

Topic Study Group No. 6: Adult Learning

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and Evelyn Süß-Stepancik**

The Program

July 26, 27, 28 and 29, Tuesday to Friday, 12:00–1:30

John O'Donoghue (Ireland): Mathematics education and adult learning in Ireland
Aoife M. Smith (Ireland): An investigation into the concept of Math Eyes with a particular focus on the Math Eyes poster competition

Wolfram Meyerhöfer (Ireland): Mathematics education and adult learning in Ireland
Katherine Safford-Ramus (United States of America): Learning from research, advancing the field

David Kaye (United Kingdom): Defining adult numeracy and mathematics—an academic and political investigation

Pradeep Kumar Misra (India): Open Educational Resources: A potential tool for adult learners, to achieve lifelong learning of mathematics

Maria Elizabete Souza Couto (Brazil): The mathematics in the young people and adult education: The practice in Construction

Co-chairs: Jürgen Maaß, Pradeep Kumar Misra

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Wolfram Meyerhöfer (Ireland): Mathematics education and adult learning in Ireland
 Zekiye Morkoyunulu (Turkey): Parent's training in mathematics: A social awareness study

Wolfram Meyerhöfer (Ireland): Mathematics education and adult learning in Ireland

Terry Maquire (Ireland): Math Eyes—A concept with potential

Sonja Beeli-Zimmermann (Switzerland): "I've never cooked with my math teacher"—The duality of mathematics

Shin Watanabe (Japan): Self learning mathematics on lifelong learning

Andrea Maffia (Italy): Adults' conception of multiplication: How does it change along studies?

Jürgen Maaß (Austria): Thinking about relations between adults learning mathematics and reality

The manifold presentations in this topic study group spanned a wide range of issues and fall under the headings: (1) current state of research, (2) numeracy, (3) schooling and lifelong learning, (4) beliefs of adult education teachers, and (5) incorporating technology.

1. Current state of research

In the research of adult mathematic education several areas can be identified. On the one hand a great amount of studies emphasizes student issues and on the other hand a large number of published research deals with teacher issues. The crucial student issues are math anxiety, self-efficacy and classroom methods. Math anxiety is well documented and it's obvious, that this anxiety looks people out of jobs that require mathematics degrees. The relationship between math anxiety and self-efficacy is inversed. The results of research focused on classroom methods are diverse and show contradictory findings. The explorations cover topics like the effectiveness of Integrated Learning System, the implementation of online, weekend and shot-term courses, the impact of cooperative and collaborative learning methods, etc. The most important teacher issues are teachers' characteristics and the necessity of a professional adult teacher development.

2. Numeracy

The debate around the use and meaning of "numeracy" lasts for a long time and applies to (adult) learners, (adult) teachers, researchers and politicians. Many definitions of numeracy exist and a lot of them mentioned terms like context, solving problems, work-related and empowering in connection with numeracy. All of them agree that numeracy is not less than mathematics but more. Furthermore numeracy is about using mathematics to make sense of the real world and being critical in social and political analysis and also about mathematics itself. Thus numeracy includes personal abilities from basic skills to high-level cognitive abilities. By now numeracy is an important aspect for curriculum development in some countries (e.g. Denmark, England, Ireland). But the perception of numeracy is diverging. Researchers focus on the learners' needs and the relevance of the numeracy to the learners' lives while policy makers' priorities to increase numeracy for economic

grow. Over and above this the role of school mathematics in numeracy development is not clarified yet, even if it's confident that numeracy is not automatically developed of schooling.

In Ireland the *Math Eyes* concept was developed as a central component of the professional development for adult numeracy teachers. The idea of Math Eyes is to support individuals to look at familiar things through the lens of mathematics. The hypothesis is, that the development of maths eyes has an impact on the numerate behavior, the motivation and mathematical confidence of the individual and it seems that Math Eyes reengage adult learners in learning mathematics. The evolution of Maths Eyes is proceeding rapidly in Ireland. By now the concept is also relevant for the primary and post-primary secondary schools sector. Despite the widespread use of Math Eyes the output of some projects demonstrate that developing maths eyes is not easy for teachers and learners. Therefore an appropriate professional development especially for adult mathematics teachers is necessary.

The idea of discovering mathematics in one's everyday life is also pursued in many other countries. In Brazil, where Freires pedagogic concept is originated, adult learners were faced with the economy of water in mathematics classes because everyone knows the lack of water. After discussing the significance of this theme the learners studied graphs about the global water consumption, calculated their personal water consumption and debated how mathematics helps to grasp this topic much better. Another interesting example was reported from India, where an adult mathematics class successfully elaborated themes like optimization and multiple representations. Some of the adult learners worked as vegetable sellers and were highly interested to optimize their spending and earning. In the mathematics class they tabulated their data (e.g. vegetables, rates, ...), draw graphs and infer functional variations. This work led to a rulebook for the vegetable sellers that helped them to earn more. One conclusion of this experience is that mathematics curriculum should be built on the learners' own lives, especially in their participation in economic activity.

3. Schooling and lifelong learning

Discussing the field of schooling and lifelong learning, it became clear that the duration of compulsory schooling and the duration of schooling also has a big influence on the needs of the adult learners and adult teachers. In Japan for example a lifelong learning strategy is not yet established. This leads to the division of mathematical education into two periods. The first takes place in school and the second much longer period is carried out from everyone without public support. Due to the importance of lifelong learning and a continuing mathematical education the Japanese education system is building up a lifelong learning strategy in which creativity and mathematical thinking plays an important role. From a very different angle a study about adults' conception of multiplication looked at the effect of duration and typology of schooling. In this specific field of arithmetic a qualitative analysis of semi-structured interviews pointed out that people with low

mathematical education recall just situations from school while people with medium and high education in mathematics associate their personal life experience to their conception of multiplication. Another aspect in the context of school and lifelong learning is the mathematical education of mathematical analphabets. In Germany within the scope of the “National Strategy for Literacy and Basic Education” the courses for adult learners try to overcome the mathematical autobiography of failure, which mathematical analphabets often have and attempt to regard the mathematical needs of learners.

4. Beliefs of adult education teachers

While mathematics teacher for primary and secondary school run through traditional academic studies many adult educators get their job by circumstances rather than by choice. Usually they attend some kind of training before they start working as an adult mathematics teacher. For research it's interesting to study their views of mathematics and how they relate to their practice. A qualitative study shows that adult mathematics teachers have a broad variety of positively connoted affects and their negative associations are more homogenous and often traced back to discriminating school experience. Positive and negative affective aspects can coexist in the same person and are linked to different strands of mathematics. One consequence could be that further training for adult education teachers in numeracy should result in increasing their awareness of the their mathematical views and how they relate to their practice.

5. Incorporating technology

As the state of research shows several attempts were mad to incorporate technology in adult mathematical education. Today there is great hope that Open Educational Resources (OER) promotes lifelong learning of mathematics, because there are many opportunities to use OER for adult learners. For example OER can be used to design courseware for adult learners without much financial burden. However at least there are two important conditions to speed up the usage of OER. The first is the necessity of a special repository of OER for adult learners and the second is the necessity of establishing a mathematical community for adult learners to benefit from their experience.

The scope of this topic study group shows that future research should still concentrate on numeracy, investigate technology as a tool for adult education and should make an effort to develop adult teacher training as well as an advanced degree in adult mathematics education.

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