



The Australian Journal of **INDIGENOUS EDUCATION**

This article was originally published in printed form. The journal began in 1973 and was titled *The Aboriginal Child at School*. In 1996 the journal was transformed to an internationally peer-reviewed publication and renamed *The Australian Journal of Indigenous Education*.

In 2022 *The Australian Journal of Indigenous Education* transitioned to fully Open Access and this article is available for use under the license conditions below.



This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

MATHEMATICS AND ABORIGINALITY

BY MS CATHERINE POTTER, M.ED.ST



Since first coming to the Northern Territory in 1982 I have spent much time in Aboriginal Education in many different roles. Remote school Principal, Batchelor College lecturer and Centre of Aboriginal and Islander Studies Maths lecturer to name a few. I would like to share with you some of my findings over this time.

My area of expertise is mathematics and the motivation for this article is the failure that most Aboriginal students experience in the areas of mathematics and science. Classic mathematics has been assumed to be too difficult and it has been replaced by a program of language and maths. It is my thesis that through the study of classic mathematics much language and appreciation of it is taught.

Mathematics has often been considered irrelevant to Aboriginal people but it underpins

that secret language that we often hear Aboriginal people refer to. The concepts learnt in maths dictate the structures we build, the way we manage accounts and enhance our everyday communication.

The learning of classical mathematics does not adversely affect the Aboriginal identity of Aboriginal students.

As Mandawuy Yunnipingu in the July A.T.U. journal (Australian Educator, Winter 1993) makes the point that Yolngu learning methods are different to Western methods, he says "It is different in that it is centred on kinship; centred on a system that is governed in a social sense - how we relate to each other and how things are run; everyday normal sort of things. We learn and abide by the kinship system and it can be applied to Western areas where Yolngu people have traditionally had trouble grasping concepts, such as mathematics and the sciences. In mathematics you have recursive processes and even though it is an ongoing thing it keeps on coming back - similar in that after 10 you keep on counting from one to the next ten. By applying the recurring themes of our kinship system. This is an area to which Aboriginal students can be linked. There are similarities which can help us grasp the concepts of mathematics and ultimately

enable Yolngu people to function in a contemporary world."

Perhaps Aboriginal kinship systems fit nicely into our modulo number systems theory or perhaps they present a new pattern or system that European mathematics has not even considered. Aboriginal mathematicians will be able to answer these questions. But if this is ever going to happen we the holders of the knowledge of mathematics theory thus far must communicate this to our students.

Some theorists would suggest that our enthusiasm to teach politics and history has been a ploy to learn more of Aboriginal culture. For example, teachers are more successful at teaching stories and art because students work reveals the unknown culture to them. Colonisers need this information to control. Teachers are the agents of the colonising power. Whereas teaching mathematics is unashamedly teaching the roots of the dominant culture. It could therefore be argued that the secret language of the dominant culture is classical mathematics.

We, the educators, have for too long been only taking. We need to *give* more scientific methodology as this is critical to empowerment in the dominant culture. An example from semantics is the word "central", its precise mathematical definition informs its use in literal English.

Having provided this political backdrop, I will return to the discussion of contemporary mathematics education. I would like to divide the topic into four subtopics that I will treat independently. These are, in order of presentation, Effective Mathematics Learning, Age

and the Acquisition of Mathematical Language, the Oral Tradition and Teaching Strategies.

Scientific methods of enquiry require concentration, persistence and repetition. I could be addressing academia generally with these comments and perhaps this is one of the reasons that mathematics is such a universal subject. Across the world we find it included in all primary courses and many secondary. There are very few courses that have no mathematical component.

All curricula have three levels. There is the intended curriculum (the one that is written down), the implemented curriculum (the one that is actually taught) and the attained curriculum (the one that the students take away with them). Teaching strategies effect attained curricula. In mathematics we should aim for the attained curriculum to be enjoyment of the puzzle, the paper and pen exercises and the organisation that are the processes of the subject. An essential component then is the dynamic of interaction between the student and teacher. Aboriginal people (the Aboriginal council of Yirrara College, Alice Springs voted to go to the Lutherans for education) have observed that the missionary style of education needs re-examination. Has modern education thrown the baby out with the bath water?

Elements of this church education were rote learning and repetitive exercises. The development of these skills are essential to immediate recall of vital information. Not only does scientific methodology require these traits but so also do the industrialists. Every kind of employment requires repetitive tasks to some degree. Repetitive exercises beg diagnostic testing for levels and we start to see

familiar objections from the modern educationalists.

Mathematics can be a positive experience for Aboriginal children. An underlying assumption of this paper is that successful education will only occur in an environment of honest dialogue between teacher and student. This often involves the teacher working very hard at learning the local language.

Mathematics has earned the title of "the queen of positivism" and yet so many people have negative experiences associated with this subject. Perhaps it is the abstraction that is required. Too many rebel against a removal from the 'real world'. The decontextualisation taught by mathematics is what makes it a desirable attribute in all students of the dominant culture. This is a tenet of scientific methodology.

Mathematics may be regarded as another language which is built on ordering and classifying. However there are very few students who take on *mathematics*. Arithmetic focusing on estimation, measurement and calculation is much more popular. The number knowledge needed to be an efficient member of the bureaucracy. Seldom do students learn the pleasure of intellectual stimulation that mathematics fosters. Mind you there was much rebelling before I realised I actually enjoyed sitting quietly by myself nutting out problems. Perhaps as teachers we have to deal with this rebellion rather than be the student's friend.

Trends in modern primary education are away from repetition and rote learning. Unfortunately mathematics is not being absorbed by students subjected to this "continual new experiences methodology". Many of our stu-

dents have been victims of this approach. Are we (maths educators) pleased that the majority of the population think that maths is a waste of time, you'll never fully understand it but then what will you ever fully understand?

Experiential learning needs to be accompanied by some rote learning and repetitive exercises. A Vision for Australian Schooling, Draft, 1993, states;

The personal repertoire of all teachers should include teaching strategies that are appropriate to a personally empowering curriculum. These strategies include pedagogical approaches that promote:

- * active involvement
- * collaborative processes
- * experiential learning
- * problem solving and decision making skills

While I agree with this document, I argue that this list should include rote learning in Aboriginal education. A traditionally non literate culture has a strong understanding of learning things by memory, we should be building on these student's strengths.

Some may accuse me of conservatism however I would suggest is a radical stand given modern education theory. As you have probably ascertained, I see nothing fundamentally wrong with repetition or rote learning. I have come to see rote learning of multiplication tables, for instance, as a form of medita-

tion or mantra. The oral tradition of Aboriginal students meant that all knowledge had to be committed to memory. These particular students have a history of rote learning and building on their strengths will facilitate the learning process.

Mathematics can be confidence building as the immediate feedback acts as a stimuli to proceed. However it can also be incredibly destructive to the confidence if the student has not grasped the processes of calculation early in their schooling. Ideally maths should educate students in the joy that can be found in quiet academic endeavour and efficient organization. This is not possible however if teachers communicate a negativity about the subject to their students. If the teacher doesn't like the subject this will be the first thing that the students pick up on. Unfortunately too often our trained primary teachers have always avoided maths themselves.

It is not enough to simply tell them about orderly work and the keeping of notes. Students need this behaviour modelled and its practice encouraged. They then will learn informally the value of well compiled notes, as an example. Notes copied from the teacher and constantly referred to will achieve this aim. The language of mathematics will not be learnt by writing a journal on your feelings during a maths class. Any education must reflect the needs of the student. This, I believe to be a fundamental premise, it has often been referred to as student centred education. As our students are from another culture it is much more difficult to predict their needs. Hence there should be a greater emphasis on the student than on the "accredited course".

The fact of the colonisation of Australia by the English has produced a resistance to the colonising culture. We cannot expect Aboriginal students to respond immediately to our suggestions or to share our view of the world but this does not mean that we have nothing to offer them. More than with students conditioned in the dominant culture we have a responsibility to be good listeners, to try our best to understand where each student is coming from.

Aboriginal students are extremely brave. Very often their decision to study is ridiculed by their family and the label of 'coconut' cuts very deeply. A shyness and fear of failure are often disguised by cheekiness and bravado which can be extremely insulting to our middle class persona. Aboriginal children are not reared to trust teachers from the dominant culture and there will be much trying out before a successful educative relationship is arrived at.

Often irritating are Aboriginal students demands for lunch money and rides home but again these are ways that whitefellas are tried out. These minor things are extremely important if you have not eaten all day or it is pouring rain and a little give by teachers in these areas can facilitate a trust that needs working on. We must be aware of unwanted dependencies but we mustn't assume a ride home will mean a daily request.

The teacher must be aware of their role as the performer. In front of a class you have a responsibility to keep the students attention. This means constantly monitoring attention levels and being ready to change strategies if the planned approach is not maintaining the interest of the students.

Students are often in the position of watching the teacher and it helps us achieve our aims if we do not alienate our students by our body language. If we are always sick and tired of the job and the class this is the loudest message the students receive.

It is part of our responsibility to enthuse our students with our subject matter and the joy that is to be found in education. Mathematics relies on the student knowing their acquired level and being able to move on. This requires an immediate feedback by the teacher. Any assignment work should be returned corrected to the students at their next class if possible.

Honesty on the part of the teacher will encourage the same in the student and enhance the student/teacher relationship. It is better to admit ignorance with a commitment to finding out than it is to make up an answer that may be only partially right. If the student finds reason not to trust the teacher the educative relationship may be destroyed forever.

In summary I would like to say that if we can provide our students with additional tools to deal with the dominant culture we have succeeded. Communicating the joy of unravelling complexities will certainly help this endeavour. Let our students have the best tuition possible in Western Science and mathematics so the assumptions of the dominant culture can be seen clearly.



1980 Mathematics Teaching Theory in Practice.

London: Harper and Rowe Publishers.

Biggs,J.

1988 The role of metacognition in enhancing learning.

Australian Journal of Education.

Volume 32, Number 2, pp. 127-138.

Brown,I.(Gurulwini Enemburu)

1989 Koori English.

Victoria: Ministry of Education.

Capp,B.

1988 Even Desert Kids need Heroes.

Learning My Way.

Christie, M.J.

1988 Aboriginalising Post Primary Curriculum.

The Aboriginal Child at School.

Volume 16, Number 5, pp. 3-16

Cole & Scribner,S.

1974 Culture and Cognition.

"Culture and Thought: A Psychological

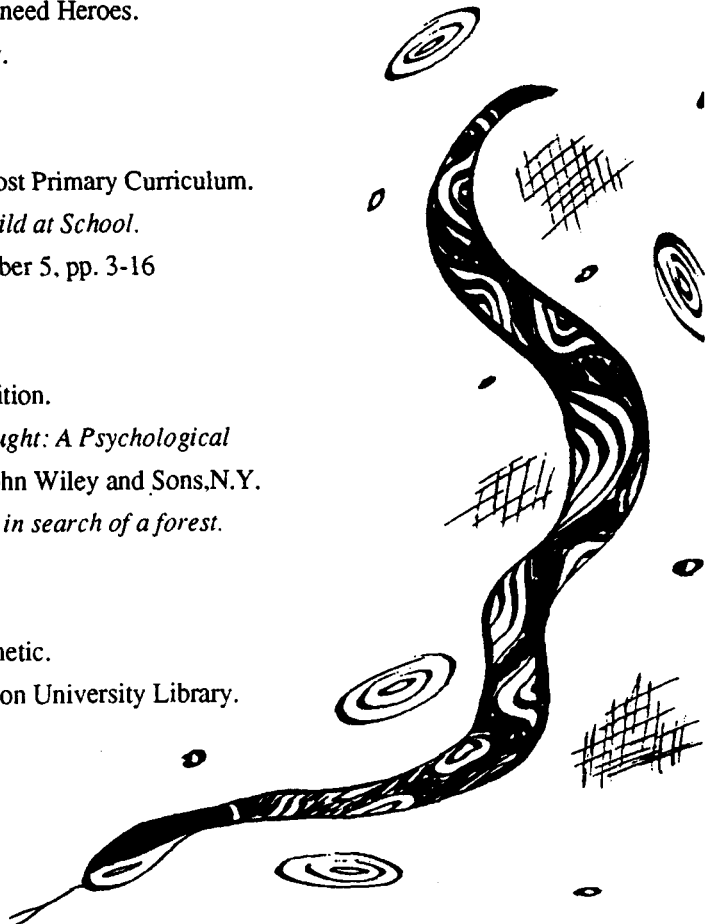
Introduction." John Wiley and Sons,N.Y.

Chapter 8; *Trees in search of a forest.*

Davenport,H.

The Higher Arithmetic.

London: Hutchinson University Library.



Davenport,H.

The Higher Arithmetic.

London: Hutchinson University Library.

Dawe,L.C.S.

1983 bilingualism and mathematical Reasoning
in English as a second language.

Educational Studies in Mathematics

14, pp. 325-353.

Ellerton,N.F. & Clements,K.

1990 Mathematics, Culture and Curriculum.

Paper presented as a background for a special
panel discussion on issues associated with
the introduction of a national curriculum in
mathematics for Australian Schools, at the
13th Biennial.

1990 July Conference of the Australian Association of
Mathematics Teachers, University of Tasmania,
Hobart.

Harris,S.

1990 Two Way Schooling.

Northern Territory University Press.

Harris,S.

1988 cultural Boundaries, Culture Maintenance-in-
Change, and Two-way Aboriginal Schools.
Curriculum Perspectives. Volume 8, No 2,
October. (Perth, W.A.)



Howson, A.G. & Kahane, J.P.

1986 ICMI Study Series, School Mathematics in
the 1990's. Cambridge University Press.

Lajamanu Community School Mathematics Curriculum.

Mac Donald, T.H.

1975 The Teaching of Mathematics in Schools:
A Critique.

Mac Gregor, M.

1987 Reading and Writing in Mathematics,
Australian Reading Association, edited by
Bickmore-Brand.

Mc Mahon, K.

Research in Ganma Curriculum Development:
Mathematics Education for Yolngu Teachers.
Unpublished Manuscript.

Mc Taggart, R.

1988 Aboriginal Pedagogy versus Colonization of the
Mind. *Curriculum Perspectives*, Volume 33,
number 2, August 1989.

Marshall, J.D.

1989 Foucault and Education.
Australian Journal of Education, Volume 33,
number 2, August.



National Mathematics Curriculum Draft materials

Rowe, K.J.

- 1988 Single-sex and mixed-sex Classes. The effects of class type on student achievement, confidence and participation in Mathematics. *Journal of Education*, Volume 2, Number 2, August, pp. 180 - 202.

Morris, R.(ed)

- 1984 Studies in Mathematics Education, *The Mathematical Education of Primary School Teachers*. volume 3, published by the United Nations Educational, Scientific and Cultural Organisation.

Watson, H.

- 1989 Two Ways of Looking at Mathematics. Notes from an Address to Yirakala School.

White, W.F.

- 1989 Towards a Psychology of Pedagogy. *Education*, Volume 109, Number 4.

Wilmot, E.

- 1981 The Culture of Literacy. *Aborigines and Schooling: Essays in honour of Max Hart*, edited by B. Menary and P. Finnone. Texts in Humanities, Adelaide.

