
Title	Perceptions of interpersonal teacher behaviour in secondary science classrooms: A cross-national story
Author(s)	Darrell L. Fisher, Goh Swee Chiew, Angela F. L. Wong and Tony W. J. Rickards
Source	<i>ERA - AARE Joint Conference, Singapore, 25-29 November 1996</i>

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PERCEPTIONS OF INTERPERSONAL TEACHER BEHAVIOUR IN SECONDARY SCIENCE
CLASSROOMS:
A CROSS-NATIONAL STUDY

Darrell L. Fisher
Curtin University of Technology, Australia

Goh Swee Chiew
Angela F L Wong
Nanyang Technological University, Singapore

Tony W.J. Rickards
Curtin University of Technology, Australia

Paper presented at the Conference of the Educational Research
Association, Singapore and the Australian Association of Research in
Education. Singapore, November, 1996.

ABSTRACT

This paper examines an important aspect of classroom learning environment: student teacher relationships. Information was obtained through the use of the 48-item version of the Questionnaire on Teacher Interaction (QTI). Twenty secondary science classes in each of Singapore and Australia provided the sample of teachers and students. Students responded to the QTI indicating their perceptions of their science teachers' interpersonal behaviours while their teachers responded to two versions of the QTI. The teachers provided their perceptions of their own personal behaviour with their students and their perceptions of an ideal science teacher. Validation data is provided on the use of the QTI in the two countries. Comparisons are made between the students' and teachers' perceptions in each country and the science classrooms of the two countries are compared.

This paper describes the first use of the Questionnaire on Teacher Interaction (QTI) in secondary school science classes in Singapore and reports validation data on its use. Students responded to the QTI indicating their perceptions of their science teachers' interpersonal behaviours while their teachers responded to two versions of the QTI. The teachers provided their perceptions of their own personal behaviour with their students and their perceptions of an ideal science teacher. The data from a similar sample of secondary science classes in Australia allowed comparisons between the students' and teachers' perceptions in each country. The paper also describes associations between students' perceptions of interpersonal relationships with their teachers and student attitudinal outcomes in each country.

The Questionnaire on Teacher Interaction

International research efforts involving the conceptualisation, assessment and investigation of perceptions of psychosocial aspects of the classroom environment have firmly established classroom environment as a thriving field of study (Fraser, 1994; Fraser & Walberg, 1991). 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, 1994).

A team of researchers in The Netherlands extended this research by focusing specifically on the interpersonal relationships between teachers and their students as assessed by the QTI (Wubbels, Créton & Hoomayers, 1992; Wubbels & Levy, 1993). The Dutch researchers (Wubbels, Créton & Holvast, 1988) investigated teacher behaviour in a classroom from a systems perspective, adapting a theory on communications processes developed by Waltzlawick, Beavin and Jackson (1967). Within the systems perspective of communication, it is assumed that the behaviours of participants mutually influence each other. The behaviour of the teacher is influenced by the behaviour of the students and in turn influences the student behaviour. Thus, a circular communication process develops which not only consists of behaviour, but determines behaviour as well.

With the systems perspective in mind, Wubbels, Créton and Hooymayers (1985) developed a model to map interpersonal teacher behaviour using an adaptation of the work of Leary (1957). In the adaptation of the Leary model, teacher behaviour is mapped with a Proximity dimension (Cooperation, C - Opposition, O) and an Influence dimension (Dominance, D, - Submission, S) to form eight sectors, each describing different behaviour aspects: Leadership, Helping/Friendly, Understanding, Student Responsibility and Freedom, Uncertain, Dissatisfied, Admonishing and Strict behaviour. Figure 1 shows typical behaviours for each sector.

The Questionnaire on Teacher Interaction (QTI) is based on this model.

The items of the QTI belong to eight scales, each consisting of six items and corresponding to one of the eight sections in the model. Examples of items are "This teacher is friendly"(Helping/Friendly) and "This teacher gets angry unexpectedly"(Admonishing). The scores for each item within the same sector are added to obtain a total scale score. The higher the scale score the more a teacher shows behaviours from that sector. Scale scores can be obtained for individual students, or can be combined to form the mean of all students in a class.

Figure 1. The model for interpersonal teacher behaviour

The original version of the QTI developed in the early 1980s in The Netherlands had 77 items (Wubbels, Créton, & Hooymayers, 1985). Later, an American version of the QTI was developed which had 64 items (Wubbels & Levy, 1991). The Australian version of the QTI described in this paper, is more economical and has 48 items which are answered using a five-point response scale. This version of the QTI is available for use by teachers to gather their own perceptions and the perceptions of their students about their science classrooms.

One advantage of the QTI is that it can be used to obtain the perceptions of interpersonal behaviour of either students or teachers. When the QTI is administered to both teachers and their students, information is provided about the perceptions of teachers and the perceptions of their students of the interpersonal behaviour of that teacher. The information obtained by means of the questionnaire includes perceptions of the behaviour of the teacher towards the students as a class, and reflects relatively stable patterns of behaviour over a considerable period. Similarly, teachers can be asked for their perceptions of their own behaviour or the behaviour that they consider to be ideal. The wording of the questionnaire is varied slightly when used to obtain teachers' self-perceptions and ideals. For example the question "This teacher talks enthusiastically about his/her subject", becomes "I talk enthusiastically about my subject" in the teacher self-perception version, and "The teacher would talk enthusiastically about his/her subject" in the teacher ideal version.

By using these three separate forms of the QTI it is possible to collect data on students' perceptions of teacher-student interpersonal behaviour, teachers' perceptions of their actual teacher-student interpersonal behaviour in the classroom and what they perceive to be ideal.

Previous use of the QTI

The QTI has been shown to be a valid and reliable instrument when used in The Netherlands (Wubbels & Levy, 1993). When the 64-item USA version of the QTI was used with 1,606 students and 66 teachers in the USA, the cross-cultural validity and usefulness of the QTI were confirmed. Using the Cronbach alpha coefficient, Wubbels and Levy (1991) reported acceptable internal consistency reliabilities for the QTI scales ranging from 0.76 to 0.84 for student responses and from 0.74 to 0.84 for teacher responses.

Wubbels (1993) used the QTI with a sample of 792 students and 46 teachers in Western Australia and Tasmania. The results of this study were similar to previous Dutch and American research in that, generally, teachers did not reach their ideal and differed from the best teachers as perceived by students. It is noteworthy that the best teachers, according to students, are stronger leaders, more friendly and understanding, and less uncertain, dissatisfied and admonishing than teachers on average.

When teachers described their perceptions of their own behaviours, they tended to see it a little more favourably than did their students. On average, the teachers' perceptions were between the students' perceptions of actual behaviour and the teachers' ideal behaviour. An interpretation of this is that teachers think that they behave closer to their ideal than their students think that they do.

Another use of the QTI in The Netherlands involved investigation of relationships between perceptions on the QTI scales and student outcomes (Wubbels, Brekelmans & Hoymayers, 1991). Regarding students' cognitive outcomes, the more that teachers demonstrated strict, leadership and helping/friendly behaviours, then the higher were cognitive outcomes scores. Conversely, student responsibility and freedom, uncertain and dissatisfied behaviours were related negatively to achievement.

Variations in the students' appreciation of the subject and the lessons have been characterised on the basis of the proximity dimension: the more cooperative the behaviour displayed, the higher the affective

outcome scores (Wubbels, Brekelmans & Hoymayers, 1991). That is, student responsibility and freedom, understanding, helping/friendly and leadership behaviours were related positively to student attitudes. Uncertain, dissatisfied, admonishing and strict behaviours were related negatively to student attitudes. Overall, previous studies have indicated that interpersonal teacher behaviour is an important aspect of the learning environment and that it is related strongly to student outcomes.

Levy, Créton and Wubbels (1993) analysed data from studies in The Netherlands, the USA and Australia involving students being asked to use the QTI to rate their best and worst teachers. Students rated their best teachers as being strong leaders and as friendly and understanding. The characteristics of the worst teachers were that they were more admonishing and dissatisfied. In a further investigation into the characteristics of teachers, Wubbels and Levy (1991) compared Dutch and American teachers and found very few differences, although American teachers were perceived as stricter and Dutch teachers as giving their students more responsibility and freedom.

The QTI also has been used to develop typologies of teacher interpersonal behaviour in The Netherlands (Wubbels, Brekelmans, Créton & Hooymayers, 1990). Using cluster analysis, eight types were distinguished. The behavioural patterns on the eight teacher types were characterised as directive, authoritative, tolerant/authoritative, tolerant, uncertain/tolerant, uncertain/aggressive, repressive, and drudging. Teacher types associated with the greatest student cognitive and affective gains were directive (characterised by a well structured task oriented learning environment) and tolerant/authoritative (characterised by a pleasant well structured environment in which the teacher has a good relationship with students). Uncertain/aggressive (characterised by an aggressive kind of disorder) and uncertain/tolerant teacher types were associated with the lowest student gains.

In one of the first uses of the QTI in Australia, (Fisher, Fraser & Wubbels, 1993), associations were investigated between teachers' perceptions of their work environment, using the School Level Environment Questionnaire (SLEQ), and students' and teachers' perceptions of their classroom interactions (Fisher & Fraser, 1990). Results from this study indicated that relationships between SLEQ and QTI scores generally were weak, thus suggesting that teachers believed that they had considerable freedom to shape their own classrooms regardless of their school environment.

Recently, a team of researchers in Australia completed the first use of the 48 item QTI in senior biology classes with a sample of 489 students in 28 biology classes (Fisher, Henderson & Fraser, 1995). Although past studies have examined associations between student perceptions of the learning environment mostly in science classes and student outcomes, this Australian study was unique in that it examined student outcomes in three distinct areas – student attitude, achievement in a written examination, and performance on practical tests. This study confirmed the validity and reliability of the QTI when used in senior secondary biology classes. The alpha reliability figures for the different QTI scales ranged from 0.63 to 0.83 when the individual student was used as the unit of analysis and from 0.74 to 0.95 when the

class mean was used (Fisher, Henderson & Fraser, 1995). Generally, the dimensions of the QTI were found to be associated significantly with student attitude scores. In particular, students' attitude scores were higher in classrooms in which students perceived greater

leadership, helping/friendly, and understanding in their teachers' interpersonal behaviours. Conversely, students' attitude scores were lower in classrooms in which students perceived greater uncertainty, dissatisfaction, admonishing, and strictness in their teachers' interpersonal behaviours. It was concluded that, if biology teachers want to promote favourable student attitudes in their class and laboratory work, they should ensure the presence of these interpersonal behaviours.

Fisher, Rickards and Fraser (1996) have described how science teachers can use the results obtained with the three versions of the QTI as a basis for reflecting on their own teaching and thus providing a basis for guiding systematic attempts to improve their teaching practice. Fisher, Rickards and Fraser also reported that after having completed the questionnaire and having had time to read the QTI report supplied to them, science teachers stated that the results had stimulated them to reflect on their own teaching. The results of the QTI led one teacher to comment on verbal communication in her classroom. Based upon her sector profile diagrams, she concluded that she had become more aware of the students' needs for clear communication. This subsequently became a focus for her in improving her classroom environment and her teaching.

A primary school adaptation of the QTI was used in Singapore by Goh and Fraser (1996). This revised questionnaire was administered to 1,512 students in 39 fifth-grade classes in Singapore and each scale exhibited satisfactory internal consistency and predictive validity for two levels of analysis (the student and the class mean) and differentiated between classes. Furthermore, girls consistently rated the teacher, behaviour more favourably than did boys.

Method

The study involved 720 students in 20 grades 8 and 9 science classes in Singapore and 705 students in 29 grades 8 and 9 science classes in Australia. All students completed the student version of the QTI to describe the teacher-student interpersonal behaviour occurring in their classrooms. Teachers completed the actual version of the QTI to describe their perceptions of their own personal behaviours with their students and their perceptions of an ideal science teacher. Student attitudes were assessed with a seven-item Attitude To This Class scale, which was based on the the Test of Science-Related Attitudes [TOSRA] (Fraser, 1981).

Results

Table 1 provides some cross-validation information for the QTI when used specifically in the present samples of science classes. Statistics are reported for two units of analysis, namely, the student's score and the class mean score. As expected, reliabilities for class means were higher than those where the individual student was used as the unit of analysis. Table 1 shows that, for Singapore, the alpha reliability figures for different QTI scales ranged from 0.50 to 0.88 when the individual student was used as the unit of analysis, and from 0.60 to 0.98 when the class mean was used as the unit of analysis.

For the Australian sample, the corresponding values were 0.60 to 0.88 and 0.64 to 0.96 respectively. The values presented in Table 1 for the present sample generally provide further cross-validation information supporting the internal consistency of the QTI with either the individual student or the class mean as the unit of analysis. The Student Responsibility/Freedom scale has reliability figures less than the other scales, particularly in Singapore, and this scale requires

examination and revision before using the questionnaire in that country.

Table 1
Internal Consistency (Cronbach Alpha Coefficient) and Ability to Differentiate between Classrooms of the QTI for Singapore and Australian Samples

Another desirable characteristic of any instrument like the QTI is that it is capable of differentiating between the perceptions of students in different classrooms. That is, students within the same class should perceive it relatively similarly, while mean within-class perceptions should vary from class to class. This characteristic was explored for each scale of the QTI using one-way ANOVA, with class membership as the main effect. It was found that each QTI scale differentiated significantly ($p < 0.001$) between classes and that the eta² statistic, representing the proportion of variance explained by class membership, ranged from 0.13 to 0.47 for different classes in Singapore and from 0.15 to 0.40 in Australia.

Using the scales of the QTI as independent variables, associations were computed with attitude to the class. Simple correlations were calculated between each QTI scale and each student attitude. Also a multiple regression analysis, involving the whole set of QTI scales, was conducted to provide a more conservative test of the association between each QTI scale and attitude when all other QTI scales were mutually controlled.

Table 2

Associations between QTI Scales and Students' Attitudinal Outcomes in Singapore and Australia in terms of Simple Correlations (r) and Standardized Regression Coefficients (β).

An examination of the simple correlation (r) figures in Table 2 indicates that there were eight significant relationships ($p < 0.05$), out of eight possible, between student/teacher interactions and student attitudinal outcomes for the student samples from both countries. An examination of the beta weights reveals five out of eight significant relationships ($p < 0.05$) for the Singapore sample and four out of eight for the Australian one.

In classes where the students perceived greater leadership, helping/friendly and understanding behaviours in their teachers, behaviours depicted on the right side of the model, there was a more favourable attitude towards the class. The converse was true for behaviours on the left side of the model. The picture for both countries was very similar.

Country differences in teacher-student interpersonal behaviour were examined using a two-way MANOVA with the eight QTI scales as dependent variables. Table 3 presents the scale means and standard deviations for Singaporean and Australian science students scores on the eight scales of the QTI. The magnitude of these differences is not large, but statistically significant country differences were apparent in students' responses to six of the eight scales of the QTI, with Australian students perceiving greater helping/friendly, understanding behaviours in their teachers and receiving more responsibility and freedom. They also perceive their teachers as being more uncertain, dissatisfied and

admonishing. In contrast, Singaporean students perceive their teachers as being stricter.

Teachers from each country responded to questions about their perceptions of the actual classroom environment as they perceived it and to the teacher ideal version of the questionnaire which asks the teacher to respond to questions that refer to an ideal teacher in their classroom environment. As described previously, the wording of these two teacher versions is altered slightly. By completing these two questionnaires, the teachers were able to provide details about the interpersonal behaviour in their actual classroom environments as well as their ideal classroom environments.

Table 3.

Scale Means and Standard Deviations for Singapore and Australian Science Students' Scores on the Eight Scales of the QTI

Thus the three versions of the QTI were completed and mean scores were calculated for each version for each country. The results were plotted onto sector profiles as shown in Figure 2.

Figure 2.. Comparison Sector Profiles for a Sample Classes in Australia and Singapore

The sector profile diagrams of the Singapore teachers suggest that these teachers perceive themselves as being close to their ideal teacher in all sections of the model of interpersonal behaviour. Their students perceive them to have a lower level of leadership, helping/friendly and understanding behaviour than they believe. Furthermore, the teachers perceive more strictness in their own behaviour than do their students.

The profiles for the Australian teachers suggest their ideal teacher would exhibit greater leadership, helping/friendly and understanding behaviour than they perceive they demonstrate. The students' perceptions of the classroom interpersonal behaviour is similar to that of their teachers.

Individual teachers from both countries could use such sector profile diagrams, constructed from their own classes, to reflect on their own classroom behaviours and use the results as a basis for modifying their behaviour when interacting with students

Conclusions

This study confirmed the reliability and validity of the QTI for use in science classes in Australia and Singapore. Generally, the dimensions of the QTI were found to be significantly associated with student attitude scores. In particular, students' attitude scores were higher in classrooms in which students perceived greater leadership and helping/friendly behaviours in their teachers. If science teachers want to promote favorable student attitudes to their class, they should ensure the presence of these interpersonal behaviours.

Small differences were found between student perceptions of the science teachers in Singapore and Australia. The greatest of these were that Australian teachers were perceived as giving more responsibility and freedom to their students while the teachers in Singapore were perceived as being stricter.

The three versions of the QTI allow science teachers to obtain their

students' perceptions of their interpersonal behaviour, their own perceptions and the behaviour that they consider to be ideal. This

valuable information then can be used as a basis for self-reflection by teachers on their teaching performance. Based on this information, teachers might decide to change the way they behave in an attempt to create a more desirable classroom environment.

Sector profiles could be used when considering staff development activities as they provide individual science teachers with information about their actual and preferred classroom environments. This information can be used to identify areas for personal development in specific classroom environments. The sector diagrams also could be used as a basis for discussion of teaching behaviours. For example, science teachers wanting to improve their leadership behaviours could organise professional development activities accordingly.

Science teachers can make use of the QTI to monitor students' views of their classes, investigate the impact that different interpersonal behaviours have on student outcomes, and provide a basis for guiding systematic attempts to improve this aspect of their teaching. Furthermore, the QTI could be used in assessing changes that result from the introduction of new curricula or teaching methods, and in checking whether a science teacher's interpersonal behaviour is seen differently by students of different genders, abilities or ethnic backgrounds.

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