Boundaries and Bridges: adults learning mathematics in a fractured world

The 25th International Adults Learning Mathematics conference incorporating NANAMIC 2018

UCL Institute of Education, London UK

9th – 12th July, 2018

ALM25 Programme including short abstracts

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ALM 25 Conference schedule

Monday – Welcome reception

15.00	Registration
15.15	Visit to British Museum
16.00	Coffee
16.45	Welcome to UCL / Post 14 Centre for Education and Work / ALM 25
17.00-18.00	Plenary 1 *Getting Adults Involved in Mathematics* Rob Eastaway, Director of Maths Inspiration and winner of the Zeeman medal for excellence in the promotion of maths. Rob's website
18.00-19.00	Drink reception

Tuesday – Practitioner Day incorporating NANAMIC 2018

9.00	Registration and coffee
10.00-10.25	Welcome to conference Addresses by ALM, NANAMIC and ETF
10.30-11.30	Plenary 2 *Inspiring mathematics* Professor Chris Budd OBE, University of Bath and Gresham College. Latest series of lectures.

Break 11.30-11.55

Parallel sessions Tuesday 11.55-13.00

	784	790	PC Lab 3	944	Elvin Hall
11.55-12.25	Rachel Cook Teaching the 'unreachable': 16-19 maths resit students	Jenny Stacey First Language Interference: a guide for teachers of mathematics	Tanja Aas Managing money: using an app to help adults develop financial literacy	Sophie Parker Using Lego to Understand Algebra	Kooske Franken and Mirjam Bos Numeracy in vocational education in Holland: making your maths lessons more attractive
12.30-13.00	Norma Honey Teaching maths for 'mastery' in post-16 education	Naeem Nisar How effective questioning and discussion can help to remove misconceptions in the adult mathematics classroom			

Lunch 13.00-14.00

14.00-15.00	Plenary 3 *Changing cultural attitudes to mathematics* Bobby Seagull, University Challenge participant, teacher and ambassador for mathematics, currently presenting a money management course with the Open University.

Break 15.00-15.25

Parallel sessions Tuesday 15.25-16.30

	417 / Comm Room 1	731	739	Elvin Hall
15.25- 15.55	Maria Ryan, Olivia Fitzmaurice, Patrick Johnson "Divorce, Evil, and the Regime of Terror" - Personal Characterisations of Mathematics in the Lives of Mature Students	Shin Watanabe Constructing a football with Origami - discover the hidden mathematics in a paper football	Kooske Franken Presentation by the Dutch prize winners • Nori Kreetz, ROC Midden Nederland with "The Shakers" • Dirk Megens, ROC Nijmegen with the "Geometry Quest" • Dimitri Verzijl, Albeda Rotterdam with "Mojo Concerts"	Diane Dalby – The challenges of teaching mathematics in English Further Education colleges
16.00- 16.30				

16.40 – 17.00 NANAMIC AGM Elvin Hall

Wednesday

9.00	Registration and coffee
9.30-9.35	Conference updates
9.35-10.30	Plenary 4 *Transcending boundaries and barriers in an uncertain world* Dr. Gail FitzSimons, University of Melbourne (Emerita), Founding Editor, *Adults Learning Mathematics – An International Journa*l
10.30-11.00	Plenary 5 Mike Ellicock, Chief Executive, National Numeracy

Break 11.00-11.25

Parallel sessions Wednesday 11.25-13.05

	736	834	836	Elvin Hall
11.25-11.55	Katherine Safford-Ramus and Brook Istas Power in Numbers: Advancing Math for Adult Learners - The First Two Years	Beth Kelly Adults Learning Mathematics: Motivation, Confidence and Emotion	Hans De Zeeuw Mathematical gaming: a research study of young post-16 students in the Netherlands.	Kees Hoogland, Terry Maguire and Javier Diez-Palomar Towards the 2nd cycle of PIAAC
12.00-12.30	Charlotte Arkenback-Sundstrom Working as a Salesperson in the Digital Mobile Checkout – Is it still to be regarded as unqualified work?	Sonja Beeli and Annegret Nydegger The usefulness of "Maths Histories" as a holistic assessment tool	Franc Lafeber Building bridges in vocational education	Javier Díez-Palomar, Gail FitzSimons, & Katherine Safford-Ramus Adults Learning Mathematics— An International Journal: Future Directions, Your Voice & Your Participation
12.35-13.05	David Miller and Belle Raim Numeracy Achievement Gaps of Low- and High-Performing Adults: An Analysis Within and Across Countries	Elisabeth Gerger Bridging between traditional and new numeracy practices: A report of a numeracy pilot project for women in Senegal		

Lunch 13.05-14.00

14.00-15.00	Plenary 6 *The evolution of discourse in high stakes assessment* Professor Candia Morgan, Mathematics Education, UCL Institute of Education

Break 15.00-15.25

Parallel sessions Wednesday 15.25-17.00

	736	305 / Clarke hall	Elvin Hall
15.25-15.55	Zekiye Morkoyunlu and Alper Cihan Konyalıoğlu Parents' opinions on "parent mathematics seminars"	Hans De Zeeuw Building bridges by mathematics gaming	Aristoula Kontogianni and Konstantinos Tatsis Proportional reasoning of adult students in a Second Chance School
16.00-17.00	Gail FitzSimons Developing mathematics and numeracy through thematic teaching: Transcending the boundaries of [official] curricula	Judy Larsen The invisible teacher – engaging students in a 'thinking classroom'	Kees Hoogland, Javier Diez-Palomar and Madeleine Vliegenthart Towards a European Numeracy Framework for Adults

17.15 – 18.00 ALM AGM (Elvin Hall) including ALM 26 announcement

19.00-21.00 ALM Dinner (Jeremy Bentham Room – Main UCL Building)

Thursday

Thursday 9.30 -9.55

	Elvin Hall
9.30-9.55	Posters & Networking Marcus Jorgensen - Teaching Students to Identify Deceptive Use of Numbers in Political Claims Graham Griffiths - Developing mathematical dialogue scenes for reading aloud with adult learners Israa Alshami – Developing engaging community programmes for adult mathematics learners – Maths with Lego, Microsoft hacking STEM, Coding and Maths

10.00-10.15	Address by chair of ALM (David Kaye)
10.15-11.15	Plenary 7 *A perspective on the economics and politics of adult numeracy* David Walker, Journalist, Chair, governing board Understanding Society

Parallel sessions Thursday 11.40-13.00

	417 / Comm Room 1	421 / Nunn hall	Elvin Hall
11.40-12.10	Jeff Evans 'Seeing the World as It Really Is' (in at least 5 dimensions): the work of Hans Rosling and Associates	Diana Coben and Judy Bowen Numeracy in action: Combining task models of medical devices with numeracy skills and technical competence	Marcus Jorgensen A framework for successful teaching of mathematics to adult learners: Margin = Power/Load
12.15-13.00		Laura Di Milla Dichotomies and paradoxes in the learning space of the present time	David Kaye and Charlotte Arkenback-Sundstrom Common sense, mathematical knowledge and adults learning – a workshop discussion

Lunch 13.00-14.00 & Update on ALM26

13.50 Meet by the welcome desk for the trip to Kew Gardens

14.00 End conference

Plenary speaker biographical details and overview of talks.

Rob Eastaway

Rob Eastaway is an author, speaker and broadcaster. He has written numerous books aimed at making maths accessible to the general public, including the bestselling Maths for Mums and Dads, and Why Do Buses Come In Threes? He is the Director of Maths Inspiration, a national programme of theatre-based interactive lecture shows aimed at 14-17 year olds, which have been attended by over 150,000 teenagers in the last twelve years. He regularly appears on BBC Radio to talk about the maths of everyday life, in particular on Radio 4's 'More or Less' and the Today programme. In 2017 he was awarded the Zeeman Medal for his work in communicating maths to the general public.

Plenary talk: Getting adults engaged in mathematics

How do you get an adult engaged in maths? And what is the best way to turn them off the subject? Since he last spoke at an ALM conference – over 20 years ago – Rob Eastaway has enjoyed an exciting career in communicating maths to audiences of every age group, on the radio, in schools and pubs, at the Edinburgh Fringe, and even in a prison. In this plenary session he will talk about some of his experiences, from dealing with the maths anxieties of parents, to discovering the maths topic that got a group of prisoners at Pentonville most excited.

Professor Chris Budd, OBE

Chris Budd OBE is Professor of Geometry at Gresham College and is based at the University of Bath, where he is Professor of Applied Mathematics and Director of the Centre of Nonlinear Mechanics. He has a long history of engagement in the public understanding of science and mathematics through institutions such as the Royal Institution and the Institute of Mathematics and its Applications. The advancement of the public understanding of and engagement in science and mathematics is a central element of Professor Budd's career and his other current positions include Chair of Mathematics at the Royal Institution at Great Britain since 2000, and Professor of the Public Understanding of Mathematics at the ICMS, Edinburgh, since 2015. When not doing maths he enjoys long walks in the country with his dog Monty.

Plenary talk: Inspiring mathematics

One of the main barriers to adults learning mathematics is a lack of appreciation of what mathematics really is, what it can do, its relevance to our lives and, above all, its creative nature. This lack of appreciation can lead to a feeling that mathematics is a dull and boring subject which is not worth learning and can never be understood or appreciated. In this talk, I will show that this view of mathematics could not be further from the truth. To do this I will draw on a number of examples that I have found very effective in inspiring adult learners of mathematics. These will include a show case of some of the ways that mathematicians have changed the world in which we live, some mathematical magic, some mathematical art, and some 'mathematical experiments that you can try at home'.

Be warned, audience participation will be expected.

Bobby Seagull

Bobby is an ambassador for National Numeracy and the Open University. He's teaching maths at a community school in Cambridge at the moment whilst he studies for his PhD in education and maths. Educating us all to be less scared and more mathematically able is his mission in life.

He has been described as extraordinarily personable and modest and he got himself a full scholarship to Eton from his state school in Newham, East London. Bobby now has involved Stephen Fry and Louis Theroux in both the radio 4 programme he recorded (POLYMATHS) and the - just released - MONKMAN AND SEAGULL QUIZ BOOK.

Bobby's own book about the JOY OF NUMBERS, comes out this Autumn and, in the meantime he'll be filming a BBC2 series for broadcast this winter interspersed with speaking engagements and his work as a trustee of Uprising (he's also supporting the National Numeracy charity too, as you know). He writes for the Financial Times and also contributes a frequent puzzle to Radio Four's Today programme.

Plenary Speech: Changing cultural attitudes to mathematics

Bobby is enthusiastic about numbers, whether working with adults in his role as an ambassador for the National Numeracy charity that seeks to improve adult numeracy or as a school maths teacher with young students. However, he appreciates that once learners leave school, many people's negative classroom experiences scar their adult relationships with maths and numeracy. Bobby's doctoral research at Cambridge University is about maths anxiety and phobia. He will share his understanding of why there is such antipathy towards maths, that one wouldn't find with other subjects such as English. To change cultural attitudes towards maths takes time, but is important to start now.

Dr Gail FitzSimons

Gail has been a teacher of mathematics in vocational, workplace, and further education in Australia. She is also an experienced curriculum developer, professional development co-ordinator & presenter, working group organiser & animator, including at 8th & 9th International Congresses on Mathematics Education [ICME], in 1996 & 2000. She participates in numerous international scientific committees, including CIEAEM [The International Commission for the Study and Improvement of Mathematics Teaching] and History & Pedagogy of Mathematics [HPM]. She is an author of over 150 publications, including 3 books, editor, and reviewer of numerous book chapters, journal articles, and conference papers. She is also the Book Review Editor for Educational Studies in Mathematics. Gail was a researcher in Tine Wedege's Swedish Research Council project: Adults' Mathematics: In Work and for School, 2010-2014, led by Lisa Björklund Boistrup. Gail is an Honorary Trustee of ALM and a founding Editor of ALMIJ.

Plenary Speech: Adults Learning Mathematics: Transcending boundaries and barriers in an uncertain world

In this plenary I will address briefly the possible interests that adults might have in learning mathematics in a fractured and fragmented world with constantly changing horizons in terms of politics, economics, technology, the environment, and so on. I will draw on Bernstein's theories to stress the importance of understanding the big ideas of mathematics, and hence its underlying structures and relationships, in order to support numeracy in this era of change. In addition, I emphasise the importance of keeping adult mathematics and numeracy practitioners and researchers professionally informed through having access to high quality research related to their interests, such as ALM's own journal. As a member of the founding editorial team, I will recall salient aspects of the formative process that was also an important learning experience for the three of us at the time.

Prof. Candia Morgan

Candia Morgan is Professor of Mathematics Education at UCL Institute of Education. Her career started in a secondary school in London, teaching mathematics to students aged 12 – 18 years. The majority of students in this school were from homes where English was not the main language, prompting an interest in language issues that has continued since then. Having led the PGCE (Postgraduate Certificate in Education) programme for a number of years, preparing new mathematics teachers for secondary schools, her teaching now is mainly at postgraduate level with Masters and Doctoral students. Her research focus is on the nature and role of language in mathematics education, with a particular interest in the use of language in shaping curriculum, pedagogy and assessment.

Plenary Speech: The evolution of discourse in high stakes assessments

High-stakes assessments such as the General Certificate of Secondary Education (GCSE) in the UK have a strong influence on the actions and orientations of teachers and students. Examinations define the kinds of mathematics that students are expected to engage with, not only by overt specifications but also by the ways in which questions are posed and the types of answers demanded. In a recent project in collaboration with Anna Sfard, we developed a scheme for analysing the discourse of examination questions and applied this to an extensive set of GCSE examination questions in order to investigate how expectations about student engagement in mathematics may have changed over time.

Two key issues were raised in the analysis:

Issue 1 - The role of contextualisation of mathematics: how has this changed over time and what difference may it make to students' mathematical activity?

Issue 2 – Mathematical and linguistic complexity: changes over time and dilemmas for examiners and teachers

Discussion of how the findings and the analytical tools of the project can be used by teachers preparing students for examinations, including consideration of recent changes in the GCSE examination.

David Walker

David Walker is a contributing editor at Guardian Public, chair of Understanding Society - the UK household panel study - a member of the Ethics and Governance Council of UK Biobank and deputy chair of Central and North West London NHS Foundation Trust. After a career in journalism, with the BBC, The Economist, The Times and the Guardian, he became managing director, public reporting at the Audit Commission. Other roles have included chair of methods and infrastructure at the ESRC and director of getstats, the Royal Statistical Society's project to improve public statistical literacy. His books include The Times Guide to the New British State and, with Polly Toynbee, *The Verdict - did Labour change Britain?* and *Dismembered - how the attack on the state harms us all*.

Plenary Speech: A perspective on the economics and politics of adult numeracy

Wanting to (re)learn maths skills, an adult peruses the Learndirect website, which offers qualifications and courses. (UK adult quantitative skills are relatively weak.) With some difficulty, she finds out that Learndirect is owned by a private equity division of one of the banks that precipitated

the financial crash of 2008 and after further diligence discovers that Learndirect has been the subject of highly critical reports by a government inspector but has received preferential financial support from the same government.

The tale introduces twin themes.

(1) In England (and much of the rest of the UK) post school learning - outside of higher education - is occluded if not actually ignored. Adult education is, largely, a policy oxymoron. Programmes - such as the new apprenticeship scheme -- are disjointed. Quantitative capacity is lacking - but we need to explain why, despite the evidence for commercial and individual benefit, this capacity shows no sign of improving substantially. If, simply put, numbers make money, why is adult numeracy not actively propagated?

(2) Numbers are unavoidably political. Becoming more adept at statistics can't be separated from acquiring better understanding of how numbers are generated and for what purpose. Sometimes, the view is taken that statistical literacy is about technique. Of course it is but it must also embrace awareness of who is generating numbers, for what purpose.

Conclusion. In Britain this is a dark decade. We can't naively say that numeracy (statistical enlightenment) is a precondition of progress. But better skills are needed. We're seeing a backlash against the 'tyranny of metrics', fuelled from both right and left. That's healthy, provided it doesn't reinforce a culture in which basic technique is still limited and too many have to resort to the poor second chance offer of such companies as Learndirect.

Short abstracts (in order they appear in the programme)

Tuesday

Parallel sessions 1 starting at 11.55

Rachel Cook

Teaching the 'unreachable': 16-19 maths resit students

What do you do when your students do not have the confidence to attempt a question? When they aren't remembering basic facts and procedures? When they don't know their times tables nor understand negative numbers? How do you reinforce learning and the value of education when parents are absent? What do you do when they have to be forced to sit an exam you know they will fail again? Are we responsible for making them more unreachable? Explore why so many 16-19 year olds are in this situation in the UK and what impact we can have on their experience of learning maths. This session will incorporate lessons I have learnt from managing the maths department in a London College where maths qualifications on entry for 16-19 year olds are in the bottom 2% of the country.

Jenny Stacey

First Language Interference: a guide for teachers of mathematics.

English language learners attending mathematics classes in the UK may experience a number of barriers to learning that arise from differences between the structure and content of their first language and English. There are also variations between countries and cultures in the language and symbols used in mathematics.

Drawing on works such as Swan and Smith's 'Learner English: A teacher's guide to interference and other problems', this presentation will aim to help practitioners appreciate some general and specific issues of English language acquisition, and how differences between languages might impact on a learner's ability to engage with resources in class.

Tanya Aas and Susan Easton

Managing Money: Using an app to help adults develop financial literacy.

Financial literacy, or how to manage money is a subject most adults finds interesting, even if math or numeracy is not. Managing Money is also an EU-project focusing on financial literacy and adults. The project started up in 2015 with the aim to develop an app that users can use whenever and wherever to get a better understanding in managing their own money.

The initial focus of the project was on finding what type of resources already existed, and then focus on what was wanted and needed. The project conducted a needs analysis and interviewed different stakeholders to map the need as well as possible solutions. In addition to the app, the project has also developed a curriculum, and resources to be used both in and outside a classroom.

The session will present the project itself with the findings of the need analysis, curriculum, examples from the teacher resources and the last section will be spent on launching the app to the public, demonstrating the content and how to use it.

Sophie Parker

Using Lego to understand Algebra

Struggling to show students that maths is fun? Not sure how to demonstrate that maths is used in the real world? Maths is used on almost a daily basis by everyone everywhere. In school, this is pretty obvious – we have maths lessons and so of course we use maths! But what happens when students aren't at school? Do they realise maths is fundamental for rollercoasters to stay on course upside, or that your luggage at the airport needs maths to arrive in the right place? We run workshops to show young people how playing with LEGO (and other great games) can showcase the usefulness of maths and Operational Research (O.R.) in the real world. In this session we want you to make a table and chairs out of Lego (but don't worry – we'll provide the Lego for you)! Perhaps you want to make the tables with square blocks and the chairs with rectangle blocks. Or you may want to use all square bricks for the tables but different colours. We will show you how to master algebra, draw graphs and interpret them using different Lego bricks.

Kooske Franken and Mirjam Bos

Numeracy in vocational education in Holland: making your maths lessons more attractive.

Numeracy in vocational education in The Netherlands is often taught in a tedious, monotonous and dry way. It is hard for students to relate knowledge to real life situations. Often teachers stick to their traditional methods of teaching numeracy. They generally follow methods that make their teaching dull and verbal. Therefore, the teacher should adopt more concrete means to encourage practical work in mathematics and numeracy.

Numeracy plays a vital role in the lives of our students for professional purposes. It is applied broadly in the field of agriculture, accountancy, banking, business, engineering, carpentry, nursing, tailoring and surveying etc. Because numeracy has so many practical applications, it is important to use concrete materials for all sorts of activities. This makes teaching numeracy motivating and easier to remember for the students. In this workshop we will demonstrate several specific materials which are very easy to collect. You will be inspired to make your own materials and find out how to integrate them in your lessons. We will use them to calculate and carry out other activities.

Parallel 2 sessions 2: 12.30

Norma Honey

Teaching maths for 'mastery' in post-16 education

This session will consider the application of 'Teaching Maths for Mastery' in English post 16 education, especially for students resitting the GCSE examination normally taken at age 16 years. The Education and Training Foundation has supported two small projects to take elements of the 'Teaching Maths for Mastery' approaches, led by the National Centre for Excellence in the Teaching of Mathematics (NCETM) in the primary and secondary sectors, and consider their application to teaching the GCSE resit. Evidence from the NCETM work suggests that there is merit in the approach and the ETF projects have set out to investigate how and where they might be applied in Further Education in England, particularly with GCSE resit courses.

In this session we will look at the projects and some of the early feedback to discuss where/how teachers can be supported in their teaching and learners can be supported to achieve by introducing a Teaching for Mastery approach. With the recruitment of Centres for Excellence for mathematics in English Further Education, and an emphasis on innovative and engaging methods of teaching being part of the brief, 'Teaching Maths for Mastery' could be an important starting point.

Naeem Nisar

How effective questioning and discussion can help to remove misconceptions in the adult mathematics classroom

Through the use of effective questioning techniques, tutors can use multiple wh-questions to elicit hidden techniques and ideas in maths from learners used in their daily life. These hidden maths techniques can then be contextualised with the learners' own experience and used to encourage them to discuss common mathematical misconceptions.

In this way, the tutor as a facilitator, encourages a learner centred approach through open discussion and the removal of misconceptions in both the GCSE and Functional Skills classroom. This approach:

- encourages learners to read problem solving tasks, and discuss in pairs/groups before going on to find solutions
- sets a framework or environment for cross-cultural discussion about the topics to help classroom learners identify errors and to remove misconceptions, focusing on methods, rather than "answers"

The practitioners can then deliver meaningful teaching: moving from 'transmissions' problems to 'challenging' problem solving creating an active learning environment.

Parallel sessions 3: 15.25

Maria Ryan, Olivia Fitzmaurice and Patrick Johnson

"Divorce, Evil, and the Regime of Terror" - Personal Characterisations of Mathematics in the Lives of Mature Students

Increasing numbers of students attending Higher Education institutions in Ireland take obligatory mathematics modules – service mathematics – as part of their programmes of study. A dislike of mathematics is frequently expressed among students, particularly mature students, some of whom experience mathematics anxiety; however, despite their experiences with mathematics, mature students demonstrate motivation and resilience in respect of their engagement with mathematics. As part of a mixed methods study, the author endeavoured to explore the mathematics experiences of mature students throughout their lives, and to identify those incidents that have impacted significantly on the students' engagement with mathematics. Twenty mature students were asked to identify a theme to characterise their relationship with mathematics. This paper presents these findings, depicting an interesting variety of responses.

Shin Watanabe

Construct a football with Origami - discover the hidden mathematics in a paper football.

The focus of this activity is for learners themselves to construct a paper football using a simple Origami technique and to discover and understand the properties of common 2D and 3D shapes.

This visual and tactile activity provides learners with the opportunities to develop their discovering and problem-solving abilities and experience numeracy from a real life perspective.

Applying Origami in a classroom provides not only cultural diversity but also the realisation for learners of how simple it is to discover various shapes around us.

With the confidence and knowledge about 2D and 3D shape properties gained within this activity learners will be enabled to further understand other geometric properties and solve new problems.

Kooske Franken

Presentation by the Dutch prize winners

This session will showcase the work of the winners of a national competition for teachers that has been held in the Netherlands. During the last school year, this competition was held for third time, with the aim of generating good ideas and good practices from Dutch practitioners for Adults Learning Mathematics. The three prize winners have the opportunity to visit the ALM25 conference to present their ideas in this session. These are:

- Nori Kreetz, ROC Midden Nederland with "The Shakers"
- Dirk Megens, ROC Nijmegen with the "Geometry Quest"
- Dimitri Verzijl, Albeda Rotterdam with "Mojo Concerts"

Last year in Rotterdam at ALM 24 and previously in Maynooth at ALM 23 there were also similar presentations from the Dutch competition prize winners for those years, so this is now becoming a tradition for ALM. The session provides a great opportunity to view and discuss some innovative approaches used in teaching mathematics to adults.

Diane Dalby and Andrew Noyes

The challenges of teaching mathematics in English Further Education colleges.

Teaching students who are eager to learn mathematics, enjoy solving problems and see the value of mathematical knowledge can be a very different experience to teaching those who have become disaffected by their struggles with the subject. In this session, we present some findings from the Nuffield-funded project Mathematics in Further Education Colleges (MiFEC) about the teaching approaches used in post-16 mathematics classrooms for low-attaining students, who are re-sitting the GCSE examination taken at age 16. These students often face difficult cognitive and affective journeys towards the goal of achieving a better grade in mathematics. Teaching approaches that shift the emphasis from reliance on memory to the development of deep conceptual understanding can repair essential foundations and an emphasis on the relevance of mathematics can engage and motivate students. Data from student focus groups and teacher interviews in eight English Further Education colleges show, however, that traditional approaches are still dominant in many classrooms. We will discuss the merits of different teaching approaches in common use and consider how effectively these engage disaffected students into successful learning journeys.

Wednesday

Parallel sessions 4: 11.25

Katherine Safford-Ramus and Brook Istas

Power in Numbers: Advancing Math for Adult Learners - The First Two Years

The United States Department of Education project, Power in Numbers: Advancing Math for Adult Learners aims to help adult learners receive the higher-level math skills they need to succeed in the real world. The initiative has published two of three reports, The Math Gap: Implications for Investing in America's Workforce and Multiplying Impact: Five Frameworks for Investment in EdTech for Adult Learners, and a review of selected Open Educational Resources (OER) by an initial cohort of adult classroom teachers. In this presentation, Brooke Istas and Kathy Safford will delve into the project focus — how OER can help serve the unique needs and learning styles of adult learners — as well as describe the goals for the upcoming final year of the project and share progress to date. Brooke Istas participated in the first round of teacher reviews and Kathy Safford serves as a subject matter expert on the project. Both will share their experiences as part of the project team and their aspirations for the products that will exist by the conclusion of the initiative.

Beth Kelly

Adults learning mathematics: Emotions, confidence and motivation.

This workshop focuses on the voice of adults learning mathematics in the workplace through their trade unions. We will explore the words and phrases used by interviewees to describe their experiences, including the emotions they went through. Not just negative words, although there were many, but also words describing positive emotions related to an increase in their confidence after successfully learning mathematics. The possibility of adults moving from negative to positive feelings about mathematics will also be considered as this develops the adult learners' confidence, which can then prompt changes in their motivation in relation to mathematics both inside and outside the classroom. We will explore the notion of an Affective Mathematical Journey (AMJ), which is a phrase used to describe these changes in feelings and confidence in relation to motivation to learn mathematics.

The research points to adults describing emotions in many different aspects of motivation. When adults described their initial motivation to reengage with learning mathematics they spoke about being driven by personal needs and goals related to work, wanting to develop their personal skills, helping the family and gaining qualifications. But this initial engagement also depended on their personal *self-confidence* and the *trust* they had in others encouraging them to re-engage with mathematics. When talking about their successful learning experiences they spoke about *overcoming negative memories and feeling more confident* about themselves. This in turn influences their motivations to act differently both inside and outside the mathematics classroom. The adults also talk about their emotions, when they describe feeling more relaxed about learning with a group of adults who work collaboratively and encourage each other to learn. When talking about the influence of learning through trade unions the respondents speak about having 'trust' in their colleagues, who encourage and motivate them to re-engage with learning

In this research I explore the idea of adults using the notion of increased confidence to describe changes in their feelings and beliefs in relation to their motivation to both learn and use their newly acquired mathematical skills. This notion of a change in feelings and motivation I term an 'Affective Mathematical Journey'. I develop this idea building on research into motivation and emotions in mathematics education, considering the link between motivation, cognition and emotions and the

domain of affect as well as investigating the influence of the social context. I take into account the link between increased confidence and motivation described by the adults and use three learner's stories to help further illustrate the idea of an Affective Learning Journey.

This research is useful as it identifies the role that emotions play in the learning of mathematics and identifies different, less formal teaching approaches which practitioners might find useful to consider when teaching adults who have had poor previous learning experiences but still find reasons to re-join mathematics classes.

Hans De Zeeuw

Mathematical gaming: a research study of young post-16 students in the Netherlands.

This session will focus on the findings from a research study concerned with building bridges between learning, gaming and socialising. We will present findings from a study of students learning mathematics using digital games. This study involved 55 (mixed) youngsters between the ages 16-20 over a period of two months. Three similar peer-groups were studied, each following a similar learning programme, except that one group also engaged regularly with a competitive digital mathematics game. Evidence, in the form of mathematics test scores and observations of their learning experiences, would suggest that this interaction with mathematical gaming led to greater learning gains. These results will be presented and discussed in the session, with consideration of the implications for further study.

Kees Hoogland, Terry Maguire and Javier Diez-Palomar

Towards the 2nd cycle of PIAAC

The Programme for the International Assessment of Adult Competencies (PIAAC) develops and conducts a survey of adult skills. The survey measures adults' proficiency in key information-processing skills - literacy, numeracy and problem solving in technology-rich environments - and gathers information and data on how adults use their skills at home, at work and in the wider community. The second cycle of PIAAC will take place in 2022 and preparations have started by the Numeracy Expert Group reviewing the used numeracy framework and designing items which will be used to measure the numerate abilities and numerate behavior of adults. In the presentation we will inform the participants on the latest developments and discuss with the participants the intricacies in assessing adult numeracy behavior.

Parallel sessions 5: 12.00

Charlotte Arkenback-Sundstrom

Working as a Salesperson in the Digital Mobile Checkout - is it still to be regarded as unqualified work?

The ongoing digitalisation in society, working life and education intensifies the long-standing debate on how to bridge the gap between school and labour market, and how to align work experiences in education. University programmes and vocational educations are often criticised as not closely reflecting labour market requirements, and closer cooperation between the partners is sought. There is also a debate on which numeracy and literacy skills are necessary for different professions and industries, especially concerning digital artefacts and systems taking over tasks that involve counting and writing. This work in progress aims to explore and enlighten how digitalisation has changed, and continues to change, sales assistants' use of mathematics in connection with the point of purchase, POP, at checkout. Such systems began with the mechanical cash register placed on a checkout counter (point of purchase, or POP) and have evolved to the digitised customer meeting where the sales assistant has checkout system in the palm during the whole purchase process

(mobile sales assistant, or MSA). Knowledge of digitised vocational practices of sales assistants is also an important contribution to the development of sales assistant education as well as other adult vocational educations within the service and care sectors.

Sonja Beeli and Annegret Nydegger

The usefulness of "Maths Histories" as a holistic assessment tool.

Adult learners of numeracy and mathematics comprise a very heterogeneous group. A key issue in any educational context is diagnostic assessment, as this is often used to inform planning of and placement in specific classes. When it comes to adults with low educational achievements, this issue is even more pertinent, since many of these people have had negative educational experiences and are averse to formal tests. In order to overcome this challenge we aim at further developing a tool called “Maths Histories” (Archer & Newman 2003). This concept is based on the idea that individuals draw their personal maths history as a line graph. The drawings can then be used to not only talk about a person’s specific mathematical knowledge, but to also address his/her feelings about mathematics. We will present results from pilot interviews with both young adults with low mathematics achievements and their teachers and discuss next steps in developing this assessment tool. Archer, David; Newman, Kate (Eds.) (2003): Communication and Power. Reflect Practical Resource Materials. London: Books for Change.

Franc Lafeber

Building bridges in vocational education

I am a Dutch numeracy teacher at Cibap Vocational College for the Creative Arts (Zwolle). This is a leading secondary vocational college where talented students are challenged to excel as future professionals in the creative industry. Cibap has specialised in training craftspeople for more than 60 years. Future professionals meet each other here. They learn to transform their creative ideas into images with an increasingly expert eye for economic and social developments. Creativity, craftsmanship, entrepreneurship, contextual awareness and communication form the core values of our courses. Whilst working as a teacher, I have seen some ‘unmotivated’ students though who have carried out actions such as drawing on a piece of paper, folding it, tearing it apart or just playing with it. I have realized that this behaviour can be used to create rich meaningful exercises and doesn’t necessarily mean that these students are unmotivated. They just think in a different way. This session will be a very practical workshop in which we will build paper bridges. By working together and actually building bridges we are building bridges between people too. We're aiming at the strongest or longest paper bridge. You will use your math-/building knowledge to reach your goal.

Javier Díez-Palomar, Gail FitzSimons and Katherine Safford-Ramus

Adults Learning Mathematics— An International Journal: Future Directions, Your Voice & Your Participation

ALMIJ is the only academic journal specific to our field. This presentation will be in two parts. In the first part, we will briefly outline the benefits to authors of having their work published here; also plans for a new structure. Feedback will be sought from participants to ensure continuing relevance.

In the second part, we will focus on the preparation of manuscripts for publication in this journal: the writing process. We will outline the process once a submission has been received, and the various forms a research article might take in order to meet the standards of a peer-reviewed journal.

Parallel session 6: 12.35

David Miller and Belle Raim

Numeracy Achievement Gaps of Low- and High-Performing Adults: An Analysis Within and Across Countries.

Using PIAAC numeracy data, this analysis explored cross-national differences in the achievement of low- and high-performing adults ages 16 to 65, especially relative to average performance within countries. The results showed that examining average achievement within and across countries fails to provide information on the numeracy skills of low- and high-performing adults within and across countries. For example, Canada and the Republic of Korea had average numeracy scores that were not statistically different from each other, but high-performing adults (as represented by the cutscores at the 75th and 90th percentiles) did better in Canada than in Korea, and low-performing adults (as represented by the cutscores at the 10th and 25th percentiles) did better in Korea than in Canada. At the country level, smaller numeracy achievement gaps between low- and high-performing adults were associated with higher average scores in numeracy. Furthermore, it was found that these numeracy achievement gaps were positively related to country-level income inequality as measured by the Gini coefficient. That is, at the country level, larger numeracy achievement gaps between low- and high-performing adults were associated with greater income inequality. Instructional and policy implications of this research will be discussed.

Elisabeth Gerger

Bridging between traditional and new numeracy practices: A report of a numeracy pilot project for women in Senegal.

In Senegal, a pilot programme for teaching numeracy to women as part of an already existing literacy project in three local languages has shown interesting results. The programme built on traditional numeracy practices and introduced new ones, with a focus on financial management. I will present the programme, some results at the end of the two-year intervention (2015-2017) as well as various challenges the women are facing in mastering and applying the new practices.

Parallel sessions 7: 15.25

Zekiye Morkoyunlu and Alper Cihan Konyalıoğlu

Parents' opinions on "Parent Mathematics Seminars"

In this study, 6th grade students' parents were involved in mathematics seminars to be helpful on their childrens' mathematics studies. The purpose of this study is to reveal the opinions of these parents about parent mathematics seminars. The study was carried out in 2015-2016 spring and 2016-2017 fall semesters. Parent mathematics seminars were carried out for eight weeks. Duration of each seminar was 2 hours. In these seminars, mathematical concepts that the students learned at school were shared with parents. The parents were also informed about how they can support their children at home about mathematical issues. During the first semester studies, parents' written reflections were gathered from the parents in the middle and at the end of the semester. During the second semester of the study, the parents were asked to write a journal about the study and face to face meeting was carried out at the end of the study. Finally, the parents involved in the study were found satisfied with the seminars and the whole study. They stated that they were able to come in useful for their children and also for themselves in terms of mathematical knowledge and mathematical necessities.

Hans De Zeeuw

Building bridges by mathematical gaming

In this session, we will present our experiences of teaching people from other countries who were refugees from war-stricken areas of the world and reflect on the bridges built during their learning activities. The approach involved them learning and training together by playing mathematical (digital) games. After two months we were able to ascertain that the groups we set up had progressed considerably in their overall proficiency in standards of Dutch and in mathematics, but also in their respect and tolerance towards other group members. We will report on how the students interacted and learned together in different groups and what they achieved from their involvement with mathematical gaming.

Aristoula Kontogianni and Konstantinos Tatsis

Proportional reasoning of adult students in a Second Chance School

The Second Chance Schools (SCS) in Greece have been established as an effort to increase the population's literacy. The main goal of the mathematics course at SCSs is to bridge the gap between abstract mathematics and real-life mathematics that have significance for the adult students. One of the topics that constitute a problem for students is the teaching and understanding of rational numbers. Our study focuses on proportional reasoning during problem solving of adult students and it is still ongoing. We had taught rational numbers sub-constructs for three weeks and then we asked our students to complete a task sheet with tasks related to proportional reasoning. Our next step is to conduct interviews with some of our students in order to understand how they use rational number sub-constructs during problem solving. In our paper we will present results from the qualitative analysis of the students' answers and from the interview transcripts.

Parallel sessions 8: 16.00

Gail FitzSimons

Developing mathematics and numeracy through thematic teaching: Transcending the boundaries of [official] curricula.

This workshop will be based on the curriculum development work I have done over recent years for a non-mathematics qualified teacher, supported by a small group of volunteer tutors, running a general program for a group of about 30 Indigenous young people returning to study, under the auspices of the University of Melbourne. These students generally had limited success with mathematics in school and had very often developed extremely negative attitudes as a result of the process. My work [paid and voluntary] was to turn an intermediate level of a numeracy framework comprising a set of learning outcomes into mathematical activities which would engage the students. This work was done through close collaboration with the group's teacher. The workshop will be in 2 parts: 1. Interactive discussion of my curriculum development work with the teacher; 2. Personal support for people wishing to develop own approaches to their particular teaching situations.

Judy Larsen

The invisible teacher – engaging students in a 'thinking classroom'

Based on over ten years of research focused on identifying ways to improve learning and motivation in mathematics classrooms, Dr. Peter Liljedahl has developed a framework for 'building thinking classrooms'. It provides practical approaches for promoting a culture of critical thinking and meaningful engagement with course content. Over the past four years, I have adopted these approaches in my own teaching, particularly with adult learners, with great success. I have also

collaborated extensively with Dr. Liljedahl, attending many workshops and visiting a variety of school environments where this framework has been implemented. In this session, I will reveal a few of the things I've learned from these experiences. Participants will have a chance to experience 'thinking classroom' elements and reflect on their effectiveness and potentiality. The collaborative environment achieved through elements of a 'thinking classroom' have proven effective in stimulating mathematical thinking, awakening mathematical affect, and breaking down social barriers in classrooms. Given that many adult learners are burdened with negative past experiences with mathematics, the opportunities for finding enjoyment in mathematics that a 'thinking classroom' provides has true transformative power.

Kees Hoogland, Javier Díez-Palomar and Madeleine Vliegenthart

Towards a Common European Numeracy Framework for Adults

We are well into the 21st century now and the urgency for life-long learning is growing, especially regarding numeracy. There are major societal and policy pressures on education to prepare citizens for a complex and technologized society, in literature most of the time referred to as "21st century skills" (Voogt & Pareja Roblin, 2012), "global competences (OECD, 2016) or "the 4th industrial revolution" (Schwab, 2016).

With respect to numeracy (and/or mathematics) education, we will discuss in the workshop the implications of these pressures to the mathematical demands at individuals living and working in modern life, and what is expected from numeracy education as society moves further into the 21st century. New means of communication and types of services have changed the way individuals interact with governments, institutions, services and each other, and social and economic transformations have, in turn, changed the nature of the demand for skills as well.

After an introduction we will put the participants to work to design which core ingredients an European Numeracy Framework for Adults should consist of. We will be looking further than only content descriptions and will also focus on numerate behavior, competencies, attitudes and dispositions."

Thursday

Parallel sessions 9: 11.40

Jeff Evans

'Seeing the World as it really is' (in at least 5 dimensions): the work of Hans Rosling and associates

Teachers of adults' mathematics / numeracy have several strategies available for teaching data presentation and analysis. One is to can students to conduct small-scale surveys in the classroom, and to consider how to analyse the resulting data. Another is to use the increasing wealth of data made available by government or other agencies, often in especially convenient form to generate discussion. Hans Rosling and his associates have made available a range of statistics on countries of the world, in the form of dynamic interactive graphics. These have been presented in an accessible form that allows interesting and informative comparisons, and allows teachers and learners to challenge (often mistaken) preconceptions about the world. I will consider how this work enables the development of data-reading skills, demonstrates the use of statistics for knowledge development, and promotes insightful and collective ways of seeing our way to humane solutions for some of the world's geo-political problems (Rosling, 2018).

References

Hans Rosling (2018), Factfulness: Ten Reasons We're Wrong About the World--and Why Things Are Better Than You Think. London: Hodder & Stoughton.

Gapminder: https://www.gapminder.org/

Diana Coben and Judy Bowen

Numeracy in action: Combining task models of medical devices with numeracy skills and technical competence.

In this paper we cross disciplinary boundaries to focus on nurses' numeracy in action as they engage with medical equipment via digital interfaces. We propose that by more closely aligning interdisciplinary work in numeracy for Nursing and the delivery of medication using medical devices we may help address the incident-rate in incorrect medication calculations and delivery. We demonstrate the use of task models as a way of supporting safe, effective and efficient delivery of medication to the patient, taking as our example the use of infusion and syringe pumps in Nursing.

Marcus Jorgensen

A framework for successful teaching of mathematics to adult learners: Margin = Power/Load

This practitioner-oriented presentation will explore the practical use of a conceptual framework for teaching mathematics to adults. Howard McClusky's Theory of Margin will serve as the framework. He proposed that margin is related to power and load in this way: Margin = Power/Load. A margin of greater than one is necessary for adults to engage and be successful in learning. This means that the adult's power should exceed their load. As McClusky describes, power includes the resources (abilities, possessions, position, allies, etc.) which a person can command in coping with load. Load refers to the demands made by self and society where internal load includes self-concept, goals, personal expectations, etc. External load includes the tasks of life (e.g., family, career, socio-economic status). Examples from the literature will be used to help connect the framework with practice in teaching mathematics. Participants will have the opportunity to add insights based on

their own experiences and develop a use for the framework in minimizing students' loads or increasing students' power to cope with their loads. The importance of self-awareness of margin, power, and load by practitioners and also students will become apparent.

Parallel sessions 10: 12.15

Laura Di Milla

Dichotomies and paradoxes in the learning space of the present time

This workshop aims at finding ways to widen the adult learner's views on the contemporary world. By constructing a new lens to look through for a shared future, this session may lead the participants to a re-interpretation of the present time in order to learn from its inner juxtapositions. To achieve the goal, activities are purposefully designed to steer from a realistic and function-based learning to a more explorative approach of unpredictable outcomes: this learning space should expose participants to the dichotomies that have emerged rather silently over the past decade across the world, in some cases revealing unsolvable issues; on the other hand, human experiences, failures and success should not be left untold, unreferenced and unmeasured. By bridging mathematics and numeracy with geopolitics, sciences and humanities, the workshop activity ranges from facing the paradoxes of the information technology to analysing the status of the workers and their rights in the globalised market, from challenging the traditionally strong notion of history as a nation-led discipline to understanding the game theory behind climate change, from tackling poverty to managing population growth. Overall, this workshop strives to provide opportunities to experiment with a different approach to mathematics, based on a pluralistic, critical and open-minded learning process, which involves both the rational and the affective domains of the learner.

David Kaye and Charlotte Arkenback-Sundstrom

Common sense, mathematical knowledge and adults learning – a workshop discussion.

There has been tension between what learners recognise as their own skills and abilities and what they regard as mathematics. Sometimes learners refer to their own skills and abilities as 'common sense' and see these as very different from mathematical techniques and knowledge. In some cases this means that mathematical knowledge is forever unreachable.

This workshop looks at the development of ideas about common sense through the lens of adult numeracy and vocational mathematics. It examines the significance of common sense to adult mathematical education; a subject examined in some depth in the 1990s. We will suggest a contemporary interpretation of this taking into account more recent research into the concept of common sense in the light of its use in current debates about populism (popularism).

In the workshop we will ask participants to consider what the boundaries are between academic and commons sense knowledge and whether validating common sense is a bridge to greater understanding of mathematics or increases the mystification (and rejection) of expert knowledge.