Research Report on:

*Making use of Learners’ Funds of Knowledge for Mathematics and Numeracy: Improving Teaching and Learning of mathematics and numeracy in Adult Education*

Dave Baker and Val Rhodes
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Executive summary.

The Report is an account of ways that teaching and learning adult mathematics and numeracy can build more effectively on what learners know – their *funds of knowledge for mathematics and numeracy*. The report is aimed at helping professionals involved in adult numeracy improve the teaching and learning of mathematics and numeracy to adults. The target audience for this report includes: numeracy and mathematics teachers; trainers involved in staff development and senior managers in adult education settings (Colleges, work based learning, prisons, army, community and other numeracy providers); policy makers and designers of adult mathematics and numeracy curricula.

The project found that teachers do build on what learners know about the topic being taught in a narrow sense. What the project is suggesting is that more effective teaching can arise if teachers are sensitive to and take positive account of the learners’ broader funds of knowledge for mathematics and numeracy. This broader funds of knowledge includes: the learners' knowledge and skills; their histories, identities, dispositions, personal attributes and beliefs; their expectations, motivations, aspirations, and experiences; their relationships to education, learning and to mathematics practices.

To investigate the use of broad visions of funds of knowledge for numeracy the project worked with teachers of numeracy in three different adult education sites. Data was collected through interviews, observations and focus group discussions.

The project led to the following recommendations:

In terms of policy trainees on ITE and CPD should be introduced to the principles underpinning the broad view of funds of knowledge for numeracy and mathematics.

In terms of practice both the content of numeracy classes and ways of teaching formal numeracy should be based on and aimed to build on learners’ broad funds of knowledge for numeracy. Justification for selections of areas of study should be provided in terms of learners’ needs. Approaches to teaching can be used that involve identifying learners’ common interests to provide a context, which has a relevance to the learners in the class. Teachers who are sensitive to learners’ funds of knowledge can explicitly help learners to switch from informal to formal numeracy practices and thereby enable learners to respond to the demands of formal assessments more effectively.
Making use of Learners’ Funds of Knowledge for Mathematics and Numeracy: Improving Teaching and Learning of Mathematics and Numeracy in Adult Education

The Report is an account of ways that teaching and learning adult mathematics and numeracy can build more effectively on what learners know – their funds of knowledge for mathematics and numeracy. The report is aimed at helping professionals involved in adult numeracy improve the teaching and learning of mathematics and numeracy to adults. The target audience for this report includes: numeracy and mathematics teachers; trainers involved in staff development and senior managers in adult education settings (Colleges, work based learning, prisons, army, community and other numeracy providers); policy makers and designers of adult mathematics and numeracy curricula.

1 Learners’ funds of knowledge for mathematics and numeracy

This project is based on the principle that effective teaching and learning of mathematics and numeracy builds on what learners know. In most numeracy classes teachers plan and design their own lessons around the mathematics and numeracy topic or content they are scheduled to teach. For example when teaching measuring, calculating, or telling the time their objectives are closely tied to the skills and understandings learners need to master those topics. Their plans for these lessons usually take account of what learners’ skills or knowledge are of this mathematics and numeracy content. In this project we see this as a narrow view of the learners’ funds of knowledge for mathematics and numeracy. What teachers do not often do is to extend this view to take positive account of the learners’ broader knowledge, practices, backgrounds, or experiences. For example learners come to classes with different histories, identities, dispositions, beliefs, personal attributes, expectations, aspirations, experiences, relationships to learning and to mathematics, practices, knowledge and motivations. These are what we call in this project the learners’ broader funds of knowledge for mathematics and numeracy. This model of what learners know is based on work done by Gonzales et al (2004) and Baker (2005).

Examples of funds of knowledge for mathematics and numeracy that illustrate these ideas include among many others: learners’ total reliance on imperial units for measuring their own and their family’s heights and weights; some learners’ use of odds for betting; learners frequently past disastrous relationships with school mathematics; and learners’ images of themselves as incapable of learning mathematics.

In parallel with accepted practices within the Maths4Life\(^1\) programme, in which this project is sited, in this report we have used the term mathematics and numeracy to denote the subject area we are concerned with in this project. At times this can be a cumbersome terminology. In this report we have therefore tended to use the term numeracy to fit in with its use in the Skills for Life agenda. However its use does not imply any narrowing of our vision of mathematics and numeracy, which remains as broad as that specified in Maths4Life.

2 Intentions of the project

\(^{1}\) Maths4Life is a Department for Education and Skills (DfES) funded programme, as part of Skills for Life, the national strategy for improving adult literacy and numeracy. Maths4Life is a three year project which aims to stimulate a positive approach to teaching and learning in mathematics and numeracy in England, focusing on adults from Entry Level to Level 2
The *Funds of Knowledge* project within Maths4Life aims to improve teaching and learning in adult mathematics and numeracy in several ways by:

- identifying potential conflicts in numeracy classes with learners’ funds of knowledge for numeracy;
- ensuring that teachers ‘build on what learners know’;
- developing broader ways of thinking about these funds of knowledge for numeracy;
- including funds of knowledge for numeracy in initial teacher training and continuing professional development;
- developing classroom approaches using this knowledge.

This project addresses these aims, by:

- investigating valuable, productive and useful ways of thinking about learners’ funds of knowledge;
- exploring how to gain access to this knowledge;
- investigating how it should be used.

### 3 Broad funds of knowledge for numeracy

In this project we are suggesting that a broad view of what learners know will enable teachers to be sensitive to and acknowledge the learners’ broad funds of knowledge. Evidence from the project suggests that incorporating and building of the learners’ funds of knowledge for numeracy actively and positively into their teaching practices will enable them to be more effective teachers of numeracy. For example teachers can make use of learners’ use of odds for the teaching of proportions and probability and their knowledge of car engines can be used to provide links between litres and cubic centimetres. Making links and building on learners’ practices, uses and knowledge will enable teachers to be more sensitive to the needs of their learners’ numeracy practices and provides a more effective base for the learners’ learning of formal numeracy.

This means that teachers and policy makers need to accept among other things that adult learners have:

- wide ranging, different numeracy and mathematics skills and needs (*the narrower view*);
- *and extending it to a broader view, they have*;
- different dispositions towards learning numeracy and for example are attending classes for very different reasons;
- had different experiences of learning numeracy and have different relationships towards education and towards teachers;
- potentially numeracy rich knowledge, experiences and numeracy practices from outside formal classrooms.

Many of these experiences and backgrounds of the learners have the potential to be used in the classroom. Therefore to make the most of the potential of the classes these experiences, attitudes, practices and skills need to be built on and used in classes.
In this report we outline ways that teachers and researchers sought to understand these broader ways of thinking about learners funds of knowledge for numeracy, then how to access this knowledge and finally how to use it in their adult numeracy teaching.

4 Sites

In this study we have been working closely with teachers of Skills for Life learners in three sites made up of one Further Education (FE) College, one University campus site and one work-based learning centre. In this report all the sites, teachers and learners have been given pseudonyms to ensure their anonymity. The pseudonyms are as follows: Katrina is the teacher at Burstead FE College; Trisha and Marion are working at Workington work based centre; and Charlotte and Andre are working at Repton.

Observations of numeracy classes, interviews of teachers and learners and focus groups of teachers all took place between May 2006 and January 2007 at three sites. Details of the sites and teachers are provided by site below. There were two focus group meetings. The first earlier in the project was a meeting of teachers and researchers supplemented by practitioners from Maths4Life where the ideas behind the project were discussed in relation to the teachers’ work with their learners. The second focus group occurred at the end of the project where the teachers and researchers discussed the outcomes of the project together with ways forward.

**Burstead FE College** is a Further Education College in the South of England with a wide range of courses from academic to vocational, which seeks to meet the skill needs of the local workforce. It has a wide range of clientele both home and international. Its home learners come from a wider range of backgrounds than in the locality but in common with the locality a significant proportion of them are seen as “white”. It has a dedicated Skills 4 Life Centre, which includes the Basic Skills area and caters for Key Skills, the Learning Disabled and ESOL support. There are numeracy classes and programmes within the Adult Basic area. These are part time courses aimed at learners, aged 19+ from Entry 1 to Level 2 who for one reason of another lack formal qualifications in maths or numeracy. The clientele for these courses are mainly white working class learners with more women attending in the day and more men in the evening. The classes we observed on this project were Adult Basic Skills numeracy classes where most of the learners had received their Level 1 in adult numeracy; that is they were either Level 1 or Level 2 learners. Some of the learners chose to be there, for example, Sam who wants the qualification to help her career as a carer for autistic children. The pressure on her to pass Level 2 meant that she felt she had to attend. Others were required to be there by the college.

Katrina, the tutor at Burstead, is the Subject Area Manager for the Basic Skills area and is the main numeracy tutor within that area. She has A level mathematics a degree in sociology and a PGCE in Further Education. She does not have a Level 4 SVUK qualification in numeracy teaching. She has taught adult numeracy for about 10 years and has not taught any other ages. She says she struggles to remember all the connections within the mathematics she is teaching. She sees mathematical knowledge to be meanings, names or skills of doing a calculation and why they work. To her mathematics is an academic pursuit but success or failure at it could be more than the gathering of skills. It could be to do with personality, attitude, commitment or relationships with the subject. This is part of her funds of knowledge for numeracy.
Workington work-based centre is a ‘not for profit’ organisation, based in a medium sized factory site on an industrial estate. Teachers from the local FE College visit the factory once a week to run classes in numeracy, literacy and ICT.

In this work-place setting the learners who attend the course are chosen by management, partly because they need to build up a skill that they need in their day-to-day work, but also to develop the skills of the workforce generally.

Tricia: The ethos behind Workington is to move people on and get them into work. So to build up their basic skills is the priority of the company anyway. More, perhaps, than another sort of company. (Interview June 2006)

Three two-hour literacy and numeracy classes take place each week; one hour is spent on numeracy the other hour on literacy. Learners attend both the numeracy and literacy classes. Some learners may be interested in developing their literacy skills more than their numeracy skills. As one learner explained his initial reason for attending the class was:

… it was literacy mainly. I don’t know how to describe the start, because if I could I would wriggle my way out if it, I won’t lie, that is how it started off. But I actually enjoy doing it now.

One class of learners, working at Level 1 and Level 2, is part of the project. The class is a small group of four male learners, in their twenties to forties. Most have been attending the class for about two years. The teachers, Marion and Tricia, neither of which would describe themselves as numeracy specialists, team-teach.

Marion is in her forties. She teaches Basic Skills in the college, has a teaching qualification and an Adult Numeracy Level 2 qualification. She has taught numeracy to learners from Entry level to Level 2 and has experience of teaching learners aged 19 to 90. She has been teaching numeracy to adults for almost seven years.

Tricia is a language specialist. She has taught in secondary school and in adult education and has a teaching qualification in higher education. She has been teaching numeracy for just over two years. She had been asked initially to support a learner at Workington, with numeracy and literacy, on a one-to-one basis. She also worked alongside Marion teaching learners in two other groups at this work-based site.

Repton a former College, merged with a university and is now one of its Home Counties campuses. It offers a range of courses, which include leisure courses in local community centres, part-time professional courses, full-time further and higher education courses, post-graduate courses and apprenticeships in the workplace.

The project class consisted of two female and five male learners aged between twenty and sixty. Two of the learners had worked together the previous year, others were new to the class. They are nearly all unemployed and are attending a Skills for Life class where they do five hours numeracy and five hours literacy a week.

The learners have come to this Skills for Life course through a number of routes. Some have responded to the national advertising campaign on television, which has directed them to sources of provision locally. Some learners have applied to do more advanced courses in the college and have been re-directed by Student Services staff to this particular course. For others this course is a progression from a pre-entry course they were on before. Their motives for attending are varied and include wanting to help their children with their homework, wanting to get a job, wanting to get a
qualification or just to do better than they did at school. They are taught by Charlotte who is a trained maths teacher.

Charlotte is in her fifties. As well as teaching qualification she has ‘A’ level mathematics and a new Level3/4 numeracy qualification. She teaches learners working from Entry Level 1 to Level 3. She has taught for eleven years and has always taught numeracy. A part time teacher she teaches two of the numeracy sessions, a total of three hours each week. She is supported by a literacy teacher, Andre, who is there to help develop the learners’ literacy skills.

5 Conflicts and contradictions between funds of knowledge approaches and the teaching and learning of numeracy

This section will focus on possible issues, tensions and conflicts between a funds of knowledge approach to the teaching of numeracy and the teaching and learning of numeracy as seen on the project. The analysis in this section is based on data from the Burstead site. In the next section data from the other two sites, Workington and Repton, are used to illustrate two different ways teachers set about finding out about finding out about learners’ funds of Knowledge in their classrooms.

We begin by looking a learner, Clive, in a Burstead class who brought with him unexpected funds of knowledge for numeracy. He was in the class studying for his Level 2 in Basic Skills numeracy although he had a BA degree in Software engineering. This surprised both the researchers and teachers and suggested that some learners had formal skills (narrow funds of knowledge) that could themselves be drawn on in their formal numeracy classes. But he had other funds of knowledge for numeracy. He was nervous about the expectations of other learners in the class might have of him with his qualifications and was also concerned about his previous problems with learning numeracy. These concerns are part of his broad funds of knowledge of numeracy and seemed to inhibit him making much use of these funds in the classroom. He also had had substantial experience working with motorcars, which could be a valuable context to site some teaching and learning numeracy. He is a learner whose broader funds of knowledge (background, attitudes and experiences) could be drawn on in formal numeracy classes as a useful resource for both his learning and that of other learners. We did observe him working briefly on one occasion with one of the learners in the class. But there was little other evidence of his knowledge being used. For example his knowledge of car engines was not drawn on in a session on litres and millilitres. This account of Clive provides evidence to support the project’s intentions to raise the importance of the role and uses of learners’ funds of knowledge for numeracy. It suggests that approaches based on this could have real impact on the teaching of adult numeracy.

Teachers’ funds of knowledge for numeracy.

The teachers on the project arrived with their own experiences, backgrounds, beliefs and values and relationships with numeracy and the teaching of numeracy. These funds of knowledge for numeracy impacted on their teaching of the learners. We illustrate this by looking at Katrina, the teacher at Burstead. Students enjoy her numeracy lessons. But she is concerned whether she has the funds of knowledge to build on what learners know as she feels she does not have the confidence or understandings to make use of their knowledge when it arises naturally in sessions. For example, when asked whether car engine sizes (cf. the account of Clive above) could help her learners understand connections and relationships between units used
to measure volume and capacity (that is between cm$^3$ and litres or ml), she was concerned that she might not understand the learners’ contributions. They would know more than she did.

Katrina: Because I am slightly wary of some of the answers I might get. Because if we start, obviously, people are a lot more knowledgeable about different things, [cf. Clive above]. And if someone answered a question by talking to me about engine size, I would be thinking – hang on a minute, how do I relate litres or capacity, or …? ….. I am still stuck with what we discussed at the focus group, what if I don’t understand the answer, or what if I don’t know if it is right or wrong. If somebody came back and said – you use that in anti freeze. I would be saying – oh do you? That is interesting. Without knowing if it was right or wrong or being able to take it any further.. (interview Dec 2006)

What emerges from this is that the teacher here is reluctant to use the learners’ numeracy practices, their backgrounds, attitudes and experiences (their broad funds of knowledge for numeracy) in case she may not understand their responses. Her concern means that in this instance she struggled to make use of the learners’ broad strengths. Teachers in the focus group suggested that a more collaborative approach drawing on the ideas of all those in the class might help her overcome her concerns.

Conflicts with building on what learners know – how teachers teach: ‘pedagogy’

During the study conflicts and tensions between the principles underlying funds of knowledge and the teachers’ practices emerged. One conflict that is central to this project is about the teachers’ views about building on what learners know. In common with many teachers Katrina feels this is an important principle behind her teaching. However also in common with mathematics teachers and despite being personally aware of the conflict inherent in it she uses both the required formal assessments and informal assessments to find out what learners do not know rather than what they do know and as she said she would then “hammer” what they do not know. She says:

It [what learners cant do] is a mode of teaching, almost, isn’t it? Yeah. Obviously, even from our models. We assess you at the beginning, what you can do and what you can’t do, and we zoom in on what you can’t do and spend the rest of the year hammering it into you. (Interview Nov. 2006)

This notion of finding out what learners cannot do and then getting them to work on it is a dominant pedagogical approach in the teaching of mathematics and numeracy. It is, however, based on a model of learners lacking knowledge; that is they are seen to be in deficit. This model conflicts with approaches that are designed to build on what learners know; that is constructivism. It is one clearly in conflict with a vision of positively building on learners’ funds of knowledge for numeracy. The example of Clive raised above suggests that in many ways he has strengths and cannot be seen as in deficit. What this report suggests later is that rather than finding what they cannot do teachers could instead work with what the learners can do in a broad sense and enable them to move onwards from there to gain the skills, knowledge and confidence required in formal numeracy classrooms.

Conflicts with building on what learners know – what teachers teach: ‘curriculum’

There are also tensions and conflicts between the given adult numeracy curriculum and the teacher’s desire to link ideas to learners’ funds of knowledge for numeracy. Katrina, the teacher at Burstead, says that she and her learners are hampered by the size and content of the syllabus or curriculum. In Katrina’s view the curriculum is not translatable into every day concerns or problems for her learners. This does not mean
that she wanted the whole curriculum to be related to everyday situations. It is more
that she felt much of it lacked purpose and meaning for the learners.

As an example of this she says that learners have trouble remembering some of the
central things in formal maths. She teaches it and they forget it. For example, despite
being taught fractions they often think that $0.2 = \frac{1}{2}$. In her view it does not “sink in”.
It does not connect to them and does not build on their thinking or experiences
beyond the classroom.

Another example is that her learners do not cope with the metric system. They have
no feel for metric units as they don’t use them in their everyday lives. They do not
know even their own height and weight in metric units. Katrina feels that the learners
must know this topic to be able to go on to their Level 2 in numeracy. The topic is
part of the formal examination and curriculum and they need to be able to do to pass
the Level 2 examination. It is however not part of their background and current
practices in informal numeracy. She does not reject its centrality in the formal
curriculum but it is clear to her that many of her older adult learners seem to struggle
unsuccessfully with it. It is part of their previous experiences of measuring and not
sited in authentic settings for them. This, therefore, has the potential to conflict with
what learners know outside the classroom and especially their informal everyday
numeracy practices. Indeed what becomes quickly apparent is, that some of the
learners struggle with metric units because their out of class experiences are almost
solely connected to imperial units.

Katrina: And if a person has been talking in feet and inches their entire life, and has never even
looked at a thirty centimetre ruler, you are not going to transform their understanding of metric
in that time. And it does almost become like – this is a topic, this is something you have to
learn, here is a list of facts, go and learn it. It becomes very hard to make it more relevant to
their lives. Because they will be going out of the class and they won’t be using centimetres. Or
suddenly change to thinking about their journey to college in kilometres instead of miles. It is a
hard topic in that sense. Well it is a way that I think the curriculum is out of step with society,
really. It is like everything in shops now, is sold in metric units, isn’t it? But including myself,
maybe yourself, perhaps everyone you know, who goes in and asks for half a kilogram of olives
or something? It is not in our social consciousness to use metric. …. Yes, so in other words the
curriculum is in conflict with it, which is interesting. I can’t see us getting to the stage where
that isn’t the case. Which is quite bizarre when you think of how long metric has been around,
because obviously it must be taught in schools, but from my experience youngsters still learn an
awful lot of that terminology from talking to their parents. Because I have taught sixteen year
olds, who I know will have been brought up totally with measuring in metric. And I go – how
tall are you? Oh, five foot eight. (Interview Dec 2006)

The latter point shows how deep seated funds of knowledge can be and how
significant experiences beyond the classroom can be. We have to accept that funds of
knowledge are not derived solely from educational context as is sometimes assumed
in classrooms. Home backgrounds in this case seem to be more significant than
formal education experiences and may have a more substantial role to play in learning
than has been assumed in the past. It also shows that informal “home” numeracy
practices can be very different from formal numeracy practices and that learners need
to be helped explicitly to switch between them, (Street et al, 2005). We are not saying
in this report that learners should not learn about metric units but that teachers need to
be sensitive to their learners’ experiences. In particular older learners who have had
in their past extensive experience of imperial units of measurement means that they
lack the experiences on which to build knowledge of metric units. This seems to
interfere with and inhibit their learning of metric units. The conflict raised here
between the metric units of the formal curriculum and the imperial units of learners’
funds of knowledge emphasise the importance of this issue particularly for older learners who then struggle to pass their Level 2 examination.

One way to handle this is by raising teachers’ sensitivity to the issues. Teachers can then explicitly discuss with their learners strategies for switching between the numeracy practices from earlier periods of their lives and from outside the classroom and those of the formal numeracy classroom. The other implication of conflicts some adult learners have with the formal numeracy curriculum is to look closely at the numeracy curriculum and ensure that the content in curriculum is justifiable. It is worth stressing here that the curriculum is a selection of areas for study and this selection needs to be done with actual learners in mind.

6 How to use funds of knowledge.

Having looked at conflicts between practices and funds of knowledge, this section describes the ways that the projects teachers, working in very different settings, set about finding out and working with learners’ funds of knowledge in their own classrooms.

Use of learners’ funds of knowledge

At Workington the learners all work together, know each other well and are ‘very supportive’ of each other in class and on the shop floor. As the group is small and most learners have attended the class for two years, Marion and Tricia who teach both literacy and numeracy, know the learners well, in terms of their formal mathematical knowledge and progress, their work in the factory and their outside interests. The atmosphere is relaxed and sessions start with a general chat about something that interests the learners or something they have done that week, such as buying a new mobile phone or discussing the result of an important football match.

Tricia: But it is a very social class, obviously, they know each other, they are comfortable with us because they have been with us for a while, and they do chat. So we do use that to contextualise what we are doing. (Interview June 2006)

The fact that these two teachers use their knowledge of the learners’ interests and leisure activities to build on and to extend this during their teaching, is exemplified by the following example from a lesson on weight.

The class are looking at weighing using the metric system. Early in the lesson, Don, a learner in his early fifties, admits that he finds metric weight difficult to understand.

Don ‘every Thursday I go down to Sainsbury’s and buy 8lb of spuds … it works out about 300 point 1 kilograms … I don’t understand it’ He says he does know however, that a kilogram of sugar weighs 2 kilograms. (A regular bag of sugar is in fact 1 kilogram which is 2.2 pounds which indicates that it is very likely that Don meant pounds, a unit he was most familiar with).

Another learner says that it is 1 kilogram and Tricia passes a bag of sugar round to give them ‘an idea of what a kilogram weighs’ (Observation June 2006)

Later in the lesson Marion asks Don about using weights in the gym, somewhere she knows he goes frequently. Marion is aware that Don comes into contact with weight in the context of one of his leisure pursuits although he may not recognise his engagement within this context as being ‘mathematical.’

Don ‘I am totally confused … I was 11 and a half stone … roughly about 75 kilograms … now I’m just over 12 stone … 12 stone 2’ (Observation June 2006)

Tricia and Marion pick up on this and build on his experiences by eliciting from Don that he does in fact know his body weight in both imperial and metric measures and by making the relationship between the two explicit. By using Don’s experience of
visiting the gym, Marion and Tricia use the knowledge of weight he has already, in a context that he knows and is familiar with, to help him begin to understand the relationship between imperial and metric measures. They want to help Don to find meaning in what he knows already rather than learn from facts presented in isolation.

The fact that they teach both numeracy and literacy is seen to be an advantage by these teachers, because literacy more than numeracy, is seen as lending itself to talking and somehow legitimises their discussions with the learners.

Tricia, whose background is as a language teacher, believes that she has learned through experience to find out more broadly what the learners know, their funds of knowledge, and build on it. As Tricia explains, teachers need to be aware that the skills learners use in their everyday lives can be transferred and built upon in order to enhance the learning experience. Working on this project has made her realise that teachers needed to understand that learners can do ‘a lot more than we think they can do’. However funds of knowledge implies much more than this, it is about acknowledging that teachers’ understanding of learners is not only limited to the facts and skills that learners have acquired. It is about developing a reciprocal relationship where teachers come to understand that learners’ experiences of numeracy practices within informal settings are valid and valued.

At Repton only two of the seven learners have been in the class the previous year, so Charlotte and Andre know little about most of their hobbies and backgrounds. Unlike the Workington learners, this group have no contact with each other outside the classroom. Charlotte believes that numeracy could and should be taught through a theme or topic-based curriculum wherever possible. She believed that it empowered learners by enabling them to bring something to the lesson which they had some knowledge about, even if they were not confident with the mathematics. It also helped them understand that mathematics in the adult classroom is not the same as school mathematics, something that that have had difficulty with and failed at in the past:

Charlotte: I think learners benefit from maths taught through a topic because they can bring something to the session, even if they are not confident with maths. Learners can have an opinion about interest rates, or supermarkets or sport etc. and can join in an initial discussion. They often don't realise that maths is involved in all these things. It also helps them to lose the image of maths from their school days - it is something you do in the classroom and it is hard. (email correspondence, March 2007)

It also enables Charlotte to make links across the curriculum in a meaningful way so that in any one session learners may be dealing with money, adding, subtracting, multiplying or dividing, calculating averages and drawing graphs. As Charlotte explained, ‘(a) lesson (c)ould cover several elements of the Core Curriculum and enable learners to see that maths is all inter-related.’ From her experience of teaching this particular group she believed that they had been encouraged to take part more in discussion and work independently and had achieved more than they might have done or she would have expected otherwise.

Charlotte: They stretch themselves, often introducing more complex ideas than I would have planned. (email correspondence, March 2007)

As she taught numeracy to this group for three hours a week, she felt that she had the scope to ‘develop … themes and bring out the maths in topic-based teaching’. Helping learners to identify and recognise that the mathematics they engage, as part of
their everyday life, helps to legitimise and demystify the subject. Tapping into a common leisure pursuit is found to be a good way to do this.

Charlotte and Andre decided to focus on the topic of finance with their E1 and E2 learners. They found that the television programme ‘Bargain Hunt’, a daytime television programme, is popular with the learners, and something they know more about than their teachers. (‘Bargain Hunt’ gives two teams of people a set amount of money and challenges them to search the UK to find antique bargains which they sell at auction, preferably for a profit. The team that makes the most profit wins.) This is a home numeracy practice that learners are engaged in, although they may not recognise the formal mathematical connotations themselves.

Charlotte and Andre decide to use the programme to introduce a topic on finance and then organise a ‘Bargain Hunt’ activity where, using Monopoly money and working in groups, the learners buy bid for goods, which include a painted ornamental duck, a camera, a Sony Walkman, a picture frame and a necklace, brought in by the teachers, which they then sell (using the Monopoly money), to other members of the class through auction. The groups then work out how much profit or loss they have made on each item and present their results in a table. A group three, two men and a woman work together.

They add up all the prices that the articles are bought for and add these up. They repeat this procedure for the selling price. The two men, add the amounts (£65, £35, £90) on paper using vertical addition. Sunita, a Pakistani woman who has never been to school, adds up the numbers mentally using her fingers to help her and gives the correct answer, £190, quickly. A single mother, it transpires that she does the bills and shops for her family and sometimes for that of her sister. She can do quite complex mathematical calculations in her head and knows for instance, how much change she should have when shopping. However she finds writing things down very difficult. (Observation November 2006)

In this instance Charlotte is using the group’s outside and largely shared interests to encourage them to work out and practice some basic operations of addition and subtraction in a context which has a relevance for them. Although not ‘real’ in the sense that it is a role play exercise, it is ‘real’ in the sense that they are acting out a scenario that is part of their reality, it has purpose for them, in the context of a television show with which they are very familiar. This contrasts sharply with more formal lessons where the content is often de-contextualised, or at best, plays lip service to the reality in which learners function within their everyday lives. The notion of funds of knowledge creates a symbiotic relationship in which the everyday experience of learners becomes a dynamic part of their learning within a formal classroom setting.

As for Sunita, it was clear to the observer that she is good at mental calculations and uses this knowledge continually in her everyday life. For her the problem is that she is unable to record what she knows on paper. The challenge to Charlotte is to acknowledge that Sunita has considerable funds of knowledge, as exemplified through her undoubted mental ability to manipulate numbers, and build upon her informal numeracy practices within a formal setting.

For Charlotte, building on learners’ interests and encompassing what they want to learn within lessons is seen as a very important part of the teaching process. She sees no conflict between meeting learners’ expressed needs and getting learners through formal examinations, as she is able to build in the things learners want to learn about within the context in which they, as a class, decide to work. She is more aware of listening to what learners say, to uses real examples in her teaching which are relevant
and purposeful to learners lives and experiences and incorporating their ideas into her planning.

How to find out about funds of knowledge for numeracy

At an initial focus group meeting (June 2006), teachers discussed how they might try to find out about learners funds of knowledge for numeracy. They suggested that there were informal methods and formal methods:

- being aware of the potential value and importance of a broad understanding of learners’ funds of knowledge for numeracy, then they could, through careful and sensitive listening, observing and talking with their learners, react positively to the potential of their learners’ funds of knowledge for numeracy. These informal methods are dependent on the teacher’s awareness, understandings and openness to the broader vision of funds of knowledge. Without these understandings they would miss much of value. (report focus group June 06)

More formal ways were also suggested as having a part to play: for example circle time at the start of a programme; plenaries at the end of teaching sessions; discussions about what they know at the start of topics; and individual interviews. But formal approaches were seen as turning funds of knowledge into findable objects rather than teachers becoming sensitive to their learners. The latter requires teachers going beyond formal set moments (when teachers may feel they are looking for specific things), and instead listening, observing and talking with the learners and becoming aware of their learners’ backgrounds experiences, relationships to maths and so on.

7 Findings

Some of the findings of the study are that

- Some learners have substantial funds of knowledge for numeracy that teachers are not always aware of or are unable or reluctant to use in their formal classrooms.

- Dominant approaches to the teaching of numeracy tend to be about finding what learners cannot do; that is seeing learners in deficit and then working on that. Instead teachers could work with what the learners can do in a broad sense and enable them to move onwards from there to gain the skills and knowledge that required in formal numeracy classrooms. This would give greater credence to learners’ knowledge.

- Many aspects of the numeracy curriculum lack meaning and purpose for learners

- There are substantial and troubling conflicts between the formal numeracy curriculum and the learners’ experiences beyond the classroom

- Enabling teachers to be sensitive to the their learners’ funds of knowledge is an important part of being a teacher. This requires teachers becoming aware of learners needs through listening, observing, chatting and talking with their learners and going beyond formal classroom assessments and moments.

- Once teachers are sensitive to learners’ funds of knowledge they should explicitly help learners to switch between informal formal numeracy practices

- Teachers can use funds of knowledge of their learners in planning and designing their teaching. One successful approach tried on the project was identifying learners’ common interests to provide a purposeful or relevant context or topic, such as finance, in which to frame their teaching.
The teachers on project felt that through their engagement with the ideas about funds of knowledge they had become more critically self reflective about their current teaching.

8 Implications for Policy and Practice

Policy

What possible impact do these findings have on how numeracy is taught, what is taught and then ways of implementing ideas about broad approaches to funds of knowledge through Initial Teacher Education (ITE) and Continuing Professional Development (CPD)?

The current drive for qualifications derived from official department policy towards adult education results in pressure on teachers to get their adult learners to pass national tests. This is closely linked to funding issues, and it can constrain how numeracy is taught to adult learners. As the studies in this project have shown this need not be the case. When groups are small, as at Workington, it is possible and realistic for teachers to get to know what individual learners can and cannot do. An informal ‘chat’ before the lesson where teachers and learners can talk to each other about aspects of their lives, can give teachers valuable insights into learners’ lives outside the classroom. This knowledge can then be utilised within lessons, as and when appropriate, to build on what learners know already. Even in larger groups, such as at Repton, where eliciting such information informally from all learners may be too time consuming to be a viable option, learners’ common interests can be used to provide a context in which to frame teaching, which has a relevance to everyone. It builds not only upon a shared common knowledge but also upon what interests them in their everyday lives.

The findings of this study have clear implications for initial teacher training and continuing professional development (CPD). Without support and training, teachers may feel that by adopting this approach in the classroom they will relinquish control to the learners. They may feel scared about what may happen, especially if they do not feel confident in what they are teaching. ITE and CPD programmes therefore need to raise their trainers’ awareness of and sensitivity to their learners’ broad funds of knowledge for numeracy. Ways of doing this have been tried successfully in other programmes (Street et al 2006). Getting teachers to try out this approach on training courses and reflect upon the outcomes for them as teachers and the impact on their learners’ learning, could become a valuable part of initial teacher training programmes and CPD.

Practice

From this project the impact of the funds of knowledge approach on the practices of teaching numeracy would be on ways of using the funds of knowledge in classrooms and in ways that it impacts on the teachers themselves by enabling teachers to be more sensitive to their learners’ strengths and needs as explained below.

What to teach – the content. Teachers could use as starting points numeracy events, which are familiar to the learners especially drawing on the language they use and the occasions when they are used. For example, starting from moments when they are measuring lengths using imperial units to build on their skills, language, understandings, confidence and uses of mathematics. The place of metric units in an adult numeracy curriculum could be discussed but if deemed necessary then it needs to be taught with explicit links to learners’ prior knowledge and practices of
measuring. That is it should not only draw on the measuring units they use and the uses and roles of measuring but should also explicitly deal with issues of switching between the formal practices of the classroom and the informal practices beyond the classroom. However the evidence from this project suggests that the teaching of metric units to mature adults will remain problematic whilst society is unsure of which units of measuring will be used in non educational contexts.

Examples raised in this project of areas of the numeracy curriculum that often do not relate to learners needs or interests could include amongst others: fractions which learners rarely use outside the class and yet are frequently taught; odds which are part of some learners lives but are not on the curriculum; the reading of timetables which have been rendered less useful by digital displays at bus stops; and long division algorithms which learners never use. There are many such areas of the adult numeracy curriculum that could benefit from examination to establish their meanings, purposes and values for learners.

*How to teach the content – pedagogy.* It is easy for teachers to fall back on a ‘deficit’ model of learners where the focus is on what learners do not know rather than what they do know. The deficit model leads to practices where the teacher finds out what a learner cannot do and then teaches it again and again, until the learner can do it. Rather than adopting a deficit model, the funds of knowledge approach recognises that learners, and adult learners in particular, bring a range of numeracy practices and strengths into the classroom, which they will have acquired, in formal and informal settings, over a number of years. If teachers can identify what these practices are they can use this to build upon the knowledge learners have acquired already. This is not to say that learners are never introduced to ‘new’ ideas. But that for learners to learn they need construct their own understandings which must be linked in a substantial manner to their previous funds of knowledge. Learning that is not so linked will by its nature either not be retained or will remain difficult to use constructively. Thus if there is a need to teach ‘new’ ideas in order to be successful these must be explicitly linked to what learners already know in a broad sense.

This implies that teachers need to listen to and take note of what learners say to them and what they say to each other. They need to talk to learners about their lives, their interests and their hobbies outside the classroom. They need to observe them when they are working and be aware of the strategies they are using in order gain some insights into how learners are thinking or working things out. For instance, whilst Sunita a learner at Repton, had few formal numeracy skills and found writing things down difficult, she had a good understanding of number and could add and subtract mentally with accuracy, a skill that she used daily in her everyday life managing her own and her sister’s household. Asking her to explain to the class how she worked things out would acknowledge and give credence to her undoubted skills and help build up the confidence in her own abilities, which she clearly lacked. The teacher could then develop the skills she had and focus on the skills that she did not have, which in Sunita’s case was writing down what she knew using formal notation.

Another approach could be the embedding of numeracy ideas in contexts that are meaningful for the learners as shown in the discussion of Charlotte’s work on finance and the TV programme ‘Bargain Hunt’ at Repton as discussed above.

One of the concerns raised by teachers in the focus group was that basing approaches on what individuals know and their levels of maths could lead to individualised teaching, which could neglect or lack collaboration and interaction with others. It was
suggested by other teachers in the focus group that an alternative way of making use of funds of knowledge for numeracy could include selecting or designing large topics with rich potential for numeracy. In these topics if one learner did not know something then others in the group might do so, utilising a collaborative approach to learning. What the group knows is more than the sum of individual’s knowledge, all are learning. Thus learning could be seen as distributed across the group and impact positively on individual performances on tests.

*Impact of the funds of knowledge project on the teachers*

The teachers felt that working with others on this project had raised their awareness of their learners’ funds of knowledge for numeracy and also their ability to reflect on their own practices. There was sense in which Katrina felt that this project had provided her with alternative ways of helping her learners. She was now beginning to be culturally and socially more aware of her learners’ backgrounds, strengths and needs.

Whilst Marion and Tricia had always taken account of the knowledge and experiences that this group of learners brought to the classroom, involvement in the project had highlighted the need to make the process of information gathering more explicit. Since working with the project they have included a plenary session at the end of lessons, which helped them, and the learners reflect on their learning and helped them, as teachers, to plan for the next class. It has impacted not only them but also on their learners who were now, they felt, more aware of how numeracy is involved in their everyday lives.

*Central References*


