31. Gender, School Situation and School Size Differences in Students' Perceptions of Teacher-Student Interactions in Biology Classes in Thailand

Duangsmorn Kijkosol,
Udonthani Rajabhat University, Thailand
Darrell L. Fisher,
Curtin University of Technology, Australia

Abstract

This paper reports the use of a classroom interaction questionnaire in Thailand. This questionnaire named the Questionnaire on Teacher Interaction (QTI) was translated and modified into a Thai version to assess in interactions between teachers and students in biology secondary classes in Thailand. This involved over 1,000 secondary biology students from different areas of Thailand. The data provide a valid instrument to gather information on students' perceptions of interactions between teacher and students in secondary biology classes. In addition, it also provided information in the differences of students' perception between gender, school situation and school size. The results will be useful for improving teaching and learning of biology classes in secondary schools of Thailand.

Introduction

Education in Thailand has changed rapidly in recent years following the policy of the National Education Act, 1999 and the National Education Reform of Thailand. Teaching and learning in Thailand, as in other countries, has shifted from a traditional approach to a new paradigm, especially a student-centered approach. Nowadays, the role of teachers in the classroom are in accord with Piagetian-based learning approaches. These approaches have been considered and have influenced learning in science (Ormord, 2000). The learning environment is one of the factors that science teachers should consider when managing their classes, especially laboratory classes.

In general, many teachers acting as facilitators of the learning process have provided and designed maximally beneficial classrooms for all students. They know that classrooms are places with specific social and psychosocial characteristic, which motivate students' learning. In addition, they realize that the classroom is a social environment where much interaction and interpersonal dynamics occur (Parsons, Hinson, & Sardo-Brown, 2001). Fraser, Anderson, and Walberg (1982) stated that the classroom social climate or learning environment includes the interpersonal relationships among pupils, relationships between pupils and their teachers, relationships between pupils and both their subjects and the method of learning.

In Thailand very little research has been conducted on the associations between cognitive and affective learning outcomes and the psychosocial environment. Therefore, it is desirable to provide valid instruments to gather information on students' perceptions of interactions between teacher and students in science classroom. The QTI used in this study will contribute to our understanding of biology classes in Thailand. Furthermore, it is hoped that eventually the QTI will be used to provide feedback to Thai teachers, so that they can use this information to evaluate and improve their own effectiveness.

Assessment of Teacher-Student Classroom Interaction

The study of classroom environment has occurred over the past 30 years (Fraser, 1986; Fraser, 1989; Fraser & Walberg, 1991). One particular aspect of the learning environment is the relationship between a teacher and students. Many studies have indicated that interpersonal teacher behaviour is an important aspect of the learning environment and that it is related strongly to student outcomes (Fisher, Rickards, & Newby, 2001; Jones & Jones, 2001; Wubbels, Brekelmans, & Hooymayer, 1991). In many of this studies, the Leary Model, which has been used in clinical psychology, provided a basis for describing interpersonal behaviour. This model consists of two dimensions - a Dominance (D)- Submission (S) dimension and a Cooperation (C) - Opposition (O) dimension. It was been applied to investigation on teachers' and students' perceptions or communication through the *Questionnaire on Teacher Interaction* (QTI) (Wubbels, 1993; Levy, Rodriguez, & Wubbels, 1993).

Table 1: Scale Description and Example Item for Each Scale of the QTI

Scale name	Description of scale	Sample item
Leadership (DC)	Extent to which teacher provides leadership to class and holds student attention	This teacher talks enthusiastically about his/her subject.
Helping/Friendly (CD)	Extent to which teacher is friendly and helpful toward student.	This teacher helps student with their works.
Understanding (CS)	Extent to which teacher shows understanding/concern/care to student.	This teacher trusts student.
Student responsibility/freedom (SC)	Extent to which students are given opportunities to assume responsibilities for their own activities.	I can decide some things in this teacher class.
Uncertain (SO)	Extent to which teacher exhibits her/his uncertainty.	This teacher seems uncertain.
Dissatisfied (OS)	Extent to which teacher shows unhappiness/ dissatisfaction with student.	This teacher thinks that student cheat.
Admonishing (OD)	Extent to which teacher shows anger/temper/impatience in class.	This teacher gets angry unexpectedly.
Strict (DO)	Extent to which the teacher checks, maintains silence and strictly enforces the rules.	This teacher is strict.

A recent version of the QTI has been used in Australia and consists of 48 items and eight scales (Fisher, Fraser, & Cresswell, 1995). Table 1 presents the scales of the QTI, descriptions each scale and a sample some item from each scale.

The reliability and validity of the QTI have been computed in various countries. For example, Wubbels and Levy (1991) reported that seven of the eight measured reliabilities were in excess of 0.90 in the Netherlands and the USA, and from 0.68 to 0.85 in the Australian study. Ferguson and Fraser (1999) reported acceptable internal consistency reliabilities for the QTI scales ranging from 0.60 to 0.81 for student responses in the study of changes in learning environment during the transition from primary to secondary school in Australia.

Many research studies have used the QTI to gather data on teachers and students perceptions and have been reported. For example, Fisher, Henderson, and Fraser (1995) found that the dimensions of the QTI were significantly associated with student attitude scores, which were higher in classrooms where students perceived greater leadership, helpful/friendly, and understanding behaviours in their teachers.

Importantly, for the proposed study, learning environment research which has adopted a person-environment fit perspective (Fisher & Fraser, 1983a) revealed that a similarity between the actual environment and that preferred or considered ideal by students leads to improved student achievement and attitudes (Fisher & Fraser, 1983a; 1983b). The practical implication of these finding is that student achievement could be enhanced by attempting to change the actual classroom environment in ways that make it more congruent with that preferred by the students.

Objectives

The aims of this study were:

- to validate the Thai version of the QTI; and
- to investigate students' perceptions of teacher-student interactions in biology classes in Thailand according to actual and ideal differences, gender, school situation and school size.

Research Methods

The sample was composed of students who study in biology classes at the grade 10 level of secondary schools in Thailand. The total sample involved 1,194 students who filled in the questionnaire, namely, the Questionnaire on Teacher Interaction (QTI) in its modified and Thai version. Students completed two forms of the QTI. The first form was the Actual or perceived Form used to assess students' perceptions of the teacher whose class the students actually were attending while responding to the questionnaire. The second was the Ideal or preferred form in which students were asked to rate teacher-student classroom interactions that they would preferred to have in an idea their biology class. Each form consists of 48 items. Students indicated their perceptions by responding on a 5-point Likert scales ranging from Never to Always.

For measuring the validity and reliability of both forms (actual and ideal) of the QTI, the Cronbach alpha coefficients (Cronbach, 1951) were computed for each scale the individual student as the unit of analysis. *The interpersonal behaviour model on which* the QTI based is a circumplex model. This model presents the eight scales in eight sectors arranged in a circular fasion in which scales tend to merge slightly to the scales next to them. It is assumed that the correlation of each scale should be greatest with the scale next to it and show the lowest correlation with opposite scales and in order to fit the circumplex Leary model (Wubbel et al., 1993). The circumplex nature of the QTI was checked in this study.

The eta^2, the ratio of the between group sum of squares and the total sum of squares, was analysed to indicate the ability to differentiate between classrooms. It is considered important that learning environment questionnaires are able to distinguish between classrooms. Students within a class should perceive their teacher's interpersonal behaviour relating the same but students should differ from one class to another.

The difference between the two means (from the Actual and Ideal forms) was tested for statistical significance using t tests and effect sizes.

Gender, school situation and school size differences between the Actual and Ideal Forms were examined using a one-way multivariate analysis of variance (MANOVA) with the set of QTI scales as dependent variables. When the F test was found to be statistically significant ($p<0.05$), a univariate analysis of variance (ANOVA) was computed.

A One-Way Analysis of Variance (ANOVA) was used to compare the means of more than two groups of an independent variable. If the ANOVA result of more than two values, such as three school sizes, were significant, post hoc (Tukey post hoc) analysis was employed to identify such pairs.

Results

Validation of the Questionnaire

Table 2 shows that the Cronbach alpha reliability, after adjusting by deleting the items, ranged from 0.55 (Strict) to 0.81 (Leadership scale) for the Actual Form and ranged from 0.59 (Strict scale) to 0.75 (Helping/Friendly) for the Ideal Form. The lowest reliability for both forms was on the Strict scale. The highest reliability scales were different with the Leadership scale being highest on the Actual Form while the Dissatisfied scale was highest for the Ideal Form.

It can be concluded that both forms of the QTI are reliable as all the modified scales are consistently above 0.50 (DeVellis, 1991). In particular, this result is comparable with other studies. For example, a range of 0.61 to 0.83 for the Actual Form, and from 0.59 to 0.76 for the Ideal Form, was reported by Fisher, Henderson and Fraser (1995) and from 0.50 to 0.72 by Koul and Fisher (2003) in India. In an Indonesian study, Soerjaningsih, Fraser and Aldridge (2001) reported a range of 0.65 to 0.87 for a 39-item version of the QTI.

In order to determine whether the Actual Form of each scale of the QTI is able to differentiate between student perceptions between classrooms, an analysis of variance (ANOVA) was calculated. Table 2 presents the eta^2 statistic, as the ratio of "between" to "total" sums of squares, ranged from 0.10 (Strict scale) to 0.35 (Leadership scale) for actual form of the QTI. The result indicates that each QTI scale differentiated significantly ($p < 0.001$) between classes.

Table 2 : Internal Consistency (Cronbach Alpha Coefficient) for Actual and Ideal Forms of the QTI and Ability to Differentiate Between Classes of the Actual QTI

Scale	No of Items	Alpha Reliability		ANOVA(Eta^2)
		Actual	Ideal	For actual
Leadership	6	0.81	0.68	0.35***
Helping/Friendly	6	0.79	0.75	0.28***
Understanding	6	0.76	0.71	0.23***
Student Responsibility/	5	0.63	0.63	0.15***
Uncertain	6	0.63	0.61	0.13***
Dissatisfied	6	0.80	0.76	0.13***
Admonishing	6	0.65	0.64	0.15***
Strict	4	0.55	0.59	0.10***
Total Items	45			

***p< 0.001 **p<0.01 *p<0.05 n = 1,194

As an example to investigate the circumplex nature of the QTI, Figure 1 illustrates these distinctive patterns of interscale correlation on the circumplex model for correlations between Helping/Friendly and the seven other scales on the Actual Form of QTI.

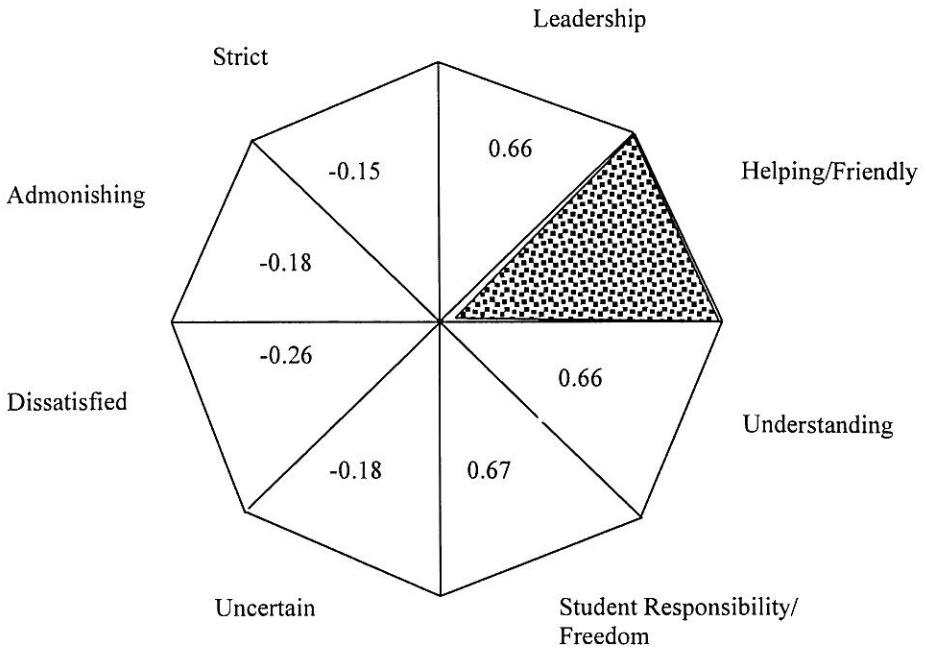

Figure 1 : Profile of scale intercorrelations for the Helping/Friendly scale on the QTI.

Similar results were obtained from the other scales. Overall, the Thai version of the QTI, both Actual and Ideal Forms that consist of 45 items each, were good valid instruments and can use to assess students' perceptions in secondary school, particularly in biology classes.

Descriptive Information

Students responded to each item of the Actual and Ideal Forms of the QTI and the results are presented in Table 3. The scoring of students perceptions of the instruments uses a five-point Likert-type scale ranging from 1 to 5 corresponding with 'Never' to 'Always' for rating scale of the QTI. Moreover, the graph in Figure 2 is presented to facilitate comparison between scale means in students' actual and ideal perceptions.

The data indicate that students prefer teachers who show strong leadership, are more helping and understanding and who give their students more responsibility and freedom. They also prefer their teacher to be less uncertain, admonishing, dissatisfied and strict. These differences are all statistically significant ($p<0.001$). The difference between students' actual and ideal perceptions of the level of student responsibility and freedom is similar to that reported by Fisher, Henderson and Fraser (1995) for the Australian students' sample.

Table 3 : Scale Means and Standard Deviations for Actual and Ideal Forms of the QTI

Scale	Actual		Ideal		Difference
	Mean	S.D.	Mean	S.D.	(Ideal - Actual)
Leadership (DC)	4.05	0.60	4.38	0.47	0.33***
Helping/ Friendly (CD)	4.00	0.62	4.21	0.56	0.21***
Understanding (CS)	4.05	0.56	4.33	0.48	0.27***
Student Responsibility/(SC)	3.57	0.60	3.81	0.59	0.24***
Uncertain (SO)	2.57	0.59	2.44	0.63	-0.13***
Dissatisfied (OS)	2.22	0.71	2.10	0.72	-0.12***
Admonishing (OD)	2.28	0.61	2.16	0.59	-0.12***
Strict (DO)	3.06	0.71	2.71	0.76	-0.36***

***$p< 0.001$ (n = 1,194)

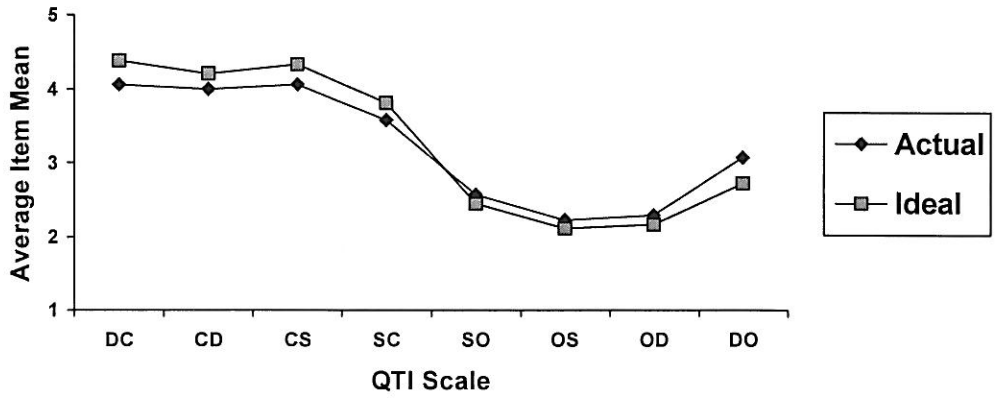

Figure 2: Differences between average item means of Actual and Ideal Forms of the QTI.

Differences in Gender, School Situation and School Size

The student sample in this study consisted of 424 (35.51%) males and 770 (64.49%) females. Gender differences were examined using the Actual forms of the QTI using a one-way multivariate analysis of variance (MANOVA) with the set of QTI scales as dependent variables. When the F test was found to be statistically significant ($p<0.05$), a univariate analysis of variance (ANOVA) was computed.

Gender Differences

Table 4 illustrates the differences in value of the average item means (mean of females minus mean of male) and the level of statistical significance. The results are also illustrated in Figure3. The F values shown in Table 4 indicate that there were three out of eight, statistically significant differences. These differences were that male students perceived greater uncertain, dissatisfied, and admonishing behaviours in their teachers than did female students. In addition, effect sizes were calculated to confirm the magnitude of differences. Based on Cohen's (1988) suggestion that they are small for 0.10, medium for 0.25, and large for 0.40, the results were confirmed in that the Dissatisfied and Admonishing scales have medium effect size but the Helping/Friendly, Student Responsibility, Uncertain, and Strict scales have small effect sizes.

Table 4 : Scale Means, Standard Deviations and Differences between Male and Female Student Perceptions for Actual Form of QTI

Scale	Male		Female		Difference	F value	Effect size
	Mean	S.D.	Mean	S.D.	F-M		
Leadership (DC)	4.05	.59	4.05	.61	0	.07	0
Helping/Friendly (CD)	4.01	.62	4.00	.62	-0.01	.15	0.02
Understanding (CS)	4.05	.57	4.05	.55	0	.01	0
Student Responsibility(SC)	3.59	.61	3.56	.60	0.03	1.00	0.05
Uncertain (SO)	2.63	.62	2.54	.57	-0.09	6.30**	0.15
Dissatisfied (OS)	2.35	.75	2.15	.69	-0.2	21.33***	0.28
Admonishing (OD)	2.38	.66	2.22	.58	-0.16	16.41***	0.26
Strict (DO)	3.03	.69	3.08	.73	0.05	1.19	0.07

***$p< 0.001$ **$p<0.01$ *$p<0.05$

(No. of students: Male = 424, Female = 770)

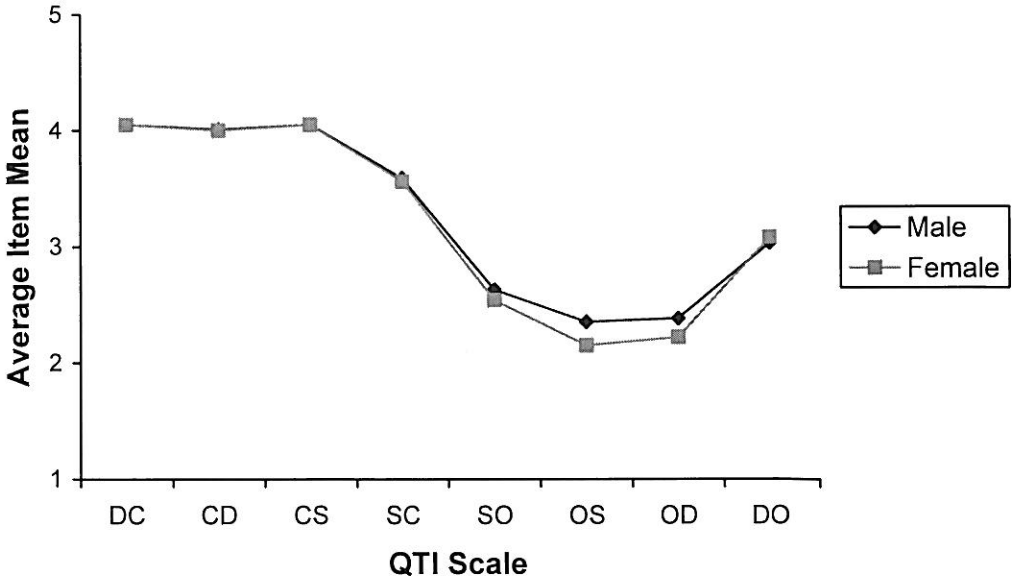

Figure 3 : Average item means for QTI scale scores for male and female students.

School Situation Differences

It was also of interest in this study to find whether there were any differences resulting from the school's situation. In the sample concerned 1,194 students, 419 (35.09%) students were from 14 schools that are situated in the city, and 775 (64.91%) students were from 23 schools that are situated in rural areas: Therefore, two different school situations.

The F value in Table 5 indicates that there were only two scales, the Helping/Friendly and Strict scales, in which there were differences in school situation. Students in rural schools perceived greater degrees of helping and friendly and strict behaviours in their teachers than did students from city schools. However, the effect sizes of both scales were small (0.11).

Table 5 : Scale means, Standard Deviation and Difference between School Situation for Actual Version of the QTI

Scale	City (C)		Rural (R)		Difference	F value	Effect size
	Mean	S.D.	Mean	S.D.	(C-R)		
Leadership (DC)	4.03	.58	4.06	.62	-0.03	0.69	0.05
Helping/Friendly (CD)	3.96	.61	4.03	.63	-0.07	3.84*	0.11
Understanding (CS)	4.02	.55	4.07	.57	-0.05	1.48	0.9
Student Responsibility/ (SC)	3.57	.62	3.57	.59	0.00	0.05	0
Uncertain (SO)	2.57	.63	2.57	.57	0.00	0.00	0
Dissatisfied (OS)	2.23	.75	2.21	.69	0.02	0.18	0.03
Admonishing (OD)	2.30	.66	2.26	.58	0.07	1.23	0.11
Strict (DO)	3.01	.77	3.09	.68	0.08	4.20*	0.11

*p<0.05 (N: Students of City School = 419, Students of Rural School= 775)

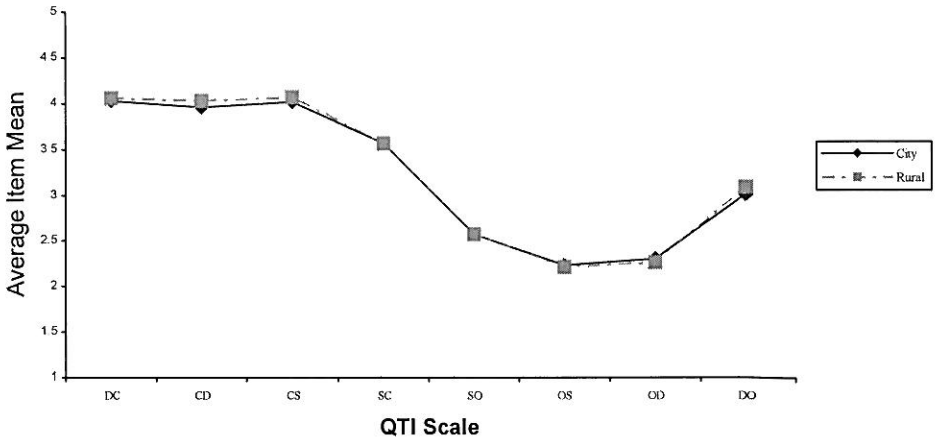

Figure 4 : Mean differences between city and rural school students on the Actual Form of the QTI.

Figure 4 illustrates a comprehension of city and rural schools on the QTI. The results indicate that both city students and rural students perceive quite similar teacher-student interactions in their biology classes.

School Size Differences

The 1,194 students, who perceived their perception of teacher-student interaction in biology classes, came from three school-size groups. In the total sample, 330 students came from 14 small schools, 486 students were in 15 medium schools, and 378 students were in 9 large schools. Large schools were defined as having more than 1,500 students, medium schools had between 500 and 1,499 students, and small schools had less than 500 students.

Table 6 and Figure 5 present the differences of mean score of the QTI scales for the three different school sizes, small, medium and large. These differences present three statistically, out of eight scales, namely, the Uncertain, the Dissatisfied, and the Strict Scale.

To investigate which of the differences were statistically significant, a post hoc Tukey analysis was performed with the scales as dependent variables. Table 7 shows that large-school students perceived their biology teachers as displaying less uncertain, dissatisfied, and admonishing behaviours than did students in both the other school types. However, students from all three school sizes had similar perceptions of leadership, helping/friendly, understanding, student responsibility, and strict behaviour.

Table 6 : Scale Means and Standard Deviations and Difference Small, Medium and Large Schools for Actual Form of the QTI

Scale	Small		Medium		Large		F value
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Leadership (DC)	4.10	.50	4.02	.66	4.04	.59	1.46
Helping/Friendly (CD)	4.02	.54	4.00	.68	3.99	.60	0.24
Understanding (CS)	4.06	.51	4.02	.61	4.08	.54	1.07
Student Responsibility (SC)	3.58	.56	3.56	.62	3.58	.62	0.18
Uncertain (SO)	2.63	.57	2.59	.58	2.48	.61	6.70***
Dissatisfied (OS)	2.29	.76	2.25	.68	2.11	.71	6.27***
Admonishing (OD)	2.35	.67	2.30	.59	2.19	.59	6.05***
Strict (DO)	3.10	.68	3.06	.68	3.03	.78	0.65

***$p < 0.001$ (No of Students: Small School = 330, Medium School = 486 Large School = 378)

Table 7 : ANOVA and Significance Post-hoc test Results for Three school sizes On the QTI

Scale	F value	Significant (Mean Different)		
		S & M	M & L	L & S
Leadership (DC)	1.46			
Helping/Friendly (CD)	0.24			
Understanding (CS)	1.07			
Student Responsibility (SC)	0.18			
Uncertain (SO)	6.70***	0.03	0.12*	-.15*
Dissatisfied (OS)	6.27***	0.04	0.14*	-.18*
Admonishing (OD)	6.05***	0.05	0.01*	-.15*
Strict (DO)	0.65			

***$p<0.001$, *$p<0.05$

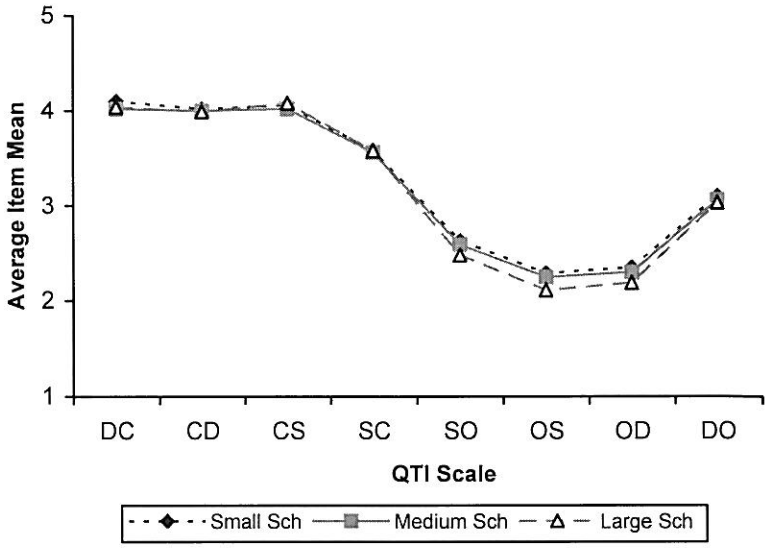

Figure 5: Mean differences between small, medium and large school students on the Actual Form of the QTI.

Conclusion and Discussion

This study has supported the reliability and validity of the QTI in a Thai version when used with 1,194 Grade10 biology students in 37 classes. The findings also indicated that students prefer teachers who show strong leadership, are more helping and understanding and who give their students more responsibility and freedom. Furthermore, students prefer teachers who are less uncertain, dissatisfied and admonishing.

For gender differences, male students perceived greater negative behaviours in their teachers than did female students. Both city and rural students perceived quite similar teacher-student interactions in their biology classes. Small, medium and large school-size students had similar perceptions of their biology teacher behaviours for leadership, helping/friendly, understanding, student responsibility and strict behaviour.

Researchers and biology teachers can use of the QTI to monitor students' views and use these instruments for improving teaching and learning and thus promote student attitude. Furthermore, the QTI could be used in assessing the management of education in different gender, school situation and school size for promoting equity of education. However, it should be compared between actual and preferred students' perceptions to provide more information for practical implications.

References

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. New York: Academic Press.

Cronbach, D. J. (1951). Coefficient alpha and internal structure of tests. *Psychometrika, 16*(3), 297-334.

DeVellis, R. F. (1991). *Scale development: Theory and applications* (Vol. 26). Newbury Park: SAGE Publication.

Ferguson, P. D., & Fraser, B. J. (1999). Changes in learning environment during the transition from primary to secondary school. *Learning Environments Research, 1*, 369-383.

Fisher, D. L., & Fraser, B. J. (1983a). A comparison of actual and preferred classroom environments as perceived by science teachers and students. *Journal of Research in Science Teaching, 20*, 55-61.

Fisher, D. L., & Fraser, B. J. (1983b). Validity and use of classroom environment scale. *Educational Evaluation and Policy Analysis, 5*, 261-271.

Fisher, D., Henderson, D., & Fraser, B. (1995). *Gender differences in Biology students' perceptions of actual and preferred learning environments*. Paper presented at the annual meeting of the National Association for Research in science Teaching, San Francisco, CA.

Fisher, D.L., Rickards, T., & Newby, M. (2001, December). *A multi-level model of classroom interactions using teacher and student perceptions*. Paper presented at the annual conference of the Australian Association for research in education, Fremantle, Australia.

Fraser, B.J. (1986). *Classroom environment*. London, England: Croom Helm.

Fraser, B.J. (1989). *Assessing and improving classroom environment* (What Research Says to the Science and Mathematics Teacher, No.2). Perth, Western Australia: National Key Center for School Science and Mathematics, Curtin University of Technology.

Fraser, B.J., & Walberg, H.J. (Eds.). (1991). *Educational environments: evaluation, antecedents and consequences*. Oxford: Pergamon Press.

Jones, V.F., & Jones, L.S. (2001). *Comprehensive classroom management: Creating communities of support and solving problems*. Boston: Allyn and Bacon.

Koul, R. B., & Fisher, D. (2003). *Teacher and student Interaction in science classrooms in Jammu, India.* Paper presented at the Third International conference on science, mathematics and technology education. East London, South Africa: Making science, mathematics and technology education accessible to all, East London, South Africa.

Levy, J., Brok, P. D., Wubbels, T., & Brekelmans, M. (2003). Students' perceptions of interpersonal aspects of the learning environment. *Learning Environments Research, 6*(1), 5-36.

Ormrod, J.E. (2000). *Educational psychology: Developing learners* New Jersey: Prentice-Hall.

Parsons, R. D., Hinson, S. L., & Sardo-Brown, D. (2001). *Educational psychology: A practitioner-researcher model for teaching*. Canada: Thomson Learning, Inc.

Soerjaningsih, W., Fraser, B.J., & Aldridge, J.M. (2001, December). *Teacher - student interpersonal behaviour and student outcomes among university students in Indonesia*. Paper presented at the annual conference of the Australian Association for Research in Education, Fremantle, Australia.

Wubbels, T. (1993). *Teacher-student relationships in science and mathematics class* (What Research Says, No.11). Perth: Curtin University of Technology

Wubbels, T., Brekelmans, M., & Hooymayers, H. (1991). Interpersonal teacher behaviour in the classroom. In B. Fraser & H. Walberg (Eds.), *Educational environments:Evaluation, antecedents and consequences*, (pp.141-160). Oxford: Pergamon Press.

Wubbels, T., & Levy, J. (1991). A comparison of interpersonal behaviour of Dutch and American teachers. *International Journal of Intercultural Relations, 15*, 1-18.

Wubbels, T., & Levy, J. (Eds.). (1993). *Do you know what you look like? Interpersonal relationships in education*. London, England: Falmer Press.