The School Environment and Student Self-Concept: 
A Comparison of Urban and Rural Schools

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ues more adequately addressed the hierarchical nature of the data, that is, the variability between schools and within schools was separated (Bryk & Raudenbush, 1986; Goldstein, 1984, 1987). While early British research by Reynolds (1982) and Rutter et al. (1979) indicated that schools affected students equally, later studies by Aitkin and Longford (1986) found significant differences in school effects for students from different socioeconomic backgrounds. Further, Cuttance (1992, pp. 78-79) reported that achievement was significantly greater for students from more affluent home backgrounds, when compared with students from poorer homes. In this British study, Cuttance showed that school intake differences account for a large proportion of the variation in unadjusted variation in student achievement. Finally, Cuttance asserted that any analyses of the effectiveness of schools need to adjust for the social background and prior attainment of students.

The examination of social and gender differences in United States schools has led researchers such as Levine (1992) to recommend that multiple measures of students' social and economic background be used to control for social class influences on achievement. Levine et al. (1979) found that the frequently used US indicator, students' subsidised lunch status, was not useful due to highly variable reporting by principals. Levine also urged that schools be examined for their effectiveness in equalising the academic achievement of minorities and disadvantaged groups. The importance of examining the equity of the school, as well as the school's effectiveness, was advocated by US researchers who found that a school could be identified as highly effective, yet have lower class and minority students with poor academic performance (Brookover, 1985; Shoemaker, 1984; Lezotte, 1986).

The importance of the school and classroom environment in enhancing learning has also been investigated by Fraser (1986, 1991), who found strong links between student outcomes and their educational environments. Fraser and Tobin combined qualitative and quantitative methodologies in their study of exemplary teachers and found the classroom learning environment was decisive in enhancing student learning in science (Fraser & Tobin, 1989; Tobin & Fraser, 1987). In addition, studies into factors associated with educational productivity
found nine consistent factors: student ability, student development, student motivation, instructional time, instructional quality, home environment, classroom environment, peer groups and television viewing (Fraser, Walberg, Welch & Hattie, 1987).

Assessing The School Environment

International research efforts involving the conceptualisation, assessment and investigation of perceptions of psychosocial aspects of educational environments have firmly established educational environment as a thriving field of study (Fraser, 1994; Fraser & Walberg, 1991). One of the originators of this line of research, Moos (1974), found that the same three general categories can be used in conceptualising the individual dimensions characterising diverse psychosocial environments. This finding emerged from Moos's work in a variety of environments including hospital wards, school classrooms, prisons, military companies, university residences and work milieus. The three basis types of dimensions are: Relationship Dimensions (e.g., peer support, involvement) which identify the nature and intensity of personal relationships within the environment, and assess the extent to which people are involved in the environment and the extent to which they support and help each other; Personal Development Dimensions (e.g., professional interest) which assesses the basic directions along which personal growth and self-enhancement tend to occur; and System Maintenance and System Change Dimensions (e.g., innovation, work pressure) which involve the extent to which the environment is orderly, clear in expectations, maintains control and is responsive to change.

Recent classroom environment research has focused on science laboratory classroom environments (McRobbie & Fraser, 1993), constructivist classroom environments (Taylor, Dawson & Fraser, 1995) and computer-assisted instruction classrooms (Teh & Fraser, 1995), while other studies have focused on the school environment (Fisher, Fraser & Wubbels, 1993). However, a careful review of the potential strengths and problems associated with existing school environment instruments led to the development of a new school environment instrument named the School Level Environment Questionnaire (SLEQ) (Fisher & Fraser, 1990), which measures teachers' perceptions of psychosocial dimensions of the environment of a school. This instrument consisted of seven scales, with two measuring Relationship Dimensions (Student Support, Affiliation), one measuring the Personal Development Dimension (Professional Interest) and five measuring System Maintenance and System Change Dimensions (Staff Freedom, Participatory Decision Making, Innovation, Resource Adequacy and Work Pressure).

Fisher, Fraser and Wubbels (1993) have reported validation data for a number of samples including one study of 46 teachers in seven Australian schools. The validation data include information about each scale's internal consistency (Cronbach alpha reliability), discriminant validity (mean correlation of a scale with the other seven scales) and the ability of the instrument to differentiate between the perceptions of teachers in different schools. The alpha coefficients for different SLEQ scales ranged from 0.65 to 0.92 suggesting that each SLEQ scale displays satisfactory internal consistency for a scale composed of only seven items. The mean correlation of each scale with other scales which ranged from 0.05 to 0.42 indicated satisfactory discriminant validity and suggested that the SLEQ measures distinct although
somewhat overlapping aspects of school, the SLEQ has been revised in keeping with developments in schools and validation data reported by Fisher and Cresswell (1996) and environment. A one-way ANOVA was performed for each scale, with school membership as the main effect. It was found that each SLEQ scale differentiated significantly (p<0.001) between schools and that the eta2 statistic (an estimate of the proportion of variance in SLEQ scores attributable to school membership) ranged from 0.16 to 0.40 for different scales (Fisher, Fraser & Wubbels, 1993).

The SLEQ consists of 56 items, with each of the eight scales being assessed by seven items. Each item is scored on a five-point scale with the responses of Strongly Agree, Agree, Not Sure, Disagree and Strongly Disagree. Table 1 clarifies further the nature of the SLEQ by providing a scale description and sample item for each scale and shows each scale's classification according to Moos' scheme. As well, Table 1 provides information about the method and direction of scoring of SLEQ items.

Table 1. Description of scales in SLEQ and their classification according to Moos' scheme.

Student Satisfaction

Students in this study were asked to respond to items regarding their satisfaction with the school. There were 18 items in this measure and three scales. These student satisfaction scales were then used as the dependent measure for this study.

Table 2. Description of items in the student satisfaction scales.

Student Self-Concept

'That self-concept is related to achievement presupposes that certain classroom environments enhance both aspects.'(Hattie, 1992, p. 197).

In previous research about self-concept, the multidimensional nature has been well documented (Byrne, 1984; Hattie, 1992; Marsh, 1990, 1993; Marsh & Shavelson, 1985). The academic components of the model have been the focus of attention in relationship to external constructs such as academic achievement. We included two components of the Marsh Self Description Questionnaire (SDQII) designed to measure adolescent self-concepts (Marsh, 1992).

Included in this study, were two measures of Self-Concept, namely, General Self-Concept and School Self-Concept each comprised of 10 items. Examples of items from these two measures are presented in Table 3. The General Self-Concept scale describes the student's feelings about himself/herself. There are both negative and positive statements related to success and failure in life. The School
Self-Concept scale measures the student's perceptions about their academic ability and potential to be a success at school. In this paper, this scale will be referred to as academic self-concept.

Table 3. Description of items in the student Self-Concept scales.

Sample

Western Australian schools are located in a variety of locations, which have previously been categorized into three groups in other analyses (Tomlinson, 1994; Young, 1994): metropolitan Perth, rural and remote. Unfortunately, these three categories did not account for rural cities and other types of rural locations (similarly for the remote category). Subsequently, these categories have been expanded by the Department of Primary Industries and Energy and the Australian Bureau of Statistics (DPIE, 1994) into seven categories, five of which were then used in this study. The five categories were Metropolitan (Capital City), Small Rural Centres, Other Rural Areas, Remote Centres and Other Remote Areas and these were incorporated into this study. In Western Australia, only these five categories are applicable.

Classification Category Population Size

Metropolitan: Capital City
Other Metropolitan Centres urban centre pop ≥ 100,000
Rural: Large Rural Centres urban centre pop 25,000 - 99,999
Small Rural Centres urban centre pop 10,000 - 24,999
Other Rural Areas < 10,000
Remote: Remote Centres urban centre pop ≥ 5,000
Other Remote Areas < 5,000

Additionally, the sample was stratified further into three categories of Socioeconomic Status (SES). Socioeconomic strata was defined using the student SES consisting of mother and father's occupation and education. This SES measure was then aggregated to the school level and categorised into three groups of Low, Medium and High average socioeconomic status. For this Western Australian study, therefore, the total number of strata will be 5 Location strata by 3 SES strata = 15 strata altogether.

Stratified Sample Design

Strata Type Strata Categories Location Metropolitan Perth, Small Rural Centres, Other Rural Areas, Remote Centres and Other Remote Areas SES Low, Middle and High Socioeconomic Status

Sampling techniques used in this study were developed by Kish (1965) and further refined by Ross (1976, 1987). The applicant has had long experience in the use of the stratified complex sample design (Young, 1991). An important feature of this study involves the inclusion of Non-government schools. These included Catholic, Anglican and other types of Non-government schools, although no stratification was used for these school types.

There were 3397 students in the achieved sample of students from 28 schools (see Tables 4a and 4b below). While the three categories of SES were constructed so as to include approximately equal thirds of
students, this did not eventuate with the five categories of location. Unfortunately, the metropolitan schools sampled were from low and medium SES catchments and this had the effect of an empty strata for high SES metropolitan schools. Similarly, high SES schools in remote centres were not sampled. In the second stage of this study, 1997, a further sampling will occur and these strata will be filled at this time.

Table 4a. Sample size by rural location.

Table 4b. Sample size by rural location and average socioeconomic status.

Methodology
Students from 28 schools were asked to complete a questionnaire and mathematics and science test. Students in Years 8, 9 and 10 participated, with the target to continue to survey and test this cohort at least one more time (1997) and preferably two more times (1997 and 1998). The student questionnaire consisted of background and socioeconomic questions, along with questions about their rural life. In this questionnaire, students completed satisfaction items (3 scales) and self-concept items (2 scales). For the Student Satisfaction Scales, the item responses were a five point measure from Very Happy (coded 5) to Very Unhappy (coded 1) with the described support. Similarly, the Self-Concept scales consisted of a set of statements to which the student responded on a five point measure, from False, Mostly False, Neither False nor True, Mostly True to True (coded 1 to 5). Descriptive statistics and item reliabilities for these scales are presented in Table 5, with means for each location provided. The Science/Mathematics teachers participating from each of the 28 schools completed a Teacher Questionnaire, consisting of the School Level Environment Questionnaire (SLEQ), including 8 scales and 56 items, and a few other background questions. The SLEQ has already been described previously. Teachers mailed their completed questionnaires directly to the research project using a reply-paid envelope. Once each scale was computed for each teacher, all teacher results for each school were aggregated to the school level (averaged) and presented as a mean. While students, parents, teachers and the principal provided a vast array of information, this paper will focus on these variables as described in Table 5. There were 106 teachers and 3397 students participating in this study. Additionally, the Alpha Cronbach's Reliability coefficient is provided in Table 5.

Table 5. Frequencies, means and reliabilities for student and teacher/school variables.
differences for all scales except general self-concept (see Table 6). All scales tended to be lowest for the schools from Remote Centres, however it was suspected that these variations may be more related to socioeconomic status. Therefore, a further breakdown by the three categories of socioeconomic status was incorporated. These results are presented in Tables 7a (Low SES), 7b (Medium SES) and 7c (High SES).

Table 6. Means and ANOVA F-test for student and teacher/school variables by location and for total sample.

For those schools which were designated as low socioeconomic status schools, Table 7a shows a comparison of means by location. While teacher perceptions of the School Level Learning Environment (SLEQ) was generally lower for the rural and remote schools, the trend was not consistent. Three of the scales were highest in the Other Remote Area schools. Further, it was very clear that rural and remote students had the lowest self-concept and metropolitan students had the highest self-concept. Student satisfaction was highest for students in the Other Remote Areas. There were higher percentages of Aboriginal/Torres Strait Islander students in the Remote Centre schools and Other Remote Area schools.

Table 7a. Means for student and teacher/school variables by location and for Low Socioeconomic Status schools.

For those schools designated at medium socioeconomic status (Table 7b), teachers reported higher levels of their work environment in metropolitan schools, although there were some aspects which were higher in rural and remote schools. Student Self-Concept was lowest in the Other Remote Area schools and highest in metropolitan and rural schools. Finally, Student Satisfaction was highest in the Other Rural Area schools and lowest in the Other Remote Area schools. The Other Remote Area schools had higher percentages of Aboriginal/Torres Strait Islander students.

Table 7b. Means for student and teacher/school variables by location and for Medium Socioeconomic Status schools.

There were less high socioeconomic status schools in this sample for each location. However, Table 7c does show a distinct difference between Rural and Remote schools. Again, student Self-Concept was lowest in the schools from Other Remote Areas.

Table 7c. Means for student and teacher/school variables by location and for High Socioeconomic Status schools.

The Three-Level Multilevel Linear Model: Background
While there appeared to be differences between rural, remote and
metropolitan schools in the initial analyses, some of these differences could be due to socioeconomic factors rather than rurality. Further, there could be other school or teacher effects which contribute towards explaining these differences. Therefore, it is not enough to simply examine location differences by SES categories (low, medium and high). In order to investigate the importance of location and rurality in explaining differences in student attitude towards the school, a multilevel linear model of analysis was employed. In this case, a three-level model was used where student, class and school comprised the three levels of analysis.

Traditional linear models on which most researchers have relied upon, require the assumption that errors are independent, yet most subjects are ‘nested’ within classrooms, schools, districts, states and countries so that responses within groups are group dependent. To ignore the nested structure of this type of data ultimately will give rise to problems of aggregation bias (within-group homogeneity) and imprecision (Burstein, 1980; Raudenbush, 1988).

The Multilevel Linear Model provides an integrated strategy for handling problems such as aggregation bias in standard error estimates and erroneous probability values in hypothesis testing of school effects. For this study, MLn was chosen as the software program appropriate to study school and student effects relating to student outcomes. Research on school effects has previously been conducted with a set of data analysed at the individual student level, with the assumption that classrooms and schools affect students equally. However, when the effects vary among individuals and their contexts, this type of statistical analysis can be misleading (Bryk & Raudenbush, 1987). Ordinary least squares analysis provides information about the total variance, but can only break this total variance into the between- and within-school effects. The between-school effect may be influenced by school level variables, such as the affluence of the school. This study endeavoured to explain variations in student outcomes by first decomposing observed relationships into between- and within-school components.

Previous studies have shown clearly that educational researchers need to account for the inherent multilevel structure of data collected from schools and this literature includes Mason et al. (1983), Bosker and Scheerens (1989), Bryk and Raudenbush (1986, 1989, 1992) and Goldstein (1981, 1984, 1987, 1995).

The Variables
The response variable for this analysis was Student Satisfaction (an 18 item scale). There were six different types of variables used in the multilevel analysis (shown below). While some analyses described earlier suggested that rural schools may be disadvantaged, the findings were unclear. The multilevel analyses combined all of the possible explanatory variables under investigation here and revealed how they combine to influence student attitudes.

Student Satisfaction
A student measure described previously as the student’s attitude to and satisfaction with the school (continuous and standardized). [Response Variable]
Location
A five category measure described previously: Metropolitan Perth, Small Rural Centre, Other Rural Areas, Remote Centre and Other Remote Areas (1 to 5).
SESSocioeconomic Status of the students consisting of mother and father's occupations and education (continuous and standardized).
Average SESSocioeconomic Status of the students in the school aggregated to the school level (continuous and standardized).
SLEQ ScalesEight measures of the teachers' perceptions of the school environment aggregated to the school level (continuous and standardized).
Self-ConceptTwo measures of the students' self-concept: Academic or School Self-Concept and General Self-Concept (continuous and standardized).

The Three-Level Multilevel Linear Model: Statistical Models
In this study, the use of the multilevel linear model involved the single cross-section of data with a three-level structure consisting of students (Level 1) nested within classes (Level 2) nested within schools (Level 3).
The simplest model was used first, that is, the fully unconditional model with no predictor variables specified. The outcome measure, student satisfaction, is free to vary across three different levels of analysis: student, class and school.
Student-Level Model. Student satisfaction for each student was estimated as a function of the class average plus random error:
\[ \text{Stu}^{att} \text{ijk} = p^{0jk} + e^{ijk} \]
where
\[ p^{0jk} \text{ represents the satisfaction of class } j \text{ in school } k. \]
\[ e^{ijk} \text{ represents the random error of student } i \text{ in class } j \text{ and school } k. \]
\[ i = 1, \ldots, n_{jk} \text{ students in class } j \text{ and school } k. \]
\[ j = 1,2, \ldots,J_k \text{ classes within school } k, \]
\[ k = 1, \ldots,K \text{ schools.} \]
Class-Level Model. Student satisfaction average for each class was estimated as a function of the school average plus random error:
\[ p^{0jk} = b^{00k} + r^{0jk} \]
where
\[ b^{00k} \text{ represents the mean satisfaction in school } k. \]
\[ r^{0jk} \text{ represents the random error of class } j \text{ in school } k. \]
School-Level Model. Student satisfaction for each student was estimated as a function of the class average plus random error:
\[ b^{00k} = g^{000} + m^{00k} \]
where
\[ g^{000} \text{ represents the mean satisfaction in school } k. \]
\[ m^{00k} \text{ represents the random error of class } j \text{ in school } k. \]
This three-level model partitions the total variability in the outcome measure, student satisfaction, into its three components: students within classes (s2), classes within schools (tp) and between schools (tb).

Discussion of Results
The Three-Level Multilevel Model: Student Satisfaction with the School
Firstly, the variation in student attitude was decomposed at the three levels as described in Table 8. Most of the variation was found to be at the student level (89.0%), with 5.5% variation between classes and 5.5% variation between schools (Table 8).
Second, two school level variables were estimated with a 14.3%
reduction in school level variance. That is, the school average socioeconomic status and rural location of the school accounted for 14.3% of the unexplained variation in student attitudes (Table 9). Third, two student level variables were included in the three level model: General Self-Concept and Academic or School Self-Concept. Self-Concept appeared to account for 51.0% of the variation across classes and 16.6% of the variation between students in student attitude (Table 10). Finally, the School Level Environment Questionnaire scales were estimated for their effect on student attitude and found to be not significant, but to account for some school level differences in student attitude (Table 11). Results of the multilevel model estimation showed that the school level differences reduced by 43.7%. However, while these scales accounted for almost half of the school level variation, they were not significant in terms of being greater than two standard errors.

Table 8. Variance Components for Three-Level Multilevel Model.

Figure 1. Pie Diagram Depicting Variance Components

Table 9. Three-level Multilevel Analysis of Student SES, Average SES and Location.

As can be seen from Table 8 and Figure 1, most of the variation in student satisfaction was at the student level of analysis. However, the school does account for 5.5% of the variance. While rural schools are purported to be different, the contribution made by the location of the school and socioeconomic status of the student/peers in the school was relatively small. In Table 9, these variables were found to account for 12.5% of the school level variance = .125 x 5.5% = 0.69% of the total variance.

Table 10. Three-level Multilevel Analysis of School Level Environment Questionnaire (SLEQ) Scales.

While the School Level Environment scales accounted for a larger proportion of the differences between schools in student attitudes towards the schools, this was still only 2.2% of the total variance (Table 10). The teachers' perceptions of their school contributed towards explaining student attitudes to a limited extent, however most of the variation appeared to be at the student level.

\[
\text{Variance Explained} = \frac{(0.049 - 0.027)}{0.056} \times 5.5\% = 0.393 \times 5.5\% = 2.2\%
\]

Table 11. Three-level Multilevel Analysis of School Level Environment Questionnaire (SLEQ) Scales and Student Self-Concept.

While not influencing school level variance, student self-concept did appear to vary with school location. When the two Self-Concept scales were included in the multilevel model, there was a significant reduction in variation between students and classes (Table 11) in student satisfaction with the school. The estimation of these effects
was large and significant.

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