

More... or less? Towards a critical pedagogy of Adult Numeracy

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Abstract

The development of socio-cultural understandings of mathematics combined with policy interest in adult numeracy as a result of international studies, which compare skill levels in different countries, have impacted adult education practice in recent years. In Scotland, a ‘social practice approach’ is espoused and adult numeracy tutors are encouraged to add more to the learning experience – more context, more activity. But is this a sufficient pedagogic response to the insights from social practices theory and a socio-cultural perspective of mathematics? This paper draws on evidence from studies of practitioners’ understandings of social practices theory to argue that these responses are limited and potentially limiting of adult learners and represent a neo-deficit approach. Instead a critical pedagogy is required, which may require that the tutor bring less, not more, to the learning experience. Critical pedagogies would involve exploring with learners the powerful uses of mathematics in society. Adult numeracy learners could learn not only to understand the mathematics in use but to use mathematics for their own projects. The paper concludes with some thoughts on the kind of teacher education required to support tutors to become more critical in their pedagogy.

Key words: Adult numeracy, social practices, critical pedagogy

Introduction

This paper argues that the changes to adult numeracy practice evident in recent years are an insufficient response to current theoretical perspectives on mathematics in society and potentially limiting of adult learners. It arises out of a number of personal and professional concerns: to promote education for social justice, to synthesise literacy and numeracy issues, to share insights about practice across different sectors of education. It is informed by my experience in schools, further education colleges and as a tutor and organiser for a voluntary sector provider of adult education for democracy. The argument has been developed through my work as teacher educator involved in designing and delivering professional development for Adult Literacies practitioners in Scotland between 2005 and 2012¹. A research project undertaken in this period, with practitioners participating in the work based professional development programme, provides evidence in support of my arguments.

Writing for a journal with mathematics in the title, I am however, beset by imposter syndrome. An arts graduate, teacher of English, literacy tutor and qualitative researcher, I find myself subject to doubts about my capability and credibility to contribute to academic debate about maths. Boaler (2009) provides one explanation for my feelings of unworthiness. She describes as ‘the elephant in the

¹ Between 2005 and 2012, I was Curriculum and Research Leader for the Scottish TQAL Consortium which consists of the Universities of Aberdeen, Dundee & Strathclyde. The Consortium was contracted by Scottish Government to develop and deliver a teaching qualification for adult literacies tutors (TQAL), which became the Professional Graduate Diploma in Education (Adult Literacies).

classroom' the assumption that success in maths is a sign of general intelligence (p.2). Such an assumption breeds adult insecurities as they assess their own value in relation to the value accorded their different kinds of knowledge. Boaler reminds us that the mathematics afforded such power – school maths - is a narrow subject restricted to classroom contexts: 'a strange mutated version' (ibid) of real mathematics'. Nevertheless, 'people who teach maths', the voice in my head goes, 'are much cleverer than me'. I share this reflection because power is at the core of my argument about the teaching of adult numeracy. My proposal is for pedagogies, which confront the elephant and expose assumptions about different forms of knowledge to examination.

Although I will base my argument primarily on the situation in Scotland, I believe it has validity internationally at a time when a culture of global comparisons of educational outcomes drive harmonisation of educational practice in different countries. Whilst claims have been made about the distinctiveness of Scotland's approach to what is termed here, adult literacies (Scottish Government, 2011), the direction of practice developments is similar to many other countries and related to the hegemony of the neo- liberal capitalist project.

The paper begins with a brief description of the Scottish context for adult literacy and numeracy. Since the 'social practice approach' endorsed in Scotland appears to derive from socio-cultural understandings of literacy and numeracy as social practices, these perspectives are presented and their implications for educational practice considered. Drawing on data from studies of Scottish practitioners' understandings of a 'social practice approach' I suggest that much adult literacy and numeracy practice does not in fact reflect these implications. The assumptions behind some new practices of numeracy teaching and learning are then examined. Following an assertion that these assumptions could indicate what Auerbach (1995) labels a neo-deficit approach, I propose alternative critical pedagogies, providing some examples from the school sector as well as adult education.

Finally, I conclude with a consideration of the need to develop critical pedagogies of teacher education.

The Scottish Adult Literacy and Numeracy context

In 2001 the Scottish Executive responded to the International Adult Literacy Survey results (OECD, 2000) with a policy initiative for Adult Literacy and Numeracy (Scottish Executive, 2001). The strategy acknowledges that 'Literacy and numeracy are skills whose sufficiency may only be judged within a specific social, cultural, economic or political context' (Scottish Executive, 2001 p. 7) and defined literacy in broad terms as

The ability to read and write and use numeracy, to handle information, to express ideas and opinions, to make decisions and solve problems, as family members, workers, citizens and lifelong learners. (Ibid)

The socio-cultural perspective implicit in these statements was further reflected in a subsequent shift in terminology in policy and in practice - from Adult Literacy and Numeracy (ALN) to 'adult literacies' (plural), an umbrella term which encompasses literacy, numeracy, ICT and ESOL. The plural term recognises the diversity of literacies as well as the interconnectedness of these four domains in social practices. The Curriculum Framework (2005) advocated 'a Scottish approach to adult literacy and numeracy learning' described as a 'social practices approach' (Scottish Executive, 2005, p.5).

The broad definition and the use of the concept of adult literacies blurred the boundaries in practice between, in particular, literacy and numeracy and many tutors who had previously taught one or the other were now required to teach both. There was concern, however, that in contrast with literacy, adult numeracy may be overlooked and that practitioners, some of whom may be themselves 'maths anxious', required support to provide effective numeracy learning opportunities. Professor

Diana Coben was commissioned to produce a report making recommendations for the development of an effective adult numeracy strategy for Scotland. *Adult Numeracy: shifting the focus* (Coben, 2005) elaborated the Scottish definition of literacies with a working definition of numeracy:

To be numerate means to be competent, confident, and comfortable with one's judgements on whether to use mathematics in a particular situation and if so, what mathematics to use, how to do it, what degree of accuracy is appropriate, and what the answer means in relation to the context. (Coben, 2000, 35, emphasis in the original)

Whilst emphasising the importance of numeracy not being overshadowed by literacy, the report recognises correspondences between literacy and numeracy as social practices. Social practices theory and the implications for teaching and learning have, however, been 'articulated more clearly with respect to adult literacy than to numeracy' (Coben, 2005, 28). Coben articulates a 'social practices approach' to numeracy as critical numeracy requiring connectionist teaching and realistic mathematics (p.8; p.22).

This group of approaches starts from the position that adults are active agents in the world, rather than seeing them as inadequate individuals with a numeracy deficit.

Adult education ... is seen as a tool for social justice, aiming to equip people with knowledge and tools to examine, criticise and seek to change the economic, political, and social realities of their lives. (Coben, 2005, p.23).

She recommended a number of ways in which this approach could be progressed in Scotland.

To summarise, in Scotland adult numeracy is encompassed within the term adult literacies. A social practices approach is advocated, in contrast to a '...deficit approach...where the individual is encouraged to take a test that will demonstrate a failure to meet a set of standards...' (Scottish Government, 2011, p.14). Coben articulated this Scottish social practice approach to numeracy as critical numeracy. In the years since these key texts, 'the social practice approach' has become the doxa of practice in Scotland.

Literacy and numeracy as social practices

As Coben acknowledged, the conceptualisation of literacy as social practices has received more attention than similar socio-cultural understandings of numeracy. The social practices theory of literacies in society advanced by the New Literacy Studies (NLS) (see for example Street, 1984; Barton, 1994; Barton and Hamilton, 1998; Gee, 2008) emphasises the inherent power relationships affecting uses of literacy in a social context and illuminates the situated nature of literacies acquisition. The NLS view of literacy as situated, socially constructed and inherently ideological challenges what Street refers to as the autonomous model (Street, 1984), which assumes literacy to be a value and context free individual cognitive competence. Crowther et al highlight the ideological dimension in the title of their edited book, *Powerful Literacies* (2001). They demonstrate in a variety of practice contexts how work with literacies learners requires practitioners to be aware of power relations and to critically examine with learners sociocultural literacies practices. Gee (2008, p.45 - 49) provides a very clear illustration of such a critical approach in his examination of the 'aspirin bottle problem'. His analysis of the warning text on an aspirin bottle demonstrates how teaching the 'reading' of such a text must go beyond decoding to engage with questions about drug companies, social relations and the structure of society. As Freire and Macedo (1987) put it, literacy requires 'reading the word and the world'.

Understandings of numeracy as social practices have mainly been explored in ethnomathematics (see for instance Powell and Frankenstein, 1997) and through ethnographic research (for example, The new Mathematics project in Liberia, Cole, 2000, pp72 -80). Benn (1997) explored the

implications of this perspective for adult education. She states the fundamental tenet of this perspective as ‘that mathematical knowledge is a social construct... created by human beings whose thinking is influenced by a historical and political context’ (p.27). Chapter 3, ‘Mathematics: a peek into the mind of God?’ provides a historical and social analysis of mathematics and traces a move from an absolutist to a fallibilist view. ‘The absolutist views mathematics as neutral and value free as opposed to subjective and value-laden’ (p.31). This shift corresponds with Street’s distinction between the autonomous and ideological views of literacy. A social practices view recognises that numeracy as well as literacy practices exclude, position, implicate people in relation to ideological assumptions (Kerka, 1995). Benn (1997, p.37) argues that in adult numeracy learning values must therefore be made overt within a critical pedagogy.

According to Ernest (2002, p.5), a critical mathematics education would develop the following aspects of understanding and awareness:

- Critically understanding the uses of mathematics in society: to identify, interpret, evaluate and critique the mathematics embedded in social, commercial and political systems and claims, from advertisements to government and interest group pronouncements.
- Being aware of how and the extent to which mathematical thinking permeates everyday and shop floor life and current affairs.
- Having a sense of mathematics as a central element of culture, art and life, present and past, which permeates and underpins science, technology and all aspects of human culture.
- Being aware of the historical development of mathematics, the social contexts of the origins of mathematical concepts, symbolism, theories and problems.
- Understanding that there are multiple views of the nature of mathematics and controversy over the philosophical foundations of its knowledge.

Although Ernest here refers to a critical mathematics education, increasingly the term numeracy is used in adult education to indicate the wider perspective, to acknowledge mathematics as a discourse and to distinguish between real mathematics and school maths (Yasukawa et al., 1995). Numeracy here is more than mathematics and it is only numeracy if it is political (p. 816); if, in other words, it recognizes the power dimension.

Practitioners’ understandings of a social practices approach

Above I have sketched out the theoretical views apparently influencing adult literacies practice in Scotland. In these views, the espoused Scottish ‘social practice approach’ entails critical pedagogies. MacLachlan and Tett (2006) found little evidence of critical practice, however, and in 2008 Hillier questioned the extent to which the social practice perspective of literacies was actually transforming practice in Scotland (Hillier, 2008, p.6). Involved at this time in the development of the new teaching qualification for adult literacies tutors, I was concerned with how the theory of social practices was currently being construed in practice to better appreciate the challenge of how the radical socio-cultural understandings could be translated into changes in practice. Between 2008 and 2010 I undertook research with a group of practitioners undertaking the professional qualification. The research used a variety of methods inspired by Personal Construct Theory (Kelly, 1955) - including individual and group reflective activities, and structured interviews - to explore how practitioners were construing ‘a social practice approach’. (For full details of this research and its methodology see Ackland, 2013.)

Practitioners in this study associated the social practices approach with two main characteristics – learner-centeredness and relevance. The following quotes, from an activity in which students had 5

minutes to write their definition of the approach, are representative of how these two characteristics are repeated throughout the data:

My understanding of the Social Practice of literacies is that it's directed by the needs of the learner; Learner-centred...making the learning process relevant; Creates a relevant link to the learner's life. It individualises learning; Social practices is you're asking learner what they want to improve; It's taking the learner's perspective into account and, if appropriate, adapting my practice to their social norms.

Within this discourse, the learner (singular) tends to be isolated in the learning environment but linked to their individual everyday life, which is unquestioned. The relationship between teacher and learner is generally interpreted as one of service. Teachers should be 'empathic' and 'non-directive'. Care for the learner is paramount and summed up in the notion of practice being 'non-threatening' (these terms appeared frequently in the interview data). In all the data there is little trace of the critical pedagogy implied by the social practices perspectives as examined previously, or with the articulations by Benn (1997), Papen (2005) and Coben (2008) of the implications for adult literacy and numeracy. Yet one practitioner reflected that 'you don't really need to have a wonderful theoretical grasp of it, it's just... to me it's natural'.

My findings are supported by research by Swinney (2013), which included analysis of Scottish adult literacies practitioners' narratives of practice. She found that a marked consistency of discourse of 'social practice' and 'literacies' masked significant differences in underlying philosophies of adult education. She describes how practitioners use the term 'social practice approach', 'as encapsulating an array of 'learner centred', 'informal' and 'contextualised' approaches to learning and teaching which placed an emphasis on emotional and relationship aspects of learning' (p.241). She concludes that 'there was no evidence to suggest practitioners, in using 'literacies', intended to convey a politicised understanding that...is implied by a 'social practice' analysis...'. The practitioner in her study who reflected that 'the social practice approach was nothing new to most of the workers that we had here' (p. 239) may be expressing a similar taken-for-grantedness about characteristics of practice as the student quoted above.

Characteristics of practice – more, more, more

From both studies it is clear that practitioners in Scotland believe that their practice conforms to the orthodoxy of the Scottish 'social practice approach' and is distinct from a deficit approach. In the following section, quotes from practitioners in my study (Ackland, 2013) indicate some of the elements of their practice that they associate with the new approach. What this appears to mean in the detail of practice is more...particularly more work for the tutor:

I feel the social practice model is so important to literacies as it creates a relevant link to the learner's life. It individualises the learning, which makes for a lot more preparation for us, but demonstrates the difference between adult and children's learning.

More individual learning planning is evident:

...after some discussion with the learner about what they need their literacy/numeracy for, what areas of their life is their need for literacy most necessary, then a program of learner led literacy/numeracy would be developed and worked on. This will enhance inclusion, confidence, and employability and allow the learner to participate more confidently in everyday life, whether it is shopping, going for a meal, paying bills and so on.

To support individual learning planning, an interactive tool, 'The Curriculum Wheel', was developed (Scottish Executive 2005) and its use 'rolled out' to all adult literacy and numeracy partnerships. Individual learning planning was given even greater priority as the focus of a Practitioner-Led Action Research project in 2008 (St Clair et al, 2009). The project aimed 'to support

practitioners in leading a research project looking at the individual learning planning (ILP) process. ILPs are central to the literacies field in Scotland, as they are used for defining objectives, planning instruction, and assessing achievement by learners' (p. 1). The shift in this introductory statement from the singular 'process' to the plural 'ILPs' is indicative. It is plans that have proliferated, in many cases as quite extensive textual artefacts incorporating a degree of initial diagnosis as well as identification and evaluation of relevant learning. They are sometimes experienced by tutors as more paperwork, 'not part of the 'real' work of literacy teaching and learning' (Hamilton, 2009). Hamilton demonstrates how ILPs can shape the relationships between tutors and learners and align both their identities with system goals. Although in Scotland the guidance on developing ILPs is perhaps even more permissive than in England where Hamilton was studying ILPs, her analysis contains important insights about how the forms can constrain the possibilities for learners. For instance, as more formal accreditation is required to demonstrate learner progress (HMIE, 2010), the learning outcomes of the qualifications influence learners' goals. Learning goals written on ILPs are also identified within discourses about literacy and numeracy 'needs', mainly linked to economic participation, and in Scotland, inside the discourse of 'relevance'.

The planning process focuses learning on the individual needs and requires tutors and learners to identify learning goals associated with their everyday lives:

It [social practices] is when people work on the things they need to be able to do for specific activities in their lives, for example if they have a new job and need to be able to convert metric and imperial measurements or be able to use an electronic till – it's a sort of 'functional literacy'.

Another more then is contextualisation:

Social Practices is about ensuring that all learning that goes on in our service is contextualised and embedded in the learner's chosen vocational area or interests.

In relation to numeracy the contexts drawn upon tend to be shopping, budgeting, work and sometimes leisure interests such as sewing or DIY. There can be a number of problems, in my view, with this interpretation of 'contextualised' in relation to numeracy. In some cases the contextualisation is superficial and may mathematise a problem that in ordinary circumstances would not involve the use of mathematics. For example, the following problem is set in an everyday context. There is, however, no purpose to the problem, other than to demonstrate the ability to create a graph.

A gardener plants a variety of bulbs for the spring in both his front and rear gardens. Detailed below:

45 Tulip bulbs – 30 in front and 15 in rear garden
60 Snowdrop bulbs – 40 in front and 20 in rear garden
80 Daffodil bulbs all in front garden
40 Crocus bulbs – 20 in front and 20 in rear garden
30 Hyacinth bulbs – 20 in front and 10 in rear garden

Create a suitable graphical form (table, graph, chart or diagram) to illustrate his planting.

Figure 1. Numeracy assessment, Core Skills Numeracy modules²

Contextualisation such as this, I suggest, is a mere dressing up of school maths with the backdrop of everyday life. Problems are not structured in the context of real life purposes, rather only elaborated with textual detail. This can lead to another more... more words. Numeracy tasks become literacy tasks. Whilst mathematics in societal contexts is often entangled with language, text that is not crucial to the purpose of a classroom task can serve simply to create an additional barrier. For example:

² <http://www.aloscotland.com/alo/viewresource.htm?id=2819>

Jimmy needs to wallpaper his bedroom. The dimensions of the room are 3m by 4m by 2.5m. There is one door - 2m x 1m - and one window 1.5m x 1m. A standard roll of wallpaper is .53m x 10m. How many rolls of wallpaper does Jimmy need?

In real life, Jimmy is unlikely to make a narrative of the problem in this way. He is more likely to tackle it physically and with concrete objects. An extra dimension of difficulty is introduced into the spatial and numerical problem by its translation into the language of the maths problem. The requirement to decode language such as 'dimension' and to understand the conventions of giving width and height measurements adds a superfluous literacy task.

Even where the context suggested has a real purpose, the adult literacies tutor's commitment to not challenging the everyday life of their learners can pose problems. The following is the transcription of an excerpt from a recording of practitioners discussing a social practice approach as part of the research project:

A For the sake of argument... if a learner comes and says I want to learn weights and measures coz I want to be a drug dealer... do you say 'no problem, we'll start here then....' or start questioning their motives?

B (laughing) I once did ratios and the topic was...the question was... 'where would you use ratios in everyday life?'... and it actually came up. And I'm going 'I'm no teaching this!' but that's what they are doing anyway ...

C ...if that's what they can relate to...

D ...but if you go against your employer...

A ...we're agents of the state...

B Well see as long as I wasn't advocating that this was a good thing I would take their scenario...

C I've done that too

B...coz at the end of the day if you can get them to learn.....(laughs) to dae it properly... (all laugh) ...no but....

An extreme example, perhaps, but one that raises serious issues about the dangers of carrying contextualisation too far without critical consideration of purpose.

In many cases the commitment to contextualisation brings with it the requirement for tutors to furnish their groups with realia. More stuff. From my experience of lesson observations, this frequently involves food – pizzas and chocolate bars to cut up and share, supermarket goods to compare prices. Shopping catalogues are also popular. As well as providing artefacts for the contextualisation, these are often justified in relation to the need to accommodate different learning styles. In the new numeracy classroom, teaching must be adapted to more learning styles and particularly for kinaesthetic learners. The allegiance to the concept of learning styles and to the necessity of tutors catering to different styles continues to be very strong despite critiques of learning styles theory and practice (Coffield et al, 2004) which draw attention to the ways in which it can restrict rather than empower. It has become part of the culture of care, in which not identifying an individual's style and providing for it is considered disrespectful.

I have enumerated a number of ways in which I believe tutors are adding more material to the adult learning experience with a focus on meeting individual needs with 'relevant' activities. In adult numeracy 'relevance' concentrates on arithmetic calculations in everyday activities such as budgeting; indeed literacies now encompasses a further literacy - financial literacy. Financial capabilities are referred to repeatedly throughout the refreshed Scottish adult literacies strategy (Scottish Government, 2011). Whilst these changes to approach are a positive shift from a culture of 'death by worksheet', I believe they can be limiting of adult learners' possibilities and represent a

limited response to socio-cultural understandings which emphasise the power relations inherent in social practices.

Firstly, there is evidence that learners have motivations for wanting to attend numeracy classes beyond the everyday application. Swain (2005) concludes that ‘mathematics does not have to be ‘functional’ to capture students’ interest, involvement...’. He found that one of the main reasons they want to learn ‘is ...to prove their ability to learn a high status subject which they believe to be a signifier of intelligence’ (p. 305). This is congruent with Boaler’s point mentioned in the introduction. As she implies, the assumed link between maths and intelligence has great power, and not just in the classroom. Ernest (2002, p. 4) explores how success in mathematics can ‘give students advanced power through enhanced life chances in study, the world of work and social affairs... Qualifications in mathematics are accorded a privileged role and have unique social significance as gatekeepers’. The concentration on everyday application may ignore the broader empowerment issues Ernest identifies. Whilst numeracy teachers and researchers may use the term to denote more than maths, it may be experienced by learners as less than maths – a basic functional level of the subject without status and power. There are class issues also in the embedding of numeracy in vocational interests, as Bernstein warns: ‘Vocationalism appears to offer the lower working class a legitimization of their own pedagogic interests and in doing so appears to include them as significant pedagogic subjects yet at the same time closes off their own personal and occupational possibilities’ (Bernstein, 2004, p.213).

Whilst I am by no means suggesting that adult numeracy teaching does not have an empowerment agenda, I am worried that the ‘functional’ discourse is erasing the more critical ingredients. In Scotland, literacies were described as complex capabilities consisting of knowledge, skills and understanding (Scottish Executive, 2005, p.35), understanding being linked to the more critical dimension. In texts between 2000 and 2012, the three terms gradually reduce to two – ie knowledge and skills, with understanding disappearing. At UK level, The National Institute of Adult Continuing Education’s (NIACE) report on adult numeracy presents a variety of case studies of effective practice. Effective practice is represented as ‘...relevant, interesting and enjoyable’ focusing on ‘...practical and relevant skills’ (Southwood and Dixon, 2012, p. 3). The case studies provide examples of learning for:

- Shopping for bargains
- Budgeting
- Measuring for DIY
- Decorating

The ‘vital ingredients’ of adults learning maths do not appear to include any critical approaches. Here too there is silence about the political dimensions of numeracy. I have no doubt that examples of critical approaches exist across the UK, but where this approach is invisible in authoritative documents, it may cease to be a legitimate practice, even in Scotland where the rhetoric of the social practices approach persists.

Echoing Freire and Macedo (1987), Frankenstein (1998) refers to ‘reading the world with math’. Like Gee in his aspirin bottle problem (2008, p.45 - 49) she argues that it is insufficient to support learners to merely calculate budgets or best deals correctly - budgeting tasks can make ‘money and family finance ‘neutral’ (Frankenstein, 1998): ‘Even trivial math applications like totaling grocery bills carry the ideological message that paying for food is natural and that society can only be organized in such a way that people buy food from grocery stores...’. A critical pedagogy is required which would explore the power relations of supermarkets, global corporations, consumers and capitalism. The discourses of financial literacy and employability so prevalent now in adult numeracy conceal the assumptions of a neo-liberal ideology. Skills for ‘employability’ are predicated on the

requirements of the global economic race. A functionalist approach does not question these requirements.

Allman (1999) discriminates between normalizing/limited reproductive praxis and critical/social transformation praxis. Despite the discourse in Scotland of the 'social practice approach', the findings of research with practitioners (Maclaclan and Tett, 2006; Ackland, 2013; Swinney, 2013) suggest that praxis tends to be of the first kind; learner-centeredness and relevance is mainly concerned with supporting people to operate within the structures - 'a better fit for the world' (Freire 1972, p.57). This falls short of the critical stance implied, as argued above, by a social practices perspective.

The rhetoric of 'a social practice approach' and its apparent anti-deficit stance has become an orthodoxy of literacies practice in Scotland (Ackland, 2013). This masks underlying differences in values, ideologies and pedagogical approaches. In the main Scottish practitioners' construe 'a social practice' approach as similar to the learner centred approach which prevailed in adult basic education prior to the emergence of the new literacy studies (Hamilton and Hillier, 2006, pp. 109-124); the language has changed but this is experienced as a new way of talking about what was already accepted and 'natural' practice. Writing in relation to family learning, Auerbach (1995) describes this 'post-deficit' situation as dangerous; she examines how discourses which apparently reject a deficit model, as 'the social practice approach' claims to do, continue to be based on traditional deficit assumptions of the requirement for individual change to adapt to unquestioned social structures. As she does with family learning discourses, I have tried to problematize some of the claims of 'a social practice approach' to adult numeracy with the concern that unexamined the rhetoric may serve 'a rationalising function, masking underlying deficit views with an aura of credibility' (Auerbach, 1995, p.651). In *Adult Literacies in Scotland 2020* (ALIS 2020, Scottish Government, 2011) the neoliberal economic project is explicitly connected to the language of socio-cultural theory. Adult Literacies for economic participation is 'most successfully taught using a "social practice" approach' (Scottish Government, 2010, p.7). Auerbach (1995) describes this as a 'neo-deficit' discourse in which the emphasis on power relations and the requirement for critical pedagogies implied by social practices perspectives are excluded.

Less is more – a critical pedagogy of numeracy

How then can numeracy education reflect more effectively the implications of social practices perspectives? Such pedagogy, I believe, requires that tutors bring less to the learning experience, taking a problem-posing stance in which they examine with learners mathematics in use in society. Even a superficial skim of the daily media demonstrates how contemporary life is saturated with numbers and statistics entangled with text. Numbers have a powerful effect on language: 'The power of numbers is such that they render visible and hence incontestable the complex array of judgements and decisions that go into measurement, a scale, a number' (Rose, 1999, p. 208). A critical pedagogy would engage with the power of numbers, explore calculation as 'qualculation' (Callon and Law, 2005), infused with values and ideologies.

It may begin, as practitioners often say, with the motivations and interests of learners but in this case the question of what and why they want to learn - maths, mathematics or numeracy - would be discussed critically, with the elephants clearly visible in the room. Within a critical pedagogy, rather than merely reflecting on their own mathematics history, learners might investigate the history of mathematics in different cultures as a means of engaging with a fallibilist perspective. It is sometimes believed that learners must master the basic processes of a subject before they can engage critically at a meta level. Based perhaps on Bloom's taxonomy, critical thinking, it is assumed, comes higher up the hierarchical triangle of capabilities. Although a critical pedagogy of numeracy should also

develop learners' capacity to use mathematical processes for their own projects, its starting point might reverse the hierarchy to assume adults' capabilities as critical thinkers.

Hierarchical thinking can also permeate numeracy curricula as a building block mentality where simple rote operations build systematically to more complex problems. Realistic mathematics is much messier and Frankenstein (1998, p.56) argues that 'problems with neat pared down data and clear cut solutions give a false picture of how mathematics can help us 'read the world''. She advocates studying mathematical topics through deep and complicated problems and outlines a number of examples of investigating mathematics in use – such as unemployment statistics – which could meet the 4 goals of a critical mathematical curriculum, which she defines as:

1. Understanding the mathematics
2. Understanding the mathematics of political knowledge
3. Understanding the politics of mathematical knowledge
4. Understanding the politics of knowledge (ibid, p.53)

As in a Freirian pedagogy (1972) the complex problems can come from the learning group's observations of their own surroundings. In this case the tutor does not bring the context to the classroom but takes the learning process into the context. Numeracy groups might use ethnographic techniques to examine numeracy practices or numeracy in the media in similar ways as have been used in literacy (see for example, Roberts and Prowse in Papen, 2005, pp. 143-146 who describe how literacy learners explored their favourite soaps critically).

Gutstein (2003; 2006; 2008; 2012) describes the development of mathematics curricula for social justice in an urban Latino school. Here current community issues, such as the redrawing of a school catchment area, provide the problems to be investigated mathematically with school pupils. This goes beyond exploring other people's uses of mathematics to develop the capabilities to use mathematics to address and represent community projects.

Gutstein (2006) also engaged parents in a critical dialogue about the school maths curriculum. Given that Swain's research (2005) noted that another powerful motivator for adults attending numeracy classes is to help their children with maths, this is an important extension of developing new curricula. Some adult numeracy courses of the 'Keeping up with the kids' variety, respond to parents' fear of confusing their children by not knowing the 'right way' to do school maths, by giving them a better knowledge of the school's approach so that what they do will 'fit' with this. E.g.

All parents want their children to do well at school and to succeed. However, many simply don't know where to start. Everything seems to have changed since your own schooldays, and you don't want to confuse your children by using different methods to their teacher. Family Learning can help. (Family Learning website³)

The danger is that this may reinforce an absolutist view of mathematics. It is not congruent with Boaler's (2009, p. 138 -40) assertion that the children who are most successful at maths are those who can decompose and recompose problems using a variety of strategies. In her view, parents should not only be supported to help their children 'play' with maths problems developing confidence in a variety of strategies, parents can also have a powerful role in challenging narrow maths curricula and traditional pedagogies in schools (pp195 -206). A critical pedagogical approach with parents whose motivations are to help their children, then, would problematize schools curricula. It might involve critical dialogue about changing fashions in teaching and learning and about the relationships between maths, mathematics and numeracy. Rather than a relationship being established in which the school tells parents about how they teach maths, as is sometimes the case, the relationship could be one of critical dialogue between parents and schools in which adults are empowered to challenge the authority of school curricula.

³<http://www.familylearning.org.uk/>

Other aspects of family life are ripe for critical numeracy investigations. Critical approaches to examining text for author, purpose, values, positioning etc. are standard in literacy groups. A model for applying a similar critical ‘reading’ process to numeracy texts has been developed from Freebody and Luke’s (1990) Four Resource Model of Critical Literacy. This model could be used with adults to examine commonplace texts and question how numbers, measurements and statistics are being used within power relations. Below is an example using a numeracy text from a common family breakfast cereal box.

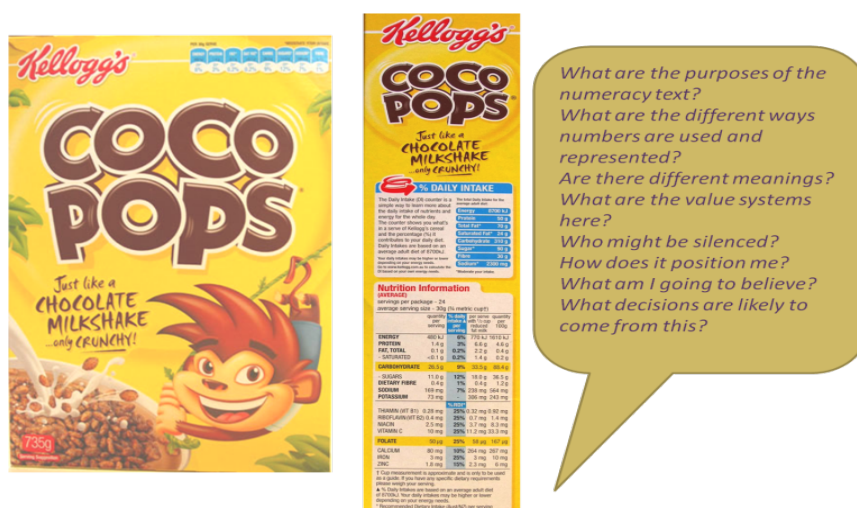


Figure 2. Breakfast cereal box

Dr Terry Maguire’s work on developing maths eyes with children, parents and in communities⁴ explores the power of large numbers in public discourse. The question of ‘how big is a billion?’ might lead, in a critical pedagogy, to investigations about relative spending at international level and the values implicit in government budgets for war, welfare and poverty. Investigations on such issues might make use of Internet sources such as, *what can \$611 billion buy?*⁵ or *Information is Beautiful*⁶ which provide different representations, including info graphics, about economic decisions.

Info graphics are becoming a significant feature of multimedia and appear daily in news stories in print, on television and on the Internet. A critical pedagogy might explore why this is the case, what makes them powerful communicators and communicators of power. As new communication technologies shift to support authorship rather than readership, learners could create their own info graphics to represent their own analyses of issues⁷. In this section, I have sketched out just a few illustrations of a critical pedagogy of numeracy drawing from examples relating to schools as well as adult education and making links between literacy and numeracy. This problem-posing stance engages not just with the personal concerns of learners but with political issues. Gutstein insists that such curricula require teachers to build political relationships with students (2008), in which they do not merely meet people’s needs but support their projects. This may be challenging for some numeracy tutors. I share Freire’s view that education is never neutral (1972) but this view is not shared by all teachers, some of whom see this position as containing the threat that they will unduly influence learners or appear judgmental of alternative political or cultural perspectives. Being ‘non-judgemental’ and ‘non-threatening’ are linked in the adult education culture of care. De Freitas (2008, p. 205) suggests that some maths teachers may even be drawn to the subject by a perception of its

⁴<http://www.haveyougotmathseyes.com/>

⁵ http://www.boston.com/news/nation/gallery/251007war_costs/

⁶ <http://www.informationisbeautiful.net/visualizations/the-billion-dollar-gram/>

⁷ <http://www.educatorstechnology.com/2012/05/eight-free-tools-for-teachers-to-make.html>

neutrality. Perhaps if we concentrate on teachers bringing questions rather than answers, respect for learners may become decoupled from the need to remain non-judgemental and non-threatening. A critical pedagogy is one in which all are challenged to examine the taken for granted. It inevitably involves discomfort.

Critical teacher education

What kind of professional development might, then, support a shift to more critical pedagogies of adult numeracy? I believe its starting point must be that education is never neutral. It must explore the purposes of adult education and examine why educational content, curricula and pedagogies are the way they are not merely how to teach (Ackland and Wallace, 2006). As in any critical pedagogy of adult learning, questions, not answers, should initiate practitioners' own investigations in which theory, policy and practice are regarded as contingent and power-laden. The process might involve Freirian decoding of representations of education. Throughout this paper I have used the three terms maths, mathematics and numeracy at different times and to denote different things according to my understandings. The significations of these three terms are fluid and they are in use in education loaded with quite different assumptions. As stated previously, numeracy is favoured by some adult educators and researchers to encompass the social practices and fallibilist perspective. In my experience it is used by many tutors, and in policy, to relate to a more functionalist view of mathematics. Recently listening to some maths colleagues in teacher education discuss their development of a new course for the primary school sector, I was intrigued to hear them insist that they would not use the term numeracy at any point. Their use of the term was pejorative, implying that it carried associations of a 'dumbing down' of maths. Adult learners may also perceive numeracy as more basic than maths and perhaps as a more current form of the old term arithmetic which was used in Scottish schools for a subject taught to pupils in 'lower sets'. Numeracy is a contentious term. In teacher education, exploring the distinctions between the terms can stimulate reflexivity as practitioners surface their own assumptions but also dialogue about the power of different forms of knowledge. I have found a triad activity drawn from Personal Construct Theory (Kelly, 1955) very powerful. The three terms are presented on cards as so:

Maths	Numeracy	Mathematics
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Participants are asked to group them as two that they think are similar and one that they think is different. They are then asked to explain why they have arranged them in this way. Questions are used to prompt an exploration of the assumptions implicit in the arrangement.

Other taken for granted concepts of adult education must also be examined. The shift in language from education to learning has been adopted almost universally, but it is not without critiques (e.g. Biesta, 2005). Learner-centeredness, as I have explored above, is not automatically empowering. These shibboleths and what is held to be 'natural' (see practitioner quote in Practitioners' understandings of a social practices approach section above) and accepted practice should form the core of deconstructive dialogues in a critical pedagogy of teacher education. Assumptions about the practice of other sectors, schools for example, as opposed to community based learning, and popular contrasts between andragogy and pedagogy could be deconstructed. In Scotland, the claims to the distinctive of 'the social practice approach' should be examined within the bigger picture of the political and ideological hegemonies that frame practice within the UK, Europe and internationally. This would entail critical discourse analysis of the policies which shape practice (such as in Oughton, 2007) combined with critical analyses of how numbers are used in policy (Hamilton, keynote

presentation ALM20). We should not forget too to discuss how numbers get used in practice for justification and recognition. (In Scotland, statistics from the International Literacy Survey – 23% of Scots have insufficient skills – quickly achieved factual status as they were repeated at all levels of practice to substantiate the need for adult literacies work at local level.)

An understanding of learners is a requirement in most standards of teacher competence. A narrow interpretation of this requires teachers to know about the circumstances and characteristics of learners to consider the barriers they might experience to learning. Whilst knowledge of communities is important, and can be developed through trainee teachers' ethnographic investigations, it is insufficient to support critical pedagogies. 'Community knowledge' should be combined with 'critical knowledge' (Gutstein, 2012, p. 301) – a sociological appreciation of history, economics and political relations - and would entail examining roots as well as manifestations, perhaps using problem solving tree diagrams. Learning styles for example, might be examined not merely as a phenomenon to react to but one, which may have cultural roots, mechanisms of reinforcement and a role in the maintenance of existing socio-cultural privileges.

Fundamentally, the culture of cares in which being non-judgemental and non-threatening are held as sacred principles must be questioned as potentially limiting. When participants in teacher education are themselves challenged to move out of their comfort zone, they easily see the parallels with their learners' experience:

We ask learners to go outside their comfort zones in their learning... so why should we not be pushed outside ours? And it's good to see how this feels (on reflection of course!) and be reminded of how valuable it is to face challenge. (TQAL participant comment⁸)

Risk, discomfort and uncertainty, reflexively explored, can build confidence in teachers to confront challenge for themselves and with their learners.

Conclusion

In this paper, I have explored the implications of social practices theory for adult numeracy and examined some current practices in relation to these. I argue that the discourse of 'the social practice approach' in Scotland may mask neo-deficit ideologies implicit in practices focussed on learner-centeredness and relevance. I have proposed some alternative practices towards more critical pedagogies of adult numeracy. Professional development, which also commits to a critical pedagogy, is key, I believe, and might write back the critical into current discourses of practice.

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References

- Ackland, A. (2013). At play in the space: the concept of 'the social practice approach' in the Scottish Adult Literacies field. *Literacy and Numeracy Studies: An international journal in the education and training of adults*, 21(1), 59–84.

⁸ Professional development through professional enquiry <http://www.nrdc.org.uk/content.asp?CategoryID=1548>

- Ackland, A. and Wallace, D. (2006). Teaching as social practice. Conference paper presented at the NRDC international conference, Nottingham, Spring 2006.
- Allman, P. (1999). *Revolutionary social transformation: Democratic hopes, political possibilities and critical education*. Westport, Connecticut: Bergin & Garvey.
- Appleby, Y. & Barton, D. (2008). *Responding to people's lives*. Leicester: NIACE.
- Auerbach, E. (1995). Deconstructing the discourses of strengths in family literacy. *Journal of Literacy Research*, 27, 643-661.
- Barton, D. (1994). *Literacy: An introduction to the ecology of written language*. Blackwell: Oxford.
- Barton, D. and Hamilton M. (1998). *Local Literacies: Reading and writing in one Community*. Routledge: London.
- Benn, R. (1997). *Adults count too: Mathematics for empowerment*. NIACE: Leicester.
- Bernstein, B. (2004). Social class and pedagogic practice. In Ball, S. (Ed) *Sociology of education*. London: Routledge.
- Biesta, G.J.J. (2005). Against learning. Reclaiming a language for education in an age of learning. *Cambridge Journal of Education*, 36(1), 63-79.
- Boaler J. (2009). *The elephant in the classroom: Helping children learn and love maths*. London: Souvenir Press
- Callon M. and Law J. (2005). On qualculation, agency, and otherness. *Environment and Planning D: Society and Space*, 23(5), 717-733.
- Coben, D. (2005). *Adult Numeracy: shifting the focus. A report and recommendations for adult numeracy in Scotland*. Edinburgh: Communities Scotland.
- Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy in post-16 learning: A systematic and critical review*. Learning and Skills Research Centre. Retrieved from www.LSRC.ac.uk: <http://www.lsd.org.uk/files/PDF/1543.pdf>
- Cole, M. (2000). *Cultural Psychology: A Once and Future Discipline 2nd Edition*. Cambridge, MA: Belknap Press of Harvard University Press.
- Crowther, J., Hamilton, M. and Tett, L. (Eds). (2001). *Powerful Literacies*. Leicester: NIACE.
- de Freitas, E. (2008) Fear of the Political. In E. de Freitas & K. Nolan (Eds.). *Opening the research text: Critical insights and In(ter)ventions into mathematics education* (pp. 205-209). Springer.
- Ernest, P. (2002). Empowerment in mathematics education. *Philosophy of Mathematics Education Journal*, 15,1-16.
- Frankenstein, M. (1998). Reading the world with math: Goals for a critical mathematical literacy curriculum. In E. Lee, D. Menkart, & M. Okazawa-Rey (Eds.), *Beyond heroes and holidays: A practical guide to K-12 anti-racist, multicultural education and staff development* (pp. 306-313). Washington D.C.: Network of Educators on the Americas.
- Freebody, P., & Luke, A. (1990). Literacies programs: Debates and demands in cultural context. *Prospect: Australian Journal of TESOL*, 5(7), 7-16.
- Freire, P. (1972). *Pedagogy of the Oppressed*. Harmondsworth: Penguin Books.
- Freire, P., and Macedo, D. (1987). *Literacy: Reading the word and the world*. Massachusetts: Bergin and Garvey.
- Gee, J.P. (2008). *Social Linguistics and Literacies: Ideology in discourses* (3rd edition). Routledge: Abingdon.
- Gutstein, E. (2003). Teaching and Learning Mathematics for Social Justice in an Urban, Latino School. *Journal for Research in Mathematics Education*, 23(1), 37-73.
- Gutstein, E. (2006). The real world as we have seen it': Latino/a parents' voices on teaching mathematics for social justice. *Mathematical Thinking and Learning*, 8(3), 331-358.
- Gutstein, E. (2008). Building political relationships with students: An aspect of social justice pedagogy. In E. de Freitas & K. Nolan (Eds.), *Opening the research text: Critical insights and in(ter)ventions into mathematics education* (pp. 189-204). New York: Springer.
- Gutstein, E. (2012). Connecting community, critical and classical knowledge in teaching mathematics for social justice. In S. Mukhopadhyay & W. M. Roth (Eds). *Alternative forms of Knowing (in) Mathematics* (pp. 299-311). Rotterdam, The Netherlands: Sense Publishers.
- Hamilton, M. (in press). Engaging critically with powerful numbers in public discourse. *Adults Learning Mathematics*.
- Hamilton, M. (2009). Putting words in their mouths: the alignment of identities with system goals through the use of Individual Learning Plans. *British Educational Research Journal*, 35(2), 221-242.

- Hamilton, M and Hillier, Y. (2006). *Changing Faces of Adult Literacy, Language and Numeracy: A critical history*. Trentham Books: Stoke-on-Trent.
- Hillier, Y. (2008). *Evaluation of the pilot programme of the teaching qualification adult literacies*, Retrieved from <http://www.aloscotland.com/alo/viewresource.htm?id=272>.
- HMIE. (2010). *Improving adult literacy in Scotland*. Livingston: HMIE.
- Kelly, G. A. (1955). *The psychology of personal constructs*. New York: W.W. Norton.
- Kerka, S. (1995). *Not Just a Number: Critical Numeracy for Adults*. ERIC Digest No. 163. Retrieved from <http://www.ericdigests.org/1996-2/numeracy.html>
- Maclachlan, K. & Tett, L. (2006). Learning to change or changing the learning: adult literacy and numeracy in Scotland. *Journal of Adult and Continuing Education*, 12(2), 195–206.
- OECD and Statistics Canada. (2000). *Literacy in the Information Age: Final Report of the International Adult Literacy Survey*. Paris and Ottawa: OECD.
- Oughton, H. (2007). Constructing the ‘ideal learner’: a critical discourse analysis of the adult numeracy curriculum. *Research in Post-Compulsory Education*, 12(2), 259–275.
- Papen, U. (2005). *Adult Literacy as Social Practice More than Skills*. London: Routledge
- Powell, A. B. and M. Frankenstein, Eds. (1997). *Ethnomathematics: Challenging Eurocentrism in Mathematics Education*. Albany, NY: State University of New York Press
- Rose, N. (1999). *Powers of freedom: Reframing political thought*. Cambridge: Cambridge University Press.
- Scottish Executive. (2001). *Adult Literacy and Numeracy in Scotland*. Edinburgh: Scottish Executive.
- Scottish Executive. (2005). *An Adult Literacy Curriculum Framework for Scotland*. Edinburgh: Scottish Executive.
- Scottish Government. (2011). *Adult literacies in Scotland 2020: Strategic guidance* Edinburgh: Scottish Government
- St Clair, R.; Maclachlan, K.; Hall, S.; Tett, L. and Edwards, V. (2009). *Practitioner-Led Action Research: The individual learning planning process*. Edinburgh: Scottish Government.
- Street, B. (1984). *Literacy in Theory and Practice*. Cambridge: Cambridge University Press.
- Street, B. (1995). *Social literacies: Critical approaches to literacy in development, ethnography, and education*. London: Longman.
- Southwood, S. & Dixon L. (2012). *The vital ingredients. Adults learning maths*. Leicester: NIACE.
- Swain, J. (2005). Beyond the Daily application: motivations for adults attending numeracy classes. *Research in Post-Compulsory Education*, 10(3), 305–324.
- Swinney, A. (2013). *Social Exclusion and Discourses of Literacy and Physical Activity (post-16) in Scotland*. PhD thesis. University of Edinburgh: U.K.
- Yasukawa, K., Johnston, B. & Yates, W. (1995). Numeracy as a critical constructivist awareness of maths: Case studies from engineering and adult basic education. *Proceedings of the ICMI Regional Mathematics Education Conference*, Monash University, Melbourne, 19-23 April, 815–826.

Websites

- Eight Free tools for Teachers to Make Awesome Infographics
<http://www.educatorstechnology.com/2012/05/eight-free-tools-for-teachers-to-make.html>[accessed 29/01/14]
- Family Learning: <http://www.familylearning.org.uk/> [accessed 29/01/14]
- How big is a billion: http://www.boston.com/news/nation/gallery/251007war_costs/ or
<http://www.informationisbeautiful.net/visualizations/the-billion-dollar-gram/>[accessed 29/01/14]
- Maths Eyes: <http://www.haveyougotmathseyes.com/> [accessed 29/01/14]
- Numeracy assessments, Adult Literacies Online resource:
<http://www.aloscotland.com/alo/viewresource.htm?id=2819>[accessed 29/01/14]
- Numeracy in the News /4 resource model for critical numeracy
http://www.simerr.educ.utas.edu.au/numeracy/critical_numeracy/critical_numeracy.htm#The_Four_Resource_Model_for_Critical_Numeracy [accessed 29/01/14]
- Professional development through professional enquiry <http://www.nrdc.org.uk/content.asp?CategoryID=1548>
[accessed 29/01/14]