT solutions, the results of which indicated that they were valid in two-thirds of the cases. The percentage of valid solutions varied, but there was not such a marked difference on a concept basis. Notably, ChatGPT was more successful with purely mathematical problems than with contextualised problems. Further analysis of the invalid solutions generated by ChatGPT identified four sources of error. The findings of this study provide insights into the strengths and limitations of AI-generated mathematical solutions and their potential implications for mathematics education.

Fenton, Kirsten\*; Drummond, Holly

[PRESENTATION]



## ***Mathematical Journaling for Purposeful Talk: Enhancing Metacognitive Development through Mathematical Journaling***

This session explores the innovative practice of mathematical journaling in classrooms, aimed at fostering purposeful talk and enhancing metacognitive development. By integrating journaling into daily mathematics lessons, we seek to improve students' understanding of their learning processes, problem-solving skills, and reflective thinking. Despite its proven benefits, mathematical journaling remains underutilized in educational settings. This paper aims to address this gap and demonstrate the transformative potential of mathematical journaling in fostering deep thinking and articulation of reasoning among students.

Participants will gain insights into the concept of metacognition and its critical role in learning. The session will provide practical examples and strategies for implementing mathematical journaling, highlighting techniques to encourage students to engage in meaningful discussions about their mathematical thinking. Case studies and evidence will be presented to showcase the positive impact of mathematical journaling on childrens' problem-solving skills and overall academic success.

By the end of this session, participants will be equipped with the knowledge and tools to implement mathematical journaling in their classrooms, fostering a deeper understanding of mathematics and enhancing childrens' metacognitive development. This session is designed for educators, curriculum developers, educational researchers, and anyone interested in innovative teaching strategies to enhance student learning and metacognitive development.

Fu, Arya

[PRESENTATION]



## ***Generative AI-Driven Personalized Mathematics Competition Teaching Materials: A Case Study on Teacher Practices and Euclid Contest Preparation***

This study investigates how teachers utilize generative artificial intelligence (AI) to design personalized competition review materials, with a focus on the Euclid Mathematics Contest. Through case analysis and mixed-methods research (interviews, classroom observations, AI-generated content comparisons), the research explores the potential of AI tools in generating adaptive content (e.g., tailoring problems to student proficiency levels, creating variant exercises), improving teaching efficiency (reducing repetitive tasks), and transforming teacher roles (from "content designers" to "AI collaborators"). Grounded in the TPACK framework, the study identifies challenges in AI integration (e.g., prompt engineering, output validation, ethical risks) and proposes "technology-pedagogy" synergy strategies. It aims to advance theoretical and practical insights for personalized STEM education and teacher professional development in competitive mathematics.

**Gifford, Sue\*; Marks, Rachel; Ineson, Gwen**

**[WORKING GROUP]**



*Early Years and Primary Working Group*

Following our successful November meeting, we would like to continue the focus on research-based curriculum reform in Key Stage 2 (KS2). This is in the context of the current Francis Curriculum and Assessment Review, and we will share recent updates about this. Despite being online, we hope there will continue to be lively discussion on this and other topics of current concern to primary and early years maths educators. For the minutes of our last meeting, see: BSRLM Working Groups.

**Hall, Elizabeth**

**[PRESENTATION]**



***Keep up! The impact of attainment on pupils' active goal pathways within a problem-solving lesson.***

Mathematics mastery purports that all pupils should have the opportunity to 'keep up, not catch up' within mathematics lessons. As a result, there is a need for teachers to be mindful of all pupils' progress through a lesson. Recently, there has been a growing awareness of the presence of pupils' short-term, in-the-moment goals, or active goals across mathematics lessons; these can enable insight into a pupil's cognitive progress across a period of time. By considering the affective domain, active goals can be inferred and with it the chance to compare pupils' active goal pathways across a lesson to judge whether all pupils are 'keeping up'. This presentation focuses on part of a PhD study. The active goal pathways of multiple year 5 pupils of differing attainment, within a mathematics problem-solving lesson, will be discussed. It will reveal pupils appear to form differing start and exit points along an active goal pathway dependent on their academic attainment. Thus, suggesting that not all pupils within a problem-solving lesson are 'keeping up'. A generalised active goal pathway model for the problem-solving lesson will be proposed.



Inglis, Matthew

[PRESENTATION]

*Hype in Mathematics Education Research: A Peculiarly British Problem?*



In the plenary session of the June 2024 BSRLM conference I reported an analysis of submissions to the education subpanel of the 2021 Research Excellence Framework, using a machine learning technique. I demonstrated that making claims of significance in academic journal articles was associated with higher unit-level scores in the REF. In this session I explore this result further, by reporting an analysis where I applied the REF2021 model to articles from leading mathematics education articles between 2000-2003 and 2020-2023. I demonstrate that the extent to which we make explicit claims about the significance of our work has increased over the last twenty years, and that it has disproportionately increased in articles where at least one author is based in the UK. I argue that it is plausible that this is the result of the REF's explicit definition of research quality ("originality, significance and rigour"), which was introduced for the 2008 RAE. I will offer some reflections on whether or not this trend is helpful.

Kassim-Lowe, Tazreen

[PRESENTATION]

*A prismatic look at stem sentences in textual discourse around the primary Multiplicative Conceptual Field (MCF) using Commognition.*



In propose to discuss how I have utilised commognition - communication and cognition - (Sfard, 2008) as a theoretical lens to make sense of how stem sentences feature in textual discourse around the Multiplicative Conceptual Field (MCF) in primary mathematics in England. Stem sentences, which are speaking scaffolds used in primary mathematics classrooms in England, are non-research driven (Coles and Helme, 2022) with limited literature and seem to go unquestioned. I will take a prismatic view of the simple stem sentence and highlight their complexity by considering how they are conceptualised via Sfard's Commognition (2008). I will use this conceptualisation to challenge an oversimplified narrative, which endorses stem sentences as faultless discursive objects - d-objects (Sfard, 2019, p. 98).

**Kaur, Tandeep\*; McLoughlin, Eilish; Grimes, Paul**

**[PRESENTATION]**



***Designing a conceptual framework for Productive Dispositions in Mathematics***

Student proficiency in mathematics is more than simply learning a skill or developing understanding. Mathematical proficiency has been conceptualised across five interconnected strands - Conceptual Understanding, Procedural Fluency, Strategic Competence, Adaptive Reasoning and Productive Disposition. Productive disposition refers to a student's tendency to see mathematics as sensible, useful, and worthwhile, along with a belief in their own efficacy as mathematical thinkers. Students with a strong productive disposition are more likely to persist through challenges, engage in problem-solving confidently, and develop a sense of ownership over their learning and, conversely, students who lack a productive disposition may struggle with mathematical anxiety, disengagement, and avoidance behaviors. However, while productive disposition has been recognized as essential for developing mathematical proficiency, there is a lack of literature that reports on its conceptualization and evaluation. This presentation describes the process of developing a conceptual framework for understanding productive dispositions in mathematics that bridges the gap between cognitive, motivational, and emotional domains. By explicitly considering the influence of students' emotions on their productive dispositions, the framework provides a holistic understanding of students' learning and engagement in mathematics.

**Kaur Jagdev, Manjinder**

**[PRESENTATION]**



***Teaching critical mathematics education and social justice***

I share my work and research at York St. John University, about critical mathematics education and social justice themes. I outline the impact of my work, on the themes of anti-racism, diversity and inclusion, providing examples of activities with student teachers' and pupils' responses, with references to relevant academic literature and practices. Activities created by student teachers including a secondary school mathematics lesson on climate change, Primary undergraduate student teachers' ideas, and cross-curricular activities from Secondary PGCE student teachers are outlined. This work with student teachers, their school-based mentors, pupils, and mathematics teachers, is impactful across the wider communities of Yorkshire schools and beyond.

Karathanasi, Chrysanthi\*; Misailidou, Christina

[PRESENTATION]



*Enhancing understanding of “addition” for very young children. The case of the multimedia application “Sums up to 10”.*

The study reported here examines how the use of a multimedia application titled “Sums up to 10” can support young pupils’ understanding of addition. The application was designed based on the Realistic Mathematics Education (RME) principles and includes an interactive story with familiar characters along with digital activities that incorporate mathematical concepts.

The research took place in the first-grade class (18, 6-year old pupils) of a state primary school in Greece. Data were collected from classroom observations, pre- and post-tests, and student feedback. The results indicate that the selected learning tool fostered a positive attitude toward mathematical explorations. The children exhibited motivation, enthusiasm, interaction and engagement with the learning process. Such a dynamic and enjoyable learning environment appeared to enhance the pupils’ understanding and performance of addition up to 10. It is suggested that the integration of interactive and “friendly” technological learning tools in mathematics instruction can effectively support very young children in their initial mathematical explorations.

Kerrison, Lois

[PRESENTATION]



*Learning and Teaching Real-life context in mathematics*

The aim of the research is to improve students’ outcomes by focusing on how their ability to work mathematically in real-life contexts may be improved. It explores whether barriers exist for students and teachers when applying mathematics in real-life contexts and what those barriers may be if they exist. It seems likely that students’ cultural capital can support their understanding of real-life context questions, indicating that those that lack extensive cultural capital may experience barriers to being able to solve real-life context questions. In addition, research suggests that teachers’ different levels of experience and understanding of how mathematics is used outside of the mathematics classroom can impact on students’ success in learning and comprehension.

By analysing student performance over multiple GCSE examinations, I have identified that students really struggled with speed, distance, time questions and questions involving time when they involve real-life context. Working in collaboration with the teacher participants a set of lessons was designed intended to improve students understanding of speed and time. We created a pre and post assessment to identify whether there was any improvement in the pupil’s ability to solve speed/distance/time context problems after using the proposed lesson strategies. There were positive results from this collaboration, in that teacher participants bought into the change in approach, and it provided ideas to move forward into the next stages of the research, such as using teachers within the real-life context.

Larbi, Ernest\*; Fletcher, Jonathan

[PRESENTATION]



## *Pre-service Mathematics Teachers' Understanding of Completing the Square of Quadratic Functions*

Knowledge of completing the square plays a significant role in learning several topics in mathematics. Pre-service mathematics teachers content knowledge is crucial for teaching effectiveness. The study investigated pre-service mathematics teachers' understanding of completing the square for given quadratic functions and it was guided by three objectives. Simple random sampling was used to sample 87 pre-service mathematics teachers who were in the third year first semester of their study program to participate in the study. Participation in the study was voluntary. Using a sequential explanatory design, data were collected using a test of three questions on quadratic functions followed by interviews and focus group discussions. The study found that the pre-service mathematics teachers demonstrated limited knowledge in completing the square of the quadratic functions. The main difficulty of the pre-service teachers in completing the square for a function was that some began by equating the function to zero. Other difficulties were the mathematical procedure of making the coefficient of  $x^2$  in a quadratic function to be 1, errors in the use of integers and errors in computation. It was recommended that pre-service mathematics teachers should be guided to revisit the secondary school mathematics content to deepen their understanding and remediate their difficulties.

Lighter, Charlotte

[PRESENTATION]



## *Exploring engaged research in mathematics: A-level students on university research placements*

Higher education (HE) public engagement (PE) aims to develop positive relationships between university and local communities, but the most common form of HE-PE is often based on a deficit assumption, where academics decide how, what, when and with whom to share their research, and audiences are expected to receive this knowledge without question (Grand et al., 2015). In contrast, 'engaged research' (Holliman, 2017) suggests rethinking HE-PE with research, transforming interactions between academics and non-academic stakeholders from superficial and sporadic to purposeful and methodical, taking place at different stages of the research process and aiming to create a more equal partnership. In this presentation I will share analyses from a pilot study, exploring the phenomenon of engaged research between A-level students and professional mathematicians, using a two-week research placement in one HE institution as a case study. This research explores the possibilities and potential limitations of carrying out engaged research in this setting. Students independently applied to take part in the projects, all based in the school of mathematics and statistics at a UK university. Data was collected via semi-structured interviews with students and supervisors. Students shared their motivation for taking part in the scheme, described their projects and discussed if and how they felt able to make unique contributions to "real" research. Supervisors discussed their view of what mathematics research is and described the ways in which students were able to engage with their research. Preliminary findings highlight the varied ways students worked with academics across projects based on pure and applied mathematics and statistics including working on open problems in mathematics and conducting research-related tasks.

**Meangru, Matthew**

[PRESENTATION]



### ***Engaging Undergraduate Students with AI-learning Tools to Explore Calculus Applications***

This study focuses on engaging undergraduate calculus students with ChatGPT to explore its calculus content on differentiation and integration. The National Council of Teachers of Mathematics (2023) encourages embedding AI tools such as ChatGPT into mathematics classroom activities. There have been several research studies that explored ChatGPT with calculus topics to understand if ChatGPT knows calculus (Green, 2024; Zhuang and Zhang, 2024; Urhan et al., 2023). The activity of this study involves students enrolled in a U.S. degree programme in the United Kingdom working on a set of calculus problems during class time, asking ChatGPT to also solve them. In addition, the classroom instructor demonstrates a different approach to ChatGPT and asks students which methods are sufficient. This presentation aids mathematics educators in exploring ways to implement ChatGPT in university mathematics modules in the United Kingdom.

**Morgan, Candia\*; Adler, Jill; Bergqvist, Ewa; Österholm, Magnus** [PRESENTATION]



### ***The construction of “reasoning” in a KS3 textbook***

Textbooks and other teaching resources play an intermediate role in the curriculum chain, interpreting the intended curriculum, manifested in official curriculum documents, into forms that may be used by teachers to shape the curriculum they implement in their classrooms. We will present the first stage of an analysis of one textbook scheme for Key Stage 3, focusing on how the tasks offered to pupils seek to address the National Curriculum aim of ensuring that all pupils should “reason mathematically”. In particular, we characterise the types of reasoning that pupils are expected to engage in, considering also how these may differ between mathematical topic areas and how expectations about engagement may vary for pupils perceived to have different needs. This analysis forms part of a broader project that aims to investigate how ideas about reasoning, advocated in frameworks originating in the research community, are recontextualised in curricula, textbooks and classrooms.

O'Brien, Dan\*; Moeller, Korbinian; Foster, Colin

[PRESENTATION]



## *A Conceptual Framework for Optimising Number Line Development in Augmented Reality*

The benefits of Augmented Reality (AR) in mathematics education are of increasing interest to researchers. However, even widely available applications of this technology are still rarely used in classrooms. This seems surprising, as AR enhances methods for teaching and learning mathematics, such as number lines beyond 2D formats. Number lines are widely used in primary mathematics and improve student achievement. By integrating research on both number lines and AR, we systematically evaluated AR number line characteristics (e.g. horizontal vs. vertical, on the floor vs. the wall) to compare layout and implementation, considering aspects from embodied cognition to programming ease. We propose a partially quantitative conceptual framework to guide selection of optimal AR number line designs for students learning directed numbers.

Pham, Quang

[PRESENTATION]



## *Teachers' Perceptions of Using Games for Mathematics in Secondary Education.*

Engagement and mathematics educational games are two complicated factors that illustrate the strict interconnectedness of the students' learning mathematics process. In Vietnamese education, game integration in teaching mathematics is not yet considered an orthodox pedagogical method, leading to the lack of teachers' acknowledgement of the game's usage. This project explores teachers' perceptions of game implementation at secondary schools, followed by entangling the multi-dimensional engagement in gamification and game-based learning settings. With the sociocultural approach, the commognition theory served as a theoretical background and an analysis tool for participants' interpretation. The findings reveal that although teachers have a generally positive perspective on game use, gamification is merely considered an entertainment tool for classroom management regardless of its educational values rather than as a method for fostering an effective learning environment, as game-based teaching can. Additionally, public school teachers expressed their preferences for the use of gamification because of simplicity, while those in private schools are more inclined to employ game-based teaching focusing on conceptual development.

Ramirez, Paola

[WORKSHOP]



***Can designing a mathematical task to elicitate mathematical body movements be possible? Exploring the experience of body memory in the early years***

Body movement is one of our fundamental biological functions, a natural part of human behaviour and experience. Although research shows the importance of body movements, full-body movement and memory have rarely been considered in educational studies—including mathematics education research. In addition, many studies focus on teacher or student verbalisations, looking for representationalist forms and signs of mathematical thinking rather than accepting that movement may be mathematical thinking.

In this workshop, I will focus on the experience of body movements and mathematics learning in the early years (4-5 years old), introducing and discussing extracts from the interviews with children after being part in a mathematical task that elicitate body movements within three sessions (around 45 min each) at their nursery. Specifically, I would like to discuss the role of body memory and mathematics, the challenges of seeing body memory, and how I started to see the students' body memory experiences as part of their mathematics learning, thinking and knowing mathematics.

Riding, Katie\*; O'Brien, Dan; Xinyue, Jiao; Liu, Bohan; Li, Sophie; Rumbelow, Michael; Yang, Yang

[WORKING GROUP]



***XR and Mathematics Education: XRME Working Group***

The rapid development of Extended Reality (XR) technologies, including Augmented Reality (AR) and Virtual Reality (VR), is poised to revolutionise education and society more broadly. While research demonstrates promising potential for enhancing mathematical understanding, there remain significant gaps in our knowledge about effective implementation, pedagogical frameworks, and equity considerations. This working group will investigate how XR may transform mathematics education, focusing on both theoretical and practical issues. Are certain mathematical concepts more effectively taught in mixed-reality environments, and if so, why? Could these technologies bring about 'epistemological rupture' (Hegedus & Moreno-Armella, 2011)?

Initial objectives for the working group include: 1. Foster an open, supportive research community for anyone interested in the intersection of XR and Mathematics Education, 2. Synthesise recent research examining XR interventions in mathematics education, 3. Explore current and emerging XR technologies relevant to mathematics teaching and learning. 4. Organise workshops where BSRLM members can experience and critique these XR technologies first hand. 5. Develop guidelines and frameworks for effectively incorporating XR technologies into future mathematics curricula.

Researchers from all backgrounds are welcome to be part of this action-oriented working group - whether you are new to XR, or spend the majority of your time in the Metaverse!

Rycroft-Smith, Lucy

[PRESENTATION]



### *Bridging the Gap: Transforming Arithmetic Noticing into Algebraic Insight*

This session considers innovative approaches to teaching algebraic thinking, grounded in the latest evidence. ‘Algebra’, often seen as a gatekeeper in mathematics education, has become increasingly politicised. However, research shows that students can engage in algebraic thinking from a very young age. This session explores what early algebraic thinking looks like and argues that students should be exposed to algebraic ideas as they develop computational proficiency in arithmetic. Rather than focusing on secondary school algebra processes such as solving, simplifying and factorising, it is proposed that we could refactor the way arithmetic is taught to support a smoother transition to algebraic reasoning. By mastering noticing, questioning and playing with arithmetic structures, students can attend to the underlying structure of mathematics through analysing relationships between quantities, noticing patterns, studying change, generalising, problem-solving, modeling, justifying, proving, and predicting. This session aims to provide participants with creative ideas to foster algebraic thinking, supporting better depth of understanding and promoting a sense of play and curiosity at all ages.

Rycroft-Smith, Lucy\*; Macey, Darren

[PRESENTATION]



### *Bridging the research-practice gap: can AI be a reliable knowledge broker in mathematics education?*

As artificial intelligence (AI) continues to evolve, its potential to broker research knowledge in mathematics education is both exciting and concerning. AI tools promise to efficiently select and summarise research, offering us quick access to evidence with the promise of improving our practice and policies in education. However, recent evaluations suggest that AI often falls short of human capabilities in accurately summarising complex information, raising questions about trust, credibility, and reliability. This workshop will explore whether AI can be a dependable intermediary between research and practice, considering issues such as bias, transparency, and accountability. We will provoke discussions about the ethical implications of AI-driven knowledge brokering, the risks of misinformation, and strategies for ensuring that AI complements—rather than replaces—human judgement. Join us to critically examine the role of AI in mathematics education research-to-practice and consider how we might navigate its challenges to support informed decision-making in the classroom.



**Saddiq, Khalid\*; Sabitu, Kamoru Abiodun; Malik, Nasrudeen  
Ayinde**

[PRESENTATION]



***Breaking the Silence: A Qualitative Exploration of Silence and Speaking Up in Pre-Service Mathematics Teachers Education***

Silence among pre-service mathematics teachers can inhibit the collaborative exploration of mathematical concepts and stall their professional growth. This qualitative study investigates why some prospective educators remain quiet during mathematics lectures while others choose to actively participate. Drawing on lecture observations, field notes, and video-based reflections, the research captures the experiences of 200-level student teachers in a Nigerian University. Findings reveal that negative feedback, insufficient foundational knowledge, and peer influence often contribute to PSTs' reluctance to speak or contribute during a math lecture, while a strong desire to clarify uncertainties and receive supportive guidance encourages more vocal engagement. Additionally, the study highlights how speaking up can reinforce conceptual understanding, boost confidence, and cultivate a sense of community and problem-solving skills in the classroom. Implications for practice include emphasizing positive lecturer-student interactions, offering structured scaffolding to bridge knowledge gaps, and nurturing a classroom culture that respects diverse communication styles. By proactively addressing the barriers to open dialogue, teacher education programs can better equip future educators to create inclusive learning environments in their own mathematics classrooms. Ultimately, the research underscores the transformative power of fostering an atmosphere that values every student's voice, thus enriching the teaching and learning of mathematics.

**Sarfraz, Waqas\*; Jones, Ian; Hewitt, Dave; Wortha, Franz**

[PRESENTATION]



***Strategies used by Year 2 pupils to solve equal group multiplication problems using the 'Stick and Split' app***

This study explores Year 2 pupils' strategies to solve equal-group multiplication problems while interacting with the Stick and Split (S&S) app. Building on previous research on arithmetic learning strategies, this qualitative exploratory study involved five pairs of Year 2 pupils from two primary schools, categorised as high, middle, and low-attaining. The study aimed to understand which strategies pupils use, how they communicate their problem-solving processes, and whether the app facilitates or hinders learning.

Data collection spanned two sessions (approx. 1 hour total), incorporating video, audio, and screen recordings. Pupils interacted with different levels of S&S, classified by the number of multiplication facts required and the complexity of splitting operations. Results showed a transition from counting-based strategies (e.g., skip counting) to declarative knowledge and newly established awareness (NEA). High-attaining pupils transitioned earlier to declarative strategies, whereas low-attaining pupils relied more on skip counting and exploration. The findings emphasise the role of interactive educational apps in strategy development and highlight the diverse learning trajectories among primary pupils. This research contributes to understanding how game-based learning supports multiplicative reasoning and offers insights for designing effective digital learning tools.

**Stacey, Jennifer**

**[WORKING GROUP]**



***Further Education Working Group***

This session is to facilitate networking, and support research and discussion for those working and/or researching in the FE sector. This includes those teaching functional skills, GCSE and other mathematics qualifications taught in FE, and those working to support teacher training in this challenging, absorbing and fascinating sector. One of the long term aims of this group is to encourage more conference presentations and articles for the RME journal. Participants for this group are in touch through an optional What's App cluster, and currently include members working in or with a range of 16+ and lifelong learning providers.

**Wenderlich, Maja**

**[PRESENTATION]**



***Experiences crystallizing the path of outstanding Polish women in mathematics***

Mathematics has long been a male-dominated field, yet numerous outstanding Polish women have made significant contributions, breaking stereotypes and academic barriers. In this presentation, the author will explore the pivotal experiences that have shaped the careers of exceptional Polish women in mathematics. The discussion will highlight the key factors that sparked their interest in the field, including influences from education, mentorship, and academic challenges. Special attention will be given to the difficulties they encountered—both historically and in the present—on their path to scientific recognition. By analyzing these experiences, the presentation aims to provide a deeper understanding of the forces shaping women's careers in mathematics and the ongoing challenges that still need to be overcome.

Wright, Pete\*; Povey, Hilary

[WORKING GROUP]



***Critical Mathematics Education (CME) Working Group - discussion on 'What are the implications of Dewey's ideas for the mathematics classroom?'***

This is an opportunity to discuss how researchers, educators and teachers might draw on Dewey's ideas, including 'democracy', 'experiential learning', 'inquiry', 'reflection' and 'transformative teaching'. We will unpack how these words are used in contemporary discourse and what other meanings might be available, and consider how they might inform our practice. Bring along your ideas to share or just come along to learn more about how Dewey's ideas might inform your practice.

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.

References:

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