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Parent and student perceptions of classroom learning environment and its association with student outcomes

Debra Allen · Barry J. Fraser

Abstract This research is distinctive in that parents' perceptions were utilised in conjunction with students' perceptions in investigating science classroom learning environments among Grade 4 and 5 students in South Florida. The What Is Happening In this Class? (WIHIC) questionnaire was modified for young students and their parents and administered to 520 students and 120 parents. Data analyses supported the WIHIC's factorial validity, internal consistency reliability and ability to differentiate between the perceptions of students in different classrooms. Both students and parents preferred a more positive classroom environment than the one perceived to be actually present, but effect sizes for actual-preferred differences were larger for parents than for students. Associations were found between some learning environment dimensions (especially task orientation) and student outcomes (especially attitudes). Qualitative methods suggested that students and parents were generally satisfied with the classroom environment, but that students would prefer more investigation while parents would prefer more teacher support. The study provides a pioneering look at how parents and students perceive the science learning environment and opens the way for further learning environment studies involving both parents and students.

Keywords Learning environment · Parent perceptions · Student outcomes · Student perceptions

Introduction

Professional dialogue among teachers often suggests that parents' perceptions of what is going on in the class do not match the teachers' perceptions. This anomaly was the seed for

D. Allen · B. J. Fraser (✉)
Science and Mathematics Education Centre, Curtin University of Technology,
GPO Box U1987, Perth, Western Australia 6845, Australia
e-mail: b.fraser@curtin.edu.au

D. Allen
e-mail: allend2@comcast.net

this research. What do parents think is going on in their children's classroom? And, what would parents like to be going on in their children's classroom?

This article, which includes a description of the modification, validation and use of a classroom learning environment questionnaire, is distinctive in that parents' perceptions were utilised in conjunction with students' perceptions in investigating Grade 4 and 5 classroom learning environments in Miami, Florida. First, an existing and validated questionnaire, called the What Is Happening In this Class? (WIHIC) (Aldridge, Fraser, & Huang, 1999; Fraser, Fisher, & McRobbie, 1996), was modified for young students and their parents and subsequently checked for validity. Second, differences between students' and parents' perceptions of the actual and preferred learning environment were explored. Finally, associations between student outcomes (both attitudes and achievement in science) and parents' and students' perceptions of learning environment were investigated.

Background

Connection between home and school

School learning and the home environment are highly linked (Haynes, Comer, & Hamilton-Lee, 1989; Kellaghan, Sloane, Alvarez, & Bloom, 1993). Kellaghan et al. have proposed that it would be desirable to extend the traditions of learning environment research involving students to involve their parents also. Marjoribanks (1991) advocates family–school environment research in which families and schools are examined not only as places where ideology is imposed upon students, but also where it is produced. Investigations that include students from different family contexts are likely to lead to a more complete understanding of the complexities of individuals' learning environments and the challenges that confront parents and teachers when they attempt to influence students' school outcomes by altering the learning environment (Marjoribanks, 1999).

Kellaghan et al. (1993) have established a link between positive school–home partnerships and improved student outcomes. Likewise, Moos (1991) reported that students achieve better in classrooms with interaction rules that are similar to those that they have experienced in their families. Kellaghan et al. (1993) propose that any effort to support children's development and learning should take into account the context in which it is implemented, as well as parents' needs and wishes.

Various studies have reported links between parental involvement in schooling and positive school outcomes including student achievement (Buttery & Anderson, 1999), student attendance (Berger, 1991), and a more positive school climate (Haynes et al., 1989). Overall, the potency of positive parent–school partnerships in improving a range of desirable outcomes has been well established (Epstein, 1995; Kellaghan et al., 1993; Kelly-Laine, 1998).

In Walberg's nine-factor model of educational productivity, student outcomes are co-determined by three student aptitude variables, the quantity and quality of instruction, and the psychosocial environments of the class/school, the home, the peer group, and the mass media (Fraser, Walberg, Welch, & Hattie, 1987; Walberg, 1981). Although a large amount of past research on learning environments has focused on the class/school (Fraser, 1986, 1998a), only a few studies have attempted to determine the joint influence of the class/school and home environments. The famous Coleman et al. (1966) report drew attention to the way in which the contributions of the school and the home to variance in student

achievement are confounded. Moos (1991) and Marjoribanks (1999) have teased out linkages between outcomes and the student's school and home environments. In a secondary analysis of a national database, the environments of the class and home were found to be significant independent predictors of achievement and attitude (Walberg, Fraser, & Welch, 1986). In a study of the joint influence of the classroom, home and peer environments, Scantlebury, Boone, Butler Kahle, and Fraser (2001) found that the home environment (defined as the extent to which parents or adults in the home support students' science education) accounted for unique variance in student attitudes to science, but not to science achievement, when the environments of the class and peer group were mutually controlled.

Field of learning environments

There is a wide variety of economical and valid questionnaires that have been used for the past 30 years to assess students' perceptions of the learning environment (Fraser, 1998b, 2002). One highlight in the development of questionnaires is the construction of instruments which permit the investigation of differences between actual and preferred classroom environment (Fisher & Fraser, 1983). Additionally, qualitative methods for assessing the learning environment have been combined with quantitative methods to provide additional validity and plausible explanations for findings (Fraser & Tobin, 1991; Tobin & Fraser, 1998; Tobin, Kahle, & Fraser, 1990).

Much of the past research has focused on the students' perceptions of the learning environment and their association with student outcomes (Fraser, 1986, 1994, 1998a; Fraser & Walberg, 1991; Goh & Khine, 2002). Also, student achievement and attitudes have been shown to be enhanced when there is similarity between the actual classroom environment and students' preferred classroom environment (Fraser & Fisher, 1983). Fraser's (1994) tabulation of 40 past studies has shown that associations between students' perceptions of the classroom environment and their outcomes have been replicated with a variety of instruments, outcome measures and samples. Our study also explored associations between the classroom learning environment, as perceived by both students and parents, and the two student outcomes of attitudes and achievement in science.

Research questions

1. Is it possible to develop valid questionnaires to assess:

   - 9–11-year-old students' perceptions of the actual and preferred science learning environment?
   - parents' perceptions of the actual and preferred science learning environment for their children?

2. Are there differences between parents and students in their preferred classroom environment and in their perceptions of the same actual classroom environment?
3. Are there associations between the student outcomes of achievement and attitudes and:

   - students' perceptions of the science learning environment?
   - parents' perceptions of their children's science learning environment?

Methods

Learning environment questionnaire

Parents' and students' perceptions of the learning environment were assessed using a modified version of the What Is Happening In this Class? (WIHIC) questionnaire (Aldridge et al., 1999; Fraser, 1998b). The version of the WIHIC used in this study has four forms. We chose the WIHIC for our study because, when used widely in research around the world, it has been found to be valid and useful. For example, the WIHIC has been cross-validated with 1,081 Australian and 1,879 Taiwanese science students at the junior high-school level (Aldridge & Fraser, 2000; Aldridge et al., 1999), 2,310 Singaporean geography and mathematics students at the senior high school level (Fraser & Chionh, 2000), 543 Korean students in Grade 8 (Kim, Fisher, & Fraser, 2000), 2,498 Indonesian university computing students (Margianti, Aldridge, & Fraser, 2004), 1,404 secondary-school Canadian students in internet-based classes (Zandvliet & Fraser, 2004, 2005) and 525 prospective elementary teachers in the USA (Martin-Dunlop & Fraser, 2004). Furthermore, in a cross-national study involving 3,980 Australian, Canadian and British students, Dorman (2003) used confirmatory factor analysis and structural equation mod-elling to confirm the WIHIC's factor structure and to demonstrate that the same factor structure applied irrespective of country, grade level and gender.

Two forms of the WIHIC were used to measure students' and parents' preferred classroom environment, while the other two forms measure students' and parents' per-ceptions of the actual classroom environment. The wording of the items in the original WIHIC was simplified and the number of items was reduced from 56 to 39 items to improve appropriateness for 9–11-year-olds. The parent version of the WIHIC was mod-elled after the modified student version. The main modification to the parent version involved substituting 'I' for 'My child' and 'My teacher or class' for 'My child's teacher or class'. The six dimensions assessed were Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Equity and Investigation. The seventh scale in the original version of the WIHIC, namely, Cooperation, was excluded in our study.

Our research combined quantitative and qualitative methods for collecting data. Through triangulation of quantitative data and qualitative information, greater credibility can be placed in a study's findings (Fraser & Tobin, 1991; Tobin & Fraser, 1998). Fraser (1999) explains that qualitative and quantitative methods can be appropriately used at differing 'grain sizes'. Qualitative data, collected by looking and asking, enable researchers to document the conduct of everyday events and to identify the meanings of those events (Erickson, 1998). Insights gained by one method are followed up by using the other methods. Qualitative methods are the best way in which to gain the insider's perspective and to provide 'thick' descriptions of the data (Punch, 1998).

Sample

A sample of 520 students aged 9–11 years completed the actual and preferred student version of the WIHIC. The 520 students were from 22 classes in 3 schools in a large urban school district in South Florida. Six of the classes in the sample were at the school of one of the researchers and were taught by three teachers (with the researcher teaching two of these classes). The other classes were in the same school district. The class sizes ranged from 20 to 35 students, with boys and girls being approximately equally represented. The ethnicity

of the students reflected the diversity of the school district (US Census Bureau, 2000). Students in this study and their families come from a variety of backgrounds, with many having immigrated from the Caribbean Islands, Central America and South America.

Teachers at the researcher's school gladly administered the WIHIC to students. The return rate for teachers at the researcher's school was 100%, with the total being approximately 360 students in 11 classes. The other 160 students were in 11 classes from 2 other schools from the same school district. Because the class rosters of these schools were not provided to the researcher, there is no way to know the completion rates for these 2 schools.

The parent sample was limited to the researcher's school and grade level because of the anticipated difficulty in obtaining cooperation from parents. Additionally, the school district requires parental approval before academic records can be released. Out of the 200 parents who were sent home letters requesting their participation in this study, along with permission to access their children's academic records, only 161 parents responded affirmatively and only 120 parents completed the actual and preferred versions of the WIHIC for parents.

Because permission was obtained from only 161 parents to access students' achievement records, this group also became a subsample of 161 students who responded to all achievement and attitudes measures. A sample of 120 parents corresponding to the subsample of 161 students completed the learning environment questionnaire. Of the 120 parents, 10 parents participated in follow-up interviews. These 10 parents and their children were interviewed using varied techniques. Focus-group, paired (parent and child), and individual interviews were conducted with this 'fine grain' sample (Fraser, 1999).

Student outcomes

Students' attitude towards science and achievement in science were the two outcome measures used in this study. A modified version of the Test of Science-Related Attitudes (TOSRA) (Fraser, 1981) was chosen for assessing attitudes towards science among our subsample of 120 students. TOSRA has been cross-validated and found to be useful in studies of attitude–environment associations in several countries (Farenga & Joyce, 1998; Fraser & Butts, 1982; Fraser & Fisher, 1982; Wong & Fraser, 1996). Only 20 items evaluating 2 of TOSRA's 7 conceptual categories (Attitude to Scientific Inquiry and Enjoyment of Science Lessons) were used in our study. TOSRA items were read aloud to alleviate reading difficulties.

The achievement levels of individual students were determined from the Stanford Achievement Test (SAT) science subtest, which is administered by Miami-Dade County Public Schools in April each year. Additionally, a school-based measure of student achievement was obtained from the school's final report card grade.

Results

Reliability and factorial validity of WIHIC

Factor and item analyses, conducted separately for actual and preferred data for the sample of 520 students, were used to identify and remove specific items in order to improve the structure of the questionnaire and scale internal consistency. Principal components factor analysis with varimax rotation provided strong support for the a priori structure of our

modified version of the WIHIC. An item was retained in the student analysis only if it had a factor loading of at least 0.30 on its own scale and less that 0.30 on each of the other WIHIC scales. For the parent analysis, an item was retained only if it had a factor loading of at least 0.40 on its own scale and less than 0.40 on each of the other scales.

Factor analyses showed that the same 37-item version of the WIHIC questionnaire could be used to assess young students' and their parents' perceptions of actual and preferred classroom learning environment along the six dimensions of Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Equity, and Investigation. The final factor structure corresponds closely with the questionnaire's a priori structure for the student version, except that the original 48-item version was reduced to 37 items. The parent version also corresponded closely with the questionnaire's a priori structure except for the collapsing of the Teacher Support and Equity dimensions (perhaps because of the relative smallness of the sample size for parents). The factor loadings for the items that survived the factor analysis are provided in Table 1.

Table 1 shows that, for the student data, Items 3 and 17 are the only ones whose factor loading is smaller than 0.30 on their a priori scale, and Item 26 is the only item with a factor loading of greater than 0.30 on a scale other than its own scale (namely, Student Cohesiveness). For the parent data, Table 1 shows that Item 17 has a factor loading of less than 0.40 on its a priori scale and more than 0.40 on another scale (namely, Teacher Support), as well as the Equity scale being lost altogether. The bottom of Table 1 also shows that the percentage of variance accounted for ranges for the student data from 3.51 to 23.83% for different scales, with a total of 49.45%, and for the parent data from 4.13 to 29.88% from different scales, with a total of 54.21%.

The Cronbach alpha reliability for the actual version was determined for each scale and is presented in Table 2 separately for students and for parents. The reliability of different scales for the student version of the WIHIC ranged from 0.67 to 0.86 with the individual as the unit of analysis and was higher with the class mean as the unit of analysis. The reliability for the parent version of different WIHIC scales ranged from 0.77 to 0.89 with the individual as the unit of analysis and was higher with the class mean as the unit of analysis except for the Student Cohesiveness dimension.

In order to check the ability of the WIHIC to differentiate between the perceptions of students in different classes, an ANOVA was conducted for each scale with class membership as the independent variable. The ANOVA results for the student version of the WIHIC (see Table 2) revealed significant differences between perceptions of students in different classrooms for the Involvement, Equity and Investigation dimensions. The eta^2 statistic (which represents the proportion of variance in scale scores accounted for by class membership) ranged from 0.06 to 0.11 for different WIHIC scales for the student sample. For the parent version of the WIHIC, the ANOVA results indicated significant differences between the perceptions of parents of students in different classrooms for the Teacher Support, Involvement, and Task Orientation dimensions. The proportion of variance accounted for by class membership (eta^2) ranged from 0.01 to 0.10 for different WIHIC scales for the parent sample.

Differences between parents' and students' perceptions of the learning environment

The availability of WIHIC data from both parents and students allowed for the first time a comparison of parents' and students' perceptions of the preferred classroom environment and of the actual classroom environment of the same classes. The sample for these comparisons consisted of 120 matched pairs of parent and student responses.

Table 1 Factor loadings for the WIHIC items (actual form) for students and parents

Item no.	Factor loading											
	Student cohesiveness		Teacher support		Involvement		Task orientation		Equity		Investigation	
	Student	Parent	Student	Parent	Student	Parent	Student	Parent	Student	Parent	Student	Parent
1	0.56	0.75										
2	0.61	0.74										
3	–	0.46										
4	0.64	0.63										
7	0.42	0.48										
8	0.37	0.48										
9			0.53	0.75								
10			0.72	0.60								
11			0.51	0.69								
12			0.46	0.55								
13			0.65	0.60								
14			0.41	0.48								
15			0.32	0.45								
16					0.42	0.45						
17				0.44	–	–						
18					0.31	0.41						
19					0.49	0.71						
20					0.64	0.62						
21					0.53	0.46						
22							0.44	0.55				
23							0.64	0.58				
24							0.52	0.64				
25							0.66	0.63				
26	0.34						0.39	0.49				
27							0.33	0.56				
28				0.67					0.51	–		
29				0.74					0.61	–		
30				0.60					0.49	–		
31				0.82					0.67	–		
32				0.74					0.64	–		
33				0.62					0.63	–		
34											0.56	0.50
35											0.71	0.50
36											0.78	0.75
37											0.72	0.79
38											0.75	0.76
39											0.53	0.66

Table 1 continued

Item no.	Factor loading											
	Student cohesiveness		Teacher support		Involvement		Task orientation		Equity		Investigation	
	Student	Parent	Student	Parent	Student	Parent	Student	Parent	Student	Parent	Student	Parent
% Variance	4.06	7.06	8.02	29.88	3.51	4.13	4.66	5.00	5.37		23.83	8.14
Eigenvalue	1.5	2.6	3.0	11.1	1.3	1.5	1.7	1.8	2.0		8.8	3.0

Factor loadings smaller than 0.30 for students and smaller than 0.40 for parents have been omitted

The sample consisted of 520 students in 22 classes and 120 parents of students in 6 classes in South Florida

In order to determine the statistical significance of differences between parents and students, a one-way MANOVA (multivariate analysis of variance) for repeated measures was performed with the set of WIHIC scales as the dependent variables and with the group responding to the instrument (students versus parents) as the independent variable. Because the multivariate test using Wilks' lambda criterion yielded significant overall differences, the univariate ANOVA was interpreted separately for each WIHIC scale. All analyses were performed separately for the actual and preferred forms of the WIHIC. MANOVA/ANOVA results are reported in Table 3.

Whereas MANOVA provided information about the statistical significance of the differences between students' and parents' perceptions, effect sizes were used to estimate the

Table 2 Internal consistency reliability (Cronbach alpha coefficient), discriminant validity (mean correlation with other scales) and ability to differentiate between classrooms (ANOVA results) for two units of analysis for the WIHIC for students and parents

Scale	Number of items		Unit of analysis	Alpha reliability		Mean correlation with other scales		ANOVA eta^2	
	Student	Parent		Student	Parent	Student	Parent	Student	Parent
Student cohesiveness	5	5	Individual	0.67	0.78	0.38	0.33	0.06	0.01
			Class mean	0.73	0.29	0.69	0.30		
Teacher support	7	7	Individual	0.80	0.89	0.42	0.51	0.10	0.11**
			Class mean	0.90	0.95	0.68	0.50		
Involvement	5	6	Individual	0.74	0.77	0.46	0.45	0.09**	0.11**
			Class mean	0.86	0.83	0.73	0.53		
Task orientation	6	6	Individual	0.71	0.81	0.41	0.41	0.09	0.11**
			Class mean	0.85	0.91	0.77	0.52		
Equity	6	6	Individual	0.82	0.88	0.39	0.44	0.11**	0.10
			Class mean	0.92	0.95	0.70	0.48		
Investigation	6	6	Individual	0.86	0.87	0.37	0.39	0.07**	0.06
			Class mean	0.90	0.80	0.66	0.26		

The sample consisted of 520 students in 22 classes and 120 parents of students from 6 classes in South Florida.

The eta^2 statistic (which is the ratio of 'between' to 'total' sums of squares) represents the proportion of variance explained by class membership.

** $p < 0.01$

Table 3 Average item mean, average standard deviation and differences between student and parent scores on actual and preferred versions of the WIHIC (effect size and MANOVA for repeated measures) with the individual as the unit of analysis

Scale	Form	Average item mean		Average item standard deviation		Difference	
		Student	Parent	Student	Parent	Effect size	F
Student cohesiveness	Actual	4.21	4.23	0.49	0.47	0.04	0.48
	Preferred	4.14	4.34	0.48	0.52	0.40	1.83**
Teacher support	Actual	4.00	3.94	0.69	0.68	0.09	0.84
	Preferred	4.04	4.31	0.60	0.62	0.44	1.99**
Involvement	Actual	3.89	3.78	0.69	0.58	0.17	1.23
	Preferred	3.88	4.30	0.65	0.77	0.59	2.24**
Task orientation	Actual	4.32	4.17	0.53	0.55	0.28	1.60**
	Preferred	4.36	4.40	0.50	0.55	0.08	0.91
Equity	Actual	3.93	3.93	0.88	0.66	0.00	0.10
	Preferred	4.11	4.35	0.73	0.61	0.36	1.71**
Investigation	Actual	3.94	3.81	0.81	0.67	0.18	1.24
	Preferred	4.09	4.29	0.68	0.65	0.30	1.66**

The sample consisted of 120 pairs of parents and students in 6 classes in South Florida

**$p < 0.01$

magnitudes of these differences as recommended by Thompson (1998). The effect size expresses the difference between a pair of student and parent means in standard deviation units and is calculated by dividing the difference in means by the pooled standard deviation.

Table 3 reports the average item mean and average item standard deviation for each WIHIC scale separately for students and parents and for the actual and preferred forms. The average item mean is simply the scale mean divided by the number of items in that scale, and it is useful for providing meaningful comparisons between the means of scales containing differing numbers of items. The last two columns in Table 3 show the difference between students and parents for each scale using effect sizes and the MANOVA/ANOVA results (F ratio).

Table 3 shows that parents perceive the actual science classroom environment less favourably than their children do on most WIHIC scales, but that the effect sizes are generally small and differences are statistically non-significant for all scales except Task Orientation. Using the average item mean as the basis of comparison, parents perceive that there is less actual Teacher Support (effect size of 0.09 standard deviations), Involvement (effect size of 0.17), Task Orientation (effect size of 0.28), and Investigation (effect size of 0.18) than their children. A negligible difference was found between parents' and students' perceptions of the amount of Student Cohesiveness (effect size of 0.04) present in the classroom learning environment. Students and parents indicate agreement on the amount of Equity in the classroom with no difference shown. For Task Orientation (the only scale for which differences between students and parents were statistically significant for the actual form of the WIHIC), students perceive a higher level of Task Orientation than do their parents.

In contrast, differences between what parents would prefer happening in their children's science classroom and what their children prefer happening are medium or large in

magnitude. Parents prefer greater levels of Student Cohesiveness (effect size of 0.40 standard deviations), Teacher Support (effect size of 0.44), Involvement (effect size of 0.59), Equity (effect size of 0.36), and Investigation (effect size of 0.30). All of these effect sizes suggest an educationally important difference between students' and parents' preferences. The only area for which parents indicate a slightly lower preference than students is Task Orientation (effect size 0.08). Relative to their students, parents consistently indicated a preference for a more favourable learning environment. ANOVA results confirmed the statistical significance of these differences between students' preferred and parents' preferred learning environment for five of the six scales (see Table 3), with Task Orientation being the only scale for which differences were statistically non-significant.

Figure 1 graphically illustrates the average item mean for students and parents on the actual and preferred versions of the WIHIC. Overall, parents perceive a somewhat less favourable actual science classroom environment than students, but parents prefer a much more favourable science classroom environment than students do. Figure 1 also shows that both students and parents prefer a classroom environment that is more favourable than the one which they perceive as actually being present, a finding that is consistent with numerous previous studies conducted throughout the world (Fraser, 1998b; Henderson, Fisher, & Fraser, 2000). Moreover, Fig. 1 illustrates that the differences between actual and preferred scores are considerably larger for parents than for students.

Associations between student outcomes and students' and parents' perceptions

A strong tradition in past research on classroom learning environment has been the investigation of associations between a variety of student outcomes and the nature of the environment (Fraser, 1998a; Fraser & Fisher, 1982; Wong & Fraser, 1996). Our study was consistent with past research, but also extended it in a new direction by comparing parents and students in terms of the strength of outcome–environment associations.

As noted previously, we measured students' attitudes using the Attitude to Scientific Inquiry and Enjoyment of Science Lessons scales from the Test of Science Teacher Attitudes (TOSRA) (Fraser, 1981), and we assessed students' science achievement with the Stanford Achievement Test (SAT-9) and a school-based final grade. Simple correlation and
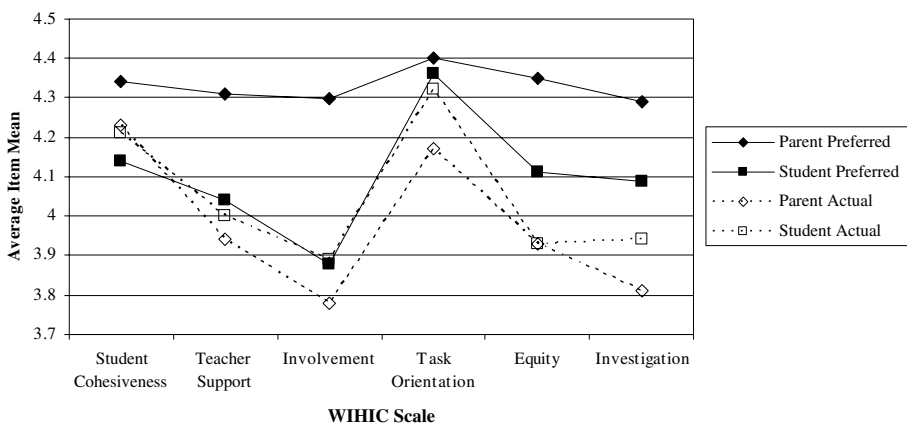
Fig. 1 Comparison of average item means for students and parents in their actual and preferred WIHIC scores

multiple regression analyses were carried out to determine associations between each student outcome of attitudes and academic achievement and dimensions of the actual forms (parent and student) of the WIHIC. Whereas simple correlations describe the bivariate association between each specific outcome and each specific environment scale, multiple regression analysis provides information about the joint relationship between an outcome and the whole set of WIHIC scales.

Table 4 shows the results of these analyses separately for students and parents. The results of the simple correlational analyses reported in Table 4 for students show that 4 out of 24 simple correlations are statistically significant, which is three times that expected by chance. For the student sample, Investigation is significantly correlated with Attitude to Scientific Inquiry, and the learning environment scales of Involvement, Task Orientation, and Investigation are significantly correlated with Enjoyment of Science. All of these statistically significant correlations are positive. The correlation between a learning environment scale and an achievement measure, assessed using either the students' final school grade or SAT-9 scores, is not significant for any of the environmental scales.

The multiple correlation between an outcome measure and the set of six environment scales for the student sample was 0.25 for Attitude to Scientific Inquiry, 0.39 for Enjoyment of Science Lessons, 0.21 for final school grade, and 0.26 for SAT-9 scores (see Table 4). The multiple correlation is statistically significant only for Enjoyment of Science Lessons.

Standardised regression coefficients were used to identify for the student sample which of the six WIHIC scales contributed uniquely to the variance in student outcomes when other environment scales were mutually controlled. However, because the multiple

Table 4 Simple correlation and multiple regression analyses for associations between student attitudes, academic achievement and dimensions of the WIHIC for students and parents

Scale	Sample	Outcome-environment association							
		Attitude to science inquiry		Enjoyment of science lessons		Final grade		SAT-9 scores	
		r	β	r	β	r	β	r	β
Student cohesiveness	Student	0.05	−0.01	0.05	0.12	0.03	−0.09	−0.09	−0.17
	Parent	0.12	0.08	0.20*	0.12	0.22*	0.09	0.07	−0.03
Teacher support	Student	0.06	0.08	0.00	−0.04	0.14	0.10	0.01	0.05
	Parent	0.11	0.20	0.21*	0.28	0.18	−0.04	−0.15	0.04
Involvement	Student	0.08	−0.02	0.24**	0.16	0.08	−0.01	0.02	−0.09
	Parent	0.15	0.06	0.08	−0.21	0.21*	0.02	0.12	0.02
Task orientation	Student	0.09	0.03	0.33**	0.33**	0.15	0.12	0.20	0.21**
	Parent	0.04	0.04	0.24*	0.28**	0.41**	0.37**	0.15	0.06**
Equity	Student	−0.03	−0.11	0.03	−0.07	0.14	0.07	−0.03	−0.07
	Parent	−0.07	0.32**	0.11	−0.16	0.21*	0.03	0.17	0.09
Investigation	Student	0.23**	0.23**	0.20**	0.07	0.11	0.06	0.13	0.13
	Parent	0.22*	0.20	0.11	−0.03	0.21	0.00	0.16	0.09
Multiple correlation (R)	Student		0.25		0.39**		0.21		0.26
	Parent		0.33		0.33		0.42**		0.21

The sample consisted of 161 students in 6 classes and 120 parents of students in 6 classes in South Florida

**p < 0.01

correlation is statistically significant only for Enjoyment of Science Lessons, regression weights were only examined for this outcome. Table 4 shows that Task Orientation is the only significant independent predictor of Enjoyment of Science Lessons

For the parent sample, the results of the simple correlational analysis reported in Table 4 show that 8 out of 24 simple correlations are statistically significant, which is 7 times that expected by chance. Investigation is significantly correlated with Attitude to Scientific Inquiry, which is consistent with the results for the student sample. Student Cohesiveness, Teacher Support, and Task Orientation also are significantly correlated with Enjoyment of Science Lessons. Additionally, Student Cohesiveness, Involvement, Task Orientation, and Equity are significantly correlated with the students' final school grade. As with the results for the student sample, all significant relationships are positive. There are no significant correlations between the SAT-9 scores received on the standardised science achievement test and any of the six environment scales.

The multiple correlation between an outcome measure and the set of six environment scales for the parent sample is 0.33 for Attitude to Scientific Inquiry, 0.33 for Enjoyment of Science Lessons, 0.42 for final school grade, and 0.21 for SAT-9 Scores (Table 4). The multiple correlation is statistically significant only for the Final Grade outcome.

Standardised regression coefficients were used to identify which of the six WIHIC scales contributed uniquely to the variance in student outcomes for the parent sample when other environmental scales were mutually controlled. Results were interpreted only for final school grade because it is the only outcome for which the multiple correlation is statistically significant. Task Orientation is a significant independent predictor of final school grade.

Overall, our results suggests that either student-perceived or parent-perceived classroom learning environment was related (albeit relatively weakly) to student attitudes to science. However, in terms of students' school achievement scores in science, parents' perceptions of classroom environment were stronger predictors than students' perceptions.

Interviews and observations

After the questionnaires were administered to the 520 students and 120 parents, follow-up interviews and observations were conducted. Ten students and their parents were interviewed. The main interview questions sought information about what the science learning environment was like in the current classroom and what type of science learning environment would be preferred in an ideal classroom. Additionally, the 10 students interviewed were observed once in their science classrooms.

Generally the quantitative probes indicated that parents perceived the actual classroom learning environment somewhat less favourably than their children did. Additionally, statistically significant differences existed between parents' perceptions of the actual science learning environment and the learning environment preferred for their children. While this might indicate dissatisfaction with the classroom environment, the overall impression from the interviews was exactly the opposite. All parents during interviews expressed the belief that teachers were doing the best that they could under the prevailing constraints such as mandated testing, overcrowding and discipline problems created because of overcrowding. Parents felt that these three factors all negatively impacted the learning environment of their children. But parents generally considered that these issues are beyond the control of the classroom teacher and need to be addressed at the district or even the state level.

While quantitative findings indicated that students generally prefer a more favourable learning environment in their science classrooms, all the students interviewed were relatively happy with their teachers and classrooms. Involvement, Equity, and Investigation were the three specific areas for which there were statistically significant differences between students' actual and preferred perceptions of the science learning environment. The results from the interviews helped to provide possible explanations for these differences.

One of the interview questions asked parents how they came to know what was going on in their children's classrooms. Two of the ten parents said that they did not really know what their children did in science class. Three of the parents said that they knew what their children were doing in science class by what their children talked about when they came home from school. Half the parents indicated that it was through homework that they came to know what their child was doing in school. In fact, every parent referred to the science fair project that was currently being completed at home by students.

The qualitative probes were designed to augment the quantitative probes and to offer plausible explanations for the results. The main findings from the student and parent interviews, along with relevant classroom observations, are summarised in Table 5 which uses the names of the WIHIC scales as organising themes: Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Equity, and Investigation

Conclusion

Our research focused on parents' and young students' perceptions of the science learning environment. After finding that parent and student versions of the What Is Happening In this Class? (WIHIC) questionnaire were reliable and valid for our samples, similarities and differences in perceptions of students and parents were explored. While students were fairly satisfied with the learning environment, parents wanted more for their children. Overall, parents perceived a somewhat less favourable actual science classroom environment than students, but parents preferred a much more favourable science classroom environment than students did.

This study also identified associations between students' outcomes (attitudes towards science and achievement in science) and the classroom learning environment as perceived by parents and students. While the relationships between achievement and the learning environment as perceived by students were generally weak, a somewhat stronger relationship was found between student attitudes and the learning environment scales of Task Orientation and Investigation. Similarly the relationship between students' attitudes and parents' perceptions of the learning environment were relatively weak, except for the learning environment scale of Task Orientation. For the outcome of school achievement grade, associations with classroom environment were stronger for parents than for students. These results suggest that there are some links between parents' and students' perceptions of the learning environment and students' outcomes in science. Our finding of associations between student outcomes and the nature of the classroom environment replicates considerable prior research (Fraser, 1998a; Wong & Fraser, 1996).

This research is significant because it paves the way to extend traditions of classroom environment research involving students' perceptions also to involve the perceptions of their parents. An economical and widely applicable questionnaire for assessing elementary school students' and their parents' perceptions of actual and preferred classroom learning environment was adapted, validated and used. The relationship between parents' perceptions of the learning environment and their children's outcomes (attitudes and

Table 5 Main findings from the student and parent interviews

Category	Students	Parents
Overall findings	Generally, the students interviewed were satisfied with their science classroom learning environments.	Generally, parents were satisfied with the science learning environments of their children's classrooms, and they suggested that most of the problems (the number of students in each class, the physical structure of the classroom, and discipline) were largely outside the control of the teacher.
Student cohesiveness	Students generally reported both advantages and disadvantages of having friends in the classroom.	Parents generally felt that positive interactions between students in the classroom were likely to foster greater enjoyment of science lessons and academic achievement.
Teacher support	Students were generally happy with the amount of teacher support provided in their classrooms.	During every interview, parents cited teacher support as being the most important variable in an ideal science classroom for their children.
Involvement	Students indicated fear of being embarrassed as the main reason for not being more involved in the classroom.	Parents indicated that it was up to teachers to involve all students in the classroom, even if they resisted.
Task orientation	All students maintained that completing their work and knowing what to do in science were important.	Parents felt that they instilled the importance of task orientation in their children.
Equity	Students indicated that teachers treated students differently because of student behaviour and academic achievement.	The manner in which the teacher treated their children in the classroom was an important issue. Parents felt that the concept of equity in the classroom was intertwined with student cohesiveness.
Investigation	No matter what level of investigation was present in the classroom, students wanted more hands-on investigations.	While parents indicated that hands-on experiences in the science classroom are an important learning tool, parents felt that teachers are constrained in the use of hands-on experiments because of the physical structure of the classrooms and number of students in the classroom.

achievement) was explored and possible associations were identified. The analyses of associations in this study might have implications for improving student attitudes and achievement by utilising feedback on both parents' and students' perceptions of the learning environment to guide changes to classrooms.

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