

Mathematical Literacy – mathematics and/or literacy: what is being sought?

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Introduction

Mathematical Literacy was introduced as an alternative option to Mathematics in the Further Education and Training (FET) phase (Grades 10-12, learners generally aged 15-18) in South Africa in January 2006. As a new subject in the FET phase, and with aims that differ somewhat from the notion of mathematical literacy that figured within the Mathematical Literacy / Mathematics / Mathematical Sciences (MLMMS) learning area in the General Education and Training (GET) phase, teachers are faced with implementing a subject which does not have established aims, understandings and practices associated with it. In this paper I use empirical data to present two agendas – mathematics and literacy – that two teachers I collaborate with are drawing upon in different ways, according to their interpretations of putting policy into practice. These empirical data are located within a trajectory of research in mathematics education in South Africa that has pointed to problems when attempts have been made to link mathematics with other agendas – the need for relevance being a prime example. Many of these critiques have raised the issue of the ‘displacement’ of mathematics when other agendas are brought into the arena.

In contrast, I will argue here that the empirical data from Mathematical Literacy lessons point to ways in which ‘tweaking’ the flow of questions and activities can allow for a productive integration of mathematical and literacy-oriented agendas, with each agenda working to bolster, rather than distract from, the other. The Mathematical Literacy curriculum statement defines the subject in the following terms:

Mathematical Literacy provides learners with an awareness and understanding of the role that mathematics plays in the modern world. Mathematical Literacy is a subject driven by life-related applications of mathematics. It enables learners to develop the ability and confidence to think numerically and spatially in order to interpret and

critically analyse everyday situations and to solve problems. (Department of Education, 2003a: 9)

This definition, with its emphasis on enabling learners to act in ways that involve awareness of the roles and uses of mathematics, and an inclination and ability to think mathematically and use mathematics in real-life, shares much in common with contemporary notions of ‘literacy’. Gee’s (2001) discourse-based definition of literacy relates to “the mastery of or fluent control over a Secondary discourse”. ‘Secondary’ discourses are “ways of being in the world” that are purposively promoted or pursued, often within the school context. They differ from ‘primary’ discourses, Gee’s term for discourses that are naturally acquired through a person’s initial ways of understanding and interacting in the world. This definition of literacy emphasises behaviour and identity, and whilst knowledge is implicated within both the Mathematical Literacy definition and Gee’s definition of literacy, both notions of literacy emphatically involve more than acquisition of content. Walsh (1991) also places emphasis on understanding and interpreting the world within her description of literacy as:

A creative activity through which learners can begin to analyse and interpret their own lived experiences, make connections between these experiences and those of others, and, in the process, extend both consciousness and understanding. (1991: 6)

The links between the curricular definition of Mathematical Literacy and these broader understandings of how literacy is comprised are unsurprising, given the overt acknowledgement of Gee’s notion of literacy within the Organisation for Economic Cooperation and Development / PISA notion of mathematical literacy (Organisation for Economic Cooperation and Development, 2003), which in turn has been acknowledged as an important source of ideas about how the Mathematical Literacy subject area has been constituted in South Africa (Department of

Education, 2007). The sense that Mathematical Literacy involves acquiring the mathematically literate discourses required for constructive and critical participation in, and interpretation of, the practices related to the future life roles of learners – a self-managing person, a contributing worker, a participating citizen (Department of Education, 2003a: 10) – is therefore foregrounded in the definition and preamble to the curriculum specification within this document. This agenda differs in important ways from the agenda driving Mathematics as a subject in the FET phase. Mathematics is defined in its FET curriculum statement as follows:

Mathematics enables creative and logical reasoning about problems in the physical and social world and in the context of Mathematics itself. It is a distinctly human activity practised by all cultures. Knowledge in the mathematical sciences is constructed through the establishment of descriptive, numerical and symbolic relationships. Mathematics is based on observing patterns; with rigorous logical thinking, this leads to theories of abstract relations. Mathematical problem solving enables us to understand the world and make use of that understanding in our daily lives. Mathematics is developed and contested over time through both language and symbols by social interaction and is thus open to change. (Department of Education, 2003b: 9)

Whilst the notion of mathematics as a subject with applications in real-life is mentioned, emphasis is laid on abstract rather than concrete concepts, on intra-mathematical connections rather than mathematics-real-world connections, on rigour and logic rather than interpretation and critique, and on knowledge itself, as well as applications of knowledge.

I am not suggesting here that mathematics curricula do not require literacy in Walsh's sense of analysing and interpreting situations. I am however pointing to the extensive body of evidence that suggests that mathematical learning is often restricted to the acquisition of content with little room for sense-making and interpretation of problems (Mukhopadhyay & Greer, 2001; Schoenfeld, 1985). Many critiques have argued for a more literate agenda within mathematics, such as Kilpatrick, Swafford, & Findell (2001), in order to facilitate flexible conceptual understanding and the willingness to make sense of situations alongside procedural fluency. In this paper, the mathematical

agenda refers therefore to the more restricted (but widely prevalent) emphasis on mathematical content and procedures.

Critiques of the Mathematical Literacy curriculum statement, for example, AMESA (2003), have pointed out that the curriculum specification (detailed largely in terms of mathematical content) conflicts with, and runs the risk of derailing, the broader literacy-focused agenda in which acquisition of content forms just one part. Thus, within the Mathematical Literacy curricular documentation there are tensions between whether Mathematical Literacy should focus more on furthering a mathematical agenda in terms of extending the learning and understanding of mathematical content, or a literacy agenda that suggests the need to develop learners' willingness and ability to use mathematical thinking to analyse, interpret and solve problems in increasingly complex contexts. In spite of this conflict between the tone of the policy texts and the nature of the curriculum specification, the overall signals tend to state that the two agendas – developing mathematics and developing literacy – need to be balanced and can, and should, be integrated:

The challenge for you as the teacher is to use situations or contexts to reveal the underlying mathematics while simultaneously using the mathematics to make sense of the situations or contexts, and in so doing develop in your students the habits or attributes of a mathematically literate person. (Department of Education, 2006: 4)

This debate on whether a mathematical agenda can and should be brought together with the literacy agenda forms the focus of this paper. I consider the ways in which the introduction of Mathematical Literacy in the FET phase, with aims that differ from those associated with Mathematics, might provide openings for the linking of the 'mathematical' and 'literacy' agendas.

In order to consider this question, I detail some of the positions that have been taken up in previous South African debates on whether mathematics can be linked with other agendas. A key antecedent with associated literature was the attempt to shift towards a more 'relevant' Mathematics curriculum within Curriculum 2005 in the General Education and Training phase. Much of this writing (though not all) pointed to the incommensurability of the 'mathematics' and 'relevance' agendas, providing examples of the 'hollow' use of 'relevant' problems. However, this debate was located within a curriculum that was firmly rooted in a

mathematical agenda, so part of my aim is to consider the ways in which Mathematical Literacy teaching may change the terms of this debate.

In the body of this paper I present two excerpts of Mathematical Literacy teaching drawn from research exploring the implementation of Mathematical Literacy in schools, in which I have been involved through the Marang Centre at Wits University. The first excerpt shows a teacher foregrounding a more mathematical agenda; the second shows a teacher foregrounding a more literacy-focused agenda, but with the mathematical features somewhat backgrounded. This format may suggest that my aim is to add evidence into the ‘incommensurability’ claim mentioned earlier within the contours of Mathematical Literacy. This is not the case. In the analysis that follows the two excerpts, I provide evidence, from teachers’ comments and from other classroom observations, to argue that these excerpts are better interpreted as ‘near misses’ rather than ‘incommensurability’ in terms of integrating the mathematical and literacy-based agendas, and that the contrasts of foreground reflect differing understandings about what Mathematical Literacy is about. Greeno (1998) developed the notion of ‘attunements’ – “regular patterns of an individual’s participation” – to environmental ‘affordances’ and constraints, which reflect historical routines of practice based on these understandings to explore interactions in teaching and learning environments.

The two excerpts in this study detail contrasting ‘attunements’ relating to what should be aimed for in Mathematical Literacy, with understandings that draw upon educators’ priorities – or deficiencies – in the context of their prior experiences of Mathematics teaching. A ‘near miss’ perspective, rather than simply highlighting an absence of mathematics, allows me to highlight what *is* achieved in class in relation to teacher’s aims. I also identify gaps in terms of what might be possible with better integration of the two agendas.

Both educators whose teaching is presented in this paper saw the need for mathematics and literacy to be developed, and during the course of 2006, I observed some lessons in which integration of the two goals was closer to being attained and others in which one or the other agenda took precedence. I conclude that educators should aim to improve awareness of the twin agendas at work, and improve the flow of questions and activities. In this way, both of the approaches presented in the excerpts can better achieve the kinds of integration

suggested in the definition of Mathematical Literacy and in other related policy documents.

Integrating agendas – historical antecedents

Questions were asked regarding the role and function of mathematical knowledge and skills in relation to their integration with other agendas, in the context of a shift to a more ‘relevant’ Curriculum 2005. In that debate, some argued that the mathematics and relevance agendas were focused on fundamentally different goals, and hence, could not be reconciled – the ‘incommensurability’ claim (Davis, 2003). Others, while tentatively supporting the shift to Mathematics teaching and learning that highlighted the links between mathematics and the real world, pointed out the dangers of either agenda taking precedence (Sethole, 2003), or more pessimistically, of the mathematics becoming ‘lost’ (Adler, Pournara, & Graven, 2000) – an issue that is considered later in this paper in relation to the literacy agenda.

Whilst not related directly to the introduction of Curriculum 2005, Barnes’ (2005) research on Realistic Mathematics Education (RME) advocated the use of a relevant, experientially real context as a starting point for the process of mathematisation, and highlighted their role in helping learners make sense of a situation. Although RME is closest to the literacy agenda within Mathematical Literacy, it needs to be remembered that this approach is firmly focused on a mathematical agenda in which contexts are viewed largely as vehicles for progressive mathematisation. This differs from the emphasis of the Mathematical Literacy policy documents on inculcating attitudes and behaviours that quip learners for participation in future life roles.

The South African literature thus provides a mixed message regarding the useful integration of mathematics with other agendas, and alerts the reader to the mathematical emphasis of previous efforts.

Research outline and data sources

The two excerpts of teaching presented in the following section were drawn from a longitudinal study of policy implementation in one inner-city Johannesburg school in which three Mathematics educators taught the three Grade 10 Mathematical Literacy classes. The research involved weekly observations in all three classes during the course of 2006. Field notes were taken during each observation, records were kept of informal

conversations with the educators, and copies of tasks and materials given to learners were collected. Semi-structured interviews were conducted with these educators in the fourth semester; these were tape-recorded and transcribed. Additional comments are incorporated from a focus group interview that was conducted in the fourth semester which included the two main teachers.

The excerpts presented in this paper, both taken from lessons that took place in October 2006, present examples of the foregrounding of a mathematical agenda by one educator, and an emphasis on literacy – over mathematical thinking – by the other. Whilst neither excerpt can be described as ‘typical’ of the educators’ teaching, their differing agendas were more evident in their reflections on the policy. Their understandings of and priorities in implementing Mathematical Literacy are considered in relation to an analysis of their different approaches to implementation. Pseudonyms are used throughout.

Excerpt 1

Charles Naughton, an educator with 25 years’ teaching experience in Mathematics and Science at FET level, had been at the school for nine years. He had decided to do a lesson on the use of percentages, because learners had struggled to understand the topic in the previous lesson. His class consisted of 24 learners, 12 male and 12 female, all black. Charles had, at several points in the course of the year, taken time to go back over aspects of relatively basic mathematics that had emerged as problematic within lessons. For example, I observed lessons on understanding concepts related to decimals, and a lesson working on the meaning of ‘per’ across a range of problems (for example, kilometres per hour).

As learners entered, Charles wrote a title on the board: ‘All the ways of using percentages’. He then said to the class ‘Make up an example of turning a fraction into a percentage, an everyday example’. Faced with silence, he added ‘Look around the class. Think of something that might be different here’. A boy responded ‘boys and girls’. Charles, standing at the board, nodded and said ‘Yes’. He asked the class how many girls were in the group. Learners began looking around and counting. Initially, the answers called out most insistently were 11 girls, 12 boys, and he wrote on the board:

$$\begin{aligned} G &= 11 \\ B &= 12 \end{aligned}$$

A girl then called out that there were actually 12 girls in the group. Charles responded: ‘No, that’s too easy. Let’s say that there are 10 girls and 12 boys.’

Changing the numbers written on the board accordingly, he then went on to ask the class what fraction of the class were girls and what fraction were boys, and, following their answers, wrote down on the board:

$$\text{Fraction of G} = \frac{10}{22}$$

$$\text{Fraction of B} = \frac{12}{22}$$

He then asked, “How do we change these to a percentage? For example, if the proportion stayed the same, but the numbers changed, what percentage would be girls?” After 30 seconds, a learner who was using a calculator volunteered an answer. Charles wrote the learner’s method and answer on the board:

$$\begin{aligned} G &= \frac{10}{22} \times \frac{100}{1} \\ &= 45,4 \\ &= 45\% \end{aligned}$$

Excerpt 2

Freddy Dube is the Head of Mathematics, and elected to teach Mathematical Literacy in Grade 10. He attended provincial Mathematical Literacy training in 2005 and 2006, and has completed an Honours course which included Mathematical Literacy modules. He has taught Mathematics for nearly 10 years, across Grades 8-12. His class consisted of 26 learners, 14 boys and 12 girls, all black. Across the year, Freddy had drawn from a range of different resources to provide or design ‘real-life’ problems. For example, he used newspaper articles about the effects of heavy rainfall on South African dam levels, bank pamphlets about loan repayment rates, and a Mathematical Literacy textbook to work out floor areas on house plans.

Freddy settled the class to silence and then switched on the overhead projector. He showed the class a transparency (Appendix 1) detailing Body Mass Index (BMI) information – which he had photocopied from the Teacher Guide (Department of Education: 2006, 25) – and then wrote on the board:

$$\begin{aligned} \text{BMI} &= \frac{\text{body mass (kg)}}{\text{height}^2 (\text{m}^2)} \\ \text{BMI} &= \frac{\text{body mass (kg)}}{\text{height}^2 (\text{cm}^2)} \times 10\,000 \end{aligned}$$

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Freddy explained that BMI is commonly used to judge whether a person is over- or underweight, and then went through the text and figures on adult BMI on the transparency. He added that there were separate BMI graphs for boys and girls.

Twenty minutes into the lesson, he gave out a worksheet with the transparency information on one side (Appendix 1), while on the other side were the two BMI formulae which he had written on the board, together with examples of how to use them and some tasks that he had devised (Figure 1). Asking the class to focus on the first task (calculate your teacher's BMI), he wrote his own weight and height on the board as follows:

$$\text{Mass} = 67\text{kg}$$

$$\text{Height} = 1,7\text{m}$$

Freddy then asked the class to calculate his BMI using the first formula on the worksheet. Not all learners in the class had a calculator, but most could observe one being used at their table. The class began to calculate his BMI, and after looking over individuals' work, Freddy wrote on the board:

$$\text{BMI} = \frac{67\text{kg}}{(1,7\text{m})^2}$$

He asked the class for answers. '39,4' was the first response, and he wrote '= 39,4 kg/m²'

underneath. He then asked the class what advice they would give him based on this figure. Individual learners began scanning the information given on the BMI ranges. Some started laughing, saying, "Sir, you're obese". Others called out "Use Bio-slim" and "Not eating". Their laughter was due in part to the fact that Freddy is very slim. At this point, Freddy commented, 'Well, you can't always tell about someone's BMI just by looking at them', and noted too that there were categories of people that fall outside BMI scales, such as pregnant women. As the class began their own discussions around this, he asked them to work in groups and calculate each of their BMIs. As they did this, one learner pointed out that the answer given for Freddy's BMI was incorrect. He asked the class to recalculate, and as they worked, Freddy suggested that those working with scientific calculators could use the exponent key, and those without would have to do the multiplication manually. He wrote on the board:

$$(1,7\text{m})^2 = 1,7\text{m} \times 1,7\text{m} = \underline{2,89 \text{ m}^2}$$

$$\begin{aligned} \text{BMI} &= \frac{67 \text{ kg}}{2,89 \text{ m}^2} \\ &= \underline{23,2 \text{ kg/m}^2} \end{aligned}$$

Answers were contributed by the learners at

Body Mass Index – formula
The formula for calculating BMI is:

$$\text{BMI} = \frac{\text{weight (kg)}}{(\text{height (m)})^2} \text{ or}$$

$$\text{BMI} = \frac{\text{weight (kg)}}{(\text{height (cm)})^2} \times 10\,000$$

Illustration

- The BMI of an adult who weighs 86kg and who is 1,80m tall is:

$$\text{BMI} = \frac{86}{(1,80)^2} = 26,5 - \text{overweight.}$$
- The BMI of an adult who weighs 58kg and who is 1,63m tall is:

$$\text{BMI} = \frac{58}{(1,63)^2} = 21,8 - \text{in the healthy weight range.}$$

Body Mass Index – interpreting the graph
A 13 year old boy who weighs 46kg and is 1.52m tall has a BMI = 19,9 i.e. BMI ≈ 20.
If you plot the point (13; 20) on the graph you will see that it lies between where the graph labelled 50 and the graph labelled 75 cross the 13 year old (vertical) line. This means that this boy's BMI is within the 50th to 75th percentile range for 13 year olds.
If a 13 year old boy's BMI is at the 25th percentile then it means that 25% of all 13 year old boys are lighter than him and the other 75% are heavier than him.

Task 1

- 1) Determine whether your ML teacher is overweight or not.
- 2) What advice can you give him/her?
- 3) Determine whether your group members are overweight or not, including yourself.
- 4) What advice can you give them if they are overweight?

Task 2 (data collection)

- 1) Collect weight and height of at least 15 adults/ young adults.
- 2) You can start collecting data from school

Figure 1. Worksheet with formulae and classroom tasks.

each stage underlined above, and Freddy concluded that he fell within the ‘healthy weight range’. He then asked the class to proceed with the subsequent tasks on the worksheet.

Analysis

Both excerpts provide examples of teacher decision-making within the flow of classroom activity. Stein, Smith, Henningsen and Silver (2000) have stressed that looking at tasks alone is insufficient, since the nature and demand of tasks are frequently altered significantly during implementation:

As mathematical tasks are enacted in classroom settings, they become intertwined with the goals, intentions, actions, and interactions of teachers and students. (2000: 24)

While Stein *et al.* were concerned with changes in the demands of tasks, my interest is in how the actions and interactions detailed above reveal the goals and intentions of the two teachers. Both excerpts share a largely educator-led format, in which learner contributions were both expected and encouraged – this latter feature was reflected across almost all the lessons I observed with both teachers throughout the year. In addition, the pace in both excerpts was unhurried, an aspect that both educators found possible within their Mathematical Literacy teaching, in contrast to the content-laden, time-restricted pressures that constrain their Mathematics teaching.

Both educators try to set up their task in terms of a situated problem. In Charles’ case, learners are asked to calculate percentages based on a feature in their classroom, and are cued further to include the concept of ‘difference’. Freddy’s task is located in the context of BMI, with relevant information presented in text, graphs and equations. It is interesting to note that Charles begins by highlighting ‘percentages’ on the board, and then suggests a context within which percentage can ‘occur’, whereas Freddy first introduces the BMI concept, followed by the use of graphs and equations within this context. This contrast in ‘attunements’ – to mathematics in Charles’ case, and to an emphasis on *interpreting* answers in the context of the situated problem in Freddy’s case – persists across the excerpts and more widely across their teaching.

Charles – Excerpt 1

Charles’ decision-making within the lesson flow (Excerpt 1) suggests that his aim is to focus on checking, revising and teaching the procedure for

turning a fraction into a percentage. Thus, when ‘real-life’ provides him with equal numbers of boys and girls in his class – a scenario which opens up the possibility for learners to guess, remember or understand that this would be equivalent to 50% – without recourse to the procedure – he rejects these data in favour of ‘made-up’, unequal numbers producing fractions that *require* the procedure if they are to be converted into percentages. The procedure is asked for, carried out and checked, and passing mention is made of proportionality as a rather contrived motivation for why percentage might be useful to work out, although this is not dwelt upon. Charles’ concern with a mathematical agenda, with mathematical concepts and connections, has been voiced frequently during the course of the year:

I keep on wanting to help them achieve the actual mathematics.

This point came across in his reference to a task involving cell phone tariffs during the focus group interview, where he felt that the ‘realistic’ complexity of the numbers involved in the call rates tended to obscure the mathematics:

I’ve also felt all the way along that using numbers like 28,76 cents per call or something was not necessary at this early stage. We should still be keeping things simple so they see how it works rather than get confused with those actual numbers, you know, like on the price of a cell phone call.

The literacy agenda here is not being dismissed but it is being deferred because it is considered too complex for the present, and a distraction that prevents learners from seeing the underlying (mathematical) structure of the situation.

Freddy – Excerpt 2

Freddy’s awareness and use of ideas from a wide range of sources, including the policy documents, is evidenced when he draws from an exemplar unit in the Mathematical Literacy Teacher Guide document (Department of Education, 2006). In his opening exercise, Freddy draws attention to the text and context of BMI, going through the contents of the overhead, and at times adding further explanation. The formulae written on the board are introduced, but not worked through – he writes down his height and weight and asks the class to use the formulas to work out and interpret his BMI. When an answer is provided, Freddy’s attention shifts directly into asking the class to interpret and understand this answer in context – an activity that most learners participate in actively

and succeed in doing. However, neither the structure nor the calculation procedure is interrogated at this stage. This suggests either an assumption that the answer offered is correct, or an ‘attunement’ which is much more focused on encouraging learners to interpret answers in relation to the information that is provided on the worksheet. When asked on other occasions about his views on Mathematical Literacy, Freddy has stressed the importance of interpreting and understanding the context:

In Maths Literacy, we try by all means when we are teaching, we try to involve some real life situations so that learners can see the meaning of Maths Literacy. And we should actually – it does not actually force them to remember the rules and laws that they've learnt from their previous grades, such as grade nine. They just come up with their own ways of solving problems.

It is interesting to note here that learners in the class do pick up on the fact that the answer they have got doesn't connect well with ‘reality’ – Freddy's size does not indicate obesity – and offer an alternative answer. A need to make sense of the situation, to make the mathematics connect to the context, is clearly present within the classroom in spite of initial lack of attention to the mathematical aspects.

General discussion

Several avenues are available in both of these excerpts to ‘add in’ and integrate the backgrounded agenda. The question in this paper addresses the way in which a more integrated approach might affect both the educator's existing agenda and the backgrounded agenda.

In Charles' case, the initial answer of equal numbers of girls and boys could have been followed up. Charles' assumption that someone in the class would have been able to understand that $12/24$ was equivalent to 50% was undoubtedly true, but what were the alternatives? A lesson with 10 girls and 12 boys could have been the situation in a previous lesson, for example, and the relevant gender fractions of the class could have been compared. The question could have been asked, “Today, 50% of the class is made up of girls. What percentage of yesterday's class were girls?” This would have opened up avenues for comparing $12/24$ with $10/22$, for comparing $10/22$ with $11/22$, and for comparing $11/22$ with $12/24$. In terms of sense-making, this opens up opportunities to reason and understand that $10/22$ must be less than

50%, to estimate that the answer is probably only a *little* less than 50%, and also opens up a motivation for *why* the concepts and procedures related to percentages might be useful in this context as a tool of comparison. The procedure can then be checked, revised and taught, as occurred within the lesson. Such questions are not significantly different from those posed by Charles, but they are guided by the twin aims of promoting mathematical learning and a sense of literacy in terms of making sense of the situation.

Similarly, in Freddy's case, if some of his alertness to the need to understand the meaning and consequences of numbers in the context of BMI had been focused on encouraging the class to either understand the structure of the formula, and/or to estimate the likely answer before calculating and to checking the answer given, sense-making would have been better supported. Furthermore, some discussion about the structure and procedures associated with the BMI formula could have promoted a linkage to concepts relating to concentrations and density – and ratio and proportion, which are likely to feature in other Mathematical Literacy lessons. It would also have allowed for discussion about the historical development and use of the BMI concept and its implications. Once again, these possible adjustments do not represent major changes to the flow of the lesson in both cases. More importantly, the broadening of the scope of questions, whilst allowing an alternative agenda to figure, works also to support the educator's foregrounded agenda.

Conclusions

In discussing the differences between literacy and language, Gee (2001) emphasises that literacy involves more than a mastery of the language's grammar – its associated rules, procedures and syntax. By way of parallel, Mathematics education is replete with evidence suggesting that an emphasis on the rules, procedures and syntax is predominant in a range of countries (Schoenfeld, 1985), and has led to widespread concerns about learners' ability to use and apply mathematics to make sense of situations (Smith, 2004; Steen, 2001). Much of the South African literature related to debates around relevance suggests that linking mathematics with other agendas is problematic. Adler *et al.* (2000) present a number of vignettes with varying degrees of linking, and conclude that whilst integration remains desirable, the aims and conditions of mathematics teaching make it difficult, if not impossible to achieve:

This all suggests that the promises of the new curriculum might be unfounded and that what might be desirable at the level of policy and advocacy might not be feasible at a practical or a theoretical level. (2000: 12)

Adler *et al.*'s suggestions for supporting teachers in acquiring the requisite skills for more relevant Mathematics teaching include "more realistic time frames" and the increased use of "integrated mathematical tasks". The Mathematical Literacy policy documents advocate the common use of such tasks, and the comments of both teachers indicates that a less congested curriculum has provided them with more time and space than was available in their Mathematics teaching.

In this paper I have attempted to use the empirical data to demonstrate that the mathematics and literacy agendas are not incompatible. I would argue that the excerpts point to a need for improved awareness of the different ways of thinking about the agendas that underlie Mathematical Literacy – and Mathematics – teaching. This awareness can then be followed up with practical solutions for extending teaching repertoires to integrate mathematics and literacy agendas in ways that support rather than detract from either agenda in isolation. The evidence presented here further suggests that the implementation of Mathematical Literacy in South Africa may provide fertile ground for locating a mathematical agenda within the broader notions of sense-making and interpreting the world that constitute the notions of literacy considered in this article.

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Appendix 1. Overhead transparency detailing Body Mass Index (BMI) information (photocopied by Freddy from the Teacher Guide, Department of Education: 2006, 25).

BMI (Body Mass Index) is a measure used by doctors to determine the best weight range for a person's health – it is an approximate measure of total body fat. It is calculated using a person's height and weight (see formula).

Although weight lifters, pregnant women and one or two other special categories of people are considered exceptions, a person's BMI relates quite closely to the amount of body fat that he or she has.

For adults a BMI of:

- below 18,5 suggests that you are very underweight or malnourished;
- under 20 indicates that you are underweight;
- between 20 and 24,9 corresponds to a healthy weight range for young and middle aged adults while a BMI between 23 and 28 corresponds to a healthy weight range for older adults;
- between 25 and 29,9 suggests that you are overweight; and
- over 30 indicates that you are overweight or obese.

For children under 20, doctors use the graph below to decide if a child is overweight, underweight or healthy. This graph is for boys, a similar graph exists for girls.

- If a child's BMI is greater than or equal to the 95th percentile, he or she is overweight.
- If the BMI is greater than or equal to the 85th percentile but less than the 95th percentile then the child is at risk of being overweight.
- If the BMI is less than the 5th percentile the child is underweight or malnourished.

