



Plenary sessions Abstracts

Presenters in order of appearance

Ionica Smeets - Communicating Science for Mathematicians

How can you bring mathematics to the masses? Why are math communicators such as Marcus du Sautoy so successful in interesting the general public in abstract ideas? Ionica Smeets will discuss some examples of popular mathematics from the viewpoint of the existing science communication literature. Which techniques work, and just as important: which do not? Smeets will definitely bring a hands-on activity to ALM, since she loves beating her audience in a game.

John Poppelaars - Mathematics at Work

In a data driven society computers and advanced algorithms will take over many of our tasks. This will reduce the need for the skills that are now at the core of our math education. However, the demand for creative and collaborative problem solving skills will rise as working with large data sets and complex algorithms will become more commonplace. To prepare well for this 2nd machine age, students of all ages need to be able to detect patterns and relations in data, also to solve practical problems by selecting or adapting the appropriate algorithms. As data availability and algorithmic progress is accelerating, focus of math education should change to adaptive learning to prepare students better for the future. During the lecture John will use examples, ranging from simple to complex, from his work as a mathematical consultant to illustrate.

Diana Coben & Kathy Safford-Ramus, The Fruits of Research - Editors' Perspectives on Publishing Work from ICME-13

Kathy Safford-Ramus and Diana Coben will talk about editing two books based on Topic Study Group presentations at last year's 13th International Congress on Mathematical Education (ICME-13) in Hamburg, Germany. The books bring together the cream of the crop from their respective Topic Study Groups: 'Mathematics education in and for work' (TSG3 - Diana) and 'Adult learning of mathematics – lifelong learning' (TSG6 - Kathy) in two edited collections to be published by Springer. Kathy and Diana will highlight key features of the publications and reflect on the importance of publications (including ALM publications) in increasing awareness and understanding of adult and workplace mathematics education. They will also regale you with tales of the highs and lows of the editing process and look forward to answering your questions.

Stefan Buijsman – Understanding Mathematics

When teaching, there are different things that we might want students to get. Knowledge is one option, understanding another, and maybe we also want them to be able to give explanations that show their competence. These are all different notions from the philosophy of mathematics. Understanding is concerned with why something is true and explanations are supposed to give you that understanding. Knowledge, on the other hand, is only concerned with whether or not something is true.

Stefan will focus on explanation and understanding. For instance, understanding some addition fact and understanding basic arithmetic are different types of understanding. While the former is clearly related to explanations, the latter is not obviously given by explanations. Being clearer on the different notions of understanding and explanation, as well as their relation to knowledge, is also relevant for educators. Thinking about these concepts from a philosophical perspective can help clarify teaching goals and classroom practices. In particular, the benefits associated with understanding, such as improved stability of knowledge and more general abilities, suggest that understanding is a relevant goal at all levels of mathematics education. Stefan will end by discussing what understanding and explanations would look like in adult education.

Mark Mieras – 9 Misunderstanding About Learning

Downloading information to the brain... that is one of the nine painful misunderstandings about learning that science journalist Mark Mieras unravels. In his lecture he takes us deep inside the neurobiology of the learning process. How does it really work? How does one prepare the brain for learning? And what do these new insights mean for math education?





Parallel session Abstracts

Presenters in alphabetical order

Tanja Aas, Norway

[Numeracy Counts](#)

Numeracy is a critical skill, which touches several areas in everyday life. Whether you are at work, at home, at class, or shopping you will need Numeracy skills. Lacking these skills as adults, may negatively affect quality of life, labor market possibilities and participation in lifelong learning. The question is how to get this message out to those who need it the most? This poster presentation will present examples of good practice by using financial literacy as a mean to motivate adults to learn Numeracy skills. There are several resources already available to teaching financial literacy and using practical mathematics to enhance Numeracy skills. In addition, the poster will give a heads up about the Managing Money project, which finalizes in 2018. Managing Money is an Erasmus+ project, which is focusing on financial literacy in adults. The project involve 8 partners in 7 different countries and the main outcome is an app and a website full of different resources. The app itself will be available in several languages, including English, French, Dutch and German.

Charlotte Arkenback, Sweden

[Problem: The Numbers of Squares on a Chessboard – But, what if you don't see where the squares on the chessboard start and end?](#)

In this workshop, we are going to show how we work with spatial thinking and geometry in an orientation course in mathematics at Swedish tuition for immigrants (sfi). It has been found that many of our students with a short education background studying math at basic level have difficulty reading, interpreting and constructing 2D and 3D representations. In addition, when they begin to study mathematics, Swedish proficiency is limited and many lack words and expressions to describe, compare, analyze and evaluate solutions to mathematical problems. Knowledge and skills they need to develop to meet the mathematical requirements in the curriculum.

The purpose of the orientation course, which is an action research study, is to develop knowledge of the students' visual-spatial thinking and learning while providing students with the opportunity to develop spatial thinking, visual, mathematical and digital literacy. At the workshop, we will work with one of the practical parts of the course.

Charlotte Arkenback, Sweden

[Adult retail apprenticeships – Logbook and Group -supervision as learning tools in workplace-based education](#)

In this paper, I investigate the significance of structured logbook and group-supervision for the development of mathematics containing vocational competencies in adult retail apprenticeships.

In the autumn of 2014, I conducted a preliminary study of mathematics containing activities in adult retail apprenticeships through action research. The study was conducted during twelve weeks in collaboration with a group of retail apprentices at South School with the aim to find out what activities in the learning practices in retail that could be mathematics containing. Among the most important research tools were apprenticeships logbook, group-supervision and reflective dialogue conversations. Group-supervision can be described as a combination of group coaching and study circle (Arkenback-Sundström, 2013). The apprentices aim to be involved in the action research study were to: 1) identify mathematical activities at work and practice on the practical applications of the educational mathematical content (budget, shop mathematical, schedule, economic calculations) and 2) use their knowledge, skills and experiences from the workplace-based learning to achieve the mathematics containing course objectives of the retail education.





Lydia Balomenou, Greece

[Adults solving realistic problems](#)

The need for understanding the large amount of information by the use of mathematics is widely accepted. Furthermore, it is important to educate children in order to think critically and use their knowledge to improve their lives. These views are based on Critical Mathematics Education (CME) approach. Beyond this approach, Realistic Mathematics Education (RME) suggests the embodiment of real life situations in the teaching process. From our perspective, realistic problem solving is a way to join these approaches. Particularly, when the solver reads a problem s/he has to think critically in order to process the necessary data and find the relationships between them. After that, the solver has to make some realistic considerations in order to provide the answer. The aim of this study is to observe the strategies that 20 adults used to understand and solve seven realistic problems. More specifically, the adults completed a questionnaire, in which they stated their beliefs about mathematics and their uses. Subsequently, they tried to solve some realistic problems. Most adults had difficulties in solving problems by making their own assumptions. Additionally, they were unable to easily assume the solver's position. In conclusion, the survey has revealed the difficulties that adults have in using mathematics and think "out of the box" in order to face real life situations.

Mirjam Bos, NL

[Start up your lesson: How to start up your lesson.](#)

In this interactive workshop we are going to experience some lesson starters.

Why should we use lesson starters?

- Some are just for fun.
- Other starters are meant to activate prior knowledge, for instant when you start a new subject.
- Starters are also useful to differentiate. The way in which the student solves the assignment, says something about his mathematics level.
- Starters are so helpful, you can use them every lesson.

We will not just talk about starters, but most of all we're going to experience them.

Arjan van den Broek, The Netherlands

[Say hi to Eddy the educational robot](#)

Eddy helps students in an interactive way by practising numeracy. We show you a mathematics lesson in which Eddy will be helpful. You also can try Eddy by doing a quiz with mathematical questions.

Eddy can be used in educational practice with students during calculation lessons. It's an innovative didactical approach. The big advantage is that students can work independently and using the robot adheres to the modern technological experience world of the student

The expectation of using Eddy is twofold:

- The calculation skill level of students will rise
- Students will be introduced to new forms of technology, which they enjoy

During the demonstration we will show the listeners how the robot works, how it is used in classroom, and we will engage in a quiz with mathematical problems.

Joanne Caniglia, USA

[Teaching Refugee Adults Functional Mathematics](#)

The purpose of this presentation is to provide participants with concrete and hands-on resources for those teachers who work with refugees, immigrants, and asylum seekers. According to the United Nations High Commissioner on Refugees (UNHCR), the number of people displaced by conflict – refugees, asylum seekers or those displaced internally – was at an estimated 65.3 million by the end of 2015. This session will present four approaches from research in language acquisition and mathematics. These include recognizing students' mathematics backgrounds, using materials that engage all adults in mathematics; implementing inclusive teaching methods, and creating environments that are safe and enriching in mathematics. The approaches provide a framework that is not only about and for newcomer refugee and immigrant adults but for all adult learners. This presentation is for teachers of all adults, who will become members of an increasingly interconnected world and realize the importance and uses of mathematics.





Joanne Caniglia, USA

[Teaching Mathematics to Adult Learners Using Stations](#)

This session will allow participants to experience stations in teaching adult learners. Teaching with stations is not a new pedagogical innovation. Rather it is a common classroom practice used by k-12 teachers. There are many different modes for designing and implementing “math stations” during a class for adults (GED or Adult Education Classes). In this session we will demonstrate by using 4 stations: Video Station (short videos with practice), Independent Investigation Station (with technology assistance), , “Ask the Expert” (Teacher Station) and a “What to Do When You Get Done Station.” (for students who need or want more challenge). Not only will the “nuts and bolts” of stations be explained, but research describing the advantages of stations will also be discussed. The advantages of stations include: ease of implementation, differentiation, movement that helps keep interest, and student autonomy is developed. After participants “travel” to each station, a question and answer period will further clarify this strategy.

Noel Colleran, Ireland

[Exploring the genealogy of the concept of 'innate mathematical ability' and its potential for an egalitarian approach to mathematics education](#)

Recent work by a number of researchers has argued that the capacity for mathematical thinking is innate to human intelligence. Much of the evidence for this conclusion is based on findings in fields as diverse as linguistics, biology, genetics, evolution, archaeology, and psychology. This paper argues that the genealogy for this development is sourced in the philosophy of the Enlightenment, particularly the work of Immanuel Kant. Kant’s seminal idea suggests that human intelligence had a natural and necessary capacity for mathematical thinking in the forms of space and time. This paper will explore the ideas of Immanuel Kant regarding space and time particularly related to his views that the intuition of space provides the source for geometry while the intuition of time provides the source for number. A limited, yet sufficient, evaluation of recent relevant literature will be employed to illustrate that ‘new insights’ regarding innate mathematics ability can be genealogically traced to the work of the Enlightenment, particularly Immanuel Kant. Ultimately, this paper argues for the debunking of generally accepted agreement among some educators that some mathematics students have an innate capacity to do mathematics while others are innately incapable in this regard. With an acknowledgement of this ‘initial state’ regarding universal mathematics ability, an egalitarian perspective regarding students’ expectations and achievements in mathematics is in view.

Competition UK + NL price winners

[Competition UK + NL price winners presentation](#)

In the UK and in the Netherlands last school year a competition was held for practitioners to generate good ideas and good practices for Adults Learning Mathematics. In both competitions the price winners were given the opportunity to visit ALM24 to present their ideas. Last year at ALM23 in Maynooth, Ireland, it was the first time that such practitioners’ competition was held, now it finds a continuation in both the Netherlands and the UK. The price winners will present their ideas and these ideas can be discussed. Will it be a start of a new tradition in ALM? their ideas.

Diane Dalby, UK

[How can I become a better mathematics teacher? The affordance and constraints of professional learning communities in changing classroom practice.](#)

Many teachers are keen to develop their classroom practice but face setbacks due to external constraints or conflicts with the dominant culture of their department, school or college. Changing teacher practice is also a fundamental part of most national strategies for improvement but implementing such changes remains a major difficulty. There is evidence however, that when teachers work collaboratively in professional learning communities, there is the potential for effective and sustainable change in classrooms. In this session we will commence by discussing a case study of a group of mathematics teachers who work across vocational and





adult learning programmes in the same college. By tracing the journey of this small professional community, we will see how they adapt and develop their teaching approaches through times of institutional and national change. Our discussion will include practical examples and highlight ways in which participation in a supportive professional learning community can facilitate both shared and individual professional learning, despite external challenges. Finally, by exploring some of the key characteristic of such communities, such as collaboration, inquiry and reflection, we will explore how individual teachers can become better teachers through active participation in these types of groups.

Susanna East, UK

Developing independent learning skills among adult learners

Adults returning to learning often struggle with the required levels of self-study that are essential to achieve success. In 2015 Adult Learning Lewisham elected to offer GCSE qualifications to our 19+ learners most of whom have had a significant break since school with a significant number never having studied maths at this level or sat formal examinations. The content of GCSE syllabus is extensive, it is the standard accreditation for school leavers who generally spend at least two years preparing for GCSE assessment at the end of their compulsory schooling at age 16. Adult learners (and teachers) are faced with a significant challenge to cover the same course content in a period of nine months (September-May). The demands on both parties are high. Tutors are under pressure to deliver a full scheme of work with little time for revision and review and are often reliant on learners completing study tasks and developing their skills outside of the classroom. The maths team at ALL have utilised several strategies to support learners developing independent study skills with varying levels of success. My poster will reflect on the strategies employed and their impact.

Jeff Evans, UK; John O'Donoghue, Ireland; Kathy Safford-Ramus, USA; Javier Diez-Palomar, Spain

New Directions for ALM-International Journal

Following John O'Donoghue's plenary at ALM-23, which advanced a number of suggestions for revitalising ALM's work, and prior to a change of Editor(s) for ALM-IJ, this workshop will discuss a number of ideas for developing the journal. These will include:

- (i) the appointment of a new Editorial Team, of say three colleagues with complementary expertise;
- (ii) refreshing the membership of the Editorial Board;
- (iii) reviewing the priorities for topics for articles;
- (iv) related to forming links with other branches of mathematics education, organising a Special Issue of ALM-IJ, themed on a topic from maths education, and co-edited with an expert from mathematics education, e.g. the earlier issue on Gender (with the late Christine Keitel in 2008 ca.); etc.

Jeff Evans, UK

Have statistics lost their power in public policy discussions? Have statistics lost their power in public policy discussions?

Statistics is one of the important branches of mathematics taught in schools, colleges and universities. It is an important tool in public policy discussions. In this session I aim to propose a response to an article by Will Davies in The Guardian, which pointed to difficulties in the contemporary role of statistics in public discussions: "Rather than diffusing controversy and polarisation, it seems as if [...] antipathy to statistics has become one of the hallmarks of the populist right, with statisticians and economists chief among the various 'experts' ostensibly rejected by voters in 2016." The discussion will review the characteristics of the statistical approach in general, and will consider the meaning and consequences of "big data", as well as some effects of trends towards "identity politics" and globalisation. Some suggestions will be made about what may be done, hopefully to be augmented in discussion.

Participants are encouraged to read the article, before the session:

Davies, W. (2017). "How statistics lost their power", The Guardian, 19 Jan.

<https://www.theguardian.com/politics/2017/jan/19/crisis-of-statistics-big-data-democracy>





Graham Griffiths, UK

[Thinking about the use of alternative dialogue scenes when developing adult mathematics](#)

This paper is a continuation of work investigating the reading aloud use of a scene of dialogue with adult mathematics learners. Through the use of the 'real world', hands-on context of rail ticket prices, the scene and its associated task have been produced to encourage learners to engage with mathematical ideas. Nevertheless, in exploring the use of the dialogue scene with adult learners (Griffiths 2014) through reading aloud, it was noticed that the scene contains features that suggest the 'correct' response to the task without the need to fully engage with the mathematical concepts involved. In order to analyse the responses of adult learners to such mathematical scenes and narrow down my research questions, I will explore the features of some alternative, but linked, scenes of dialogue. The alternative scenes will be examined using discursive approaches to mathematics education (Kieron, Forman and Sfard 2002) and informed by empirical data (Oughton 2009)

Graham Griffiths, UK

[Citizen Maths – a free online mathematics course designed for adults. Is it working?](#)

Citizen Maths (www.citizenmaths.com) is a free and open online maths course for self-motivated adults covering five "powerful ideas" in mathematics, and involving between 25 and 50 hours of study. It does not lead to a formal qualification. The development of Citizen Maths was funded by the Ufi Charitable Trust. The work was done by Calderdale College, with the UCL Institute of Education and OCR, with advice from the Google Course Builder team. Thousands of people have signed up for Citizen Maths, at a current rate of nearly 200/week. This workshop will investigate some of the key features of Citizen Maths and discuss the data collected by the team during the development of the resource.

Giel Hanraets, The Netherlands

[Digital tools in Dutch vocational mathematics classes](#)

PISA 2012 showed that the Netherlands has one of the smallest shares of 15-year-old students who find learning mathematics interesting or enjoyable among the participating OESO-countries. Dutch students are also less willing to work through problems that are difficult, they do not remain interested in the tasks that they start, and, more than in other countries, they are likely to shy away from complex problems ([OECD, 2013-page 84](#)). This means a big challenge for Dutch math-teachers, especially in the secondary vocational education, where Math isn't always considered a high-valued subject amongst students.

In this short workshop, I'll be giving an introduction in the use of (mobile) devices in the math class. Not only to enhance student-motivation, but also to make learning visible and create the opportunity to differentiate. Make sure you're tablet of mobile device is fully charged and has access to the Albeda-wifi and we'll have a blast. Interactive learning through Nearpod or go out for a math-walk with Seppo. The main goal is to inspire co-teachers and give an example in the activities teacher have to make to enhance student-motivation and learning.

Kees Hoogland, The Netherlands, Diana Coben, New Zealand; Lynda Ginsburg, USA

[Reviewing the PIAAC Assessment Framework](#)

This presentation will report on the results of a recent review of the Programme for the International Assessment of Adult Competencies (PIAAC) Numeracy Assessment Framework. This framework was used in the first cycle of PIAAC. The review was carried out on request of the OECD by an international team of numeracy experts with a long experience in ALM. The presentation will show the results of this review and discuss the recommendations on the assessment of adults' capacity to undertake successfully the range of numeracy tasks they will face in their everyday and working lives in the third decade of the 21st century.





Kees Hoogland, The Netherlands

[Descriptive and depictive representations in mathematical problems – the effect on vocational students' results.](#)

In my dissertation the following research question was addressed: "In presenting contextual mathematical problems, what is the effect on student performance of changing a descriptive representation of the problem situation to a mainly depictive one?"

Investigating this research question shed some light on an issue in mathematics education: why do students on so many occasions show a suspension of sense-making in answering contextual mathematical problems, and as a result perform poorly, and develop inadequate problem-solving skills?

We argued that a mainly depictive representation of the problem situation, especially with photographs from real problem situations, might increase the likelihood that students address the problem with a problem-solving attitude, that is, taking into account all aspects and constraints that the problem situation demands. I will present some results with a focus on vocational students.

Brooke Ista, USA

[Mathematics for the Criminal Justice Field](#)

In the 2016-2017 academic year, I worked with a group of Criminal Justice Experts to contextualize the competencies associated with College Algebra level mathematics. This curriculum was then taught to a group of students who were interested in the field of criminal justice and were considered to be low-numeracy learners. This course/curriculum was taught twice once in the Fall and again in the Spring. I will discuss the results of this type of instruction, the curriculum and focus, as well as, discuss changes that were made to the instruction in the classroom.

Beth Kelly, UK

[Adults learning mathematics in the workplace through their trade unions: what motivates them?](#)

My research explores adults' motivation to learn mathematics and focuses on learners who are overcoming many barriers to study in the workplace; in this study through classes organised and funded by trade unions. The research identifies:

Different types of motivation: Initial motivation to re-engage with learning and motivation to continue learning. Motivation as a dynamic interplay between the personal needs or goals of individual learners, the influence of other members of face-to-face learning groups within the context of wider UK society.

Learning approaches used in the trade union classes as a key aspect of adult learner motivation. The use of 'collective' learning approaches, develops positive social and emotional encounters in the classroom that are different from their previous experiences.

Successfully developing mathematical skills develops the adults confidence, which helps to shape their identities and has considerable influence on their motivations both inside and outside the classroom.

The idea of an 'Affective Mathematical Journey' developed through the adult's use of emotional language when reporting changes in their feelings and motivation towards mathematics.

Maryam Kiani, USA

[Critical Mathematics in a Post-Truth Era: Mathematics is a prerequisite to philosophy and therefore access to wisdom and truth.](#)

"Let No One Ignorant Of Geometry Enter Here"

This phrase, reportedly engraved at the door of Plato's Academy, conveys the ancient idea that is still fueling our lives today: mathematics is a prerequisite to philosophy and therefore access to wisdom and truth.

The idea that mathematics is not only practically useful and theoretically beautiful but also broadly intellectually and cognitively beneficial is still predominant today. Indeed, numbers do thinking for us and no important aspect of life is beyond their reach (Porter, 1997). Numbers have long been important in the management of our life from what to eat to what policy to support. 21st century contains statistics which more often are just perplexing array of numbers producing confusion rather than clarity. Everyday we are being





bombarded with massive range of data, which some call them fake news, and some the pure truth. In this turbulent century, we must learn to interpret the numbers for ourselves. This talk is about how learning mathematics empowers us to evaluate data rather than just relying on arguments (mostly sound very rational) made by the press, the government, and our fellow citizens. Mathematics is a tool to think suitably and earn aptitude to understand national and global issues.

Maryam Kiani, USA

[Numeracy and Mathematics in Brain: The Untapped Potential of Learning Disabled Employees in the Workplace](#)

A new interdisciplinary field of Mind, Brain and Education has been evolving in recent years. Researchers try to answer educationally-relevant questions such as “How the brain of math learning disabilities work?” (Ansari, 2016)

Although generally mathematics learning disability such as dyscalculia considered a childhood disorder, they can persist into adulthood and impede achievement in the workplace. Dyscalculia symptoms can be associated with poor organization, time management, and interpersonal relationships. Furthermore, the costs of employing dyscalculic individuals are higher because of work absences and lost productivity. Dyscalculia is severe difficulty in comprehending mathematics, presumed to be due to a specific impairment in brain function. This disorder is sometimes referred to as a “mathematical learning disability” and can be as complex and damaging as a reading disability (dyslexia), which tends to be more usually diagnosed. Mathematics learning disabilities do not often occur with clarity and simplicity. Rather they can be combinations of difficulties, which may include language processing problems, visual spatial confusion, memory and sequence difficulties, and, or unusually, high anxiety. Dyscalculia is often manifested in struggles with conceptual understanding, counting sequences, written number symbol systems, the language of math, basic number facts, procedural steps of computation, application of arithmetic skills, and problem-solving. This review describes the brain of a dyscalculic individual, how dyscalculia symptoms in adulthood affect workplace behaviors, the effect of Dyscalculia on employment and workplace performance, and the management of dyscalculia in working adults.

Suehye Kim, Germany

[Adult numeracy within a lifelong learning metric : Action Research to Measure Literacy Programme Participants’ Learning Outcomes \(RAMAA\)](#)

Adult literacy is a foundational means of further learning as nearly all structured learning opportunities to live well in increasingly changing societies (UNESCO, 2017). In this context, adult numeracy is essential in addressing mathematical problems associated with measures to implement the Sustainable Development Goals (SDGs) agenda (UNESCO, 2016). A new vision of SDGs for education proposed adult numeracy be assessed within a learning metric to ensure quality of education.

In the lifelong literacy framework, UNESCO Institute for Lifelong Learning (UIL) has initiated a multi-country action research to measure learning outcomes for literacy programme participants (Recherche-action sur la mesure des apprentissages des bénéficiaires des programmes d’alphabétisation; RAMAA). RAMAA action research started to meet a special need for increasing adult literacy and basic skills in French-speaking African countries. Particularly, adult numeracy is measured as a key component of the skills from level 1 (counting objects or currency and writing numbers) to level 3 (performing operation with quantities or measurements of space or time). In the current second phase of RAMAA, 12 African countries set to having harmonized tools to measure adult skills. This presentation will highlight two key features of RAMAA; 1) in developing contextualized measurement tools of adult numeracy as a learning outcome and 2) in strengthening national capacities within a country-specific context.

Aristoula Kontogianni, Greece

[Investigating adults’ statistical literacy in a second chance school](#)

The main institution in Greece related to Adults’ Basic Education programs, where mathematics is taught, is the Second Chance School (SCS). Our research took place in such a school for a period of three weeks. The students were 43 adults aged, in majority, from 25 to 45. They all had a primary school leaving certificate and they





attended the first year of a SCS in a small town, in North-West Greece. Our study's objective was to assess the progress of adults' statistical knowledge during the teaching of basic statistical notions. We designed our research in light of the statistical literacy's necessity for adults, as a sub-category of numeracy. In order to assess the progress of adults' statistical knowledge during the teaching of basic statistical notions we designed a 12-hour sequence of lessons, which included: (1) data collection, interpretation and organization, (2) reading and interpretation of basic data representations, (3) data description with statistical terminology, and (4) evaluation of arguments based on misleading graphs or incorrect statistical information. In our paper we will present some of our findings about the way that adults without a strong cognitive background understand statistical notions in order to reach an early stage of statistical literacy.

Nárcisz Kulcsár, Hungary

[Studying mathematics through texts or images? The importance of visuality in university coursebooks](#)

We are part of a specific iconic revolution in which the dominance of the written language expiry and the importance of the visuality increases. Globalization catalyzes the visual language with its universality and internationality to become a world language. The dramatic rise of the role of visual culture has impact on education culture as well. Physiological processes in the brain (myelination process) of adolescence and young adults cause that they learn typically differently subsequently often utilize visual aids in order to help them better comprehend difficult subjects. These reasons lead us to pay more attention in higher education on visuality. The preferable ration between text and images in the textbooks should be between 30 and 50 % but the question is that what shows the reality. Miguel de Guzmán Spanish mathematician dealt with visuality in mathematics. He distinguished three different types of visualization in mathematics due to the strength of relation between the object and its visual mapping. I investigated some course books that students use in our university and I made some comparisons from a visual point of view based on Guzmán's theory and on other visual aspects.

Wim Matthijse, Monica Wijers, The Netherlands

[A Dutch Numeracy approach: Succes! Rekenen](#)

Over 2 million people in the Netherlands have numeracy problems. They have to deal with daily challenges such as paying (debts), measuring (jobs, healthcare), interpreting schedules, schemes, numbers and graphics etc. etc.

A team from Utrecht University has developed commissioned by and in cooperation with the Reading and Writing Foundation, a series of six thematic booklets to help low-educated adults to become more numerate in daily life and work. The series is called: Succes! Rekenen. Themes are: Money, Healthy living, Do-it-yourself, Cooking, Appointments.

Some of the characteristics of the approach are: Functional authentic situations, focus on students own solutions, interactive guidance, integrative approach of numeracy, literacy and digital competencies, suitable for use by trained volunteers. Volunteers and coordinators were trained for a pilot using the materials in non-formal settings with low-educated adults. In this pilot research was done using a survey, observations, assessment and interviews to answer question like: Are the materials helpful for volunteers and the target group? What works well? What problems do they encounter?

In this workshop you will learn more about the materials and get a chance to work with one of the booklets. We will also present and discuss the results of the pilot.

Sorcha Moran, Ireland

[Add1ng Num8er5 t0 L1fe, and Multiply the Possibilities](#)

I teach in an Adult Education setting and for many of my learners, the education system failed regarding their maths learning the first time around. They are very often left with an opinion that they can't do maths. They lack self-belief in their ability to learn maths. Maths is also linked with a perception of intelligence, so has an impact on their overall opinion of their own intellect.

My teaching approach is to NEVER teach using 'rules'. Learners always learn from the very basics of the concept. They learn using visuals, manipulatives, relating the material to real-life, and concepts they have





already grasped. They learn through understanding, linking knowledge, and presenting the same thing in many ways. They learn that maths is not just a jumble of numbers, that the order of the numbers combined with symbols gives them meaning. They learn to read maths and understand the language by matching their visuals/manipulatives, English, and mathematical symbols.

In this workshop, I will give examples of hands-on learning activities which have helped learners become proficient at fractions, algebra, and geometry. They developed their problem solving skills and express a confidence in their maths ability, and their ability to help their children.

Catherine Paulson-Ellis, UK

[My maths is OK; I can do my job; why is that a problem?](#)

Poor numeracy in working populations varies considerably across countries but is a particular issue in the UK. In its latest Skills Outlook, the OECD concludes that the skills mix in the UK is not well aligned with the needs of technologically advanced and specialised industries.

This is not a new problem and there have been many initiatives to try and enhance the numeracy levels of working people. Some have succeeded, but they tend to be small scale and rarely replicated across whole industries. Uptake of maths qualifications is dominated by apprenticeships where rules are set by Government and training providers often deliver maths education without employer involvement.

My presentation will consider why employers in the UK are reluctant to tackle poor workplace numeracy and why successive Government policies have had little impact on skills in the population. It will include behavioural insights to shine light on the way that attitudes and behaviours of employers and employees combine to obscure the issue to such an extent that it barely looks like an issue at the micro-level while continuing to be a serious problem at the macro-level. The presentation should help to stimulate a conversation about new approaches to workplace numeracy programmes.

Leah Rineck, USA

[Accelerating Students to Credit Bearing Mathematics Classes](#)

Some students come to the university very underprepared for credit bearing mathematics. How do you help adult students understand numeracy and beginning algebra if they have never understood it before? This presentation will discuss a different way to prepare students that have not succeeded in mathematics before. The class sets students up for success. An accelerated, comprehensive class that ranges from basic math all the way to beginning algebra. The class incorporates growth mindset, study skills, and conceptual understanding. The class is flipped and has a vertical redesign. The vast majority of students are successful in this class and are also successful in credit bearing math classes. Come see how to set your students up for success!

Leah Rineck, USA

[Using Algebra Tiles to Help Integer Understanding](#)

One of the major stumbling blocks for adult students in basic mathematic classes is understanding integer computations. Having students use many representations of integers to understand operations with integers helps develop conceptual understanding. I have been using algebra tiles for the last two years to help students understand what and how integers work. In this workshop I will discuss some different ways to use algebra tiles, and let participants use the tools to understand how to bring them back to their schools.

Kathy Safford-Ramus, USA

[Power in Numbers: Advancing Math for Adult Learners: A Project of the United States Department of Education](#)

In August, 2016, the United States Department of Education Office of Career, Technical, and Adult Education launched a new initiative to promote the use of high-quality Open Education Resources in the teaching and learning of mathematics by adult students. The scope of the three-year project includes the formation of a technical working group of subject matter experts, an environmental scan of available OERs, and the recruitment of Teacher User Groups who will review and evaluate OER for their utility in the adult classroom. The ultimate goal of the project is the appropriate incorporation of OER resources into adult mathematics education in order to aid adults studying mathematics.





This presentation will describe the work of the project thus far as it nears the year-one mark and share the completed products with attendees. Future project goals will be outlined and participants will be invited to contribute information about OER research in their own country that may meld with this project to advance the use of OERs as an essential instructional tool.

Uwe Schallmaier, Germany

[Mathematical competences in workplace activities of trained salespeople from different perspectives](#)

Our study aims to detect mathematical competences trained retail salespersons use for coping with mathematical requirements in their professional everyday life. Hence, it is necessary to consider the different approaches to the concept of competence in vocational education and mathematics education.

From the perspective of mathematics education, the general model of vocational mathematical competence (Siebert & Heinze, 2015) describes mathematical competences in a vocational environment. It is based on the German education standards in mathematics and, hence, refers to a cognitive understanding of competence. This model identifies domain-related mathematical competences as the intersection of general mathematical competences and vocational action competence.

In the area of vocational education, the term vocational action competence describes skills, knowledge, and abilities to act successfully in work related situations. Being linked to domain-specific situations, vocational action competence is unique to every profession. Focusing on salespeople, the integrative model of commercial competence (Winter & Achtenhagen, 2008) distinguishes between general and vocational competences which differentiate domain-specific from domain-linked economic competence. Domain-linked economic competence, in turn, embraces economic numeracy, which is similar to the conception of domain-related mathematical competences.

Our poster tries to depict this linking between the conceptualisations of mathematical competence in vocational and in mathematics education.

William Speer, USA

[Mining the Richness of "I Don't Know" Responses](#)

We can't ask our students to be seekers if we aren't seekers ourselves. More time should be spent asking questions which the students don't already know the answers. Students need to spend a greater proportion of instructional time seeking the answers than remembering ones they already know or that we expect them to know. This research-based, practice-oriented, hands-on session explores the benefits of productive struggle with questions that often initially yield a response of "I don't know" to help students shake up naïve or loose thinking and to nurture the ability to construct "new" knowledge by encouraging connections to, and transfer of, related content knowledge. Not everyone wants to be a mathematician, but everyone can learn to experience and appreciate mathematics in the ways that mathematicians do. Mathematicians consistently voice "I don't know" when faced with a real problem. In fact, being good at mathematics is evidenced by what *else* you choose to do when you don't know what to do. We must help people construct their own "new" knowledge, and, most importantly, apply that knowledge in ways different from the situation in which it was first encountered or learned.

Jenny Stacey, UK

[Mathematics and Examination Anxiety in Adult Learners: the findings of surveys of GCSE Maths students in a Further Education college in the UK](#)

I teach adult learners in an FE college in the Midlands of the UK.

As part of my work at the college I run a survey at the start of each academic year on the attitudes of adult learners around mathematics and exams. This helps inform my teaching: once I know the learners confidence or anxiety levels, it helps me to target their needs. Usually around a third of the learners each year describe themselves as anxious or very anxious about maths, and up to a half have the same responses for exams, out of a cohort of approximately 70 learners, 20% of whom are not first language English speakers.





In this paper I share the results of a further survey to investigate whether there are any patterns in confidence levels around age, gender, or nationality, and whether learners identify any key moments or events that shaped their opinions.

Finally, I look at why and how learners' views are changing as a result of their experience in an adult classroom.

Marissa van der Valk, The Netherlands

[Electronic Platform of Adult Learning in Europe](#)

[Find out about 5 lifehacks of EPAL \(and how you can share one too...\)](#)

EPAL is a multilingual open membership community for teachers, trainers, researchers, academics, policy makers and anyone else with a professional role in adult learning across Europe. Also for numeracy professionals!

Members of the community can engage with adult learning colleagues across Europe through the site's features, including forums, blogs, events and a news-section. You can also interact with your peers across Europe through the thematic areas which provide structured content according to topic. You can find projects and make professional connections using the partner search repository.

After this active workshop you'll wonder why you haven't joined before! You'll find out about this community, what you can find there, how you can use it in your daily (professional) life. Oh, and you'll add one of your own eye-openers, tips or tricks. No diploma's or certificates necessary.

Shin Watanabe, Japan

[The Connection on In school and Out School](#)

First we define the In school and Out school. In Japan we have the system of schools. But we I explore the way of the lifelong learning. We do not learn mathematics out of school. So many stop to learn mathematics at the same time to graduate from a school. We want to change this system. So we want to establish the system to learn mathematics by lifelong learning. It is important for every people to use and learn it. Now we think that "what is mathematics for lifelong learning?", and "where do we learn it out of school?" It is to create the new world using mathematics and a method necessary to solve our problem. It is important to creativity and to solve our problems in life. So we define mathematics of mathematics. We want to learn mathematics in the lifelong learning.

Hans de Zeeuw, The Netherlands

[The Math Games](#)

Games are a way to motivate students to engage in numeracy activities. In this workshop we present two games that are designed for (young) adults. We will report on our classroom experiences with these games. We will also give the participants the opportunity to play these games and discuss ways in which they might be used in class.

1. The Math game

The Math Game is developed to improve numerical skills. It is in English and comes with translations of the rules in Dutch, German and Spanish. The Math Game is a digital game, but is also available as a card game. The game can be used any time of day, at school or at home, and it only needs 3-5 minutes to finish. It's an addictive educational game that players don't want to stop playing.

The game has four levels, from easy to expert. It has a limited time to finish. There's a setting with additional time for players who require more time to understand the questions and/or lack confidence to play. To challenge the players there's a top score list as well as a top 10.

2. The game, Calculation Match

Calculation Match, is a game that trains players to link concepts, to calculate or count with them and apply them in certain situations. The typical aspect of the game is that all the players are counting even when it's not their turn. The player has to make pairs by matching two cards: one card with an assignment and one card with the solution. The game has four levels. Four types of counting are addressed: basic counting, counting in contexts, geometry and relations in figures. It's a game for two to four players. The game is aimed at vocational school students but can be played at secondary schools too. By placing the cards face down, each player needs





to remember not just which two cards belong together, but they also need to remember their place on the table! This helps to create a better memory and makes this an exciting game for everyone to enjoy.

