

Summary of Maths Review

This review attempts to distil the existing knowledge base around effective teaching of numeracy for adults, collecting analysis some of the most promising and well-developed research together in a 14-page summary. The research evidence surrounding adult numeracy teaching is still a long way short of being comprehensive, but nevertheless it does contain a number of useful, interesting and important nuggets of information. Added to this is the much more solid body of evidence from mathematics education more generally, which also features in the review. The review does not attempt to provide a comprehensive analysis of the current state of adult numeracy tuition- rather, it attempts to set the scene for those trying to develop their understanding of how Mathematics is taught in the Further Education/Adult Education sector in the United Kingdom at this time.

Post 16 and Adult Mathematics research

The Smith Inquiry into post-14 Mathematics education, conducted in 2004, identified three major deficits in the way Mathematics was taught in the UK for that age group:

1. a curriculum and qualifications framework that failed to meet the mathematical requirements of learners, failed to meet the needs and expectations of higher education and employers and failed to motivate and encourage sufficient numbers of young people to continue with the study of mathematics post-16
2. a serious shortage of specialist mathematics teachers in schools and colleges, resulting in an adverse effect on pupils' learning experiences
3. a lack of support infrastructure, both at national and local levels, to provide continuing professional development and resources, including ICT, in support of excellence in the teaching and learning of mathematics.

Though attempts have been made to address these concerns, particularly through a revamp of professional development in the sector, numeracy skills remain a significant concern for educators and employers in the UK.

A review of employers' views on numeracy conducted in 2013 revealed that the problem lay beyond a simple deficit in knowledge of mathematical procedures, but rather consisted of a failure to instil in learners what might be termed a "numerate mindset". The need is not simply to accurately teach mathematical formulae and terminology, but to help learners become comfortable practitioners of numeracy skills. The evidence indicates that this is currently something which teachers in the UK find difficult, but also that this can be changed: effective CPD programmes and resulting changes in practice, where they happened, were found to have a positive impact on learning and motivation.

Following the Smith report, Ofsted reported on what they found to be the main factors leading to high achievement, motivation and participation in 14-19 mathematics, and the factors which act against high achievement, from a sample of 26 schools, sixth form colleges and general further education colleges and from other relevant Ofsted evidence. The inspectorate found that those factors which made the most significant contributions to high achievement in 14-19 mathematics included secure teacher subject knowledge, underpinning an approach to mathematics in which all topics were seen as part of a coherent set of related ideas, with clear progression and links to previous and future learning.

These findings are consistent with the post 16 research literature, which also helps to explain and contextualise the learning activities which did help to "engage students in real mathematical thinking." They are also consistent with the idea, espoused elsewhere, that "reform-minded math educators" think

it essential for students to be able to answer as well as ask 'why' questions and to develop their conceptual understanding.

The work of Jon Swain suggests that "there is little difference between adult learning and the learning of children in terms of general methods and approaches" but rather that it is the different ways in which they learn. "It is how an adult constructs the experience of being a student and how a child constructs it that is the most important difference between teaching adults and teaching children".

Swain suggests that an adult's construct of being a student is likely to be wider than and different from that of a child because an adult is able to draw on the experience of having once been a child and of now no longer being a child. Adults have had more time to reflect on and develop their own perceptions of what they feel they are good at and not so good at in learning terms (e.g. 'I'm hopeless at maths'; 'maths is a difficult subject'). Children are still in the process of developing these perceptions of their own abilities and have less experience to draw on. Adult learners "come with a different set of motivations, interests and agendas, " and there will also be "different and competing purposes, expectations and pressures from governments, providers, managers, teachers and students."

All studies found that there was a need for teachers to identify and to build upon learners' preconceptions, prior learning and to identify and correct misconceptions and to plug gaps. Where the adult learners are different is in the many and much wider variety of experiences and identities they bring to the classroom. Hence teachers of adult mathematics would appear to need to be much more vigilant and strategic in uncovering and working with this level of variety; and to be more flexibly prepared to depart from lesson plans to accommodate and build on what they find.

Common to all learners, the research suggests, is the effectiveness of effective questioning, using mistakes and misconceptions as learning points, and the use of structured, co-operative small group work, balanced by opportunities for independent working and whole class discussion. (Again there is some evidence that, despite their effectiveness both teachers and learners in the adult studies find collaborative learning harder to do.) There is also strong evidence across the age groups that rich, collaborative tasks need to emphasise methods rather than answers, and create connections between mathematical topics and be shaped and selected by effective use of the outcomes of effective assessment for learning.