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APPLICATION OF A QUESTIONNAIRE TO DESCRIBE TEACHER COMMUNICATION BEHAVIOUR AND ITS ASSOCIATION WITH STUDENTS IN SCIENCE IN TURKEY

Esra Özay, Ercan Kaya, Fatih Sezek
Atatürk University, Kazim Karabekir Education Faculty, Turkey

Abstract. *Teachers contribute enormously to a positive social climate at science classes, particularly through their communication with students. In the study described in this article, a questionnaire (The Teacher Communication Behaviour Questionnaire (TCBQ)) developed by She and Fisher (2000) was applied. TCBQ can be used to assess students' perceptions of science teachers' interpersonal communication behaviours in their classroom learning environments. TCBQ has five scales: Challenging, Encouragement and Praise, Non-Verbal Support, Understanding and Friendly, and Controlling. The TCBQ was applied with a large sample of secondary science students in Turkey. Girls perceived their teachers as more understanding and friendly, encouragement and praise than did boys, and teachers in biological and chemistry science classrooms exhibited more favourable behaviour toward their students than did those in physical science classrooms.*
Key words: *teacher communication, students' perceptions, sex differences, subject differences.*

Introduction

Teacher-student interaction is an integral part of secondary science school classrooms, because it builds rapport between the teacher and students. When students feel that they can respect and trust their teacher, they tend to not only perform better academically but also grow more confident in themselves. Many studies have shown the importance of positive teacher-student relationships (Cho, 2003).

Classroom interactions between teachers and students occur rapidly in a classroom. Good and Brophy (1991) indicated that teachers in secondary schools may have interactions with 150 different students during a single day. However, teachers usually are not aware or are not able to describe or remember what happens in these interactions with their students. For example, Good and Brophy interviewed teachers and confirmed that teachers usually were not aware how many questions they asked students and what kind of feedback they provided. Thus, it could be helpful to teachers if their behaviours and interactions in teaching were identified and recorded. (She & Fisher, 2002).

Classroom and school environment factors were found to be particularly important influences on student outcomes, even when a number of other factors were controlled (Henderson et.al, 2000).

Specifically, teacher-child interactions are considered to be developmentally appropriate when the teacher (a) responds quickly, directly and warmly to children; (b) provides a variety of opportunities to participate in a two-way communication; and (c) identifies and elaborates on the feelings, interests, and activities of children. Much of the research investigating relationships between teacher- child interactions and child outcomes has focused on the warmth and sensitivity of interactions. Indeed, teachers who engage in sensitive and responsive interactions with children are more likely to develop nurturing relationships, which are essential to children's security. Children who have more secure relationships with their teacher are, in turn, more likely to explore their environment and, therefore to have more opportunities to learn. Children who have less directive, less harsh, and less detached teachers, experience more positive interactions, are more considerate and sociable, they display higher levels of language development, and are observed to be more competent in cognitive activities (Kruif et.al, 2000).

International research efforts involving the conceptualisation, assessment, and investigation of perceptions of aspects of the classroom environment have firmly established classroom environment as a thriving field of study. For example, recent classroom environment research has focused on constructivist classroom environments (Taylor, Fraser, & Fisher, 1997), computer-based tertiary class- rooms (Newby & Fisher, 1997), science laboratory classroom environments (Fraser, Giddings, & McRobbie, 1995), and teacher interpersonal behaviour in the classroom (Fisher & Kent, 1999). This past research has confirmed the important contribution teachers made in creating a classroom environment or atmosphere conducive to science learning (Fraser, 1998a, 1998b). Teachers make a major contribution toward creating a positive learning environment at science classes, particularly through their interaction or communication with students. Appropriate teacher–student interactions are important to prevent discipline problems and to foster professional development (Rosenholtz, Bassler, & Hoover-Dempsey, 1986). Student–teacher interactions also have been shown to be particularly important in a "constructivist" classroom, where relationships play a prominent role (e.g., Watts & Bentley, 1987).

Use of students' perceptions of classroom environment as predictor variables has established consistent relationships between the nature of the classroom environment and student cognitive and affective outcomes. Furthermore, research involving a person-environment fit perspective has shown that students achieve better where there is greater congruence between the actual classroom environment and that preferred by students (Taylor, Fraser & Fisher, 1997).

In this article, a questionnaire of She & Fisher (2000) was applied to assess students' perceptions of science teachers' interpersonal communication behaviours in their classroom learning environments in Turkey (this questionnaire was quoted from 723-726 pages of She & Fisher (2000)). This study's results were appreciated according to sex and subject differences.

Three common approaches to studying teachers and their classrooms are systematic observation, descriptive case studies, and using student and teacher perceptions. Systematic observation and case studies have been used frequently in the past; however, now perceptual measures often are used, particularly when investigating a large sample of classes. The advantages of using student perceptions as indicators of the quality of the classroom environment have been elucidated in a number of studies (e.g., Walberg & Haertel, 1980; Stodolsky, 1984). Examples of past findings include: students are directly involved in classroom activities and observe more of the teacher's typical behaviour than does an observer; students are more familiar with their teacher's idiosyncrasies, which might be interpreted differently by an observer; hiring trained observers over a period of time is more expensive and time consuming than the administration and scoring of questionnaires; and the presence of observers could alter what generally occurs in the classroom (She & Fisher, 2002).

In the past three decades much attention has been given to the development and use of instruments to assess the qualities of the classroom-learning environment from the perspective of the student. Therefore, one purpose of the study was to establish a questionnaire that would allow a study of students' and teachers' perceptions of teacher communication behaviour in a large number of science classes at the same time. The questionnaire could then be used to investigate students' perceptions of their teacher's interpersonal communication behaviour in classroom-learning environments (She & Fisher, 2002).

Of all school subjects, science probably has the greatest inequity between the sexes in participation, achievement, and attitudes (Young & Fraser, 1994). Also, previous studies have reported sex-related differences in students' perceptions of the learning environment (Lawrenz, 1987; Fisher, Henderson, & Fraser, 1995; Fraser, Giddings, & McRobbie, 1995). Other learning environment research in science classrooms has indicated differences in students' perceptions on other subjects in addition to sex differences (Fisher, Harrison, Henderson, & Hofstein, 1998).

In this study differences among biological, chemistry and physical sciences and between girls and boys were examined. Furthermore, questionnaires like the TCBQ are of use to practicing

science teachers if they are able to gain personal benefit from their use in their own classrooms. Thus, in this study we tried an application of the TCBQ with three classroom teachers.

Method

This study' methodology is the same as Taiwan methodology of She and Fisher, 2002. The study described in this article used a questionnaire to assess students' perceptions of science teachers' interpersonal communication behaviours in their classroom learning environments. The objectives of the research described in this article were to: (a) use the TCBQ to determine if there are any differences among biological science students', chemical science students' and physical science students' perceptions of their teachers' communication behaviours using, Duncan' multiple range test; (b) use the TCBQ to determine if there are any sex differences in students' perceptions of their teachers' communication behaviours using T test; (c) check the reliability of TCBQ using the Cronbach alpha coefficient in Turkey.

This research study involves Turkey. The sample of randomly selected schools participating was available to the authors. The final sample consisted of 389 biological/physical and chemical science students in Grades 7-9 in Turkey. Each student in the sample responded to the TCBQ.

Results

Sex Differences

The differences in scale means between males and females are indicated in Table 1. As determined by a t test, there were statistically significant differences between boys' and girls' perceptions of the learning environment ($p<0.05$) on two of the five scales of the TCBQ. Girls perceived their teachers as more understanding and friendly than did the boys. Furthermore, the girls perceived their teachers as being more encouragement and praise than did the boys. On the other hand, the boys perceived their teachers as being more controlling than did the girls but there were not statistically significant differences between boys' and girls' perceptions about controlling. These results are similar to those of previous studies showing that girls tend to perceive their learning environment in a more positive way than do boys (Fraser et al., 1995; She & Fisher, 2002).

Table 1. Sex differences in item mean scores for each scale of the TCBQ.

	Male		Female		Difference	
Scale	Mean	SD	Mean	SD	(F-M)	T test
Challenging	3.56	0.74	3.61	0.76	0.05	0.65
Encouragement & praise	3.06	0.92	3.25	0.99	0.19	1.96*
Non-verbal support	3.27	0.90	3.42	0.87	0.15	1.61
Understanding & friendly	3.82	0.92	4.14	0.80	0.32	3.48**
Controlling	3.87	0.70	3.77	0.70	-0.10	-1.31

*p<0.05; **p<0.001; n= 249 (males); n= 140 (females).

Subject Differences

As depicted in Table 2, statistically significant differences were found among biological science, chemical science and physical science classrooms. On all four scales of the TCBQ, students in the biological and chemical science classrooms perceived more of these communication behaviours in their teachers. On all four scales of the TCBQ, the students in the physical science classrooms perceived less than other branches.

Table 2. Duncan multiple range tests of science subject differences in item mean scores for each scale of the TCBQ.

Scale Subject	Challenging	Encouragement & praise	Non-verbal support	Understanding & friendly	Controlling
Biological	3.61b*	3.25a	3.42a	4.00a	3.87a
Chemistry	3.82a	3.31a	3.43a	4.19a	3.84a
Physical	3.37c**	2.87b**	3.14b*	3.68b**	3.77a

The means that marked same letter are not statistically significant differences.
*p<0.01; **p<0.0001; n=139 (bio. science); n= 142 (chem. science); n=108 (phys. science).

Reliability of TCBQ in Turkey

TCBQ was used in an investigation involving associations between students' perceptions of their teachers' communication behaviours and their attitudes toward their science classes. The responses to the Attitude to this Class scale were analysed to check the reliability of the scale using the Cronbach alpha coefficient. The Cronbach alpha reliability for the Attitude scale is 0.93 for the Turkey sample. The Cronbach alpha reliability for the Attitude scale was 0.90 for the Taiwan sample and 0.85 for the Australian sample. These can be regarded as satisfactory (She & Fisher, 2000). These reliability measures also compare favourably with the use of the scale in previous studies involving students at science classes where the reliability coefficients ranged from 0.78 to 0.85 (Henderson, Fisher, & Fraser, 1998).

Discussion

The TCBQ was used with a large sample of students in Turkey, where girls perceived their teachers as more understanding and friendly than did the boys. Furthermore, the girls perceived their teachers as being more encouragement and praise than did the boys. On the other hand, the boys perceived their teachers as being more controlling than did the girls but there were not statistically significant differences between boys' and girls' perceptions about controlling. Thus, the girls in Turkey generally were more favourable about their teachers' communication behaviours than were the boys. These findings are supported by previous observation studies of Taiwan science classrooms (She & Fisher, 2002). She found that in the Taiwan situation, boys usually were dominant in the science classroom, and some of them became actively involved in class discussions to get the teacher's attention. This often resulted in a negative response from the teacher. On the other hand, teachers usually perceived girls as being more passive learners. Therefore, the teachers were less likely to give the girls a negative response (She & Fisher, 2002). These observations in Turkey are similar. The TCBQ has the potential for use in future studies in which the effect of the student's sex of the is a variable of interest.

Subject differences were also apparent, with teachers in the biological and chemical science classrooms exhibiting more favourable behaviours toward their students than did those in physical science classrooms. As determined by Duncan multiple range tests there were statistically significant differences between physical and biological-chemistrical science classrooms on four of the five scales of the TCBQ. In Turkey too as Taiwan, physical science content tends to be perceived by many students as more abstract and harder to learn than biological and chemistrical

science (She, 1998b). Conversely, the biology and chemical content is considered more relevant to the students' daily lives. Also, biology and chemistry teaching appears to have a greater variety of approaches than does physical science teaching. These might be the reasons why students perceived their biological and chemical science classrooms more favourably than did the physical science students. However, more research exploring the differentiation among biology, chemical and physical science classrooms is desirable. In controlling scale of TCBQ, there was not statistically different between physical and biological-chemical science classrooms. Differences on four of the five scales of the TCBQ were not noted between biological and chemical science classrooms. Because biology and chemistry contents are more connected with daily life than physics. In challenged scale of TCBQ, there was statistically different between biological and chemical science classrooms. Reason of this might be nature of biology and chemical science teachers in this study.

Previous study was that the TCBQ proved satisfactory in two countries (Taiwan-0.90; Australian-0.85) (She & Fisher, 2000). This study was proved satisfactory for TCBQ (Turkey-0.93).

Conclusions

The purpose of this study was to establish a questionnaire (TCBQ) that would allow a study of students' and teachers' perceptions of teacher communication behaviour in Turkey. According to sex (male, female) and subject (biological, chemistry and physical) differences, results of this questionnaire was be evaluated.

The results of this study indicate that there were statistically significant differences between boys' and girls' perceptions of the learning environment ($p<0.05$) on two of the five scales of the TCBQ (Table1). This two scales are encouragement & praise and understanding & friendly. Girls perceived their teachers as more understanding and friendly than did the boys. Furthermore, the girls perceived their teachers as being more encouragement and praise than did the boys. Because, the girls tend to perceive their learning environment more positively than do boys (Fraser et al., 1995).

Statistically significant differences were found among biological science, chemical science and physical science classrooms. On all four scales of the TCBQ, students in the biological and chemical science classrooms perceived more of these communication behaviours in their teachers than physical science classrooms. Physical science content tends to be perceived by many students as more abstract and harder to learn than biological and chemistrical science. Conversely, the biology and chemical content is considered more relevant to the students' daily lives. Also, biology and chemistry teaching appears to have a greater variety of approaches than does physical science teaching. These might be the reasons why students perceived their biological and chemical science classrooms more favourably than did the physical science students. Physical content should be connected with daily lives.

Previous study was that the TCBQ proved satisfactory in two countries (Taiwan-0.90; Australian-0.85) (She & Fisher, 2000). This study was proved satisfactory for TCBQ (Turkey-0.93). The TCBQ with its Challenging, Encouragement and Praise, Non-Verbal Support, Understanding and Friendly, and Controlling scales provides an additional way of exploring one aspect of teacher-student interactions in science classrooms, that is, the teacher's communication behavior (She & Fisher, 2002).

This study can suggest some implications for practice, personnel development, and research. TCBQ can be applied for observing teachers and classifying them. Also, this questionnaire provides training in sensitivity to average and controlling teachers and less redirective and more elaborative to increase the overall quality of the classroom environment and to increase the percentage of student engaged. Teachers can use this supplement to promote an atmosphere of positive interaction in their science classrooms and improve student learning.

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Резюме

ПРИМЕНЕНИЕ ВОПРОСНИКА ДЛЯ ОПИСАНИЯ КОММУНИКАЦИОННОГО ПОВЕДЕНИЯ УЧИТЕЛЯ И ЕГО АССОЦИАЦИИ С УЧАЩИМИСЯ ПО ЕСТЕСТВОЗНАНИЮ В ТУРЦИИ

Есра Озай, Еркан Кайа, Фатих Сезек

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Учителя способствуют к положительному социальному климату на уроках естественных дисциплин, особенно в процессе общения с учащимися. Коммуникация учителя и учащихся на уроках естествознания интегральная часть процесса обучения в средней школе. Многие исследования показывают важность позитивных отношений учителей и учащихся.

Цель этого исследования состояла в том, чтобы установить некоторые связи между поведением учителя и учащихся на уроках естествознания. Установлены интересные статистически значимые различия в зависимости от пола респондентов и предмета обучения.

Установленно, что важная проблема как соглосовать содержание естественных дисциплин с повседневной жизнью. Учащиеся отметили, что на уроках физики им более трудно чем на уроках химии или биологии. Обращено внимание на то, что содержание курса физики более абстрактно чем содержание биологии или химии. Выучить физику для учащихся Турции довольно трудно.

Учителя могут использовать результаты этого исследования для того чтобы улучшить атмосферу положительного взаимодействия в их классах по естествознанию и, конечно, для улучшения обучения.

Ключевые слова: коммуникация учителя, половые различия, перцепции студентов, предметные различия, естественнонаучное образование.

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Esra Özay

Research Assistant in the Department of Biology Education in Education Faculty
Mailing address: Atatürk University, Kazim Karabekir Education Faculty, Department of Biology Education, Erzurum, 25240, Turkey
Phone: +90 (442) 231 4036; Fax: +90(442) 236 0955
E-mail: esraozay@atauni.edu.tr

Ercan Kaya

Assistant Professor in the Department of Biology Education in Education Faculty
Mailing address: Atatürk University, Kazim Karabekir Education Faculty, Department of Biology Education, Erzurum, 25240, Turkey
Phone: +90 (442) 231 4034
E-mail: ercan25kaya@hotmail.com

Fatih Sezek

Assistant Professor in the Department of Science Education in Education Faculty
Mailing address: Atatürk University, Kazim Karabekir Education Faculty, Department of Biology Education, Erzurum, 25240, Turkey
Phone: +90(442) 231 4034
E-mail: fsezek@yahoo.com