British Society for Research into Learning Mathematics

BSRLM 2026 SUMMER NEW RESEARCHERS' DAY

SESSION HANDBOOK

King's College London

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In the case of multiple contributors, * identifies the main presenter(s).
Sessions are ordered alphabetically by the primary presenter's surname.
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Workshops

Workshop 1: Jennie Golding

'Classroom-close' scholarship and research in mathematics teaching and learning: ethical conundrums

Jennie Golding is Professor of mathematics policy and practice at UCL Institute of Education. She is an inaugural member of the UCL Humanities, Arts and Sciences Ethics Committee, and department ethics lead. Her own work builds on her extensive background in 5-18 mathematics education by focusing on the policy-practice interface through classroom-close research. See https://profiles.ucl.ac.uk/48425-jenefer-jennie-golding

Many of us work in physical or digital settings of intended learning, from pre-school settings to distance online courses in Higher Education. Intentions often include the production of physical, digital, or other identified learner outputs. I term the scholarship or research related to such settings and/or outputs 'classroom-close' and such work brings with it layers of ethical challenges not always obvious to the outsider.

Any such activity is likely to involve the development of honesty, trust, fairness, respect, responsibility, and sometimes, courage over the lifetime of your research/scholarship, including in the related interactions - and a sensitivity to changing contexts that might compromise those. So how can you develop an ongoing awareness of such issues? How do they change with the age, experience or circumstances of participants in your research? When do you need to involve an ethics 'gatekeeper' such as a university Research Ethics Committee ('Institutional Review Board')? This interactive session will address some related challenges by drawing on genuine ethical dilemmas via a set of 'vignettes', and will invite discussion of those.

Workshop 2: Igor' Kontorovich

Where do good research ideas come from? From practice of course!

Igor' Kontorovich is an Associate Professor of mathematics education at the University of Hong Kong. He is interested in the processes of mathematics learning and teaching, mostly at the secondary and undergraduate levels. In his research, Igor' aims to offer theoretically-grounded and empirically-relevant insights to improve mathematics education for all students. These insights often emerge from research-practice partnerships with school and university teachers. Igor's participation at the BSRLM is part of his Sino-British fellowship with the University of Edinburgh.

It is not rare for mathematics educators to transition to research from the field of practice. Then, they promptly discover that research "rules of the game" are quite different from what they are used to as mathematics teachers, teacher educators, textbook writers, curriculum designers, et cetera. The adjustment can be challenging and even overwhelming. Notwithstanding, in this plenary, I will argue that the practical background equips new researchers with unique experiences and resources they can leverage in their research journey. Building on concrete examples and discussions, the participants will practice noticing, framing, and communicating ideas from the field of practice in ways that make them relevant for the research realm.

Research papers, workshops, and working groups

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

Akhtar, Kalsoom **[PRESENTATION]**

Examining Key Stage 2 teachers' conceptions of creativity in mathematics teaching

This PhD research study examines Key Stage 2 teachers' conceptions of creativity in mathematics teaching, with a focus on how their beliefs and classroom practices are shaped by their school context and wider educational policy. Adopting a mixed methods approach, the research was carried out in three phases: an initial survey to identify emerging trends across a range of key stage two teachers; follow up semi structured interviews to probe deeper into individual conceptions; and two case studies of schools in economically deprived areas. Both schools explicitly promote creativity as a core value in school and implement a 'mastery' approach to teaching mathematics.

The initial analysis suggests that many teachers associate creativity in mathematics teaching primarily with the use of manipulatives or representations. However, few teachers connect creativity with promoting children's original thinking or authentic problem solving. A key tension emerging from the data so far is the gap between teachers' declared beliefs and the observed classroom practices. In this presentation I will share my initial analysis of a subset of data from one teacher and invite feedback and discussion with colleagues about my interpretation and next steps.

Ashmore, Lisa **[PRESENTATION]**

"Listen, I am NEVER going to get a grade 8. You know that, I know that, and the WHOLE SCHOOL knows that"

It is widely acknowledged in teacher education that many primary teachers experience mathematics anxiety, often rooted in negative early school experiences of learning mathematics. This qualitative study highlights the multi faceted and complex nature of mathematics anxiety. Maths anxiety is explored through the experiences of a nineteen-year-old female teacher trainee and is based on transcripts and a visual maths autobiography, as part of a pilot study for an educational doctorate. In this talk, I consider how maths anxiety can be understood through an 'embodied literacies' approach, showing that it can 'territorialise' the body in two important ways, 'shrinking in and spilling out' (Johnson-Thiel, 2016, p. 93). Shrinking in, is presented as reaction against teaching practices that promote 'ability' such as, being moved up or down in sets or being given unrealistic targets for exams. This can lead to learners feeling disconnected, unheard and powerless when learning maths. In contrast, the experience of spilling out reflects a visceral, embodied release of emotion, evident in the intense disappointment she felt when she failed to achieve the mathematics target grade that had been 'promised' by a much trusted teacher. When manifested in these two contrasting ways, maths anxiety can significantly undermine the development of a positive professional identity: one that is characterised by agency, a growth mindset for both the self, and pupils, and teaching underpinned by confident and positive attitudes towards mathematics.

Bingül, Çağla*; Arslan, Çiğdem **[PRESENTATION]**

Primary and secondary school students' feelings and emotions toward mathematical problem solving via thought bubbles

Students' emotions experienced during mathematical activities are among the important factors influencing their problem-solving approaches, strategy choices, and cognitive processes related to learning. This study aims to examine the emotions experienced by primary school students (9–10 years old) and secondary school students (10–12 years old) during the process of mathematical problem-solving. The study group consists of 66 students from different socioeconomic backgrounds in Istanbul, Türkiye. The Thought-Bubble Measurement Tool was used as the data collection instrument in the study. Within the scope of this tool, students were asked to express how they felt whilst reading and solving mathematical problems through a student drawing and a thought bubble. Students reflected their emotions and thoughts through facial expressions, symbols, and written statements. The obtained data were subjected to content analysis, and themes and codes were generated. Preliminary findings indicate that students experienced both positive and negative emotions during the mathematical problem-solving process. Among the sources of negative emotions, social anxiety, fear of failure, task avoidance, and perceived difficulty came to the forefront. Within the scope of positive emotions, sub-themes such as curiosity and excitement, understanding mathematics, enjoyment of the process, and environmental support were identified. In addition, primary school students used more direct emotional expressions, whereas secondary school students' statements about performance and fear of failure were more prominent.

Clark, Juliet*; Marks, Rachel **[PRESENTATION]**

The impact of a 'STEM for girls' club on participants' confidence in and engagement with science, technology, engineering and mathematics (STEM)

Data has shown an underrepresentation of women and non-binary people on science, technology, engineering and mathematics (STEM) higher education courses. Disinterest in the area can begin at primary school, and recent data shows significant differences between performance and interest in mathematics in girls and boys. This data motivated us to set up an action research project in a local primary school to evaluate the impact of a STEM club for girls and non-binary pupils. Data were gathered from the club participants via questionnaires and from their class teachers by interviews.

This presentation will report the impact that the club seemed to have on the participants' interest and confidence in mathematics, science, design technology and computing lessons in school. The participants perspective of a girls and non-binary only club will be discussed. The teacher's views of the impact of the club will also be presented. The presentation will consider whether other primary schools could have an impact with similar initiatives.

Gormley, Helen **[PRESENTATION]**

What? Why? How? The role of teacher dialogue in fostering early mathematical reasoning through play

Early mathematical reasoning (MR) is shaped by children's everyday experiences, interactions and opportunities to engage in critical dialogue (Nergård, 2021). Although there is growing research into the development of young children's MR through structured dialogue, less is known about how MR develops through spontaneous dialogue during play-based activities.

This presentation outlines part of a multiple case study PhD project exploring how reception teachers foster MR through dialogic interactions during self-chosen activities. Video observation data was collected from six reception classes in four schools over 20 sessions. Twelve episodes were analysed in detail using an adapted SEDA coding framework (Hennessy et al., 2016).

The findings challenge the perception that early years teachers lack confidence in teaching mathematics (Ofsted, 2021) as teachers confidently engaged in mathematical discourse across a wide range of content areas. The most common dialogic strategies used to develop MR were scaffolding-guidance and questioning. While teachers regularly invited explanation and suggestion, questions prompting children's own inquiry were rare. Self-identified teacher roles of co-player, facilitator and extender influenced the strategies used. Teachers worked within the zone of proximal development (Vygotsky, 1978) to support children's mathematical thinking, although staffing levels affected opportunities for interaction and sustained dialogue.

The findings suggest that early MR should be understood as a holistic, foundational concept, and that increased training in dialogic strategies and mathematical questioning could further support children's independent mathematical enquiry.

Hamilton, Julie **[PRESENTATION]**

Creating opportunities: Supporting inclusion through mathematical creativity

In this presentation, I will advocate for the potential of creativity to enhance inclusion within mathematics teaching. The motivation for this conceptual work arises from the large number of pupils in my local context (Northern Ireland) who either do not attain a pass grade at GCSE, or who report significant levels of worry about mathematics. Although the NI primary curriculum supports exploring ideas and thinking creatively, the post-primary mathematics specification offers relatively little scope for pupils to act with high levels of mathematical creativity and agency.

I will draw on work relating to equity (Gutiérrez, 2012) and creativity (Bicer, 2021; Glăveanu, 2013) to propose a conception of 'openness' in mathematics that could provide a fruitful avenue to address some of the above challenges. Openness suggests a sense of unrestricted access that is central for inclusion, as well as capturing a sense of welcome that goes beyond simply ensuring equitable access. Openness also implies that mathematics is not finally settled and closed, but rather that there is a place for pupils to suggest and explore and entertain new ideas, in contrast to passively receiving existing knowledge. I will present my work to date on this concept, and offer some prompts for discussion.

Hartmann, René **[PRESENTATION]**

ADHD and time perception: manifestations and implications for trainee teachers

A 'faster internal clock' may be in existence in people with ADHD (Walg et al., p. 1177, 2017). The faster internal clock is counter intuitively the cause for slower processing speed (Walg et al., 2017). Time perception difficulties are prevalent amongst the ADHD community because of the link between working memory and impaired time perception (Chutko et al. 2025).

Time perception as an individual theme emerged for most of the participants on a research study with eight trainee teachers at a university, early in the interview process and therefore it was apparent that time perception as a manifestation of ADHD would be a group theme. It was a feature in the first interviews but became more pronounced in the second interviews which took place after the teaching of a mathematics lesson on a school experience, as time pressures were pronounced because organisation, thinking on feet and responding to children's varied needs were catalysts for time perception issues to come to the fore.

The difficulty with endeavouring to focus on an area or a theme, such as 'time', is that time is related to many aspects of functioning as a pre-service teacher. Aspects such as organisation (time management), working memory, (being able to remember what comes next so that there is a smooth flow of the actions in the sequence which can lead to fast and accurate working instead of going in circles and wasting time or losing track of what is going on, Chutko et al. 2025), overwhelm (too many sensory inputs to process at the same time), the faster internal clock associated with ADHD which means that the person can go off on a tangent and spend significantly more time than intended on a task (for instance an input during a lesson) which impacts the flow of the lesson (Walg et al., 2017).

Harvey-Swanston, Richard **[PRESENTATION]**

Primary teachers' conceptions of the role of mathematical representations in learning mathematics, and the influence of those conceptions on their practice

The abstractness of mathematics requires teachers to make extensive use of mathematical representations (MR) (symbols, language, gestures, images, and manipulatives) to render ideas accessible to learners. While empirical evidence shows MR can support mathematical learning, research also highlights the teacher's pivotal role in their effective use (e.g. Carbonneau, Marley and Selig, 2013; Dreher and Kuntze, 2015; Friesen and Kuntze, 2020).

Theory and policy variously construe MR as temporary scaffolds (Fyfe et al., 2014); tools for facilitating access to concepts (Dienes, 1963; Lesh, Landau and Hamilton, 1980; Goldin and Steingold, 2001); tools for enhancing pupil engagement (Dreher and Kuntze, 2015); and as a fundamental means through which learners construct mathematical meaning (Bruner, 1964; Ainsworth, 2006; Duval, 2017; NCETM, 2024). Thus, there is much for teachers to know/believe about MR that might influence their practice (Friesen and Kuntze, 2020).

This presentation reports on a pilot of a qualitative case study investigating:
(a) two teachers' conceptions of the role of MR in teaching and learning mathematics; and
(b) how and in what ways these conceptions influence their practice.

The session will outline the research design and initial findings arising from the pilot, including tensions reported by teachers in deciding how to select and use representations in their lessons, and how their conceptions informed how they framed and responded to these dilemmas.

James-Gray, Owen **[PRESENTATION]**

COVID-19 school closures and mathematics attainment: Evidence of underestimation in PISA 2022

The COVID-19 pandemic caused widespread disruption to schooling. This disruption coincided with a fall in maths attainment in PISA 2022. However, this fall in attainment has been underestimated by the OECD. Re-analysing PISA 2022 data using school administrator reports of closure length provides a more accurate estimate of COVID-19's effect on maths attainment. School closure length has a large effect (R2 = 0.54) on a country's maths attainment; this is much larger than the effect reported by the OECD using pupil's estimates of closure length (R2 = 0.11). At the individual level, maths attainment declines by approximately 1 point for every 6 days of additional school closure time; this is only a very small effect (R2 = 0.04), although including socioeconomic status in the model increases the effect size (R2 = 0.22). Counterintuitively, those most affected were pupils with high socioeconomic status and the highest attaining pupils. Boys were slightly more impacted by school closure length than girls; however, this effect was minimal. These findings suggest that school closures have a greater impact than previously thought, and in future scenarios requiring school closures they should be minimised. During such closures, high attaining pupils should be supported to reduce lost learning.

Leonessi, Davide **[PRESENTATION]**

Recapitulating the Basel Problem in Year 12: A history-as-a-tool approach to Euler's proof

In this session I discuss the design of a lesson guiding Year 12 students towards Euler's solution of the Basel Problem, namely evaluating the series $\sum 1/n^2$. The lesson invites the students to recapitulate the understanding of this problem from its first formulation in 1650 to Euler's 1734 proof of the surprising answer: $\pi^2/6$.

History is used as a pedagogical tool, in the sense of Jankvist (2009), to scaffold students' progress through a sequence of historically situated partial results; history is also applied as an affective tool to enable students to appreciate the importance of a question that had remained open for over 80 years.

The lesson starts with a brief presentation giving the context for the worksheet questions; the guided problems are scaffolded to allow for independent work. The worksheet questions are in explicitly chronological order, ending with a mathematically transgressive task, in the sense of Watford & Clark (2024).

This lesson is a condensed version of a 100-minute lesson delivered for Year 12 Further Maths students at a selective sixth-form maths school in London. Selected excerpts of student work and a summary of an anonymous engagement questionnaire will accompany

the discussion. I made these resources available at https://leonessi.org/2026/05/20/basel/ including a bibliography of the historical sources I drew on, to support adaptation in other settings. I hope this talk will start conversations about adapting this approach for other topics.

Macey, Darren **[PRESENTATION]**

Subverting WYTIWYG: How better assessment can improve pedagogy

This session reports the initial conclusions and implications of a PhD study (in progress) that used a design-research methodology to explore how making changes to classroom assessments in statistics could be used to drive changes to both pedagogy and knowledge structures, bringing these more in line with recommendations from education research such as those embodied by the GAISE II report (launched in 2020).

While it is increasingly common in curriculum documents to see calls for statistical reasoning, a data-handling cycle, use of real data, and the use of statistical analysis software, classroom practice does not always reflect this. This study developed from the idea that high-stakes assessment, commonly focused on more procedural aspects of statistical analysis, acts as a brake on the kinds of changes to pedagogy advocated for by researchers in statistics education.

In this multiple-case study teachers were tasked with preparing their year 9 classes for an interim statistics assessment instrument designed using items that look and feel very different from those encountered by learners in GCSE exams. In this session we will explore some proposed design principles for statistics assessments that emerged from analysis of interviews and reflective diaries and discuss how these may be leveraged by teachers and curriculum designers to support changes in classroom practice.

Majothi, Ali **[PRESENTATION]**

The schema problem: How CLT can legitimize instrumental mathematics teaching

This session argues that the presentation of Cognitive Load Theory (CLT) in educational policy poses risks for mathematics teaching which emanate from its focus on schema construction and disregard of schema quality. Consequently, CLT can be used to endorse instrumental teaching practices which produce low-quality procedural schemas, standing in tension with Richard Skemp's relational ideals. By exploring two contrasting instructional approaches for teaching pupils how to complete the square, this session aims to illustrate both the existence and vital importance of schema quality as an essential dimension of CLT in mathematics teaching. As such, schema quality must be incorporated accordingly into educational policy and professional standards, lest we offer a disservice in the name of psychology.

Peng, Liang*; Li, Shujie **[PRESENTATION]**

The development of spatial sense in Grade 5–6 students: A cross-sectional survey in China

This study examines the spatial sense of Grade 5 and Grade 6 students in China, focusing on three dimensions identified in China's 2022 Mathematics Curriculum Standards: Shape Recognition (SR), Shape Position (SP), and Shape Transformation (ST). Spatial sense is an important component of mathematical thinking, yet relatively little is known about how these dimensions develop across the upper-primary years. The study asks how students in Grades 5 and 6 perform across the three dimensions, which aspects show the greatest grade-level differences, and what these patterns may suggest for mathematics teaching.

Methodologically, the study adopts a cross-sectional survey design. A total of 165 students from one primary school in eastern China participated, including 77 Grade 5 students and 88 Grade 6 students. Students completed a spatial sense assessment consisting of tasks organised around the three curriculum-based dimensions and three levels of task difficulty. Descriptive statistics and independent-samples t-tests were used to compare performance across grades and dimensions.

The findings show that Grade 6 students achieved a significantly higher total score than Grade 5 students, but this difference was mainly driven by Shape Recognition. Differences in Shape Position and Shape Transformation were not statistically significant, suggesting that these two dimensions may remain relatively stable between the two grades in this sample. The study highlights Shape Recognition as a particularly developmentally sensitive dimension and suggests the need for more targeted instructional support for students' spatial visualisation and geometric representation.

Rahman, Umme Tasfia **[PRESENTATION]**

Embedding Realistic Mathematics Education in GCSE contexts: Towards meaningful mathematical learning

This presentation critically explores the potential of Realistic Mathematics Education (RME) to support meaningful mathematical learning within the high-stakes context of GCSE mathematics. RME positions mathematics as a process of mathematisation, where learners actively construct understanding through engagement with meaningful, real-life contexts. In contrast, GCSE assessment practices often prioritise procedural fluency, speed, and single correct answers, which may limit opportunities for deeper conceptual understanding and student agency.

Drawing on key theoretical concepts such as guided reinvention and the use of context, alongside empirical research, this presentation examines how RME can foster problem-solving, reasoning, and sense-making. It also considers how assessment practices shape not only learning outcomes but students' mathematical identities, influencing how they perceive themselves as learners of mathematics.

However, the implementation of RME within exam-oriented systems presents significant challenges. This presentation therefore reflects on the tensions between meaningful learning and performative assessment, and explores the extent to which RME-informed approaches can be realistically integrated into GCSE classrooms. The aim is to contribute to ongoing discussions around rethinking mathematics teaching and assessment in ways that better support student understanding and engagement.

Sivagnanamoorthy, Ilanthiraiyan*; Shah, Rehan* **[PRESENTATION]**

Identifying and critiquing potential threshold concepts within undergraduate mathematics

The notion of 'threshold concepts' can be considered akin to a portal, opening a new and previously inaccessible view of a topic, without which students would be unable to progress intellectually. They are also known to be particularly troublesome for students due to their being conceptually difficult, alien or counter-intuitive at face value. Within HE mathematics, research literature has identified several potential threshold concepts such as functions, limits, complex numbers and mathematical proofs. However, there is a strong need for mathematics educators to identify and recognise the implications of potential threshold concepts that exist within undergraduate mathematics modules.

Motivated by this, this paper presents findings and reflections gathered from a cross-institutional staff-focused interactive workshop delivered at Queen Mary University of London that featured 26 academic lecturers and educators teaching undergraduate mathematics modules across various STEM disciplines. Following a brief introduction to threshold concepts and their characteristics, participants were asked to identify and evaluate a set of concepts from a sample module description of a core first-year undergraduate applied mathematics module against key threshold concepts criteria. The results highlight that while participants found some concepts easier to classify than others, they also struggled to conclusively evaluate concepts against certain threshold characteristics.

Stryjniak, Marta*; Ilie, Sonia; Maragkou, Konstantina **[PRESENTATION]**

Maths vs. English comparative advantage and university application behaviour

Do high-attaining girls opt out of STEM pathways, even when they perform well in Maths? This paper examines the role of Maths vs. English comparative advantage, defined as the difference between a student's performance in Maths and English, in shaping gendered educational choices and STEM participation.

Using administrative data from the GRADE dataset, this study examines the role of comparative advantage at Key Stage 2 and Key Stage 4 in explaining gender differences in favour of boys in 'facilitating' STEM A-level uptake and applications to high-tariff STEM university courses among 2017 to 2019 cohorts of university applicants in England. Multiple linear regression models are employed to estimate these relationships.

The results indicate that comparative advantage is a relevant predictor of STEM-related choices, and that it accounts for a larger share of the gender gap in the number of STEM A-levels than Maths attainment alone. In addition, high Key Stage 2 Maths attainment remains an important predictor of applying to university in the first place. Other insights regarding socioeconomic status and ethnicity are also discussed.

The session situates the findings within broader gendered attainment profiles in Maths and English and their role in shaping educational trajectories and later subject choices. It also reflects on policy goals and the broader societal consequences of gendered subject choices in higher education.

Wildani, Junaidah **[PRESENTATION]**

Beyond lesson design: A CHAT analysis of teachers' enactment of mathematical problem-solving instruction

Teachers' classroom practices are shaped not only by curriculum intentions, but also by multiple competing demands within classrooms and wider school contexts. As teachers engage with instructional tasks, these competing factors can mediate and sometimes constrain their actions. This highlights the importance of designing lesson interventions that are sensitive to the realities of classroom practice.

This study draws on a design-based intervention conducted as part of my PhD project, in which a series of mathematical problem-solving lessons was designed to support teachers in enacting problem-solving instruction. The intervention combined carefully designed problem-solving tasks with a scaffolding framework intended to support classroom interactions, with the aim of enabling students to experience mathematics as a problem-solving endeavour. Four teachers participated in the study and demonstrated differing patterns of development in their practices.

Using Cultural-Historical Activity Theory (CHAT) as an analytical lens, this paper examines the contradictions that emerged as teachers implemented new approaches into their everyday classroom activity systems. The analysis illustrates how tensions between existing classroom norms, institutional expectations, available tools, and pedagogical goals shaped teachers' enactment of problem-solving instruction. The findings suggest that improving mathematics learning requires attention to more than curriculum and support materials.

Zhang, Qiaoping **[PRESENTATION]**

A comparative study of two frameworks with Chinese in-service mathematics teachers and implications for cross-cultural research

Teacher noticing, the capacity to attend to, interpret, and respond to significant or critical classroom events, has emerged as a cornerstone of effective mathematics instruction. Yet most existing frameworks have been developed in Western contexts, raising questions about their suitability for culturally distinct educational settings such as China. This paper reports on an exploratory empirical study involving 24 Chinese primary in-service mathematics teachers who observed exemplary lesson videos using one of two frameworks: an open framework (adapted from van Es and Sherin's Learning to Notice framework) or a focused framework, which integrates the Chinese Three-point framework (key, difficult, critical points) with an additional starting point and western noticing dimensions. qualitative analysis examined what teachers noticed (agent, topic) and how they interpreted classroom events (stance), as well as their noticing levels. findings reveal that teachers utilising the focused framework demonstrated greater breadth and depth of attention to students' mathematical thinking, made stronger connections between observation and pedagogical decisions, and exhibited higher noticing levels than peers using the open framework. situating these findings within the broader cross-cultural literature, the paper argues that culturally responsive frameworks are essential, that vignette-based methods carry methodological limitations, and that longitudinal and interventional research is needed to advance the field globally.