# Researching cultural issues with NESB secondary mathematics students: "In my country it is more difficult."

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This paper presents data from a two year study on Year 7 and 9 students, who were classified using a new construct of Non-Anglo-Cultural-Background (NACB). This was used to determine results at the individual level which showed for example that the NACB students generally were more confident and less anxious about their school mathematics than were their ACB counterparts. The paper also discusses some of the problems concerned with doing research into cultural issues in mathematics education

Research on cultural aspects of learning mathematics seems to play a minor role currently in the mathematics education scene in Australia. While there has been, and continues to be, a strong interest in gender issues, in contrast there has been relatively little attention paid to the mathematical experiences of either Aboriginal or immigrant students. For example, in MERGA 1995, in Darwin, which was an occasion where there could have been some focussed attention on cultural issues, although two of the plenaries dealt with this theme, only three other papers did (one of them being from an international visitor) (Howard, 1995, du Toit, 1995, and Thomas, 1995).

Earlier research on cultural aspects, summarised and reviewed by Atweh, Cooper and Kanes (1992), and by Ellerton & Clarkson (1992) in the context of language, generated a wide literature. In recent times however the research is limited in quantity but replete with possibility. As examples, Howard (1996) continues his important research with Aboriginal teacher educators, making us aware of the importance of sensitivity in dealing with cultural issues. Leder, Rowley & Brew (1995) present some challenging data about ESL students' performances in the Victorian Certificate of Education, while Thomas (1995) develops her arguments about improving language policies in schools to improve the chances of NESB students succeeding at University mathematics.

The rarity of such research could not be due to any lack of potential benefit. Australia, with its significant Aboriginal population, also has the world's second highest variety of 'home' countries from which its immigrants have come, and would seem to be a 'research site' of huge significance for this theme. As well as having intrinsic and pragmatic interest, there is also potential pay-off for the development of theoretical constructs generally, not to mention the economic importance of improving the quality of the participation of a large segment of the school population, nor the contribution such research could make to the multi-cultural nature of Australian society. However another reason for the paucity of this research could well be due to the inherent challenges of doing it. It is indeed a complex research field.

In this paper we will present some data from a study of year 7 and 9 students, which sheds some light on both the immigrant student's experience of learning mathematics and on the difficulties to be overcome if such research is to increase. The study was concerned with cultural diversity and involved the variables of gender, ethnicity and Socio-Economic Status (SES). It was hypothesised that the typical school mathematics culture could be characterised as predominantly 'Anglo, male, middle-class', and that these three variables would assist in the interpretation of students' experiences with any kinds of conflicts with that culture.

In previous papers we have referred to the gender-related data from this study (Brew et al., 1996), to the differences between high and low achieving students and their parents'attitudes (Leder et al., 1995), and to the role of 'significant others' in affecting peers' attitudes and perceptions (Bishop et al., 1996). At last year's MERGA conference we reported on the 1995 cohort data (Pearn et al, 1996) from schools with a large percentage of Non-English Speaking Background (NESB) students. In this paper we

shall present some of the intriguing data arising from the contrasts between these '95 students and their '94 counterparts who came from predominantly ESB schools.

## Selection of sample - procedures and problems

The procedure for the selection of the sample of students was firstly to select eight State secondary schools, using such Government-based data which would maximise the possibility of contrasts between the students. There are two kinds of governmental classification which concern ethnicity - Non-English Speaking Background (NESB) and English as a Second Language (ESL).

An NESB student is commonly defined as one who was born in a country with a non-English first language, or born in Australia to parents either of whom were born in a country with a non-English first language.

An ESL student is defined as one who was born outside Australia less than seven years ago, in a country with a non-English first language, and who also has not studied English as a formal subject for more than seven years.

The SES of the school was determined by considering the Census information of the school catchment/enrolment area, participation in the Disadvantaged Schools Program, which has now ceased, and the proportion of students receiving the Educational Maintenance Allowance. In addition, four of the schools were selected from the SE Victorian region and four from the NW region.

Eight schools were finally selected, and agreed to participate in the research, according to the following plan:

| | Low SES | Medium SES |
|---|---|---|
| Low NESB | 1,2 | 3,4 |
| High NESB | 5,6 | 7,8 |

Schools 1, 3, 5, 7 were in the SE region while schools 2, 4, 6, 8 were in the NW region. Within each school, a Year 7 and a Year 9 class was then selected, and within each class the teacher was asked to choose four students whom they considered to be High Achievers and four students whom they considered to be Low Achievers, for follow-up interviews.

This then was the formal planned procedure. However as the research progressed from school level analysis to individual student level analysis, two aspects of the classification became increasingly apparent:

- the SES classification was suspect and uninformative at the individual student level, but it was not ethically possible to obtain individual students' SES levels, even if that could be meaningfully defined;
- the ESL/NESB classification was also suspect at the student level, and we decided to determine and use our own classification.

While the ESL/NESB labels may help funding and examination decisions at the state and national levels, there are too many inconsistencies and overlaps for good research at the individual level. For example, there are confusions about how to classify Hong Kong students, as they are considered NESB, even if their parents are of Anglo background, and Cook Islanders are not classified as NESB even though their first language is not English. Often schools classified pragmatically a student as ESL because of his/her English language problems despite being here for more than seven years. Also some ESL-classified students could have received all their schooling in Australia and in English.

Accordingly, we used the following criteria for our own ethnicity classification of individual students, which we will refer to hereafter as Non-Anglo-Cultural-Background (NACB). These were students:

- who were born into a non-English speaking home, regardless of country,
- whose first language is not English, and which was predominantly used at home,

- whose observable characteristics and language usage in class (if other information was unavailable) suggested that they should be called NACB.

Conversely, ACB students were those who were born either inside or outside the country, into an English-speaking family environment, and who used English as their first language.

## Collection of data - procedures and problems

The data for this study came from four sources: questionnaires to all the students in the 16 classes, video-tapes of three lessons in each class, interviews with the selected students and with their parents where possible. The formal description of the data sources have already been explained (see, for example, Pearn et al., 1996).

Regarding the data-gathering, the questionnaires were in English, but they were administered personally by the research team who had ample opportunity to explain any difficulties. Initially teachers were concerned about the effect of video recording their classes, but after the initial phase no difficulties occurred. Gaining interviews with the targeted students was occasionally a problem, particularly with some of the low achieving students. Several visits needed to be made to the classes in order to complete the interviews. Even then, some interviews were not able to be carried out.

The most challenging part of the data gathering process however was gaining the interviews with the parents. These were either carried out at home, at the parents' work-place, or at Monash. There were particular difficulties with gaining interviews with the parents of the NACB-targeted students. The ethical procedures rightly permit any chosen subjects to decline to participate in the research, and unfortunately several of the NACB students' parents took that option. Whether this was due to language worries, being too busy, or for fear of giving information to strangers, is of course not known. Whatever the reason, the difficulties of engaging these parents is one of the problems to be overcome in doing this kind of research.

## Results

### *Students' views about mathematics*

In this part of the questionnaire there was not a great deal of difference between the students at the High NESB schools and those at the Low NESB schools. However three attitudinal constructs out of the 13 in the questionnaire showed a significant difference:

Table 1

| | High NESB schools | | | Low NESB schools | | | | |
|---|---|---|---|---|---|---|---|---|
| | mean | sd | n | mean | sd | n | F | p |
| Anxiety | 2.27 | 0.76 | 178 | 2.45 | 0.82 | 179 | 5.65 | <.05 |
| Confidence | 3.81 | 0.75 | 179 | 3.60 | 0.93 | 180 | 6.41 | <.05 |
| Maths not a male domain | 4.09 | 0.66 | 176 | 4.36 | 0.54 | 180 | 27.21 | <.001 |

Scale: 1 = strongly disagree to 5 = strongly agree. Six questionnaire items contributed to each construct.

The first two findings are consistent with each other, in the sense that the High NESB school students are less anxious and have more confidence than the Low NESB school students. In terms of the earlier expectations of cultural conflict, this was a surprising result. One could well believe that the differences should be round the other way, but it is not the case.

Table 2

| | NACB students | | | ACB students | | | | |
|---|---|---|---|---|---|---|---|---|
| | mean | sd | n | mean | sd | n | F | p |
| Anxiety | 2.28 | 0.76 | 177 | 2.44 | 0.82 | 178 | 5.136 | <.05 |
| Confidence | 3.79 | 0.79 | 179 | 3.63 | 0.91 | 178 | 4.022 | <.05 |
| Maths is not a male domain | 4.10 | 0.64 | 175 | 4.34 | 0.57 | 179 | 20.21 | <.001 |
| Maths is logical | 4.01 | 0.82 | 182 | 3.76 | 1.04 | 178 | 7.28 | <.01 |
| In maths there should always be one right answer | 3.12 | 1.32 | 183 | 2.84 | 1.21 | 179 | 4.546 | <.05 |

Scale: 1 = strongly disagree to 5 = strongly agree.

At this point we have to remind readers that these are school level effects. In order to see what happens at the individual level, we present in Table 2 the significant results from the equivalent analysis done using the NACB/ACB classification described earlier.

As can be seen by comparing the Tables 1 and 2 there is not a lot of difference in the results, but the finer classification has picked up two more significant differences. Hereafter we shall therefore present the data using the NACB/ACB classification.

The data show that the NACB students feel less anxiety and have greater confidence, have a preference for logical and 'one right answer' mathematics, and have a stronger view of mathematics as a male domain.

***Attributions of success and failure***

This aspect is one which often produces interesting results, and here was no exception. Table 3 below shows the significant differences and the trends:

Table 3

| | NACB students | | | ACB students | | | | |
|---|---|---|---|---|---|---|---|---|
| | mean | sd | n | mean | sd | n | F | p |
| Success due to ability | 3.53 | 0.76 | 174 | 3.34 | 0.84 | 174 | 3.442 | <.01 |
| Success due to effort | 3.64 | 0.77 | 176 | 3.48 | 0.79 | 175 | 3.94 | 0.077 |
| Failure due to ability | 2.90 | 0.78 | 172 | 3.13 | 0.84 | 175 | 2.433 | <.01 |
| Failure due to effort | 3.06 | 0.78 | 173 | 3.26 | 0.72 | 174 | 5.426 | <.01 |
| Failure due to the task | 3.40 | 0.73 | 174 | 3.52 | 0.69 | 175 | 0.683 | 0.055 |

This pattern of results is interesting, as it shows that the NACB students rate the internal factors (ability and effort) to be more important for their success than the ACB students, while it is the reverse for the failures. Also important for the ACB students are the task reasons for failure.

***Classroom environment***

On the Fraser classroom environment questionnaire three out of the five aspects were significantly different or showed a trend, see Table 4.

The NACB school students viewed their mathematics classrooms as offering a significantly greater degree of independence, with more possibility for investigation and

participation, than did the ACB students. Possibly this may reflect a different school experience from that in their country of origin.

Table 4

| | NACB students | | | ACB students | | | | |
|---|---|---|---|---|---|---|---|---|
| | mean | sd | n | mean | sd | n | F | p |
| Independence | 2.68 | 0.65 | 175 | 2.51 | 0.60 | 178 | 4.29 | <.05 |
| Investigation | 3.27 | 0.50 | 175 | 3.10 | 0.44 | 178 | 18.11 | <.01 |
| Participation | 3.54 | 0.45 | 175 | 3.43 | 0.49 | 178 | 2.282 | 0.063 |

***Student's Perception of their level of achievement.***

This part of the data comes from a short questionnaire which asks the students to rate their own level of achievement, and what they perceive their teacher's, their peers' and their parents' opinions are about their level. The ratings go from 1 (weak) to 5 (excellent). Table 5 shows four areas of significant difference:

Table 5

| | NACB students | | | ACB students | | | | |
|---|---|---|---|---|---|---|---|---|
| | mean | sd | n | mean | sd | n | F | p |
| Self rating | 3.51 | 0.92 | 189 | 3.27 | 0.96 | 180 | 3.314 | <.01 |
| Perceived teacher rating | 3.50 | 0.98 | 186 | 3.19 | 1.01 | 178 | 5.811 | <.01 |
| Perceived class mate rating | 3.66 | 1.02 | 186 | 3.22 | 1.11 | 179 | 8.950 | <.001 |
| Student wished-for rating minus self-rating | 1.21 | 0.86 | 189 | 1.44 | 0.91 | 180 | 2.808 | <.01 |

In each of the first three cases the NACB students rated themselves significantly higher than the ACB, which confirms the earlier findings about their feelings of greater confidence and less anxiety. They also seemed more 'content' with their performance in that their 'wished-for' rating was not as far ahead of their self rating as it was for the ACB students.

## Discussion

Having anticipated that the school mathematics learning experience for the NACB students would be one of difficulty and conflict, we have been surprised by the results. We have found an interestingly coherent set of perceptions and attitudes of the NACB students, when compared to the ACB students. They generally appear to be more confident, less anxious, and more at ease with their perception of their own abilities. They generally attribute their successes to their own abilities and efforts, but not their failures, and they feel that their teachers and their classmates rate them higher than the ACB students. Furthermore, NACB students perceive their classmates rate them at a higher level compared to the rating they give to themselves.

For example, M., a year 9 high achieving student from the Ukraine, in response to the question "How good do you think your friends think you are?" answered:

M. Oh they think I'm good.
Int. Do you think that they think you are better than you are?
M. Yeah.

The NACB students also have a more 'logical' and 'right answer-oriented' view of mathematics, and they believe that maths is more of a male-subject than do their ACB peers. Furthermore the interviews revealed another interesting aspect. This was that several of the students spoke of the difference in standard of mathematical work at schools between their former country and Australia. Two example interview extracts follow. The first extract is from the interview with M., and the second is with a Year 9 Low-achieving male student from Vietnam:

Int. I keep getting a sense that in the Ukraine you worked at a different standard of maths, is that the case?
M. Yeah well I only went up to 3rd grade, so I can't remember. It was harder the stuff I did then, when I came here the stuff I did in grade 5 I did in grade 3.

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Int. What was it like doing maths in your own country?
T. In my country it is more difficult, when in year 7 we had equations and parallelograms or parabolas and bar graphs.
Int. So you did all that in year 7?
T. Yes
Int. And now you are doing it in year 9?
T. Yes.

This is clearly not the whole story, and it would be interesting to speculate on other reasons why the NACB students generally in this study seemed not to be revealing the kinds of difficulties, anxieties and conflicts which we had anticipated we would find. Despite the fact that not all of the NACB students were achieving well, it appears to be the case from this study that being from a non-English culture is not necessarily a handicap when it comes to learning mathematics at school. Moreover one might well have more concerns about the situation of the ACB students!

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