STUDENT PERCEPTIONS OF TEACHER-STUDENT INTERPERSONAL BEHAVIOUR AND CULTURAL FACTORS OF LEARNING ENVIRONMENT IN METROPOLITAN AND COUNTRY SCHOOLS

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ABSTRACT

This paper reports the findings from a study of 2,176 students in 103 science classrooms in Western Australia and Queensland. Two questionnaires, the Questionnaire of Teacher Interaction and the Cultural Learning Environment Questionnaire were used with attitudinal and concept understanding measures were used to collect data from schools from geographically diverse locations, namely, metropolitan, rural and remote areas. The paper provides information on the differences that occur between these locations, for example, in their understanding of science concepts, metropolitan students scored less than rural students who scored less than provincial students; and associations between students' culturally sensitive learning environment and their attitudes and student understanding of science concepts were found in that more positive student attitudes were associated with more equitable treatment, competition and congruence between school and home.

INTRODUCTION

This paper reports the findings from a study of 2,176 students in 103 science classrooms in Western Australia and Queensland. While these schools were from geographically diverse locations, interesting comparisons were found between each type of school in terms of student-teacher interpersonal behaviour and students' perceptions of culturally sensitive factors of their learning environment. A brief description is given of the development of a questionnaire to assess culturally sensitive factors of learning environments and its application in investigating relationships between these factors, teacher-student interpersonal behaviours, student attitude towards science and student achievement of enquiry skills in these schools.

The central importance of science education, and the urgent need for its improvement at all educational levels, have been widely recognised in numerous government reports in Australia (Brennan, 1994; NBEET, 1996), including the recent *Clever Teachers, Clever Sciences* (Department of Education, Science and Training (DEST), 2003a) and a Department of Education, Training and Youth Affairs (DETYA)-commissioned project on the quality of science education (Goodrum, Hackling, & Rennie, 2001). The most recent Australian upper school enrolment statistics again confirm low enrolments in the more 'rigorous' physical sciences and mathematics subjects, particularly among girls and ethnic minorities (DEST, 2003b).

The Department of Education, Training and Youth Affairs report *The Status and Quality of Teaching and Learning of Science in Australian Schools* (Goodrum, Hackling & Rennie, 2001) provides a contemporary, informative and disappointing picture of the current state of science education in Australia:

> The actual picture of science teaching and learning is one of great variability but, on average the picture is disappointing. **In some primary schools, often science is not taught at all.** When it is taught on a regular basis, it is generally student-centred and activity-based, resulting in a high level of student satisfaction. When students move to high school, many experience disappointment, because the science they are taught is neither relevant nor engaging and does not connect with their interests and experiences. Traditional chalk-and-talk teaching, copying notes, and 'cookbook' practical lessons offer little challenge or excitement to students. Disenchantment with science is reflected in the declining numbers of students who take science subjects in the post-compulsory years of schooling. (p. 3)

In fact, five years later, it is suggested that the report has had little impact on school science (Goodrum, 2006).

Another report, *The Place of Literacy and Numeracy in the Primary School Curriculum*, (Hill, Hurworth, & Rowe, 1998) noted that science was one of the areas of the curriculum where primary schools perceived the greatest decrease in time allocation over the previous three years. A recent study, *Foundations for Australia's Future - Science and Technology in Primary Schools*, stated that 'much has been achieved in primary science and technology education over the past ten years but much more needs to be done' (Stocker, 1997, p. 1).

In relation to education in different geographical regions, the Alston and Kent Report (2006) noted that Year 12 completion rates were significantly lower for regional and remote Australian students. During the period 1994-2004, regional completion rates were, on average, about seven percentage points lower and remote completion rates were about 15 percentage points lower than for metropolitan students. Males in regional and remote areas had lower completion rates than female students. This report focused on the impact that the drought had on completion rates. It reported that the drought had impacted on year 12 student numbers, spread of subject choice and ability of the school to attract teachers. The Tomlinson Report (1994, p. 27) in Western Australia concurs and noted that a 'systematic difference in Tertiary Education Entrance performance favouring metropolitan over rural school students' was evident. While this report signalled the author's belief that this difference was not simply a rural versus metropolitan discrimination, it offered few possible explanations for the difference. Rural students' participation in education is lower than that of students from the metropolitan areas. This lower participation rate has been the subject of concern to governments (Alston & Kent, 2006; Dawkins & Kerin, 1989). In United States schools, metropolitan schools often are better equipped, attract better and more experienced teachers and their students tend to do better than rural school students (Ballou & Podgursky, 1995; Dayton, 1998; Reaves & Larmer, 1998).

Other studies examining academic performance measures have not revealed a lower performance by rural students (Kleinfeld, 1985; Monk & Haller, 1986) while Khattri, Riley and Kane (1997) state that geographical isolation and the imposition of an urban model of schooling in rural areas could be a factor in putting students at risk academically. These apparent differences are of concern as this can affect whether or not students undertake tertiary study. Additional factors that affect whether students proceed to higher education include achievement, motivation, school type, parental encouragement, socio-economic background, and personal values (Hemmings, Kay, & Hill, 1998; Lam, 1982; McInnes, James, & McNaught, 1995).

Young's (1994) study on the importance of school location in affecting student performance showed that it was not the school location but rather whether the student was Aboriginal or Torres Strait Islander or attended a school in a low socio-economic area (Haller & Virkler, 1993) that affected the student's performance. However, relative geographical isolation of rural schools, is a factor that limits their teachers' opportunities for professional development. This, in turn, constrains teachers' abilities' to socialise with other professionals and to have access to current pedagogical knowledge (Reaves & Larmer, 1998). Young (1998) also investigated the effect of academic self-concept and learning environment on science and mathematics achievement in rural and remote Western Australia. She found that students' self-concept and their perceptions of their classroom learning environments were related to academic achievement. Ewington (1996), in examining Tasmanian schools, noted that urban parents perceived urban schools to be more effective than did parents of rural schools. He suggested the reason for this was the higher proportion of less experienced and more mobile teachers that are found in rural schools.

While it is true that rural schools, both in the USA (Khattri, Riley, & Kane, 1997; Stern, 1994) and Australia (Productivity Commission, 1998) tend to be smaller than their metropolitan counterparts, they are seen to cultivate a positive school climate, better community-school relationships and a better learning environment (Ballou & Podgursky, 1995; Tompkins & Deloney, 1994). One of the main reasons for this could be the intimacy of rural communities and the parental support often provided in rural schools. The result of this could be an enhanced learning environment. It was thus decided in this study to examine the science classroom learning environments of metropolitan and rural schools to see if there were any differences between them.

Research suggests that students who come from different geographical areas display a distinct culture, however, none of the above studies examined the effect of the local culture on learning. According to Phelan, Davidson, and Cao (1991), culture is the norms, values, beliefs, expectations, actions, and emotional responses of the group. While there are a number of research studies in science concerning culture and education generally (Aikenhead, 1997a, 1997b; Atwater, 1993; Cobern, 1996), comparatively little research examines the interaction that occurs between culturally sensitive factors of students' learning environment and their learning in science. In this paper, it is argued that at the macro-classroom level, there are distinctions that can be made between the way of life (including the classrooms) for rural, provincial and metropolitan students.

USE OF STUDENT PERCEPTUAL DATA

Until the late 1960s a very strong tradition of trained observers coding teacher and student behaviours dominated classroom research. Indeed, it was a key recommendation of Dunkin and Biddle (1974) that instruments for research on teaching processes, where possible, should deal with the objective characteristics of classroom events. Clearly, this low-inference approach to research which often involved trained observers coding teacher and student behaviours was consistent with the behaviourism of the 1960s. One field which broke with this tradition in the late 1960s and used student perceptual data is the study of classroom psychosocial environments. Low-inference approaches, which characterised early classroom environment research in the USA (see Chavez, 1984), have given way to the use of the summary judgments of milieu inhabitants based on their long-term involvement in the particular setting. Since the mid-1960s, the strong trend in classroom environment research has been towards this high-inference approach with data collected from teachers and students. Support for this methodological approach is found in Walberg's (1976) perceptual model of the learning process which proposes that student learning involves student perceptions acting as mediators in the learning process. In addition, Walberg advocated the use of student perceptions to assess environments because students seemed quite able to perceive and weigh stimuli and to render predictively valid judgments of the social environment of their classes.

Several advantages of the use of measures that define the educational setting in terms of the inhabitants' perceptions have been suggested by Fraser (1994), Fraser and Walberg (1981) and Walberg (1991). First, students and teachers are at a good vantage point for making valid judgments about classrooms and schools. As they are immersed in the atmosphere for extended periods of time, this exposure allows students and teachers to form opinions based on long-term experience. This approach contrasts with short-term observations that often are associated with the use of external observers (e.g., snapshots of one or two lessons). From a methodological perspective, this means that the milieu inhabitants have more data to bring to the data collection stage. Moreover, these data have been processed by the inhabitants, resulting in the formation of judgments. A second advantage of using student and teacher perceptions over the notes, codings and perceptions of observers is that students and teachers act on the basis of their perceptions. Accordingly, the assessment of these perceptions as determinants of behaviour is preferred to the reporting of an observer's assessment of classroom reality. Third, perceptions of classroom environment have been found to account for considerably more variance in student learning outcomes than have directly observed variables. Fiedler's (1975) study of classroom interaction showed that students' perceptions of their own influences on the class, but not observer estimates of the class, predicted academic gains (Walberg, 1991). Walberg concluded that low-inference studies using observers could be a narrow approach to the understanding of classroom environments. That students are able to make valid summary judgments about schooling is best demonstrated by the classroom environment components of the present study which focus on cultural factors and teacher-student interactions.

CULTURAL FACTORS OF THE LEARNING ENVIRONMENT

Recent reviews (e.g. Fraser, 1994, 1998) show that science education researchers have led the world in the field of classroom environment research, particularly the use of student perceptions, over the last two decades, and that this field has contributed much to understanding and improving science education. For example, classroom environment assessments provide a means of monitoring, evaluating and improving science teaching and curriculum. A key to improving student achievement and attitudes is to create learning environments that emphasise those characteristics that have been found to be linked empirically with student outcomes. However, classroom environment research has been somewhat limited in primary schooling compared with secondary schooling.

Fisher and Waldrip (1999) developed an instrument to specifically assess cultural factors of the learning environment. This new instrument, the *Cultural Learning Environment Questionnaire* (CLEQ), was based on previous learning environment scales that a review of research literature indicated could be culturally important. The selection of these scales was guided further by an examination of literature from the fields of anthropology, sociology and management theory. Analyses of the results indicated that the most consistent predictors of teacher-student interactions were the Collaboration, Deference, Competition, Teacher Authority and Modelling scales. The most consistent predictors of students' attitudes and achievement were Equity, Competition, Deference, Modelling and Congruence. For the purposes of this study, it was decided to modify the CLEQ for use in primary schools. Part of this modification involved a reduction in the number of scales to three, namely, Equity, Collaboration and Congruence. Therefore, the CLEQ (primary) contained 15 items which had been construct and content validated by teachers, students and fellow researchers. Each item was responded to on a five-point scale with the extreme alternatives of Disagree - Agree. Table 1 clarifies the meanings of each of the eight scales by providing a scale description and a sample item.

Table 1 *Descriptive Information for Each Scale of the CLEQ (Primary)*

Scales	Description	Sample Item
Equity	The extent to which students perceive males and females are treated equally.	I feel that comments in class by male and female students are equally important. (+)
Collaboration	The extent to which students perceive they collaborate with other students rather than act as individuals.	I feel that it is important for the class to work together as a team. (+)
Congruence	The extent to which the students perceive learning at school matches their learning at home.	What I learn in this class helps me at home. (+)

The first large-scale adaptation of this instrument to the primary level was thus an important component of this study and the study adds to our understanding of primary school classroom learning environments (Fisher & Waldrip, 1999). This paper, while clearly related to the previous ones, is distinct in that it incorporates classroom environment theory and research to examine the contribution that primary students' perceptions of cultural factors related to their learning environment have on their attitudes and understanding of science concepts.

TEACHER-STUDENT INTERACTIONS

One particular focus of classroom environment research has been the investigation of teacher-student interactions. Wubbels, Créton, and Holvast (1988) investigated teacher behaviour in classrooms from a systems perspective, adapting a theory on communication processes developed by Watzlawick, Beavin and Jackson (1967). Within the systems perspective on communication, it is assumed that the behaviours of participants influence each other mutually. The behaviour of the teacher is influenced by the behaviour of the students and in turn influences student behaviour. Circular communication processes develop which not only influence behaviour, but determine behaviour as well.

With the systems perspective in mind, Wubbels, Créton, and Hooymayers (1985) in The Netherlands extrapolated the seminal interpersonal behavioural research of Leary (1957) who worked in the clinical psychology field to develop an instrument, the *Questionnaire on Teacher Interaction* (QTI), to gather students' perceptions of their interactions with their teacher (Wubbels & Levy, 1993). The QTI assesses eight dimensions of teacher-student interaction: Leadership, Helping/Friendly, Understanding, Student Responsibility, Uncertain, Dissatisfied, Admonishing, and Strict. They provide a comprehensive description of teachers' interactions with their students. Table 2 presents a description and sample item for each scale of the QTI.

Table 2 *Description of Scales and Sample Items for each Scale of the QTI*

Scale Name	Description of Scale (The extent to which the teacher...)	Sample Item
Leadership	...leads, organises, gives orders, determines procedure and structures the classroom situation.	This teacher talks enthusiastically about his/her subject.
Helpful/Friendly	...shows interest, behaves in a friendly or considerate manner and inspires confidence and trust.	This teacher helps us with our work.
Understanding	...listens with interest, empathises, shows confidence and understanding and is open with students.	This teacher trusts us.
Student Responsibility	...gives opportunity for independent work, gives freedom and responsibility to students.	We can decide some things in this teacher's class.
Uncertain	...behaves in an uncertain manner and keeps a low profile.	This teacher seems uncertain.
Dissatisfied	...expresses dissatisfaction, looks unhappy, criticises and waits for silence.	This teacher thinks that we cheat.
Admonishing	...gets angry, express irritation and anger, forbids and punishes.	This teacher gets angry unexpectedly.
Strict	...checks, maintains silence and strictly enforces the rules.	This teacher is strict.

Past lines of research have related teacher-student interactions with student outcomes. Generally, higher cognitive outcome scores and attitudinal outcomes are positively associated with leadership, helping, friendly and understanding teacher behaviours. Conversely, admonishing, dissatisfied and uncertain teacher behaviours are negatively associated with students' cognitive and attitudinal outcomes (She & Fisher, 2000; Wubbels & Levy, 1993). These findings have been important in the selection of very good or exemplary science teachers (Waldrip & Fisher, 2003).

Student Attitudes Toward Science

Successful implementation of teaching strategies to teach science is likely to result in the establishment and maintenance of positive students' attitudes towards science. Previous research has shown that students' perceptions of classroom environment are related to attitudes towards science (Fisher & Waldrip, 1999; Klopfer, 1992). Given the national importance given to the teaching of science and inculcation of positive attitudes towards science in students, it was both timely and opportune to examine associations between students' perceptions of cultural factors that affect the learning environment, teacher-student interactions, and students' attitudes towards science. In order to measure student attitude towards science, students participating in this study completed an eight-item measure, *Attitude To This Class* scale (Henderson, Fisher, & Fraser, 2000) adapted from the *Test Of Science-Related Attitudes* [TOSRA] (Fraser, 1981).

Students' Understanding of Science Concepts

Learning science involves learning and understanding concepts. For students' understanding of science concepts, constructivist principles suggest that teachers need to recognise that: knowledge is not received passively but students construct their own meanings of what they hear or see; they should focus on the way in which learners construct viable and useful knowledge; and the social setting (learning environment) of the individual constrains how knowledge is constructed. (Mintzes & Wandersee, 1998).

Teachers have used a variety of strategies to assist students' development of understanding including but not limited to: models, analogies, concept maps, teaching models, small group work and student-centred learning. Conceptual change, when it does occur, includes students' recognition, evaluation, reconstruction and review of their understanding. Unless students understand their view of a concept, conceptual change is unlikely to occur and learning will not be enhanced. While this study is not focusing on conceptual change per se, it will have implications for improving student learning.

The link between understanding concepts and cultural factors of the learning environment is important. As Gao (1998) stated, the understanding of science concepts is culturally dependent. Case (1971) examined science teaching in English to students with African and Asian mother tongues respectively and showed that language clearly interfered with science learning. In fact, colloquial expressions reinforced misconceptions, for example., "The sun will set soon." The language used can facilitate science learning or it can act as a barrier to understanding (Kokkotas, Drakopoulou, Vlachos, & Plakitsi, 1999).

Students' understanding of science concepts was assessed using a concept based test that required students to identify the scientifically acceptable alternative from a list of common student alternative concepts.

METHODOLOGY

The overall aim of the study described in this paper was to investigate differences in students' perceptions of teacher-student interpersonal behaviour and culturally sensitive factors of the classroom learning environments in metropolitan and country schools. The first objective was to examine the differences in students' perceptions of teacher-student interpersonal behaviour and classroom learning environments in metropolitan, provincial, and rural/remote schools. The second objective was to examine associations between students' perceptions of cultural factors affecting the learning environment, student teacher interpersonal behaviour and their attitudes and understanding of selected science concepts.

In the study, three types of school community were defined: metropolitan, provincial, rural and remote. Provincial towns were defined as communities outside the metropolitan area with a population greater than 20,000; rural and remote towns were generally centres which had a population base of less than 5,000.

The sample used contained 710 secondary school students in 19 metropolitan schools, 696 students in six provincial schools, 766 students in 13 rural schools. All students completed a survey that included the QTI, the CLEQ, an attitudes towards science scale, and items on science concepts.

Simple correlation analyses were used to examine the degree of association between each of the CLEQ and QTI scales and attitude to science, and between the CLEQ and QTI scales and achievement of science concepts. Differences in CLEQ and QTI scales, attitudes and enquiry skills due to type of school were examined using a MANOVA.

RESULTS

Teacher-student interpersonal behaviours

For this study, the alpha coefficients of the QTI scales ranged from 0.62 to 0.81. The reliability data suggests that each QTI scale has acceptable reliability, especially for scales containing a relatively small number of items. Table 3 indicates that metropolitan students were less likely to perceive the more positive aspects of student-teacher interpersonal behaviours and more likely to perceive the more negative aspects than were students from the other types of schools. For example, metropolitan students' perceptions of student responsibility was not as high as were other students' perceptions and they were more likely to perceive admonishing behaviours in their teachers. Provincial and rural students perceived their teachers to be more helpful, and friendly and allowing them more responsibility and freedom. It is possible that this is because they are often in smaller classes. Metropolitan students reported the least dissatisfied behaviour which might reflect that metropolitan schools tend to retain more experienced teachers.

Table 3 *Means and Standard Deviations of Metropolitan, Provincial, and Rural Students' Perceptions for QTI Scales*

Scale	Metropolitan Students Mean (s.d.)	Provincial Students Mean (s.d.)	Rural Students Mean (s.d.)	Note
Leadership	0.51 (0.14)	0.53 (0.14)	0.51 (0.14)	
Helpful/ Friendly	0.55 (0.17)	0.57 (0.16)	0.57 (0.16)	
Understanding	0.52 (0.17)	0.54 (0.15)	0.54 (0.15)	
Student Responsibility	0.42[a] (0.15)	0.44[b] (0.13)	0.46[b] (0.14)	Metro were less sig than provincial & rural.
Uncertain	0.21 (0.14)	0.21 (0.15)	0.23 (0.14)	
Dissatisfied	0.21 (0.17)	0.22 (0.14)	0.22 (0.15)	
Admonishing	0.25[a] (0.18)	0.28[b] (0.18)	0.26 (0.16)	Metro was less sig than Provincial
Strict	0.35 (0.16)	0.38 (0.15)	0.36 (0.14)	

- The range for the mean is 0 - 1.
- Different superscripts across rows indicate group differences at the $p<0.01$ level

Culturally sensitive factors of the learning environment

In this study, the Cronbach alpha coefficients of the CLEQ scales were acceptable and ranged from 0.71 to 0.80 with a sample of 2,176 students in 37 schools. Table 4 shows the means for metropolitan, provincial, and rural students. The means of Equity and Collaboration suggest that the students believed that the males and females were treated equally in their classes and that there was a high degree of collaborative learning occurring. The lower means for Congruence suggest that students were less likely to view congruence between school and out-of school learning. An examination of Table 4 indicates that provincial students were more likely to view their learning more positively than metropolitan students. Otherwise, on a collective but not individual basis, the students in classrooms in rural, provincial, and rural towns had somewhat similar perceptions of culturally sensitive factors of the learning environment.

Table 4 *Means and Standard Deviations of Metropolitan, Provincial, and Rural Students' Perceptions for CLEQ Scales*

Scale	Metropolitan Students Mean (s.d.)	Provincial Students Mean (s.d.)	Rural Students Mean (s.d.)	Notes
Equity	3.22[a] (0.59)	3.38[b] (0.55)	3.30 (0.60)	Metro was less sig than provincial
Collaboration	3.17[a] (0.62)	3.29[b] (0.65)	3.21 (0.60)	Metro was less sig than provincial
Congruence	2.94[a] (0.65)	3.17[b] (0.62)	3.12[b] (0.61)	Metro was sig less than provincial and rural

* Different superscripts across rows indicate group differences at the $p<0.01$ level

Associations between CLEQ Scales and Learning Outcomes

Past environment research has often investigated associations between student outcomes and the nature of the classroom environment (Fraser, 1994). In order to permit examination of the predictive validity (i.e., the ability to predict student outcomes) of the CLEQ, students completed a simple Likert-type questionnaire which assessed students' attitudes towards science (Fraser, 1981) and items on students' understanding of selected science concepts. These items were drawn from a range of sources and reflected the range of abilities and spread of topics taught in Australian schools. Simple correlation analyses were used in examining the degree of association between each of the CLEQ scales and attitude to science and between the CLEQ scales and achievement of conceptual understanding. Overall, as depicted in Table 5, most of the scales of the CLEQ were found to be associated with students' attitudes and science conceptual understanding. Furthermore, it can be seen that all of the significant correlations were positive. The highest correlations occurred with attitudes to science when students perceived greater levels of Congruence and Equity in their classrooms. These two scales were also important for the achievement of enquiry skills.

Table 5 *Associations between CLEQ Scales, Attitudes, and Science Conceptual Understanding - Simple Correlations (r) and Multiple Correlation (β)*

CLEQ Scale	Simple Correlation(r)		Standardised Regression Weight (β)	
	Attitudes	Conceptual Understanding	Attitudes	Conceptual Understanding
Equity	0.36*	0.07*	0.17*	0.05
Collaboration	0.30*	0.02	0.04	-0.05
Congruence	0.47*	0.09*	0.38*	0.09*
Multiple Correlation, R			0.50*	0.10*
Sample Size	2,176	1,890	2,178	1,889

* p<0.01

These associations were further investigated using multiple regression. The magnitude and statistical significance of the regression coefficient provides a measure of the association between the outcomes and input variable when scores on the other input variables are held constant. Beta weights and significance levels are reported in Table 5 for each CLEQ scale and there is a high degree of congruence with the results of the simple correlations. Table 5 shows that the number of significant regression weights for the multiple correlation analysis was two for both attitudes and understanding of science concepts. An examination of the signs of the significant beta weights reveals that the regression weight for attitudes was positive for Equity, Competition and Congruence. The regression weight for understanding science concepts is positive for Congruence. Those students who perceived greater levels of congruence between their home and school had more positive attitudes towards science.

Table 6 indicates that students' attitudes to science in metropolitan schools are significantly less than those of students in rural and provincial schools. For student understanding of science concepts, metropolitan students scored less than rural students who scored less than provincial students. Care needs to be taken with this finding as the research found that only a narrow range of science topics were being taught by the teachers, even though the understanding of science items measured the broad range of topics in the syllabus. In other words, the delivered science curriculum largely focused on environmental science with a scattering of other concepts being addressed. This result reflects Goodram, Hackiling and Rennie's (2001) study that primary science is often not taught. This result is differs to previous research (Kleinfeld, et al, 1985; Monk & Haller, 1986).

Table 6 *Means and Standard Deviations of Metropolitan, Provincial, and Rural Students' Attitudes towards Science and Enquiry Skills*

	Metropolitan Students Mean (s.d.)	Provincial Students Mean (s.d.)	Rural Students Mean (s.d.)	Notes
Attitudes towards Science	3.68[a] (0.59)	3.85[b] (0.50)	3.82[b] (0.51)	Range: 1-5 Metro was sig less than Provincial & rural
Understanding of Concepts	0.44[a] (0.14)	0.53[b] (0.12)	0.48[c] (0.12)	Range: 0-1 Metro was sig less than Rural which was sig less than Provincial

Different superscripts across rows indicate group differences at the $p<0.01$ level

Gender Differences

Table 7 shows that female students perceived the classroom interactions and cultural factors of the learning environment more favourably than did the males but displayed less positive attitudes towards science.

Table 7 *Means and Standard Deviations of Male and Female Students' Attitudes towards Science and Enquiry Skills*

Scale	Female Mean (s.d.)	Male Mean (s.d.)
Leadership	0.53* 0.13	0.50* 0.15
Helpful/ Friendly	0.58* 0.15	0.54* 0.18
Understanding	0.55* 0.14	0.51* 0.17
Student Responsibility	0.45* 0.13	0.41* 0.16
Uncertain	0.20 0.14	0.22 0.14
Dissatisfied	0.18* 0.14	0.24* 0.17
Admonishing	0.23* 0.16	0.29* 0.18
Understanding of science concepts	0.45 0.13	0.48 0.13
Equity	3.30* 0.55	3.23* 0.62
Collaboration	3.23* 0.57	3.18* 0.65
Congruence	3.06* 0.59	2.99* 0.68

* $p< 0.01$, n=2,176

DISCUSSION

This article has described metropolitan, provincial, and rural students' perceptions of culturally sensitive factors affecting their science learning environment and teacher-student interpersonal relationships. It builds on a previous study which described the development and validation of a questionnaire, namely the Cultural Learning Environment Questionnaire (CLEQ), which assessed seven scales of the culturally sensitive factors of the learning environments of secondary school science students (Fisher & Waldrip, 1999). The modified primary of the CLEQ was found to be a reliable and valid instrument for use with metropolitan, provincial, and rural, students.

While some aspects of the learning environment were similar, differences were found between the students from metropolitan, provincial, and rural areas. Provincial students were more likely to view their learning more positively than did metropolitan students. Metropolitan students had a distinctly different perception of teacher-student interpersonal behaviours. Some of these aspects could be due to the generally more intense nature of metropolitan populations. These students perceived less of the more positive aspects of student-teacher interpersonal behaviours, like allowing students more responsibility in their learning, and were more likely to report the negative aspects, like admonishing behaviour in their teacher.

Associations between students' culturally sensitive learning environment and their attitudes and student understanding of science concepts were found. Regression analysis suggested that more positive student attitudes are associated with more equitable treatment, competition and congruence between school and home. The development of student understanding of science concepts also was associated with more equity and congruence. In their understanding of science concepts, metropolitan students scored less than rural students who scored less than provincial students a factor that could reflect Goodrum, Hackling, and Rennie's (2001) finding that in quite a few schools primary science is often not taught.

A previous study (Young, 1998) has shown that students' perceptions of the learning environment do affect their academic achievement. This study shows that classroom differences do exist between the locations of schools and that these differences are related to student-teacher interpersonal behaviour and culturally sensitive factors of the classroom learning environment.

This paper has provided information on what differences occur between metropolitan and country schools rather than why they occur. However, where there are such differences between schools, the achievement of students will most likely differ. These issues would be a worthwhile focus for future research.

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Acknowledgments

The research described in this paper was supported in part by a Australian Research Council Discovery Grant DP0343626.