

CAN WE COUNT ON MATHS?

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Would you like a hot dog? The Aboriginal man, who was on his first visit to a city and to whom the question was addressed, looked amazed and then responded, "Can I come and have a look?". He soon discovered that 'hot dogs' were not what his grasp of English and the mental picture it had conjured up - of a cooked canine - had led him to believe. A rather relieved young man enjoyed his first 'hot dog'. An amusing incident at the time, but how often do the words used in Aboriginal schools - particularly in maths lessons - evoke mental pictures or concepts that differ markedly from those of children who grow up speaking English and with a conceptual view of the world related to the western system of knowledge? What is perhaps even more alarming is that teachers are often unaware that this is happening, and when the child fails to act intelligently in certain situations the teacher often despairs and then gives up trying to teach maths effectively and concentrates on teaching 'sums', at which Aboriginal children, with their strong aural and visual memories, gain some measure of success. But such an approach, though measurable in school, fails to equip a child to operate mathematically in the real world where, for example, we meet our subtraction operations not clothed in the language of 'take away' and certainly never 'minus' but in comments like: "Red Cravats scored 32 and Waratahs finished 6 goals behind them," or "Nhulunbuy are at the top of the ladder with 34 points and Yirrkala are second with 29".

Maths, to be taught effectively in any community, has to begin where the children are, with the language and the knowledge to which their developing conceptual view of the world is related. It must move with the children as they develop mathematical concepts in relevant and meaningful situations which are organized for them in such a way that further mathematical ideas emerge. But is that what happens in Aboriginal schools? Most traditionally-oriented Aboriginal children speak a language other than English. They come to school with a developing conceptual view of the world related to an Aboriginal system of knowledge, and often have their

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first mathematical experiences in a language that they cannot understand, and in situations and with materials that often have little or no meaning to them. Where teachers fail to use concrete experiences and depend on verbal communication alone, the tale of the 'hot dog' is no longer cause for mirth but epitomizes the tragedy so often enacted in our schools during the teaching of maths. Perhaps an examination of some situations may help to increase our awareness of the confusion teachers so often create in the minds of Aboriginal children.

Counting is often thought of as the first mathematical idea, but Western (1979, p.6) reminds us that mathematics begins with classification and language. As a child sees that things belong together whether they be boys or plants or shells, and as he labels these groups he is on the way to developing an important mathematical concept. Classification or sorting are among the early mathematical experiences that we offer children in school, yet how often in Aboriginal schools is the content of the experience inappropriate to the children's experience of life? The materials we supply and the categories we suggest often lack meaning to Aboriginal children. 'Birds' and 'animals' are such obvious groupings for small children in our society but is that the way Aboriginal children perceive their world? At Groote Eylandt there is a generic term *wurratjitja* for flying animals - with butterflies, flying foxes and bats included - and that's not really quite what *we* mean by 'birds'. In a language spoken in North East Arnhem Land all animals, birds and reptiles that are hunted and eaten are grouped together and classified as *wayin*. How can children begin to sort out the confusions that occur and act intelligently if they do not share our classificatory framework.

Let us look at it from another angle. If I walked into an urban classroom anywhere in Australia and asked the children to group themselves into 'Yirritja' and 'Dhuwa' (the names of the moieties or 'halves' that divide the world of man and nature in Arnhem Land) they would look stunned, and yet any group of Aboriginal children from Arnhem Land would act spontaneously and intelligently in this situation. Moiety is a meaningful division within their culture that has been taught and reinforced from infancy and Aboriginal children quickly perceive the problem. Non-Aboriginal children may borrow the words 'yirritja' and 'dhuwa' for there are no English equivalents, but without the concept of moiety to give meaning to the words meaningless behaviour results.

This, of course, is the situation that so often occurs in Aboriginal classrooms when Aboriginals act as our interpreters or teach from a syllabus where the content has been prepared for non-

Aboriginal children or is related to a Western system of knowledge. Both Aboriginal teachers and children can frequently remain as unenlightened and behave as unintelligently as urban non-Aboriginal children faced with an exercise related to moiety even though the language of instruction is their own. One of the lessons we've had to learn in Bilingual Education in the Northern Territory is that change of language is not enough. If we are concerned with conceptual development and academic growth we must begin with the concepts inherent in the system of knowledge to which the Aboriginal language relates.

Some more examples may further clarify this point. A study of space is now considered an important area in mathematical education and it is an area in which Aboriginal children have a great deal of knowledge. Warlpiri children at quite an early age are familiar with a complex directional terminology and parents keep check on children's development in much the same way that non-Aboriginal parents do when they encourage children to count. Such cognitive starting points are ignored by most non-Aboriginal teachers who are often not aware of what the children actually know and find it difficult to operate in this way themselves.

Measurement and positional terms which are of great importance in Aboriginal society often vary considerably from those of the Western world. Objects that we would describe as heavy are often regarded by Aborigines as big, and a big fish is judged on width rather than length. In Gumatj (a N.E. Arnhem Land language) *djinawa*, which really means 'that the item is enclosed', may be translated into English by 'inside', 'behind' or 'under' and can cause linguistic interference for children, particularly if no effort has been made to help children be conscious of how they use their own language. In contrast Aboriginal people are much more precise in placing object in space; while in English we make do with 'here' and 'there' and perhaps use 'right over there' as well, most Aboriginal languages use up to five terms to more accurately indicate position.

Gay & Cole (1967, p.93) concluded their study on *The New Mathematics in an Old Culture*, with these words:

What then is to be done? Our basic recommendation is for the teacher to reverse the present pattern of education. Instead of using the traditional Kpelle authoritarian method of rote memory and imitation as a means of introducing the Western content, the teacher should use the Western, scientific method for comprehending, clarifying and organizing content drawn *directly* from the child's familiar, daily experience.

Many educators are not convinced by this approach and feel that it is too late for such measures in their communities where a sprinkling of English words have been absorbed into the Aboriginal language. The solution they propose is to continue ignoring the children's heritage and get on with English. Frequently such teachers are in another 'hot dog' situation and because the children are using English words they assume that these terms are continuing to function in the way they did in English. An example of this is the word 'sharing'. In English this has a 'dividing equally' connotation, and is a concept that we are anxious for children to develop so they can grow into an understanding of one aspect of the division process. However, linguistic research in one Cape York language revealed that when a back translation was done the Aboriginal word offered as an equivalent for sharing, really meant 'exchange reciprocally'. This is a vastly different concept from that which is inherent in our use of the same word. In the creole situation where many more words have been borrowed from English there are often vastly different areas of meaning for words whose shape is common to both languages. Unless each language and culture is treated with respect, and children have the opportunity to become conscious of their own language and culture and of the cognitive system to which it relates before being immersed in the English language, confusion frequently results.

The difficulties created for Aboriginal children by the use of such words as 'sharing' could, of course, have been avoided in the past and can be avoided in the future. Aboriginal people *can* talk about 'sharing equally' in their own language if they see a purpose in doing so, and all living languages are constantly expanding to absorb new ideas. Confusion arises when teachers and others are not aware of either the culture or linguistic background of the children that they teach and, assuming that all cultures operate just like their own, fall into the "What's your word for tall?" trap. Such an approach ignores a variety of linguistic factors. Sometimes there is no such idea in the culture; for example, what's the English word for Yirritja? Or there is often no one-to-one equivalent terminology, for example, it requires three words in English 'inside', 'behind', 'under' to convey the meaning of *djinawa* in Gumatj, and Aboriginal languages will provide several terms for the one English word 'there'. Aboriginal teaching 'aides' who are regarded as interpreters are faced with an impossible task when placed in this situation and often lack the English and the awareness of cultural difference to explain to us why this is so. Where interpreters aren't used and children are taught maths from the beginning in English because "after all maths is a culture-free discipline and all Aboriginal children need to learn English anyhow",

children are left on their own to sort out the mess that has been created for them.

When the effort becomes too great they simply 'turn off', and teachers and children contentedly learn 'sums' until the children eventually leave school.

What then are we to do? The best answer seems to be to have Aboriginals teach maths through the early years until eventually children can either work in English or in the vernacular - whichever is appropriate. There are two immediate reactions to such an approach and we need to examine these carefully:

- a) Many people would claim that Aboriginal teachers' understanding of maths is too inadequate to teach it effectively. This is largely true because these teachers are the product of our "English only" approach, when skills were taught but understanding was often not achieved - possibly because of the linguistic and cultural factors already outlined, although many hardworking teachers have struggled to teach maths effectively to Aboriginal children. However, if we accept that the only people who can help children develop mathematical ideas are those who can communicate with them effectively, and who appreciate how the children perceive their world (i.e. the classifications, spatial, measurement and numerical understandings they have already gained) and who appreciate the relevant situations in which such knowledge is gained, then we have no alternative but to turn to Aboriginal teachers as Early Childhood educators. We also need to appreciate that Aboriginal people are the only people who can effectively help children verbalize their understandings and so help build the linguistic bridge that Reulle (1979, p.4) maintains will carry children from concrete experience to abstract thought.

The role then of the non-Aboriginal teacher in the Early Childhood area is primarily not to teach children but to work with Aboriginal teachers and help them become aware of the mathematical ideas inherent in the system we call maths, and together discover the relevant starting points and the meaningful contexts in which these ideas can be developed and expanded. It sounds more difficult than perhaps it is. Begin with a common experience, e.g. if studying classification, classify all the people in the group one way and label the groups, then encourage the Aboriginal people to do it in an Aboriginal way. From a simple shared experience there will now be a common ground or foundation on which to build a discussion. What is the idea we are trying to develop? Why do we get children to label

groups? How do we talk about these ideas with children? ...and so the dialogue continues and both teachers and, eventually, children are helped on the way of a mathematical view of life.

Many teachers feel that Aboriginal languages are inadequate, both in vocabulary and in the way language is used, for effective teaching of maths. This may well be true at present for upper primary and secondary levels unless Aboriginal communities rapidly become more mathematically oriented, but in the early years this is really not a problem. When working with Aboriginal teachers, pursue the development of mathematical ideas and the language that conveys these ideas, rather than a translation of the English language.

Christie, (in an unpublished paper) studied the language used by white middle-class teachers in the classroom situation and noted how Aboriginal teachers use their language in similar situations. Where a non-Aboriginal may ask "Which is the biggest one?" the Aboriginal teacher may be content with "Which is the big one?" The Aboriginal language is ambiguous, teachers say, and yet the same teachers will draw a picture on the board and say "this is a cup" when really it is a "picture of a cup". Such language use in real-life, warm-blooded, meaningful situations is ambiguous, but children sort it out if the context is clear. As Aboriginal teachers work to provide meaningful, concrete, mathematical experiences for the children they teach, their language will develop more precision and their understanding of mathematical ideas will deepen.

We have to be aware that in all languages there are things people can say and things they *do* say. In English the word 'more' has two meanings, "I want *more*" which means 'extra', or it can mean 'relatively greater' in "I've got *more* lollies than you." In Gupapuyngu Christie notes that the word *bulu* is mainly used to mean 'extra' and it is seldom used in the comparative sense. It can be used that way, however, and as Aboriginal teachers become aware of the concept that needs to be developed, and use language in a meaningful context with children, the comparative idea is developed further. Nevertheless, without meaningful dialogue between Aboriginal and non-Aboriginal teachers as mathematical ideas are pursued and understandings deepened, both Aboriginal teachers and in turn Aboriginal children, are left in the 'hot dog' situation.

In later years of primary education non-Aboriginal teachers use many "why" and "if-then" questions. This approach is part of the formal strategy that non-Aboriginal teachers use effectively to build conceptual skills. This is not an approach used in Aboriginal society and whether it becomes part of that culture or is left in the English domain is a question for Aboriginal people themselves to decide. Many forms of questioning are, however, inherent in Aboriginal society and telling stories and 'telling about' are strategies used in every day life that can be adopted into the classroom so that young children can verbalize the understanding they are beginning to develop as they study maths through real-life, meaningful situations.

Edith Biggs (1971) has this to say about the teaching of mathematics:

...The chief aims of this way of teaching are *first* to set children free to think for themselves; *secondly* to give them opportunities to discover the order, pattern and relationships which are the essence of mathematics and which are to be found in the natural as well as in the man-made world, *thirdly*, to give children the skills. The third aim is just as important as the other two...

To achieve these aims with Aboriginal children we must begin with the language they speak and their own conceptual view of the world. As we provide learning experiences that help children to formally organize and verbalize their understandings of life, new mathematical understandings will develop. As children verbalize these understandings first in their own language and - in time - in English, deeper understandings of the mathematical process will emerge.

It is not pretended that the above is the final word on improving the teaching of maths for Aboriginal students. It is purely a beginning. There are far deeper issues that are yet to be thought out in relation to Aboriginal conceptual development. It is my conviction, however, that the search for these deeper answers will have to include further examination of Aboriginal language and perception of realities. In the meantime, if teachers spend more time with Aboriginal staff discussing mathematical ideas and become more sensitive to Aboriginal children's perceptions, then there will be some real progress.

(See References - p. 58)



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