



British Society for  
Research into  
Learning Mathematics

**BSRLM SPRING DAY CONFERENCE 2023**

**SESSION HANDBOOK**

**Saturday 4<sup>th</sup> March 2023**

## Plenary Presentation



### **Kenneth Ruthven**

**Emeritus Professor of Education, University of Cambridge.**

**Kenneth will be awarded a BSRLM honorary award at the conference.**

### ***Teacher craft knowledge underpinning the integration of digital tools into school mathematics teaching***

The craft knowledge of teaching is the practical working knowledge that shapes how teachers perceive teaching situations and plan for and act in them. This talk outlines a programme of research which sought insights into the craft knowledge underpinning integration of the use of digital tools into secondary-school mathematics teaching. The programme experimented with different approaches to capturing and analysing such knowledge. These approaches gave rise, in turn, to a basic model of successful practice, to outlines of the practical theories guiding specific practices and analyses across these, and to a framework relating craft knowledge to key structuring features of classroom practice.

## Research papers, workshops and working groups

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

**Awortwe, Peter Kwamina**

[PRESENTATION]



***Preparing a new generation of beginning teachers to acquire appropriate knowledge for teaching geometric constructions using dynamic geometry software.***

I report how a new generation of beginning teachers can be supported to gain appropriate knowledge for teaching geometric constructions in secondary schools. The research was designed for an online classroom learning environment with essential elements, including the use of dynamic geometry software, an interactive collaborative setting, carefully designed technological-based geometric construction tasks, and beginning teachers as learners and investigators. Twelve post-graduate university-based secondary beginning teachers worked in pairs, remote from each other, in a Microsoft Teams environment, sharing a screen with their collaborative work within GeoGebra. Data consisted of individual interviews and video recordings of all the activities they investigated and discussed. Thematic analysis was developed in the NVivo software, primarily drawing on the TPACK framework and framework of the kinds of dialogic learning talk to categorise the knowledge gained for teaching and provide insight into this co-construction of knowledge. Findings show that this designed online learning environment can support beginning teachers in collaboratively gaining appropriate knowledge for teaching geometric constructions.

**Bissell, Alistair**

[PRESENTATION]



***Interrogating transcripts of videos of online professional development sessions for teachers of mathematics.***

Online courses for the professional development for teachers of mathematics may be more convenient and accessible to teachers, but sustaining engagement and facilitating interaction are a challenge of remote learning. What are facilitator practices when running an online professional development course for teachers of mathematics? How do facilitators respond to teacher contributions and how do ways of working get established online? Between 2020 and 2022 I ran 5 cohorts of an online course, in Zoom, aimed at supporting teachers of A level Maths to develop their pedagogy. I have recorded around 80 hours of video and Zoom has transcribed the audio. In this session I would like to engage participants in the challenge of working with a data set of this size. I will describe how I plan to use a mixed methods approach to analysing this data and will share some representations of data analysis that could be used to compare course sessions. My hope is that this might spark further ideas and raise further considerations regarding how I might analyse my data.

Griffiths, Rose

[PRESENTATION]



*What can we learn from a hundred years of teaching fractions and decimals?*

When I was at primary school, every accurate drawing I did used mixed numbers with quarters and eighths of an inch. We had four farthings in a penny, twelve pence in a shilling and twenty shillings in a pound, until 1971, when decimalisation made tens, ones and tenths more common in almost every aspect of measurement. Our everyday calculations moved (somewhat bumpily) from mainly pencil and paper and in our heads, to include access to calculators and computers. How did our teaching change to accommodate this new situation? And which babies have we thrown out with the bath water? . As part of our Nuffield-funded project (with Jenni Back and Sue Gifford: Making Fractions) we have looked at how fractions and decimals appear in a sample of teachers' handbooks and pupil textbooks published from 1917 to 2021, predominantly for primary schools. I used the wonderful Mathematical Association archive (which is kept in the University of Leicester library) and some additional volumes from our personal collections. In this presentation I will show some of the materials we explored for potentially helpful tasks and ideas that may have fallen out of use, as common fractions became less common, and decimal fractions became more familiar. We will discuss the accessibility of mixed numbers, new definitions of 'families' of fractions, and the importance of halves and tenths, amongst other things.

\*Golding, Jennie; Redmond, Benjamin; Grima, Grace

[PRESENTATION]



*'The new normal': emerging evidence for pandemic-related changes in opportunity to learn.*

There is widespread evidence that pandemic constraints resulted in reduced performance in standardised attainment tests, varying by age/stage and by socio-economic status. There is also evidence of (variable) 'recovery' from such 'learning loss'. However, following the pandemic hiatus, the nature of, and reasons for, emerging classroom practice and experience are less clear. We report on the 'new normal' in five secondary mathematics departments, fairly representative in several key characteristics, and four of whom we worked with pre-pandemic. In each school, a late 2022 two-day 'deep dive' visit included observations of lessons in a range of four classes in years 7-11, supplemented by student focus groups and teacher interviews for those 20 classes. We explored the experienced curriculum breadth and balance, its relation to recent high-stakes assessments, and in particular, the development of problem solving and reasoning, of mathematical communication and mathematics-related affect, the use of digital tools for learning mathematics - and the stability of that provision. We analyse pre-to-post pandemic changes in opportunities to learn in those areas, the reasons given for those changes, and how they appear to vary with department- or student-related characteristics. We identify important features of teacher-level capacity and (physical, emotional and cognitive) support as key in these schools to sustaining more ambitious, if different, learning experiences post-pandemic.

Helme, Rachel

[PRESENTATION]



***In their own voice - Listening to the stories-as-identity-work of students having to retake their mathematics GCSE in a post-16 college.***

In this session I will share some of the findings from a study into the identity work in the context of low attainment in mathematics. The study focussed five students who were retaking their mathematics General Certificate of Secondary Education (GCSE) in a post-16 college in the South-West of England. Collecting data both pre-pandemic, from October to December 2019, and mid-pandemic, from December 2020 to July 2021, I examined the mathematical identity work as the collection of stories told by, and about, students in the context of studying mathematics (Sfard & Prusak, 2005). The findings demonstrated the complex nature of mathematical stories-as-identity-work for these five particular GCSE resit students.

Liying, Huang; Fujita, Taro

[PRESENTATION]



***Duo Virtual Reality and Tangible Artifacts in Geometry Education***

Given the importance of geometric reasoning skills, this study aims to contribute to the successful development of students' geometric reasoning skills through a combination of virtual reality and tangible objects. In particular, this study focuses on spatial reasoning skills, defined as "the ability to represent, transform, generate and retrieve symbolic and non-linguistic information". To achieve our study aim, we will investigate the following research questions: What geometric/spatial thinking skills can be developed through the use of duo Virtual Reality and tangible artefacts for students? How do students use duo Virtual Reality and tangible artefacts when solving a problem involving geometric/spatial thinking skills? In this presentation, we will present some findings from our critical review of 20 articles that specifically investigated the use of VR in geometry learning and the development of spatial thinking skills through the duo VR and tangible artefacts, the area of research that is relatively underdeveloped in terms of both quantity and diversity. In particular, the review discusses three areas: the configuration of the VR device and software and the tangible artefact according to the content of the lesson, models of the development of spatial thinking skills and instructional design, and the instructional performance of teachers and students.

\*Jones, Ian; Simsek, Emine

[PRESENTATION]



***Not the same: Substitution and the equals sign.***

Children have been reported as viewing the equals sign in three distinct ways: as an operation meaning calculate and write down the result, as a relation meaning the same value is on each side, and as a substitution rule meaning one side can be exchanged for the other. Recently, some researchers have asserted that there is in fact no distinction between the sameness and substitutive views of the equals sign (e.g. Kieran, 2022), on the grounds that substitution necessarily arises from sameness. In this presentation we will summarise the evidence that sameness and substitution are indeed distinct. This includes qualitative evidence arising from secondary students solving computer-based arithmetic puzzles by focussing on substitution but not sameness (Jones & Pratt, 2012), quantitative evidence that primary students perceive sameness and substitutive definitions distinctively (Jones et al., 2012), and quantitative evidence that secondary students who endorse a substitutive definition outperform those who do not on conceptual algebra items (Simsek et al., 2019). We conclude that the difference of opinion between us and others about whether sameness and substitution are distinct arises from differences in how the substitutive view of the equals sign is defined.

Kerrison, Lois

[PRESENTATION]



***Supports and barriers for teachers' use of real-life context to develop students' maths literacy.***

This study explores whether barriers exist for students and teachers when trying to understand and apply mathematics to real-life contexts. The study will not only investigate the potential limitations of students' understanding and ability to solve real-life context questions, but the impact and influence any teachers' limitations may have on students learning. I believe that a students cultural capital can provide support to their understanding of real-life context questions, but for those that lack extensive cultural capital this lack of experience can be a barrier to being able to solve real-life context questions. Blum suggests that the different levels of experience of the teacher and their understanding of how mathematics is used outside of the mathematics classroom can impact success in students' learning and understanding (Blum et al, 1991). In this instance, I believe that teachers rely on their own experiences to help teaching real-life context in the classroom. Firstly, this study looks to identify whether students struggle with real-life context questions on the maths GCSE and if there are any specific topics and any particular group of students impacted by real-life context questions. Secondly, for the teachers to develop their professional practice and support them to improve their students' understanding of working mathematically in real life-contexts and to build their own confidence in teaching mathematics in this way.

Koyuncu, Mehmet Kasim

[PRESENTATION]



***Studies in Mathematics Education in an SSCI Indexed Journal: Suggestions for the UK based on the Turkey Example.***

As of 2022 in Turkey, there are eight SSCI-indexed academic journals, only one of which aims at publication within the scope of educational research. Since the researcher's field of study is mathematics education, examining the articles on mathematics education in this journal motivated him to conduct this study. Therefore, this study aims to explore the mathematics education studies published in an SSCI-indexed journal in Turkey. Through which I will inform all my colleagues about the mathematics education studies in Turkey's most prestigious academic journal with educational content. I plan to contribute to the literature by shedding light on a practical problem, such as the relevant journal's mathematics education-themed publication policies. This journal, which started its publication in 1976, began to be indexed in the SSCI in 2007. For this reason, in this study, an answer was sought to the following question: "How do the samples, data collection tools, research designs and study areas of the studies on mathematics education differ between 2007-2022 in this journal?" From this point of view, the universe of this research is all the articles published in the related journal between 2007-2022; the sample is the mathematics education studies published in the same journal between the same years. The articles were selected by purposive sampling and then subjected to descriptive analysis through the publication classification form developed by the researcher.

Kucheman, Dietmar

[PRESENTATION]



***PGCE Mathematics students' written responses to some multiplicative reasoning items.***

I recently undertook a small piece of research on multiplicative reasoning. In this session I will discuss its modest findings. Twenty PGCE mathematics students, early in their course, were given a short written 'test' on multiplicative reasoning. As well as writing an answer for each item, they were asked to indicate the method they had used, by showing working or by providing a brief explanation. The items were originally designed to stimulate classroom discussion with pupils in lower secondary school. As expected, the PGCE students were generally very successful on the items. However, they used an interesting variety of methods, which we shall look at in this session. Some of the methods were quite grounded, which bodes well for the students' future interactions with pupils in school. Surprisingly perhaps, one of the items, involving similarity and enlargement, was answered successfully by only 3 of the 20 students and it is interesting to consider why - was it due to a quirk in the item, or might it reveal a challenging aspect of multiplicative reasoning? I investigated this further by giving the students another short test when I met them again 4 months later. The responses suggest that many of the students currently have fairly limited insights into this area of school mathematics. Is this because their recent university experience of mathematics is very different from school mathematics, or might they never have substantially developed the insights in the first place?

Machino, Natheaniel

[PRESENTATION]



***Mentors' views on challenges faced – and lessons learnt – while mentoring mathematics student teachers in FE during the Covid-19 lockdowns.***

The education systems globally went into emergency when COVID 19 struck and there was no choice but to go online in teaching, initial teacher education and mentoring. Education systems learnt a lot from this experience which could be beneficial post COVID 19 era. In this presentation, I report findings of an analysis of ten mathematics student teacher mentors' responses to two questionnaire questions: What are the challenges of mentoring mathematics student teachers during COVID? What have you learnt which you think could be carried post COVID? Seven out of the ten mentors were then interviewed. Following thematic analysis, findings show that mentors struggle to find time to support their mentees but collaboration freed time. Student teachers felt disconnected from personal and professional relationships while working online and mentors learnt to constantly check on their mentees using emails, texts, video calls and numerous platforms. Teaching mathematics online was problematic as physical demonstration was not possible and mentors found it difficult to observe online lessons and give feedback. This taught mentors about software which could be used. Online mentoring has opened mentors' eyes to the benefits of recording lessons and reviewing them with their mentees during feedback. Explaining to student teachers about behaviour management while teaching online was difficult but recorded lessons turned out useful in discussing various issues including behaviour management.

\*Lord, Emms; Woodham, Liz; Millington, David

[PRESENTATION]



***What is the impact of bringing the natural world into the primary mathematics classroom?***

Engaging and enthusing learners alongside delivering the core curriculum is a key challenge faced by mathematics educators. NRICH- a collaboration between the Faculties of Mathematics and Education at the University of Cambridge - joined forces with The Natural Curriculum to explore the potential of embedding video clips from the BBC's Natural History archive into classroom problem-solving lessons. In this session, Director of NRICH Dr Ems Lord will report on the findings from the nine pilot project schools.



\*Mahak, Sheeza, Morsanyi, Kinga; Foster, Colin; Bin Sarfraz, Waqas

[PRESENTATION]



***Mathematics ability in High-Functioning Autism: A systematic review and meta-analysis***

High-functioning autistic individuals are frequently perceived as mathematically gifted. However, limited existing research on mathematical ability in autism is inconsistent. To address this gap, we conducted a pre-registered meta-analysis comparing maths performance of autistic and neurotypical individuals, following PRISMA guidelines. We searched electronic databases for studies published up to Feb, 2023 and found 3061 records. After removing duplicates, 1934 records were screened for title/abstract, leaving 62 records for full-text review. Finally, 12 records met inclusion criteria, where autistic (n=518) and neurotypicals (n=514) were matched on chronological age and IQ. A random-effects model with Hedges'  $g$  revealed that autistic individuals had a small, non-significant advantage over neurotypical individuals ( $g=0.12, p=.29, (95\%CI(-0.92-0.68))$ ). Also, meta-regression analyses with the potential mediators (age and type of IQ task) showed non-significant effects. Because several studies included effect sizes from multiple types of tasks, for further analysis, the maths outcome was split into two categories: computation and problem-solving. These analyses showed that, for problem-solving only, the group differences were significant ( $g=0.25, p=.05, (95\%CI(-0.99-0.50))$ ), favouring autistic participants. Egger's regression test indicated no publication bias. Overall, the findings suggest the importance of tasks for measuring maths outcome among autistic and neurotypical individuals.

Makramalla, Mariam; Tilley, Emmanuella

[PRESENTATION]



***Cultural Perceptions to the teaching of problem solving: A case study of a curricular transfer experience between UCL and New Giza University.***

Situated in an academic collaboration, the Engineering Design Practice (EDP) program has targeted the integration of problem solving skills as a vertical pillar that extends across the various study fields on a learner's journey to become an engineer. The EDP module has been developed by consultants, stationed at University College London to be implemented at New Giza University. In this session, the two authors come together to present their experiences of this curricular transfer experience, highlighting challenges and affordances in bridging the gap between curricular envisioning and curricular implementation. The data triangulates desk based study of the learning outcomes with classroom observations of the course implementation and student focus group reflections on the course implementation, thereby capturing the student side, the instructor side and the curriculum writer side. The findings of the study indicate a varying perception of the nature of problem solving across both cultures and ways to make use of this variation to further develop the program in a way that is inclusive and sustainable.

**\*Oakes, Dominic; Lyakhova, Sofya**

[PRESENTATION]



***Student Engagement with Instructional Videos.***

FMSPW (Further Mathematics Support Programme Wales) have made Flipped and Revision videos covering the whole of WJEC Maths and Further Maths A-levels, GCSE Revision videos and various series of Enrichment videos. In our online Tuition for Further Mathematics, we use our own Flipped Videos together with Gapped Notes to maximise the possibility for interaction in our online sessions. While some of our videos were produced before the Pandemic, the majority were created in response to students studying remotely, independently, in reduced time or through a reduced curriculum during Covid-19. As time evolved, some of the video resources became more popular than others. The session will report on evidence gathered so far on how students and teachers use the videos.

**Papadaki, Evi (Paraskevi)**

[PRESENTATION]



***Reframing the opportunities to engage with advanced mathematics for teaching.***

Historically, research on advanced mathematics for teaching is considered in the context of higher education institutions (e.g., design of university courses for prospective teachers, connections between university and school mathematics). In this presentation, I adopt a commognitive viewpoint (Sfard, 2008) and discuss instances of opportunities to engage with advanced mathematics in informal settings and potentially interesting questions arising from them. The instances emerge from the analysis of data collected through lesson observations and interviews with teachers and teacher educators during my doctoral studies, and reflections on my personal and professional experiences. I argue that exploring the opportunities to engage with advanced mathematics beyond academia could provide valuable insights into the characteristics of advanced mathematical discourse for teaching and the role of universities in mathematics teacher education. Finally, I propose a working definition of advanced mathematical discourse for teaching taking also into account learning in informal or non-academic settings and outline potential research questions for further investigation.

Proshkin, Volodymyr

[PRESENTATION]



*School mathematics education in Ukraine: challenges and prospects.*

During the years of independence, education in Ukraine, particularly mathematics, underwent some transformations. Orientation to the European educational space encourages the development of new standards and school curricula that meet today's demands (practically oriented learning, conceptual understanding of mathematics, research-based learning etc.). At the same time, mathematics school education faces many problems, including a decrease in the level of teaching of mathematical subjects, the inconsistency of the education content with the requirements of today, the low quality of textbooks, and the lack of appropriate conditions for providing specialized mathematics education. The report presents the research results aimed at identifying pupils' mathematical literacy and the level of STEM education. A study of more than 3,000 pupils revealed typical knowledge gaps caused by distance learning during the Covid-19 pandemic. To overcome the identified problems, particular methodical recommendations were developed.

\*Roulstone, Alison E.; Morsanyi, Kinga; Bahnmüller, Julia

[PRESENTATION]



*Developmental Dyscalculia: Examining Performance in Curriculum-based Assessment.*

Developmental dyscalculia (DD; or a specific learning disorder in mathematics) is characterised by severe impairments in acquiring mathematical skills, which usually becomes apparent in the early years of schooling. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5, APA, 2013) recommends that pupils with DD are diagnosed on the basis of standardised, curriculum-based assessment. Yet, the evidence is still unclear about the specific areas of the math curriculum where children with DD experience the greatest challenge. According to some approaches, dyscalculia is considered a specific disorder of arithmetic skills, whereas others propose that DD is underpinned by more general cognitive deficits. In this secondary analysis of data, we explored the magnitude of group differences between children aged 8 to 11 years old with a cognitive profile matching a diagnosis of DD (n=20) and their typically developing peers (TD; n=20). We examined the effects of content domain and question item format (i.e., multiple-choice vs. constructed response questions) in curriculum-based assessment. Our results revealed that children in the DD group achieved significantly lower scores than the TD group across all content domains, irrespective of question item format. Our findings suggest that performance across all content domains, and not just arithmetic may be diagnostically informative in supporting a clinical referral and diagnosis for DD.

Rumbelow, Michael

[PRESENTATION]



***Blocks as symbols: young children's storytelling of blocks in play as proto-algebraic symbolisation.***

The genealogy of the block manipulatives now common in primary mathematics classrooms in England such as multilink and unifix cubes, as well as Lego bricks, can be traced to the wooden building blocks designed for young children by Friedrich Froebel (1782-1852), the inventor of Kindergarten. Froebel also designed a series of playthings to be introduced gradually before wooden building blocks, starting with a red woollen ball on a string supposed to represent the mother's breast, for babies, followed by a wooden ball, a cylinder and a cube, which when storied with actions by caregivers and young children together in play could represent a variety of real-world objects, such as a snowball, a tree or a house. In this presentation of my work-in-progress doctoral research, I will show video clips of 5-6 year olds using an AI-based app which detects and names blocks placed on a tabletop, and explore how play with blocks, and the building and storied of small block worlds, may be understood as proto-algebraic manipulation and expression of variables and relationships.

Shearman, Jennifer

[PRESENTATION]



***Mastering Number - First year findings.***

This presentation summarises the delivery and impact of the NCETM's Mastering Number project in the academic year 2021-22, its first year. Mastering Number is a short whole-class daily teaching intervention in Year R, Year 1 and Year 2. Its aim is to promote the development of solid number sense, including fluency and flexibility with number facts, enabled by high quality professional development for participating teachers. Nearly 5000 primary schools across 40 Maths Hubs completed the Mastering Number programme, which ran for the first time in the 2021-22 academic year. There was good evidence that the intended pupil outcome for Mastering Number, 'increased pupil confidence and competence in the areas of mathematics covered by the programme' was met by the 2021/22 cohort. The drop-out rate, as reported by schools, was less than 1%. An internal evaluation of the programme recorded an observed improvement for all sampled pupils in all year groups, no significant difference in the scores of children receiving free school meals compared with those not receiving free school meals, and no significant difference in the scores of girls or boys. Attendees of this presentation will hear about how the programme was designed and led, the evidence of impact, and adaptations made to the programme for the 2022-23 academic year.

Stacey, Jennifer

[WORKING GROUP]

***Further Education Working Group***

This session is for researchers and practitioners whose main area of interest is Further Education mathematics, whether that is Functional Skills or GCSE resits. All those involved in the delivery to FE students (16-18) or adult learners (19+), or teacher education within FE, are invited. There will be short introductions by all attendees, to explain their involvement with FE and their research interests, including titles of current and/or past research projects in FE. The long term objectives are to coordinate sufficient interest to generate publications of research outcomes both for a special issue of the RME journal, and to a wider FE audience.

**\*Stevenson, Mary; \*Hopper, Alison; \*Richmond, Ruth; North, Marc; Thallon, William** [PRESENTATION]

***'Oh! - is that how you do it!' Learning from cross-phase collaborative work in the Years 5-8 Continuity project***

Historically, the transition from primary to secondary school has led to a drop or plateau in attainment for many students in mathematics (Ofsted, 2015). In 2017 the National Centre for Excellence in the Teaching of Mathematics (NCETM) launched the Years 5-8 Continuity project, run across England by local Maths Hubs. A key aim of this project is to strengthen transition by focusing on curriculum and pedagogical continuity in mathematics over Years 5 to 8. Central to the project is the promotion of cross phase collaboration between teachers to develop common understanding and consistent teaching approaches of core areas of the mathematics curriculum. The vehicle for teacher development is the Work Group, in which groups of teachers led by an experienced colleague work collaboratively over a period of time. In 2021-22 a small research team was convened to explore the impact of this project on teachers' pedagogical practice and on school/departmental policy and approaches. The team also explored ways in which models and structures of professional practice enabled these developments. We discuss here outcomes from Work Groups obtained via internal evaluation processes, and also findings from small scale case studies and interviews carried out by the research team. Early findings indicate that cross-phase engagement with colleagues through focused and sustained professional activity is having a positive impact on practice and on school/departmental approaches.

Tiflis, Ozdemir and Saralar-Aras, Ipek

[PRESENTATION]



***Incorporating STEM Learning Scenarios in Mathematics Teaching: A Study on the Effectiveness of a Professional Development Program***

When teaching mathematics, several academics have emphasized the potential of STEM education for improving students' knowledge and engagement. According to studies, math teachers' perspectives and awareness of this potential impact their instructional practices, and as a result, their perspectives have an impact on whether and how they incorporate STEM lessons in their syllabi. Recent research has shown that teachers must have more expertise on how to incorporate STEM learning scenarios into their classes. This study looked at the effectiveness of a STEM education programme for mathematics teachers with the goal of improving their understanding of STEM education and learning scenarios. This study presents the findings of a programme that comprised specific learning sessions for 267 mathematics teachers on STEM education in general, and various types of STEM learning scenarios, i.e. contributions of programme to teachers.

Voutsina, Chronoula (Charis)\* and Stott, Debbie

[PRESENTATION]



***Exploring changes in young children's conceptions of written numerals in the world around them***

We will present findings from a study that examined preschool children's conceptions of the meanings and social uses of written numerals in everyday contexts. 33 children and their families participated in three cycles of data collection. In each cycle, with their family's support, children played a Number Spotting game, taking photographs of written numbers in their everyday life. These photographs, alongside other photographs of numerals on everyday objects selected by the researchers, were used in individual photo-elicitation interviews with children. We collected data on children's interpretations of a range of written numbers denoting order, measurement, quantity, and numbers used as labels/identifiers. The data have been analysed with a combination of a phenomenographic approach to analysis (cycle 1) and framework analysis (subsequent cycles). In this presentation, we will share our preliminary observations about changes in children's conceptions of written numerals across cycle 1 and cycle 2 of data collection. We will discuss examples that illustrate the kinds of knowledge that children draw from, to make sense of and communicate the meanings and purposes of written numbers around them. The findings can inform pedagogical activities that aim to develop children's awareness and understanding of the uses of numerals in everyday life.

Wake, Geoff and Joubert, Marie

[PRESENTATION]



***Teaching for Mastery in FE: the high-level narrative of the outcomes of a large-scale RCT***

We report on the draft results of a large-scale RCT that looked at two interventions seeking to improve student outcomes in mathematics for post-16 GCSE students. The evaluation looks at both impact in terms of exam outcomes and how teachers work in the classroom in ways that attempt to align with the design of the interventions. In this particular case, one group of teachers worked on the partial intervention that involved a professional development (PD) programme setting out an approach to Teaching for Mastery (TfM) bespoke to FE and had available seven lessons that exemplified how this approach could be implemented in classrooms. They were asked to teach five of these lessons in specific windows during the GCSE resit course. The second group of teachers engaged in the same PD and taught the same lessons in the same timeframe, but they also engaged in a lesson study group that worked to understand teaching to the TfM model. These two arms of the RCT were contrasted with a business-as-usual group of colleges that had signed up to engage in the research. The primary impact measure was the GCSE scores obtained by the students of teachers involved in the trials. In this report of the high level findings of both our impact and implementation research, we provide insights into how the approach of the full intervention (PD, exemplary lessons and lesson study) makes a difference to student learning.

Wildani, Junaidah

[PRESENTATION]



***Supporting students' mathematical problem solving with scaffolding: the experience during the data collection.***

Here I report on design research that aims to develop a teacher support programme for teaching mathematical problem solving (PS) with a specific focus on scaffolding. The intervention consists of a series of teachers group discussions and PS lessons that provide suggestions on how to scaffold students in their PS. The scaffolding framework focuses on ongoing diagnosis/ formative assessment, contingent teaching, and shifting to greater student independence. Four teachers participated in the study. In this article I focus on how contextual and socio-cultural factors (teachers' educational background, personal values, the culture they live in and so on) influence the teachers' learning and experiences through their participation in the programme. Due to the local culture of respecting their elders, the younger teachers tend to be hesitant in voicing their opinions which leads to discussions being dominated by, and practices being heavily influenced by, the older teachers. The PS lessons also present their own challenges: first, the limited time allocated for mathematics lessons makes it difficult for teachers to incorporate PS activities in their lessons, and second, the fact that both teachers and students are not accustomed to mathematics lesson that prioritise PS makes it difficult for teachers to ensure that students are interested in engaging with the problem and mathematical discussion with other students.

Weber, Christof

[PRESENTATION]



***Conceptualising algorithmic thinking for mathematics education: what aspects do we need?***

Algorithms, and therefore algorithmic thinking, are central to our mathematical culture. Accordingly, they shape school mathematics at all levels. However, their value for learning is sometimes questioned, for example, when they are denied the potential for comprehension-based teaching and learning. At the same time, universities complain that students are becoming less competent in mathematics. Moreover, procedural knowledge seems to be coming back into focus in mathematics education, especially when it comes to understanding mathematics. Last but not least, algorithmic thinking may also gain in importance in the course of digitalisation, namely as an area that could contribute to 'computational thinking'. However, there is a lack of a theoretical conceptualisation of algorithmic thinking to which mathematics education could refer. In our talk we will present and discuss first aspects.

\*Wright, Pete; \*Kelly, Joel; Hilton, Caroline

[PRESENTATION]



***Primary school teachers tackling social justice issues whilst teaching mathematics: Findings from the Primary Maths & Social Justice research project.***

We will report on initial findings from the recent Primary Maths & Social Justice (PMSJ) research project. We adopted a model of participatory action research in working collaboratively with a team of six teacher researchers from two primary schools in Greater London. The main aims were to explore how primary school teachers can maintain and build upon their initial interest in addressing social justice issues through their teaching of mathematics and to consider how to help students develop their critical understanding of mathematics and collective mathematical agency. We focus on three findings from the thematic analysis of research team meetings and interviews with the teacher researchers: teachers' appreciation that young children can engage with maths and social justice; teachers' varying and developing relationships with maths; and students growing appreciation of how maths can be used to argue collectively for change. We will present some supporting evidence and invite participants to discuss the implications of the findings.



Woollacott, Bethany

[PRESENTATION]

*Early Years practitioners' perspectives on effective communication of research.*

Research summaries for educational practitioners are increasingly common, written by researchers and/or practitioners aiming to support communication across the research-practice gap. However, there is little research on what makes an effective educational research summary or how the diverse needs of educational practitioners might be met. In particular, research communication of mathematics learning presents challenges associated with practitioners' own confidence and experiences of mathematics. Also, Early Years practitioners are a particularly diverse group, spanning many different settings, including primary schools, playgroups and nurseries. I asked 8 Early Years practitioners from a mixture of settings to read a booklet that I compiled, consisting of five research summaries from mathematics education and/or cognition. Afterwards, I interviewed each practitioner about their thoughts on each summary as well as their broader experiences of reading educational research. I am using reflexive thematic analysis and initial themes suggest that practitioners dislike complex language and prioritise relevance and good aesthetic design. Furthermore, most practitioners preferred summaries containing specific, practical advice rather than summaries enabling practitioners to determine actions for themselves. This conflicts with approaches aiming to ensure that practitioners are active participants in research communication. I will explore this tension in detail in the session.