The Role of Statistics in Achieving Numeracy for All

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1. Numeracy and literacy

The key topic in this talk is *Numeracy*. What is numeracy?

The *Shorter Oxford Dictionary* ... doesn't have the word! But maybe that is expecting too much. What about *numerate*? For this we get, "*v.rare*. To number, reckon."

Webster's Dictionary ... comes a bit closer, still no *numeracy*, but the second given meaning of *numerate* is, "*Brit*: marked by an understanding of the scientific approach and the ability to think quantitatively". (It is interesting to note the Americans think the idea is British, while the British do not seem to know about it!)

So what can we make of all this? I fear we must conclude that the concept of numeracy is not at all widespread, as there is not even a perceived need for a word definition.

This is *really* what I want to address - the passive acceptance that numeracy is not very important. And I also want to offer a suggestion about how we might overcome this problem.

The word *literacy* is well described in both of the dictionaries consulted. Our society accepts the fact that the quest for literacy - learning to read and write - is a crucial element of education and I certainly do not argue with that. What I do argue is that we need more than literacy. We live in an age when qualitative understanding is not enough. Numbers and measures are everywhere. We need *numeracy together with literacy* as joint crucial elements of education for the 21st century.

How did literacy become so accepted? It certainly wasn't always the case. Literacy for all is a modern phenomenon which only became widespread not long before the beginning of this century. Before that there was a time when literacy was considered unnecessary and indeed "too hard" for the masses - only important for an elite group who "needed it" to do their "high-level" work.

Then there was a grass roots change, probably sparked off by the mass availability of printed material, like newspapers, etc., for ordinary people. Literacy was recognised as the *key to opportunity* for the rising generation. Parents began to say, "We want our children to learn to read and write".

There are parallels with the progress of numeracy. Currently in our society there is a widespread belief that numeracy skills are only really available to those of "exceptional talent". It is considered "too hard" for the masses and besides only really "needed" by an elite few to do their "high-level" work. In keeping with this myth we have a society of people who are comfortable saying, "I was hopeless at maths at school" and laughing. How many people do you hear boasting they were hopeless at reading?

Numeracy skills, obtained by the few through coming to grips with mathematics, are in dire need today, let alone tomorrow. We have only to think of the explosion in digital computing - note the word *digital*. Central to their operation is the use of numbers. Those who are fazed by numbers will almost certainly feel threatened by computers. There are flow-on effects of computers also. More and more of the information we need to perform our daily tasks comes to us in some numerical form through computers. Computers can and do churn out graphs on virtually anything, including garbage. Could it be that the development of computing is changing society's needs just as the development of printing did? Could it be that numeracy is becoming the *key to opportunity*? As an aside, I find it an interesting quirk of fate that the very thing that should cause us to step up our efforts to have children develop numeracy skills has been a major reason why the only numeracy skill we ever focussed on in the past (arithmetic) has been significantly de-emphasised lately.

In years to come it may be possible to identify the 1990s as the time when the grass roots saw the need for change and asked educationalists to apply as much vigour to the quest for numeracy as they apply to the quest for literacy. This mood is not upon us yet, but it could be if we gave the idea a bit of a lead.

There is already a will amongst New Zealand teachers to see a change. Children at school are constantly exhorted to "keep up their maths". They are constantly told "maths is important". You will hear parents saying this too. But somehow the message isn't getting through. In fact, fewer and fewer young people are being attracted to mathematics at the tertiary level and students are therefore coming through the system into all walks of life without the knowledge that enables them to learn numeracy skills. Some say many of the capable students are being lured by the promise of "big bucks" into business administration and economics. But I believe there is another more fundamental process going on. Mathematics is largely seen as irrelevant today and I believe this perception is linked to how it is taught. Yet mathematics is currently the avenue through which the lucky few gain general numeracy. May this be why numeracy is not seen as important?

What can we do? Literacy *is* seen as important so let us look at how literacy is taught. Reading and writing are *embedded* into all parts of the school curriculum and the advancement of reading and writing skills is fostered in *all* subjects. Accepting that numeracy skills come from facility with mathematics, let us look at how we currently teach mathematics. It is largely done in isolation from other school subjects as a set of abstract ideas. Could this be the problem? Those of you who are teachers know mathematics is in fact practical and you keep on *telling* your students this is so. But, is

telling really an effective method of getting a message across? I suggest most students are taking their lesson from the structure of the exercise rather than from the content. They see the whole area as irrelevant because they see it *detached.*

Why is literacy accepted as a basic requirement to progress in every subject area? Because it is acknowledged as *important for all.* Gaining literacy skills is *expected.* Small children are told reading is fun, reading is good, reading gives you information. Then these facts are *demonstrated* and constantly *re-iterated* and indeed *embedded* into the entire learning process.

Now use the parallel of learning to read and write for teaching numeracy skills.

We need to *expect* our children to grasp numeracy skills. We need to *demonstrate* and constantly *re-iterate* and indeed ensure that numeracy is *embedded* into the entire learning process.

2. The role of statistics

To achieve this embedding, and so have the opportunity to demonstrate and re-iterate, I suggest we use *Statistics.*

Statistics is the collection, arrangement and interpretation of numerical facts or data. Here we have the ideal vehicle for this transformation, the means by which we can *demonstrate* the relevance of numeracy skills instead of just calling for them. Note here that I am not talking about theoretical statistics, but about the sensible use of numbers, the use of display techniques such as graphs and charts, and the extraction of information from numbers. These ideas can and *should* be applied in *all* subject areas.

This is how we can make sure our material is constantly linked to real situations. However, rather than taking situations out of other subject areas and carrying them into the mathematics and/or statistics lessons, how about taking basic statistical tools into the fabric of all school activities? A simple tool to start with is graphical display of some factor of the class activity, for example sports results. Monitor them over time. Do the results appear to be changing? Can any observed change be related to other activities, events, etc.? and so on. Keep the focus on using different tools to enhance understanding and enjoyment of the subject in hand. Good factories have charts and graphs on the walls in all work areas. Why shouldn't good schools have the same? With proper encouragement from the mathematics and/or statistics teacher all manner of graphical displays could be achieved. From this sort of beginning more varieties of statistical investigation could be introduced.

With statistical investigation in place throughout the school, I am sure there will be a measurable surge in general numeracy skills as statistics provides the essential bridge between mathematics and everything else and gradually works to bring mathematics in from the cold.

If you are a mathematics and/or statistics teacher and if you agree with me that numeracy for all is a desirable goal, I suggest you give serious thought to adopting the four following practices.

(i) *Never miss* an opportunity to demonstrate the value and uses of quantitative reasoning.

(ii) *Expect* simple numeracy techniques to be grasped by all.

(iii) *Help* your colleagues in other subject areas to use simple statistical tools when they teach their classes (after all, you could reason, you give your statistics classes literacy practice, maybe they would like to give their classes numeracy practice).

(iv) *Be enthusiastic* in using numbers in *all* situations and at *all* levels. For example, opportunities for games abound and games can always be linked with numbers.

This, of course, is only a beginning, but beginning is probably all we can do at present. The magic pathway between the existing belief that mathematics is important, but only for some, and the widespread expectation of numeracy for all, will not be clearly visible until after the event. Therefore I suggest we do not wait until we can see the whole way!