International students in independent schools

The divide between attitude to Mathematics class and perception of classroom environment

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Abstract

The experience of students with a non-English-speaking background (NESB) studying in Australian independent school classrooms is an ongoing concern for administrators of these schools. This paper reports on research by Kilgour and Rickards (2009) into the perceptions these students have of the learning environments of their Mathematics classrooms along with the same students' attitudes to Mathematics as a subject. Data collected by survey and interview revealed that NESB students have a more positive attitude to Mathematics as a subject than their Australian classmates, but their perception of their learning environment is more negative than their Australian classmates.

Introduction

While there is a current plateau in the arrivals of overseas students to study English in Australian schools, the twenty year period from 1985 to 2005 saw the number of overseas students entering on study visas grow more than ten times from 30,000 to 375,000 (Australian Bureau of Statistics, 2007). In this study, the term NESB (non-English-Speaking Background) students will be used to refer to overseas students who hold a study visa and those Australian resident students who were born overseas and do not speak English at home.

While many may assume that Mathematics is an area of study where NESB students, particularly Asian students, may excel, both quantitative and qualitative data tell a story of discrepancy between these students' positive attitudes to Mathematics as a subject and their far less positive perceptions of their experiences within the Australian classroom.

While learning conversational English for new students from overseas may only take around two years, learning English sufficient for the study of academic subjects often takes five to seven years (Chamot, Dale, O'Malley & Spanos, 1992). In recognition of this, Chamot et al. (1992) suggest that the teaching of academic language in ESL classes is a useful way to help NESB students in their academic subjects. If this was offered along with support for the development of language specific to Mathematics, it may help to change the perception NESB students have of their Mathematics classes.

Planas and Gorgorio (2004) found that NESB students are less likely to engage, acculturate, and be part of the Mathematics discourse in the classroom. This may be surprising because many have incorrectly assumed that Mathematics is less language reliant than other subjects. Planas and Gorgorio (2004), offer a possible cause for this unexpected finding:

> [Students from minority groups] experience difficulties when trying to participate in contexts of mathematical practices where they do not feel themselves represented, when others do not recognise them, or when they have to cope with actions and behaviours that are different from those they would expect. (p. 16)

Planas and Gorgorio (2004) observed that though the teacher may have the very best of intentions and may believe that they run an inclusive classroom, NESB students' ideas and contributions were perceived to be less valued by their classmates and the teacher than those of the English-speaking students.

The practicalities of providing the optimal learning environment for NESB students are difficult for teachers. Reeves (2006, p. 139) reported that although "teachers want to welcome ELLs [English Language Learners] into the mainstream, the data also reveals a teaching force struggling to make sense of teaching and learning in multilingual school environments".

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Table 1: A description of the sample

	Upper stream				Lower stream				Total			
	English speaking		Non-English speaking		English speaking		Non-English speaking		English speaking		Non-English speaking	
	M	F	M	F	M	F	M	F	M	F	M	F
Year 9	52	50	10	6	42	35	13	7	94	85	23	17
Year 10	54	65	17	11	43	49	15	11	97	114	32	22
	106	115	27	17	85	84	28	18	191	199	55	35
Totals	221		44		169		46		390		90	
	265				215				480			

Much of the research in learning environments has shown that attitude to the academic subject and experiences in the learning environment are connected. For example, Rickards (1998) reported a positive relationship between student attitudes and student-teacher interpersonal behaviour as a measure of perceived learning environment.

Boaler, Wiliam and Zevenbergen (2000) define success in Mathematics classes as a feeling of 'belonging' rather than an issue of 'ability'. Students may want to succeed at Mathematics as a means to an end but they may have no desire to become 'successful mathematicians'. Boaler et al. (2000) found that the Mathematics classroom becomes a "community of practice" where "learning is a social activity which encompasses the relations between people and knowing" (p. 4).

Studies conducted over the last three decades have contributed to improvements in classroom learning environments (Anderson, 1982; Fraser, 1991, 1998; Fraser & Walberg, 1981) and shown the association between student learning and the way students perceive their classroom learning environment (Fraser, 1994).

The current study

With these issues in mind, this study was designed to move away from the measurement of academic performance. This study examines the differences between NESB and English-speaking students' perceptions of their learning environment. It also investigates the differences between NESB students' attitudes to Mathematics as a discipline and the way they perceive learning environments in Australian schools. The initial hypothesis was that students with a positive attitude to Mathematics would also find their Mathematics classroom a positive environment.

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Methodology

The participants in this study were 480 students from seven schools in Australia. Participants were in Year 9 or 10 at the time of the study and included both males and females from a range of ability level classrooms. Of the 480 participants, 90 were categorised as NESB and of this group, 16 were selected for interviews in focus groups. The data collected was analysed by year level, academic ability and language background.

Of the 90 NESB students in the sample, 49 were from Asian countries, 15 were from Pacific Island backgrounds and 11 were from South American countries. The remaining 15 were from other countries.

The instrument used to survey students' attitudes to Mathematics was based on the Test of Science Related Attitudes (TOSRA), (Fraser, 1978). The TORSA was condensed and modified to suit school-based Mathematics. A 5-point Likert Scale was used with the lower scores representing a more positive attitude toward Mathematics. This attitude inventory included prompts such as, *Mathematics is fun*, and *I feel satisfied after a Mathematics lesson*.

The instrument used for researching the students' perceptions of their classroom environment was the "What is Happening in this Class?" (WIHIC) (Fraser, Fisher & McRobbie, 1996).

[This instrument] was developed for use in any classroom environment context. It combined the best features of the existing instruments and included new dimensions of contemporary relevance. (Chua, Wong & Chen, 2000, p. 367)

This instrument was originally a 90 item survey with 9 scales but the version used in this study was reduced to 56 items with 7 scales.

The scales of the WIHIC are: *student cohesiveness, teacher support, involvement, task orientation, investigation, cooperation and equity.* A 5-point Likert Scale was used where lower scores indicate more positive responses. A brief description of each scale along with a sample item can be found in Table 2.

Interviews with NESB students were included to validate and add meaning to the quantitative data. Four groups of NESB students were selected to form focus groups. At the time the sample was taken, Asian students represented the largest cultural group in the NESB category. Therefore, two of the groups contained Asian students, one contained Pacific Islanders and one contained South American students.

In order to facilitate discussion and aid comprehensibility, the interview participants had at least an intermediate level of competency in spoken English. Participants were asked to recall how they had felt when their English language skills were emerging and how they perceive current NESB students perceive classroom environments.

The quantitative data from the surveys was entered into the SPSS application in order to perform such operations as factor analyses, alpha reliability, correlations, and analyses of variance and to collect descriptive statistics such as means and standard deviations. Of particular interest in these analyses was the relationship between perception of classroom environments and ability streams; and the relationship between attitude to Mathematics and the scales of the WIHIC. Cultural differences in perceptions of classroom environments and attitude to Mathematics were also analysed.

Results and Discussion

Attitude toward Mathematics: Quantitative data

From a comparison of students' attitudes to Mathematics, it is evident that NESB students (2.95) have a more positive attitude to Mathematics as a discipline than do their English-speaking (3.20) counterparts (see Table 3). This gap is more pronounced in the upper ability stream than the lower stream Mathematics students.

This attitude score is likely to be influenced by the large Asian contingent of students in the sample schools who have a strong affinity with Mathematics.

> [Asian students] hold significantly different beliefs about their math ability, the constructs to which they attributed successful performance, their perceptions of their parents' beliefs with respect to their math ability, and their conceptualisations of math as a domain. (Whang & Hancock, 1994, p. 302)

Perception of classroom environment: Quantitative data

A key finding of this study is that although NESB students have a positive attitude towards Mathematics, they have a more negative perception of their classroom learning environment than do English-speaking students (see Table 4). The data indicates that in five of the seven scales (the exceptions were *involvement* and *investigation*), the NESB students rated their classroom learning environment less positively than the English-speaking students with differences in perception ranging from 0.10 to 0.20.

The scales with the largest difference are *teacher support* (0.17) and *equity* (0.2). In both cases, the difference between NESB students and English-

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Table 2: WIHIC scale description and sample items

Scale	Description of scale	Sample item
Student cohesiveness	This scale contains items that examine the way students facilitate each other's learning	Members of the class are my friends
Teacher support	This scale seeks to establish the perceived help the teacher provides to students	The teacher takes a personal interest in me
Involvement	This scale contains items that examine student input into the learning process	My ideas and suggestions are used during classroom discussions
Task orientation	This scale asks students how much on task behaviour is happening in the classroom	I try to understand the work in this class
Investigation	This scale seeks to establish the amount of inquiry-based learning happening in the classroom	I carry out investigations to answer questions coming from discussions
Cooperation	This scale seeks to find out how much students work together to achieve outcomes	I cooperate with other students when doing assignment work
Equity	This scale seeks student perceptions on whether the teacher treats all students in the class equally	The teacher gives as much attention to my questions as to the other students' questions

Table 3: Mean attitude scores

	Upper stream		Lower stream		Total	
	English speakers	NESB students	English speakers	NESB students	English speakers	NESB students
Year 9	3.19	2.80	3.09	3.08	3.14	2.94
Year 10	2.92	2.51	3.58	3.41	3.25	3.96
Totals	3.04	2.66	3.35	3.24	3.20	2.95

n = 480

speaking students is significant at the 95% level. These two scales are in fact related; the factor analysis of the WIHIC survey showed that while all other scales were quite independent, there was a crossover between the scales of *teacher support* and *equity*. The relationship between the two factors is understandable given that the perception of equity in the classroom is, to a certain extent, determined by the way the teacher allocates their time and resources to the students.

Possible reasons for these discrepancies in perceptions of learning environments are explored in the qualitative data.

Attitude toward Mathematics: Qualitative data

Interview data indicated that NESB students believe their positive attitude towards Mathematics is due to their culture's appreciation of Mathematics and desire to achieve highly in it. One student said that in Korea most students are tutored in Mathematics from a very young age and they are led to believe that it is the most important subject. NESB students also indicated that they feel more positive about Mathematics because they see it as a subject they will be able to deal with, even though their language skills are still developing. In addition, interview subjects reported knowing of a number of other Asian students who had come before them in their new Australian school and had succeeded in Mathematics. As a result of these factors, their expectations for success were high.

Perception of classroom environment: Qualitative data

When interviews were conducted with NESB students, particularly Asian students, the discrepancy between attitude to Mathematics class and perception of classroom environment was confirmed. The NESB students gave a range of factors that they believe explain why their perception of their learning environment does not match their attitude to the subject. Communication factors included a feeling of intimidation and embarrassment

> *Poor ratings of* teacher support *and* equity *may be due to feelings of marginalisation as a result of communication difficulties*

when emerging language skills hampered their efforts to communicate their thoughts effectively.

> Jung: They [NESB students] would probably get the support if they asked more but they are embarrassed because of the level of their English and so they don't ask.

Furthermore, new arrivals often have an expectation that interactions in the classroom should only require speaking to the person next to them and the teacher. NESB students' comments made it apparent that those coming to Australia from Asia sometimes feel embarrassed to ask questions and may not mix very well with other students either inside or outside class. They may not even mix with other Asian students who have been in Australia for some time.

> Tom: I don't think the new Asians to the school socialise very much. They are more comfortable just mixing with each other.

Poor ratings of *teacher support* and *equity* may be due to feelings of marginalisation as a result of communication difficulties. In addition, NESB students may perceive a lack of equity when they see their English-speaking classmates understanding explanations and instructions and going on with set work.

> Su: Some things could be better. The teacher gets into the work too fast and we don't get it. It would be good if it was broken down more.

The way the NESB students saw *student cohesiveness* and *cooperation* was investigated with the question: Do the students help each other with the work? A typical answer is given below.

> Kim: Not really. They [new NESB students] stay to themselves a bit. That's the way the classroom is arranged.

Even when cooperative learning tasks were assigned to groups, NESB students found it difficult to feel included.

Classroom behaviour factors were also seen to be significant. NESB students felt that many class members were poorly behaved, unfocused and therefore distracting. In many cases, NESB students are a little older than their counterparts are and find the perceived lack of maturity difficult to cope with.

Kim: Sometimes after the class, they [NESB students] will tell you how terrible it was or something.

These factors contribute to student stress because of the expectations parents place on student achievement in school, particularly in Mathematics.

The *Task orientation* scale was discussed with the students. This question was asked: Does it stop you working when other kids are mucking around?

Tom: Yes. I can't stand it. It's OK to blame the teacher but the students have to cooperate as well.

In addition, preconceived expectations that were not fulfilled led to dissatisfaction. NESB students reported feeling that they had the skills and ability to understand the Mathematics content but that they could not understand the questions as presented in class. Furthermore, some students felt that they had been placed in a class below their mathematical ability due to a language deficit.

The interview data showed that NESB students felt they could cope with the work very easily if they had a greater understanding of the language.

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Conclusion

A key finding from the combined data is that NESB students from the sample had a more positive attitude to Mathematics as a discipline than the rest of the sample but a more negative perception of their Mathematics learning environment. This finding was especially true for the upper stream students who reported that their high expectations for success in Mathematics were not being met by the learning environments in their Mathematics classrooms.

This finding is significant for schools. If a school advertises itself as a provider of education for NESB students on student visas, then it needs to ensure that it caters for their needs. Given that this research found that NESB students are struggling with the learning environments of Mathematics classes, and are particularly concerned about teacher support and equity, teachers and schools need to become more aware of individual students in the class who may want to succeed but have language as a barrier to learning.

NESB students would benefit from the constructivist learning environments many teachers are providing. Though the learning environments in their home countries would be more traditional, the interaction with English-speaking students in solving problems, doing group work and learning by experience, would enable them to interact

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Table 4: Comparison of NESB and English-speaking students' means for each scale of the WIHIC

WIHIC scale	Scale mean			Standard deviation	
	English speaking	NESB	Differences	English speaking	NESB
Student cohesiveness	2.02	2.12	-0.10	0.61	0.75
Teacher support	2.51	2.68	-0.17*	0.99	0.88
Involvement	2.80	2.79	0.01	0.82	0.89
Task orientation	2.09	2.23	-0.14*	0.73	0.74
Investigation	3.04	2.84	0.20	0.90	0.91
Cooperation	2.19	2.32	-0.13	0.83	0.93
Equity	2.06	2.26	-0.20*	0.99	1.02

English-speaking students n=390; NESB students n=90; *p<0.05

more with English speakers. This would give them an opportunity to build self-esteem in their new environment by sharing their prior knowledge that, in some cases, is substantial.

Though helpful for NESB students, this may not be the most comfortable environment for them initially. Firstly, there is the hurdle of getting the students to use their emerging English to engage in discussion. Secondly, NESB students would find a classroom organised around group processes even more foreign to them than a traditional Australian classroom.

Despite these limitations however, it is well documented that it is vital for ELLs to be placed in positions in a mainstream classroom where they are encouraged to communicate. Cummins (2003) suggests that ELL students need the engagement with other students as a means of supporting their ability to acquire English. This not only helps their social integration but also their grasp of academic language.

> Students must be involved in conversational and interactive opportunities in the classroom if they are to experience the concepts of the curriculum while simultaneously engaging in meaningful language about these concepts. (Warner & Moore, 2008, p. 14)

To facilitate better language acquisition by NESB students, more content-focused discussions on a student-to-student basis are needed. Whilst helping NESB students' academic language acquisition, this approach will aid concept development for all students.

By utilising some of the techniques discussed, and making NESB students feel more included in the classroom, the gap between student attitude to Mathematics and perceptions of learning environments will be addressed. This study pointed to a need to address NESB students' perceptions of *equity* and *teacher support* within Australian classrooms. Utilising techniques that promote increased interaction between students and with the teacher is likely to build language skills, Mathematical understanding and positive perceptions of classroom environment. **TEACH**

Utilising techniques that promote increased interaction between students and with the teacher is likely to build language skills, Mathematical understanding and positive perceptions of classroom environment

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