By Tine Wedege on Monday, April 24, 2006 - 09:15 am:

Dear all

After having read David's interesting and informative contribution to the debate, I understand the introduction of the term "functional mathematics" as a reaction to this fact: When people learn (school) mathematics they don't learn automatically to use mathematics. – The first part of the definition of functional mathematics goes like this: "Each individual has sufficient understanding of a range of mathematical concepts and is able to know how and when to use them." (Dfe). It is obvious that the first reference is given to mathematics as such (understanding of mathematical concepts) and not to an everyday competence.

Davis refers to the use of the term "functional" in our definition of numeracy from 2001. In Topic Study Group 6, Adult and lifelong mathematics education, at ICME-10, Lene Ostergaard Johansen presented a paper entitled "Functional skills and understanding: what does it mean?" (See the website). Her analytical work was provoked by the use of "functional" in our and others definitions of numeracy and literacy. In order to discuss this question, she distinguishes four analytical domains (workplace, school, everyday life, democracy); and five discursive perspectives (the perspective of society/politicians, of researchers of adults and mathematics educations, of mathematics teachers, and of the individual/the learner). I quote her conclusion from the abstract: "The analysis emphasizes that skills and understanding can be functional in one domain from one perspective and not functional in another domain or, from another perspective, and it answers the question: what are the difficulties when the idea of developing functional skills and understandings has to be transformed into formal education?" (Johansen, 2004:1) Thus, the problem with definitions and understanding of numeracy isn't solved with the introduction of "functional mathematics".

Also thanks to Corinne. It is interesting to learn about the situation within a different cultural context. Your contribution has also given illustration to this: Just like the competence of numeracy being relative to the context, numeracy as a concept is relative. Some years ago – after the introduction of numeracy in Denmark – I had a discussion with a mathematics teacher with experience from the English school mathematics. He referred to the use – or misuse – of the term "numeracy" in primary shool, which he found horrible. And in Australia the mathematics teachers has an official numeracy strategy including mathematics teaching at all levels. In Denmark, we have tried to limit the use of "numeracy" (numeralitet) to "adult numeracy". Numeracy is not (only) the aim of general mathematics education, it is adults' mathematics containing competence which is also developed through everyday life.

Thus, in agreement with Corinne (I think), I suggest that we don't try to force a common definition of a numeracy concept (termed "numeracy") in EMMA. In stead we try to pin down a common understanding of something called "adult numeracy", "adult mathematical literacy", "adult functional mathematics" i.e. the content – and not the term – is important.

Kind regards
Tine

By Gail FitzSimons on Friday, April 21, 2006 - 01:16 am:

Further thoughts on a definition of adult numeracy

Gail E. FitzSimons
Monash University
Australia

Numeracy, whether for adults or children, is a social construct. As mentioned previously, it draws upon mathematical skills and knowledges developed over a lifetime. These may be learned informally from — and even taught by —family, friends, and other significant others. In the case of pre-school children and unschooled youth and adults, learning is dependent on the social and cultural settings available to the learner in their various communities. In countries where formal education is the norm, funded to a greater or lesser extent from the public purse, decisions are made by governments (advised by bureaucrats) about the quantity and quality of education for various groups of learners. Decisions are made based on, for example, perceptions of the good of the nation and, where governments are elected, perceptions of the likelihood of re-election. Accordingly, the voices of certain groups of stakeholders are privileged over others, depending on the political complexion of the government of the time. The major focus may be on, for example, improving business or national economic outcomes or on democratic citizenship, or some combination of these. Whatever the focus, numeracy is necessarily related to mathematical skills and knowledges.

In the case of mathematics education, in many countries the historical emphasis has been on reproducing a selection of knowledge from the discipline. In England and its colonies, there was an emphasis in the 19th century on reproducing by heart the theorems of Euclid. In the 1960s there was a widespread turn to the 'new maths' influenced by the work of the Bourbakists. During the 20th century, with the rise of compulsory education in many countries around the world, sections of mathematics content were segregated according to the perceived needs of both learners and the society into which they were to be enculturated. For example, some curricula emphasised the practical aspects of mathematics (even to very high levels for certain occupational groups); some emphasised low-level computational skills for groups intended for low status work, and so forth. In Australia, the expression 'vegie-maths' was, and still is, used colloquially to describe this less demanding curricular content. In some societies at times girls were excluded from the study of mathematics after a certain age (if they were permitted to study it at all, beyond arithmetic). In the UK, Paul Dowling (1998) has drawn on and further developed the work of Basil Bernstein to identify segregated mathematical pedagogical discourses, according to the socio-economic background and intended occupational destinations of various classes of children. Valerie Walkerdine and colleagues (1989) have done similar kind of work, with a focus on gender discrimination.

In summary, the provision of formal mathematics education in school as well as adult and vocational education (even if it is labelled as numeracy) is necessarily political in that certain selections are made to meet the interests and needs of certain social and economic groups above others. Curricula are determined — whether at the state level or even the individual school or classroom, and again this is a political decision — drawing on an arbitrary selection from the discipline of mathematics. Official and local pedagogic practices then combine to recontextualise that arbitrary selection in differentiated ways. Evaluation of the learner's performance — whether via international or statewide testing, or teacher-designed assessment or individual classroom/online feedback — is also heavily influenced, if not determined, by political decisions.

In different countries different terms are used to apply to the use and even construction of mathematics outside of the classroom. Numeracy is very commonly used, often with the pejorative tag 'basic' attached in the case of adult education. One perspective is that this term is used in an attempt to disassociate from the cold, hard, judgemental image of the

discipline of mathematics in an attempt to popularise it with school children and their parents, as well as adult learners. Other terms are quantitative literacy, mathematical literacy, and also functional mathematics. However they are labelled, the curricular content, pedagogy, and assessment still remain political phenomena. The intended outcome of mathematics and numeracy teaching is numerate behaviour but, as I have argued previously, a focus on the vertical discourse of mathematics alone will not guarantee such behaviour.

It is obvious that being able to answer pen and paper or computer generated assessment questions in a classroom situation may result in certification — and this is to be commended if it engenders a sense of achievement, even pride, in the learner and contributes towards enhancing their employment prospects — but it does not guarantee the creative adaptation of existing mathematical knowledge and possible innovation in the immediate context of a problem to be solved at work or in life generally. Moreover, there is a slippage between what a person is capable of doing and their disposition to do so within the particular work/life context in which they are situated at any given time. My colleague, Elizabeth Buckingham, (1998) has identified compelling reasons why workers might stay silent and not participate in workplace mathematical discourses when they are capable of doing so. By contrast, Tine Wedege (2000) has identified disempowering consequences of workers not being able to participate in workplace mathematical discourses that management might use to control workers — and I have witnessed the same phenomenon in my workplace research in the pharmaceuticals manufacturing industry. These typically take the form of graphs, charts, and production quantities involving very large numbers.

There are four major questions to be addressed:
• Who are learning?
• Why are they learning?
• What are they learning?
• How do/might they learn?

The answers to these will frame the definition of numeracy [etc.] and will necessarily be local rather than universal in its orientation. However, the answers to these four questions may even be conflicting in themselves — as any practitioner knows. The following questions are drawn from my current work-in-progress research framework and give some indication of the complexity of the issue.

What are the motives for adult students to take on learning mathematics/ numeracy supported and delivered (wholly or in part) by new learning technologies?
• Is it to achieve a credential?
• Is it to achieve develop new and/or deeper understandings?
• Is it to prove something to one's self?
• Is it to be able to help significant others to learn mathematics?
• Is it to support their own or their family's business/financial interests?
• Is it to learn more about technology?
• Is it to learn more through technology?
• [other]

So, what I am trying to say is that any definition of numeracy ought to be provisional. Of course it must make reference to abstract concept of number (realised as counting, even statistical quantification and combination theory) — but which numbers exactly (i.e., natural numbers, whole numbers, integers, rational numbers, real numbers, …) depend on the answers to questions about purposes (both learners' and sponsors'). It must also make reference the related concept of measurement (realised as the impetus for and practical

application of counting). Then, as I have argued elsewhere (e.g., FitzSimons, 2000), numerate behaviour should include the skills of locating in two- and three-dimensional space, designing, explaining, and playing. These six activities were identified by Alan Bishop (1988) as pan-cultural mathematical activities and operationalised by him in terms of the school mathematics curriculum:

Counting: Quantifiers (each, some, many, none); includes Adjectival number names, Finger and body counting, Tallying, Numbers, Place value, Zero, Base 10, Operations on numbers, Combinatorics, Accuracy, Approximation, Errors, Fractions, Decimals, Positives, Negatives, Infinitely large, small, Limit, Number patterns, Powers, Number relationships, Arrow diagrams, Algebraic representation, Events, Probabilities, Frequency representations

Location: Prepositions, Route descriptions; includes Journeys (distance), Straight and curved lines, Angle as turning, Rotations, Systems of location: Polar coordinates; 2D/3D coordinates, Mapping, Latitude/longitude, Loci, Linkages, Circle, Ellipse, Vector, Spiral

Measuring: Comparative quantifiers (e.g., faster, thinner); includes Accuracy of units, Estimation, Length, Area, Volume, Time, Temperature, Weight, Conventional units, Standard units, System of units (metric), Money, Compound units, also capacity

Design: Design, Abstraction, Shape, Form, Aesthetics; includes Similarity, Congruence, Properties of shapes, Common geometric shapes, figures and solids, Nets, Surfaces, Tesselations, Symmetry, Proportion, Ratio, Scale-model, Enlargements, Rigidity of shapes

Explaining: Similarities, Classifications, Conventions; includes logical connectives,
Linguistic explanations: Logical arguments, Proofs
Symbolic explanations: Equation, Inequality, Algorithm, Function
Figural explanations: Graphs, Diagrams, Charts, Matrices
Mathematical modelling, Criteria: internal validity, external generalisability

Playing: Games, Fun, Puzzles, Paradoxes; includes Modelling, Imagined reality, Rule-bound activity, Hypothetical reasoning, Procedures, Plans, Strategies
(pp. 100-103)
What can we as educators do?
The first and most important issue is to have our voices heard among the stakeholders. In Australia at the moment this is a challenging task for all intellectuals — especially in relation to a government with a decidedly anti-intellectual stance. On the other hand, in France Corinne is working with the chamber of commerce and industry [maybe not the correct term?], with powerful results. Our task as mathematics/numeracy educators is to argue for the inclusion of the broadest possible curriculum which balances the needs of the various stakeholders — but especially those of the learners whose voices tend to be ignored (or who are not really in a position to articulate their own needs).

Following David Kaye's email about the UK definition of functional skills as:

essential knowledge, skills and understanding that will enable them to operate confidently, effectively and independently in life and at work,

I support the goal of enabling such behaviours, it is the use of the term 'essential' that concerns me. This is where the politics comes in — who decides what is essential and on what grounds? In conclusion, although it may be possible to describe numerate behaviour in universal terms to cover the range of possible levels of mathematics and contexts of application in very general terms, the construct of numeracy is, in my opinion, provisional

and contingent, and defies a unique definition.

What do others think?

[For more detailed discussion of the application of Bernstein's work, images of mathematics and mathematics education, and the politics of adult and vocational mathematics, see FitzSimons (2002).]

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Gail.fitzsimons@education.monash.edu.au

By **Gail FitzSimons** on Friday, March 24, 2006 - 09:01 am:

Dear Corinne

Greetings All

Thank you for your informative and insightful perspective on adult "numeracie" [it sounds so much more gentle in French!] and functional mathematics.

First of all, your comment: "for most of the people numeracy is supposed to concern only a special part of the population (immigrants, people with no qualification)" resonates with my reading of Bernstein (2000). That is, classification of knowledge so that only some people have access to 'unthinkable knowledge', where [mathematical] knowledge is impermeable (p. 11). I believe that this is also the case whenever politicians and bureaucrats talk about 'basic numeracy' — only ever intending to encompass calculations of whole numbers and fractions [decimal and vulgar/common]. I have written about this in conference papers and in FitzSimons (2002). As you rightly point out, this practice is inherently undemocratic.

Secondly, your question: "Does it mean that other mathematics are not "functional"?" suggests further questions to me.

a.. Who decides what mathematics is functional?
[Does it exclude Islamic geometry, for example? Euclidean geometry? Etc. etc.]

a.. On what basis are the decisions to be made and by whom?
[In Australia the voices of big business and industry have been responsible for removing important sections of the vocational mathematics course I was teaching for Science Laboratory Technicians on the grounds that they 'didn't use all of the topics' [e.g. conceptual understanding of the statistical processes involved in quality control]. These voices also prevented the inclusion of any calculus — even though concepts of change, maximisation and minimisation are often critical in laboratory work. (There was no opportunity given for teachers to make a case for conceptual understandings rather than rote learning of formulae.) Similar things have taken place in Electronics courses. These decisions have been taken, informed not by research, but by the shouts of the loudest voices. Although I personally believe that cost cutting for vocational education is at the heart of this process in Australia, as I have also argued previously there are issues to do with disempowering teachers as well as the argument made in the first paragraph regarding learners.

Of course I support the notion of "knowledge, skills and understanding that will enable [people] to operate confidently, effectively and independently in life and work" but it is the word "essential" that needs to be problematised — as I have tried to do in the 2nd paragraph. As a community of educators we need to take the lead in decisions concerning numeracy/functional mathematics based on our research and practical experience of what works with adult learners. Numeracy education is always a political issue, whether we like it or not.

Further to my previous discussion about vertical discourses [e.g., mathematics] and horizontal discourses [e.g., numeracy], Bernstein draws attention to the fact that vertical discourses "have their origin and development in official institutions of the state and economy", and horizontal discourses in "everyday or life world" (p. 207). Clearly these two intersect [whatever we choose to name them] — and maybe the UK definition of functional mathematics is an attempt to do so — but I believe that we need to be clear that they are different discourses with different practices, and not assume [as many people have in the past] that the teaching of [official] mathematics will ensure [locally] numerate behaviour. We need to strive for the integration of the two in both curriculum and pedagogy [including assessment]. As you pointed out, Corinne, word problems can never be a substitute for the messy realities of actual constraint-filled practice. This is what makes numeracy very difficult to assess 'officially'.

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By Corinne Hahn on Tuesday, March 14, 2006 - 02:00 pm:

Dear All,

I do not know if I can bring a contribution to this very interesting debate, but I would like to consider the situation in France.

The use of the word "numeracie", made from the English word, is rather new in France and always linked with literacy or equivalent. It means that it is concerning mostly illiterate adults. And, as you may know, in France adult education is separated from general education. "Numeracie" is mostly taught by people who are not mathematics educators. Mathematics Education researchers are not very concerned by this subject. I also found the expressions "compétences numériques" or "compétences quantitatives".

To my point of view, both expressions (numeracie or compétences numériques) seem to refer only to arithmetic. It suggests calculation. Although I think we all agree that numeracy is more than that.

I found very interesting that in England you use the word mathematics again. Call "numeracie" "mathematiques fonctionnelles" in French would, to my point of view, give more legitimacy to the field (it is serious matter because it is mathematics!) but also link this subject to traditional school education. A very important point in French culture is the notion, coming from the French revolution, of general knowledge and culture to which everybody is entitled. A citizen is supposed to get this knowledge and culture in the School of the Republic. It is very hard to admit that it is not the case for everybody. That is why, I guess, for most of the people numeracy is supposed to concern only a special part of the population (immigrants, people with no qualification).

In fact I do not feel very confortable with « mathematiques fonctionnelles » although I like the definition ("essential knowledge, skills and understanding that will enable them to operate confidently, effectively and independently in life and work"). Does it mean that other mathematics are not "functional"?

The report of a large survey called IVQ (Information about daily life) by INSEE gives 3 definitions of numeracy (the survey was mostly about literacy but they decided to include a part on numeracy). Here is a rough translation of these definitions:
1. Capacity of using the person's own (numerical) resources to be efficient in every situation
2. Mathematical competencies as used in daily and professional life
3. Operational level in mathematics

This survey pointed out the fact that the level of numeracy was weak in France. Here comes the problem of evaluation. To my point of view the only possible evaluation of numeracy should be on the ward, in everyday life or in the workplace. But this is of course impossible. So the material used consists mostly of problems to try to fit to what is numeracy. And most

of these problems use language. No doubt that we link numeracy and literacy… All we all know the problem with word problem (see studies about international surveys such as TIMMS or PISA)!…

I mention the problem of evaluation because I think it is crucial. It refers to 2 different models: efficiency model or appropriativeness model.

I hope my remarks are not too far from the subject!

Best wishes

Corinne

 By **Gail FitzSimons** on Tuesday, March 14, 2006 - 01:54 pm:

Dear David

Thank you for your carefully explained letter on numeracy/functional mathematics in the UK. I was not aware of this development, so it is an interesting new turn.

My personal view about the naming of competencies and other 'desired' knowledges and skills by governments is that they are done for good political reasons — rather than on educational grounds. Clearly this 'functional mathematics' is designed to meet the needs of employers [usually expressed by the representatives of big business]. It has obviously left out any of the aesthetic side of mathematics, to begin with. Although it supports analytic and reasoning skills, I imagine that it excludes employing these skills to critique the poor quality of management that is well documented in the UK and elsewhere, and even to critique the government itself. It does not take any account of the hard-to-fill jobs which are so boring that no-one will apply for them, except illegal immigrants (personal communication from Ewart Keep, SKOPE, Warwick Business School).

Even though this is a discussion on 'numeracy' the group acronym, EMMA, includes 'mathematics'. So that we, as members of the EMMA Discussion Group, don't run around 'chasing our tails' I propose that each person use the nomenclature adopted in their home country and, where possible, give short official examples — as you have thoughtfully included — to enable a deeper interpretation and closer analysis.

 By **David Kaye** on Tuesday, March 14, 2006 - 01:52 pm:

Dear All,

Sorry to have taken so long to join in the debate - I hope this is a positive intervention, though I find it quite worrying!

Thank you Gail for setting out your revised definition of numeracy in relation to mathematics. I like the idea of converting the vertical and horizontal discourses of Bernstein into axes. I may well be inspired to have a go at plotting definitions (of numeracy) on it. However, I must admit I am not very familiar with Bernstein's work, and so I have a bit of running to do to catch up.

What I want to add to this discussion at this moment is the "debate" that is taking place in the UK about "Functional Maths". Tine and Lena have referred to one aspect of numeracy as consisting of "functional mathematical skills and understanding", in explaining their interpretation of the term numeracy (in their 2001 publication 'Numeracy as an Analytical Tool in Mathematics Education and Research'.) Also Mieke has referred to "functional numeracy" as the middle of three levels of numeracy, the others being 'elementary and 'optimal' (in A Gateway to Numeracy, 2002).

However, in the UK I think there is a movement to replace 'numeracy' with the term 'functional mathematics'. This has arisen out of the debate to revise the 14-19 curriculum. The use of 'numeracy' for the adult sector has been included, as the debate is trying to encompass all mathematics education.

The introduction of 'functional mathematics' is part of a wider re-definition of a curriculum, introducing 'Functional Skills'. This is aimed at the 14-19 age group, and one reason for it is to address concerns expressed by employer organisations about a lack of skills in school leavers, appropriate to work.

The definition of Functional Skills is given as:
Functional skills are those core elements of English, maths and ICT that provide an individual with the essential knowledge, skills and understanding that will enable them to operate confidently, effectively and independently in life and at work. Individuals of whatever age who possess these skills will be able to participate and progress in education, training and employment as well as develop and secure the broader range of aptitudes, attitudes and behaviours that will enable them to make a positive contribution to the communities in which they live and work

The definition of Functional Maths is given as:

Each individual has sufficient understanding of a range of mathematical concepts and is able to know how and when to use them. For example, they will have the confidence and capability to use maths to solve problems embedded in increasingly complex settings and to use a range of tools, including ICT as appropriate.

In life and work, each individual will develop the analytical and reasoning skills to draw conclusions, justify how they are reached and identify errors or inconsistencies. They will also be able to validate and interpret results, to judge the limits of their validity and use them effectively and efficiently.

The introduction of these terms arises from discussions within the UK government Department for Education and Skills (DfES) and the Qualifications and Curriculum Authority (QCA), They are therefore being used as official terminology, and are likely to be linked to national qualifications from 2007.

I think we need to consider, and make explicit, why we want to continue to use the term 'numeracy', and why we think that re-defining mathematics, by adding a term like 'functional' does not do the same thing. I think this is some old territory for us, but I think

we cannot ignore this movement trying to avoid the term 'numeracy'.

If you wish to follow up further functional mathematics, there is currently an online consultation, which gives further information about it. Follow the following link

http://www.qca.org.uk/15895.html

I hope this is a useful and relevant intervention, and welcome your comments on this development.

By **Gail FitzSimons** on Tuesday, February 21, 2006 - 10:00 am:

Dear Tine, and all
I really appreciate very much your comments - particularly at this stage of my research when I am finalising the evaluative framework prior to trialling. They have come at exactly the right time!

I hadn't thought of putting the vertical discourse and horizontal discourse on separate axes [cf x-y axes]. I'll have to give this some more thought - and of course, am happy for you to do so too!

I agree that the term 'everyday mathematics' is not helpful - it can be used pejoratively [like 'basic skills'].

I used the word 'transmission' deliberately because it is what Bernstein uses. Perhaps I was also being provocative in that enculturation is really transmitting [or passing on] accepted cultural norms and knowledges. Most formal mathematics classes have an intended outcome, even if they vary in the way this is pedagogically achieved. So, the teaching is 'transmitting' and the learning is 'acquiring' in Bernstein's terms, or 'developing' in activity theory texts.

By **Tine Wedege** on Thursday, February 16, 2006 - 03:27 pm:

Gail's text is an extract from the paper entitled "An overview of adult and lifelong mathematics education", which contains a general analysis of the field. In order to make this analysis from a researcher's point of view, you make an analytical distinction between mathematics and numeracy using Bernstein's framework. I find your analysis highly interesting and relevant and I have found inspiration in your work when analysing different concepts of mathematical competence or competency.

I read your text like this: you try to catch the essence of (all) discourses on adult numeracy in one discourse characterised as being horizontal versus the essence of (all) discourses on mathematics being vertical. If we pick up a single definition of numeracy, like Lena did, it will be possible to locate this definition within the space stressed between these two axes.

This is the double sided definition of numeracy referred to by Lena:
- Numeracy consists of functional mathematical skills and understanding that in principle all people need to have.
- Numeracy changes in time and space along with social change and technological development. (Lindenskov and Wedege, 2001:5) Here, adult numeracy is situated within a

certain society and a certain culture at a certain stage of technological development. It is defined as functional skills and understanding (= competence) that is needed in society. Thus, the requirements from society, labour market, democracy etc. and the personal needs in relation to these requirements define adult numeracy.

I agree with Lena when you say that any concept of numeracy is descriptive and/or prescriptive (or "normative" as I prefer). However, I find that the definition above is descriptive as we don't define what kind of mathematics that is needed. On the other hand, when we talk about numeracy teaching in formal education, like we did in Denmark, we define the concept in a normative way through the curriculum.

Here is what I would call a normative definition of numeracy: To be numerate is more than being able to manipulate numbers, or even being able to 'succeed' in school or university mathematics. Numeracy is a critical awareness, which builds bridges between mathematics and the real world, with all its diversity. (Johnston, 1994:34) And here is another descriptive definition: To be numerate means to be competent, 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 defree of accuracy is appropriate, and what the answer means in relation to the context. (Coben, 2000:35).

Lena states: "As I see it right now from the Danish context, I would prefer the notion 'everyday mathematics' for what Gail terms as 'numeracy'" I don't quite understand what you mean by the Danish context and I am not sure that it is a good idea to introduce "everyday mathematics" in this phase of the discussion.

However, I am not sure that what Gail is working on is really a definition? As stated above, I see your work as an attempt to characterise numeracy in relation to mathematics ("Numeracy cannot … Numeracy is not …"). In your paper presented in TSG6, you refer to a series of definition and use of different concepts of numeracy that you don't include in this short paper and your characteristics are to embrace them all. Did I understand you right?

And finally a "PS": Gail, I don't understand your choice of word: "… the transmission of formal mathematics knowledge …". Do you really mean "transmission"?

By **Lena Lindenskov** on Tuesday, February 14, 2006 - 08:53 am:

As I see it right now from the Danish context, I would prefer the notion 'everyday mathematics' for what Gail terms as 'numeracy', and the term numeracy I would use as covering math-containing competence that is relevant for in principle all citizens. That means that I would like to reserve the term everyday mathematics to a descriptive/analytical concept, while numeracy for me is both a descriptive and a prescriptive concept. As a prescriptive notion I think that also a detailed discussion of 'transfer'-issues is necessary.

By **Gail** on Friday, February 10, 2006 - 12:21 pm:

Short Definition of Numeracy

Gail E. FitzSimons

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Australia

Following Bernstein, numeracy is a horizontal discourse which draws upon foundations of mathematical knowledge developed by individuals over a lifetime of personal experience and enculturation but which, unlike the vertical discourse of the discipline of mathematics, relies on common sense and is context-specific and -dependent, directed towards the achievement of specific, immediate, and highly relevant goals.

Ultimately, the learner will be expected to develop a repertoire of context-dependent strategies, based on experiential learning from a more 'knowledgeable' person (or persons) in a given situation, where achieving the task itself is the priority — not the learning of mathematics per se. The teaching of the discourse of mathematics alone (even with 'applications') can never guarantee a numerate person.

 By **JM** on Thursday, February 09, 2006 - 11:20 am:

Hi all,

did you read the discussion about numeracy on the ALM website? Please have a look at
http://www.alm-online.org/
and select ALM Discussion on the left side.

Juergen