British Society for Research into Learning Mathematics

BSRLM NEW RESEARCHERS' DAY

SESSION HANDBOOK

University of Manchester

Saturday 17th June 2023

Plenary

Using innovative research methods to examine student perspectives

Professor Jodie Hunter, Massey University
Jodie Hunter is a lecturer in the Institute of Education and teaches papers in the area of Mathematics Education and Pasifika education. She has previously at Plymouth University, UK in the Centre for Innovation in Mathematics Teaching and Learning. Her research interests include effective mathematics teaching and culturally responsive teaching for Pasifika learners.

There has been increasing awareness of the need for educators to develop and use innovative research methods to build on the voices of diverse groups of early years and primary age children. This requires methodological tools and instruments that are appropriate to use with young children and their families, and which support the identification of non-cognitive factors that have an influence on mathematical development within primary schooling. These tools and instruments need to be suitable for diverse participants across different cultural contexts and socio-economic backgrounds and provide opportunities for educators to take an expanded view of learning settings. In New Zealand and the Pacific region, Professor Hunter leads a programme of research using innovative methodology to focus on student experiences in home, community, and school settings.

In this seminar, we will examine the use of photo-voice and photo-elicitation interviews to position young children and their families to identify and document home and community experiences and activities that involve mathematics. A second key focus will be the use of mixed method approaches to investigate non-cognitive factors that influence equitable engagement in mathematics including values, attitudes, disposition, and well-being. This will include purposefully adapted and designed mixed method approaches including the use of open-response items with mathematical learning statements to investigate values and well-being (for example, to measure the value of utility, "It is important to do maths that is useful for my life outside of school"), drawings, and flexible interview approaches.

Morning Workshop

Researching your own practice

Dr Rosa Archer, University of Manchester
Previously a head of a department at a sixth form college, Rosa is a senior lecturer in Secondary Mathematics at University of Manchester. Her research interests are in lesson study and teacher subject knowledge in mathematics.

This hands-on workshop will focus the reflection on our own understanding and values regarding research in education. I will share some practical ideas that might help you establish yourself as a researcher. I will also share my experience of how I became interested in lesson study and how I used it to research my practice as a teacher educator. I will also analyse my mistakes and the strategies I adopted during my career.

Afternoon Workshop

Doing 'classroom-close' research in mathematics education: what's the same, and what's different, across phases?

Dr Jennie Golding, UCL, Institute of Education
Jennie taught mathematics learners aged 3 to 93 in her 'classroom-based' career. She is now Associate Professor of mathematics education at University College London IOE, and department graduate tutor; her research focuses on the policy-practice interface in mathematics education

This hands-on workshop will address selected methodological and ethical issues that can arise as researchers explore issues directly or indirectly relevant to education practice, whatever the researcher's degree of 'insiderliness'. The focus will be on a small number of methodological and ethical dilemmas that might vary with the age and stage of the relevant learners, but are selected to support informed reflection and discussion. Trigger examples will be drawn from a series of 'classroom-close' longitudinal studies Jennie led 2016-22, exploring the enactment of new curricula for mathematics learners aged 5 to 18, and the impact of related resources and assessments.

Research papers

Akhtar, Kalsoom **[PRESENTATION]**

Teachers' conceptions of creativity in mathematics teaching

This research study employs an interpretative approach to investigate how teachers' conceptions of creativity in mathematics teaching are influenced by the Teaching for Mastery (TfM) approach. Specifically, it aims to examine teachers' beliefs about mathematics as a subject, their pedagogical practices, and the contextual factors that may impact their conceptions and practices of creatively teaching mathematics. The study focuses on key stage 2 teachers and employs three phases of data collection. Data collection will continue until July 2024. The research prioritises the perspectives of the participant teachers and aims to explore how they perceive creativity in mathematics teaching (thinking versus enacting). Early interim findings will be presented in this session, including teachers' responses to the survey (phase 1) and interview questions (phase 2). The survey explores teachers' notions of creativity, beliefs, orientations, and subject and curriculum knowledge, while the exploratory interviews gather more in-depth understanding of how these notions are formed and applied in practice. This offers valuable insights into teachers' perceptions of interactions with students in mathematics lessons and how these behaviours may foster creativity in learners. A conceptual framework has been developed based on existing literature and theory and will be used to support the analysis.

Angier, Corinne **[PRESENTATION]**

Global Citizenship in Scottish mathematics classrooms: affordances and constraints

I will report on a PhD study to explore the affordances and constraints for integrating Global Citizenship themes in mathematics classrooms in Scotland where this is an expectation as part of the Learning for Sustainability policy. I have worked with a development education centre to devise subject specific classroom materials and professional learning programmes for mathematics teachers. Material has been collected through interviews and short responses to online prompts from some of the teachers who have chosen to engage in this professional learning. I also have some journal writing from my experiences of facilitating the programme with the DEC. I will present some of my findings and discuss some of the ethical issues that have led me to consider different approaches to using the material I have to answer my research questions.

Boli, Despoina **[PRESENTATION]**

What GCSE Maths resit learners say about Word Problems: Collecting data through revision workshops.

Solving word problems is often a challenging skill for less highly-attaining GCSE mathematics students. In a previous study I conducted, resit GCSE Mathematics learners in a Further Education college typically reported that they had not been taught strategies for approaching such problems. Consequently, they faced difficulty in applying their classroom knowledge to examinations. The current study therefore aimed to explore the methods such learners employed when tackling word problems, both in the classroom and during formal examinations. Initially, I planned a narrative approach. However, during the pilot phase, I observed that many learners hesitated to participate fully in focus groups, due to their reluctance to share their stories with peers. Although there is evidence that learners can greatly benefit from such exchanges, I respected their preferences and made adjustments to the study design. I instead gathered data via a carefully planned mathematics word problems workshop. This provided a platform for learners to both share their encounters with word problems and enhance their mathematical skills. In this session, I will discuss the workshop design process, related ethical issues, data collection and initial findings.

Flack, Stephanie **[PRESENTATION]**

The perspectives of higher attaining year six children towards concrete and pictorial representations in mathematics.

The aim of this two-phase, sequential mixed methods study was to explore the perspectives of higher attaining year six pupils (aged 10-11) towards concrete and pictorial representations in mathematics. In the first phase of the research, a questionnaire was used to assess the perspectives of 41 pupils towards concrete and pictorial representations. Linear regressions were used to explore the link between pupils' perspectives and their current mathematics attainment. The analysis found that mathematics attainment had no significant effect on the perspectives of pupils. The second phase of the research followed an action research design which aimed to explore the effect of an intervention on the perspectives of higher attaining pupils towards concrete and pictorial representations. An interview with two higher attaining pupils revealed that, although no correlation was found between attainment and perspectives in the initial stage of the study, the pupils held overwhelmingly negative perspectives towards both category of representation. These participants then engaged in an intervention focusing on how they could use representations to enhance their mathematical understanding. A further interview following the intervention revealed pupils held more positive perspectives and were able to use the representations to support their reasoning. This suggests that CPA interventions with higher attaining children are beneficial for this group of pupils.

Goodland, Jane **[PRESENTATION]**

A transmission approach to maths teaching - political narratives and teachers' beliefs

This presentation confronts the traditional style of teaching mathematics, where teachers impart knowledge to students by a transmission approach. Transmission teaching is prevalent in many mathematics classrooms and is often embedded in schools through 'mastery' curriculums. However, it is part of a neoliberal agenda and is an oppressive teaching approach, requiring students to conform and be passive, and disadvantaging students from working class or marginalised backgrounds. In this presentation, I consider the links between transmission teaching and neoliberal narratives, and look at how teaching staff have internalised the transmission approach to the point where they hold unquestioned beliefs. Through a series of interviews with teaching staff, and drawings they have made of themselves, I look at beliefs and opinions around mathematics education and teaching approaches. The data is not yet analysed but some participants appear to hold beliefs that align closely with mastery approaches, whilst others appear to experience some conflicting beliefs.

Harris, Sophie **[PRESENTATION]**

Unveiling Educational Inequalities: Exposing Factors Affecting Pupils' Mathematical Attainment

Rishi Sunak recently announced an ambitious goal for all individuals to study mathematics until the age of 18, emphasising the need to address the prevalent anti-maths mindset and re-evaluate our nation's perception of the subject. Whilst these objectives are important, it is argued that the design of GCSE mathematics inadvertently perpetuates inequalities by categorizing individuals based on their mathematical abilities. Students do not have equal opportunities in the realm of mathematics education. Numerous structural factors, such as social class, school attended and setting, significantly influences pupils' opportunities. Unfortunately, GCSE maths fails to account for these factors, thus erecting barriers that disproportionately affect students from working-class backgrounds. This can lead to many disengaging from learning mathematics, adding further to the structural barriers that working class pupils experience. Bourdieu's Theory of Practice, which explores the interplay between structure and agency, provides a valuable lens for comprehending the diverse factors that impact pupils' mathematical attainment. By unveiling these barriers, this research hopes to highlight the various barriers that impede pupils' mathematical attainment, and pave the way for transformative interventions that promote fair and inclusive learning environments, ensuring every student has an equal chance to succeed.

Howard, Teresa **[PRESENTATION]**

ScratchJr - a programming approach for developing pattern awareness

This presentation details my dissertation research project which I conducted for my MA in Mathematics Education at UCL. The project sought to explore how Key Stage 1 pupils interact with a programming language in a mathematics classroom and the meanings they made during this process. An intervention was designed that drew upon aspects from the ScratchMaths (UCL, 2020) and Pattern and Structure Mathematics Awareness Programme (Mulligan and Mitchelmore, 2016) curriculums. The intention behind this was to examine if pedagogical nuances from the KS2 ScratchMaths programme could be applied in a KS1 context and if the PASMAP framework for pattern awareness could support the evaluation of development. These starting points were grounded within a constructionism perspective which allowed the meanings the participants created within the DLE to come to the fore. Certain themes emerged from the data that was gathered, including the development of the unit of repeat, multiplicative thinking and the role of the affective. Whilst there as a demonstrable progression in concept formation for the unit of repeat, the last two themes, gave rise to surprising insights that may have implications for teachers interested in integrating programming into their mathematics classroom content.

Inan, Gamze **[PRESENTATION]**

Integrating Critical Mathematics Education with a Foucauldian Lens: Unveiling the Nature of Mathematics

This paper aims to interpret Critical Mathematics Education (CME) through the integration of a Foucauldian perspective, with an emphasis on the nature of mathematics. The underlying principle of CME is to foster awareness among students of the world around them, thereby stimulating actions to make the world a more just and equal place. To reach this emancipatory objective, it is necessary to elaborate the construct of mathematical knowledge. My argument contends that while mathematics is traditionally associated with a realist outlook, recognizing the constructed nature of mathematical knowledge is a vital step towards challenging dominant discourses and fostering critical engagement. Drawing on Foucault's theories on power, knowledge, and discourse provides valuable insights into how CME can be applied thoroughly.

King, Laura **[PRESENTATION]**

Exploring the interaction between teaching for mastery pedagogy and social justice in the 'lived experience' of mathematics mastery for children in Key Stage 1

Teaching for mastery is the government's policy initiative for improving outcomes in mathematics. However, the impact of mastery policy on pedagogy, and the resultant effect on children's experiences of their mathematics classroom, is rarely attended to. Also, considerations of social justice through the teaching for mastery pedagogy, are often overlooked when evaluating this approach to teaching mathematics. This research explores the interaction between teaching for mastery pedagogy and social justice using an interpretivist approach. Data was collected as part of a constructivist grounded theory case study of one school. This was formed through contextual interviews with teachers, participant observation of mathematics lessons and focused interviews with children, designed to co-produce data to illuminate children's experiences. In this presentation, the data from one teacher and their class will be discussed. An exploration of initial coding and the development of more focused coding will be presented, and some initial themes examined. For the teacher involved, there were many pedagogical dilemmas relating to teaching for mastery and a discourse of ability was apparent through pedagogy and reflection. For children, the role of talk and friendship was frequently encountered, alongside perceptions relating to agency and being in control of their own thinking or work. The progression to more theoretical perspectives will also be considered.

Parsell, Lee and Riley, Gaynor **[PRESENTATION]**

Unpicking Adaptive Teaching

Traditional methods of maths teaching have often involved differentiation of curriculum materials for different groups of pupils in the classroom based on their perceived ability. The move towards the mastery approach to teaching and learning maths has begun to transform classrooms so that all pupils have access to the same work, with a teacher making adaptations to their own practice in response to individual needs in the classroom. What does this look like? How can we support new members to the profession to both adapt and respond when teaching?

Proshkin, Volodymyr **[PRESENTATION]**

Development of mathematics conceptual understanding of university students in the digital learning space conditions

The digital learning space has been developed to study" Derivative", where students can explore mathematical concepts and relationships between them, formulate hypotheses, experiment, ask questions, draw conclusions and discuss the results. Digital tools are built into the space, which allows the implementation of different learning activities (individual, group and frontal) and thus ensures the effectiveness of conceptual knowledge about the derivative. On the example of studying Lagrange's theorem on finite increments and solving various applied mathematical problems, methods of conceptualising students' mathematics are given.

Srinivas, Suchismita **[PRESENTATION]**

Collective Biography as a research method to examine inclusion of low-attaining learners in the mathematics classroom

Discourses on 'inclusion' and 'social justice' in education are increasingly dominated by so-called 'meritocratic' principles. A fallout of this is that students who struggle with academic achievement are increasingly either being marginalized in the classroom or being streamed into different groups/classes/schools and excluded from important mathematics. My proposed research plans to adopt a Feminist Poststructuralist approach to interrogate existing conceptions of inclusion and social justice that are held by mathematics teachers in India and explore how research-practice dialogue can be leveraged to develop a shared vision of inclusion and social justice in the classroom that is grounded in the notion of participatory parity for low-attaining students. In my presentation, I will share the theoretical-methodological approaches and methods that I plan to use in my qualitative study. Specifically, I want to invite discussion on the pros and cons of using 'Collective Biographies' as a Feminist Poststructuralist method to develop collective agency amongst researchers and practitioners in mathematics education.

Waite, Isobel **[PRESENTATION]**

An Exploration of the Primary to Secondary School Transition in Mathematics, One Year On

This presentation reflects on my master's level dissertation (An Exploration of the Primary to Secondary School Transition in Mathematics through the Lens of Identity and Figured Worlds), one year on, from the perspective of completing a PGCE mathematics student. I transpose my first-year teaching experiences at the secondary level over the research I carried out in 2021 and offer considerations for teaching students in transition beyond pedagogical directives.