

The effect of teacher interpersonal behaviour on students' subject-specific motivation

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Abstract

This study brings together insights from research on teaching and learning in specific subjects, learning environments research and effectiveness research by linking teacher interpersonal behaviour to students' subject-related attitudes. Teaching was studied in terms of a model originating from clinical psychology that was adapted to education. Teacher interpersonal behaviour was analysed in terms of two, independent behaviour dimensions called Influence and Proximity. This study investigated the added value of students' perceptions of teacher interpersonal behaviour (after correction for covariates such as gender, report card grade, class size, etc.) on students' subject-specific motivation. Data of 52 third-year EFL-classes (English as a Foreign Language; 1041 students), taught by 32 secondary teachers, were included in the analyses. The study used multilevel analysis of variance to investigate the effect of teaching on motivation and included several covariates as well. For all of the discerned subject-related attitude variables – pleasure, relevance, confidence and effort – a positive and strong effect was found for teacher Proximity. In addition, for three of the outcome variables – pleasure, relevance and effort – Influence also had a positive effect. Overall, however, proximity seemed to be of greater importance than teacher influence. The results demonstrate the significant role of teacher interpersonal behaviour in student motivation and the importance of combining insights from various educational research disciplines.

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1. Introduction

The question of how to motivate students has occupied educational researchers, teachers as well as teacher trainers for several decades. Interest in the effect that teachers may have on students' affective outcomes can be found in multiple educational research domains, including educational psychology, the teaching of specific subjects, school and teacher effectiveness research, and the study of learning environments.

The present study investigates the relationship between students' motivation and EFL (English as a Foreign Language) teachers' interpersonal behaviour on a sample of 52 third-year classes (1041 students) in secondary education in the Netherlands. Although many scholars in the domain of learning environments research have addressed the area of motivation and the ways in which teachers can influence it, the current study tries to add to the field by combining particular insights from previous work. First of all, while most previous studies focussed on pleasure or enjoyment as single motivational outcome, in this study motivation is conceptualised and measured in terms of a *multifaceted* construct. Second, the relationship between students' subject-specific motivation and teacher interpersonal behaviour is being investigated with multilevel analysis and corrected for the effects of prior achievement and motivation (as well as various student, teacher and class characteristics), which allows us to more precisely estimate the nature of effects. Previous work using the same framework and instruments has used multilevel analysis only to a limited degree and by our knowledge none of the studies has corrected the effects of interpersonal behaviour for prior motivation.

When studying motivation, educational researchers often distinguish between motivational personality traits and situation- or subject-specific motivation (Boekaerts & Simons, 1995). Although both elements may be affected by education, in the present study we focus on the latter of the two. Following Boekaerts and Simons, *subject-specific motivation* is defined here as 'an organized structure of values, attitudes and conceptions a student has towards a specific subject or knowledge domain'. The structure results from the generalization of feelings, thoughts and intentions towards a

certain school subject. Researchers have distinguished differently between elements of subject-specific motivation, but most have ended up with four separate, though interrelated elements (e.g. Clément, Dörnyei & Noels, 1994; Gardner & MacIntyre, 1993; Gardner & Lambert, 1972; Kuhlemeier, van den Bergh & Teunisse, 1990): the *pleasure* (or enjoyment) students experience in lessons of a subject, the *relevance* of the subject (for future work or other subjects and domains), the *confidence* students have in learning and achieving for the subject, and the *effort* they put in or interest they have for the subject. Despite the fact that these four elements have been widely accepted by researchers investigating subject-specific motivation, researchers have often used one general measure of motivation (combining the four elements) when linking motivation to other factors, such as teaching in the classroom (e.g. Brekelmans, Wubbels, & den Brok, 2002; Creemers & Scheerens, 1994; Scheerens & Bosker, 1997) or have focussed uniquely on the pleasure or enjoyment element (see den Brok, Fisher & Koul, this issue). The present study hopes to provide further evidence for the assumption that teachers can affect the different elements of subject-specific motivation differently.

In the present study, teaching is analysed and described in terms of the teacher-student relationship (teacher interpersonal behaviour), with a framework that originates from both clinical psychology and communication (e.g. Leary, 1957). This model – the Model for Interpersonal Teacher Behaviour (Wubbels, Créton, & Hooymayers, 1985; Wubbels & Levy, 1993) – as well as the instrument that operationalizes it (the Questionnaire on Teacher Interaction or QTI; Wubbels et al., 1985) studies teacher-student interpersonal behaviour in terms of two, independent dimensions called *Influence* (teacher dominance versus submissiveness) and *Proximity* (teacher cooperation versus opposition). These two dimensions structure every teacher behaviour and can be used to subdivide interpersonal behaviour in eight sectors: Leadership, Helpful/Friendly behaviour, Understanding behaviour, Student Freedom, Uncertain behaviour, Dissatisfied behaviour, Admonishing behaviour and Strictness. These eight sectors and their two underlying dimensions can be displayed in a circle (see Figure 1). The model and similar circular model are often referred to as circumplex models (Fabrigar, Visser, & Browne, 1997). For a more elaborate description of the model and theory behind it, we refer to the contribution of den Brok, Fisher and Koul in this issue.

Figure 1 about here

There are several reasons to focus on *teacher interpersonal behaviour*. First, such behaviour is a major component of classroom management (e.g. Doyle, 1986) and many experienced and inexperienced teachers, experience problems in this domain (Veenman, 1984). Second, research has shown that teacher interpersonal behaviour is strongly related to student achievement and motivation in all subject areas (Brekelmans, et al., 2002; den Brok, 2001; Wubbels & Brekelmans, 1998; Fraser, 1998) and that healthy teacher-student interpersonal relationships are a prerequisite for engaging students in learning activities (Brekelmans, Slegers & Fraser, 2000; den Brok, Bergen, Stahl, & Brekelmans, 2004; Wubbels & Levy, 1993). Another specific feature of this framework is that teaching is studied in terms of students' *perceptions*, rather than (uniquely) in terms of observations of behaviour (by researchers) or self-reported behaviour (by teachers). It can be assumed that students' learning and motivation are determined to a large degree by their perceptions - and perhaps even more so than by teacher intentions or researcher perceptions (Fraser, 1998; Shuell, 1996; Shulman, 1986).

To establish a link between teacher interpersonal behaviour and students' subject-specific motivation we have used multilevel analysis (Scheerens & Bosker, 1997). One feature of this methodology is that it recognises the hierarchical nature of data that is present in many studies (in the present study classes as a whole within a limited set of schools are sampled). It has been shown that data of students in a class may be more similar than that of randomly sampled students, because students shared similar experiences, history and contexts (Hox, 1995). If this is ignored, correlations or associations may become artificially high and effects found are usually overestimated (Hox, 1995; Muthén, 1994). A second feature of this methodology is that it allows researchers to include (many) covariates that are present at different levels, e.g. to estimate the effect of teaching on motivation taking into account other (confounding) factors, such as student, class or teacher characteristics (like gender, ethnic background, et cetera). Not taking into account the effect of such covariates may lead to overestimations of the effects of teaching. Finally, if variables such as prior motivation and achievement are included in the analyses, the methodology enables researchers to determine the 'added effect' of teaching. Not including initial motivation may (again) lead to overestimation of

effects of teacher behaviour. By employing multilevel analysis and by including several covariates and prior motivation, the present study provides an estimate of the *added effect* that a teacher may have on students' subject-specific motivation.

This contribution continues with a description of the literature on the relationship between teacher behaviour and students' subject-related attitudes. The research questions then appear, followed by the outcomes of multilevel analyses on a data set of EFL students and a concluding discussion.

2. Review of research on teacher interpersonal behaviour and student motivation

Studies that have investigated associations between teacher interpersonal behaviour and subject-specific motivation display a very consistent pattern: all have found a positive effect for both teacher Influence and Proximity on motivation. Generally, the effects of Proximity are somewhat stronger than those for Influence (e.g. den Brok, Brekelmans, & Wubbels, 2004; den Brok, Fisher, & Koul, this issue). In a study of physics teachers and their students, Brekelmans, Wubbels, and Créton (1990) found a clear relationship between Proximity and student motivation toward the subject: the stronger the perception of Proximity the greater the motivation of the students. This result has been supported by studies on *immediacy*, which indicate a strong, direct and positive relationship with affective student outcomes (Gorham & Zakahi, 1990; Sanders & Wiseman, 1990; Powell & Harville, 1990; Comstock, Rowell & Bowers, 1995; Neuliep, 1995; McCroskey, Richmond, Sallinen, Fayer & Barraclough, 1995). Immediacy, an important concept in communication research, is defined as 'that communication which enhances closeness to one another' (Mehrabian, 1981, In Sanders & Wiseman, 1990). It includes behaviours that indicate approachability, signal availability for communication and increase sensory stimulation and interpersonal warmth and closeness (Sanders & Wiseman, 1990). Other studies found positive relationships between helpful/friendly and understanding behaviour, and pleasure, confidence, effort and relevance with regard to other subjects such as EFL, Math and Chemistry (Brekelmans, et al., 2002), while negative relationships were found with admonishing, dissatisfied, and, in most cases, strictness (Goh, 1994; Henderson, 1995; Rawnsley, 1997; Evans, 1998). The weakest associations have been identified between interpersonal behaviour and confidence (van Amelsvoort, 1999). It may be that the nature of confidence is somewhat different from the other

motivation elements, since studies interrelating the four motivation elements seem to indicate the lowest correlations between confidence and the other elements (den Brok, 2001).

3. Research questions

This study investigates the effect of interpersonal teacher behaviour on students' subject-specific motivation (pleasure, relevance, confidence and effort). The following research questions are investigated:

- How much variance in (EFL) students' subject-specific motivation can be explained by teacher interpersonal behaviour, taking into account student, teacher and class characteristics as well as prior achievement and motivation?
- What is the magnitude and direction of effects of teacher Influence and Proximity on students' subject-specific motivation?

4. Method

4.1 Variables

4.1.1 Teacher interpersonal behaviour

Data about the perceptions of students on their teachers' interpersonal behaviour have been gathered by means of the *Questionnaire on Teacher Interaction (QTI)*. The Dutch version of the QTI consists of 77 items which are answered on a five-point Likert scale. These items are divided into eight scales which conform to the eight sectors of the model. Table 1 presents a typical item and the number of items for each scale.

[Table 1 about here]

Several studies have been conducted on the reliability and validity of the QTI. They have included Dutch (e.g. Brekelmans, et al., 1990; den Brok, 2001; Wubbels, et al., 1985), American (Wubbels &

Levy, 1991) and Australian (Fisher, Fraser & Wubbels, 1992) samples. Both reliability and validity were acceptable.

Each completed questionnaire yields a set of eight scale scores. Scale scores equal the sum of all item scores and are reported in a range between 0 and 1. Scale scores of students from the same class are combined to a class mean. In the present study, the teacher-student relationship is analysed on the basis of dimension scores. To arrive at dimension scores, we use linear combinations of the scale scores¹. We designate the two linear combinations of the eight scores as an Influence (DS)-score and a Proximity (CO)-score. The higher these scores are, the more dominance (DS) or cooperation (CO) is perceived in the behaviour of a teacher.

For the present sample, reliability was computed for each of the scales of the QTI: multilevel λ (Snijders & Bosker, 1999) and Cronbach α for data aggregated to the class level. Cronbach α represents consistency across items, while multilevel λ represents consistency across groups of students. The results are presented in Table 2. As can be seen from the results in Table 2, the reliability coefficients (both λ and α) are very high (>.90).

[Table 2 about here]

In order to investigate discriminant validity, intra-class correlations of the scales were computed with Mplus (Muthén & Muthén, 1999). The intra-class correlations, which indicate what amount of variance of the QTI is located at the between (teacher-class) level, are listed in Table 3.

[Table 3 about here]

The percentages of variance at the between level (teacher-class level) are between 40 and 55. These percentages are higher than those reported for other instruments that measure perceptions of people or objects in clustered or interdependent situations (see Fraser, 1998; Wubbels & Levy, 1993).

Construct validity of the QTI was investigated by subjecting the scale scores to a number of analyses. First, we conducted an exploratory factor analysis on the class-level sector scores. Results of this

analysis suggested that two, orthogonal (uncorrelated) factors could be extracted, explaining 88 percent of the variance. Second, we conducted a multilevel confirmatory factor analysis using Mplus. It appeared that an unequally-spaced circumplex model - a model assuming the eight sectors to be ordered in a circle and to be represented by two, independent dimensions, but not to be equally distributed over the circle or equally distanced to the circle centre – fitted the data best (Chi-squared=72.15 with $df=13$ and $p < 0.01$; CFI=0.99; TLI=0.94; RMSEA=0.06 and SRMR=0.04). The factor loadings resulting from this model are presented in Table 4, while they are graphically displayed in Figure 2.

[Table 4 about here]

[Figure 2 about here]

As can be seen, only CFI and TLI indicate relative model fit, whereas Chi-squared and RMSEA suggest that the model still can be improved. These outcomes suggest that two dimensions underlie students' perceptions and that the interpersonal sectors are ordered in a circular structure, though dislocations exist in the positions of sectors on the circle. Third, we computed correlations between dimension scores based on empirical factor loadings (as resulting from the confirmatory factor analysis and presented in Table 5) and theoretically hypothesised factor loadings². Correlation was .987 for the Influence dimension and .999 for the Proximity dimension, suggesting that, despite irregularities in the circumplex structure, the interpersonal dimensions are replicated to a large degree nevertheless.

Based on these outcomes we decided to use the two dimension scores, rather than the eight sector scores, in establishing the effect of teacher-student interpersonal behaviour on students' subject-specific motivation.

4.1.2 Subject-specific motivation

In this study, the *Attitude Scale towards English* (ASE) was used to measure subject-specific motivation. The ASE was developed by researchers of the Dutch Central Institute of Testing (CITO) to measure subject-specific motivation of students (Kuhlemeier, et al., 1990) and later adapted for more general use by Boekaerts and Otten (1990). Four motivational elements are central to the instrument: pleasure, effort, confidence and relevance. *Pleasure* refers to the joy students experience when working with the subject (e.g. how much they like the subject). *Effort* refers to the amount of time students are willing to invest in the subject and the interest they show. *Confidence* refers to the feelings students have as a consequence of the difficulties they experience with assignments. *Relevance* is related to the practical use of the subject matter in and outside school, now and later.

The ASE consists of 32 five-point scale Likert-type statements which the student has to apply to his or her own situation. In the original version of the questionnaire students have four response possibilities, ranging from 'strongly agree' to 'strongly disagree', but in this study a neutral category was added. Each component (pleasure, effort, anxiety and relevance) is measured by eight items.

Reliability of the eight components was sufficient for pleasure ($\alpha = .87$), relevance ($\alpha = .77$), confidence ($\alpha = .86$) and effort ($\alpha = .69$). Confirmatory factor analyses on the instrument (den Brok, 2001) indicated that the four aspects can be regarded as both separate and interrelated, rather than four elements of one higher-order motivation variable (see Appendix A for these analyses). Therefore, in subsequent analyses the four motivation elements are treated separately.

4.1.3 Other variables

It was decided to include as many covariates as possible in the analyses. A set of important covariates consisted of prior achievement and prior subject-specific motivation. Prior motivation was measured by administering the subject-specific motivation instrument at the beginning of the school year (year-end scores constituted our dependent variables). Prior achievement was measured by means of a reading comprehension test (20 items, KR-20 = .82). Both prior outcome measures were calculated in terms of *average* scores for the class and the amount of *student deviation* from this mean (since we

regarded both individual as well as class outcomes as factors of importance). Other covariates included were:

- students' report card grades on a number of subjects: Dutch, Math and English (as a Foreign Language).
- student gender and the percentage of boys in the class,
- class size,
- the number of lesson minutes per week (information was gathered by asking teachers a number of question regarding lesson length and frequency),
- school type³,
- teacher gender, and
- teacher experience.

Student gender and teacher gender were transformed into sets of dummy variables. For school type, two dummy variables were created - one contrasted the intermediate and general education track (called HAVO) with lower general education (called MAVO or VMBO), and another compared the pre-university education track (called VWO) with lower general education.

4.2 Respondents

The sample in this study consisted of 1041 third-year secondary students in 52 classes (taught by 32 teachers). Of this group, 47.1 percent was male and 52.9 percent female. Nearly all (91.5 percent) were born in the Netherlands. Most were in the pre-university school track (41.3 percent), while smaller percentages were in lower general education (22.0 percent) and intermediate general education (36.7 percent). A comparison with the Dutch population of EFL students⁴ indicated that the pre-university students were over-represented in our sample (Chi-squared=4.016 with df=2 and p=.00). The Dutch population of third-year students at the time of our study was made up as follows: 28.1 percent was located in the lower general education level, 35.2 percent in the intermediate general education level and 36.7 percent in the pre-university level.

The students displayed average reading comprehension levels (they had mean scores of 60 percent of the total possible), but had high prior subject-specific motivation: on a five-point scale they scored 3.90 for pleasure, 4.23 for relevance, 4.07 for confidence and 3.32 for effort.

Of the teachers, more than half (56 percent) were female. They had an average of 12 years of teacher experience and most had full appointments at their schools. Average class size was 21, with classes between 12 and 34 students present in the sample.

4.3 Analyses

Three multilevel models were fitted for each outcome measure: an *empty model*, a *covariate model* and a model that included interpersonal teacher behaviour and/or interactions between interpersonal behaviour and other variables (*teaching model*). The empty model was formulated to obtain raw estimates of variance at the different levels of the data. For the covariate model, all covariates were entered: report card grades, prior reading comprehension and prior subject-specific motivation in terms of pleasure, relevance, confidence and effort (all of these variables were entered both as class mean as well as deviation of a student from the class mean), student gender, school type, teacher gender, teacher experience, percentage of boys in the class, the number of lesson minutes per week and class size. Only variables that displayed significant effects were retained in the analyses. In the teaching models, teacher Influence and Proximity were entered, as well as interactions of these two dimensions with student or teacher characteristics (especially gender and report card grade). Three-level models were used in the analyses, with teachers acting as the highest levels, teacher-class combinations acting as the middle level and students as the lowest level. Standard estimation procedures in multilevel analyses programs, such as Iterative Generalized Least Squares (IGLS), often produce biased estimates of coefficients and variance distribution, especially when small numbers of units are available at the higher levels (Luyten & De Jong, 1998). Because of the small number of teachers and classes involved in this study, it was decided to use the Restricted Iterative Generalized Least Squares (RIGLS) method, which is suitable for small numbers of units at the highest levels (Goldstein, 1995). In the results section, we only provide the outcomes of the empty model and the teaching model.

5. Results

This section presents the outcomes of the multilevel analyses. Results are reported separately for pleasure, relevance, confidence and effort. Each section discusses variance distribution as well as the effects of interpersonal teacher behaviour.

5.1 *Pleasure*

Outcomes for the multilevel analyses on pleasure are presented in Table 5. Most of the variance in pleasure is located at the student level, while only about 10 percent is located at the teacher level. When covariates are included in the model over eighty percent of the variance at the teacher level has been explained, only about 1.5 percent of the total variance remains unexplained.

Teacher Influence and Proximity are important in terms of their effect on the amount of pleasure perceived, since they explain nearly 10 percent of the total variance. The teacher interpersonal variables explain no variance at the teacher level, but more than 50 percent at the class level. The Proximity dimension is most important: the more Proximity perceived, the more pleasure experienced. In fact, Proximity has the highest regression coefficient of all explanatory variables. A gain of one standard deviation in Proximity corresponds to a gain of .20 on pleasure, while a gain of one standard deviation in Influence results in a gain of .05, meaning that the effect of Proximity is four times greater than that of Influence. Such gains, both for Influence and Proximity, are important, since they are as large as the difference between actual and prior pleasure (standardised coefficient of .10).

[Table 5 about here]

5.2 *Relevance*

About 90 percent of the variance in relevance (for EFL) is located at the student level. Only a very small percentage of the variance is located at the teacher level, less than one percent. After background variables are entered in the model no differences between teachers remain. Table 6 presents the results of the multilevel analyses for relevance.

Similar to the outcomes for pleasure teacher Influence and Proximity are related to the amount of relevance perceived. The effect of both variables is smaller, however, than for pleasure. The variables explain one and a half percent of the total variance, most of which at the class level. The effects of Proximity are almost two times stronger than those for Influence. A gain of one standard deviation in Proximity corresponds to a gain of .08 in relevance, while a similar gain in Influence corresponds to a gain of .04 in relevance.

[Table 6 about here]

5.3 Confidence

The smallest amounts of variance at the teacher level of all subject-specific motivation variables - about 5 percent - relates to Confidence. Further, background variables reduce this to less than 1.5 percent. Table 7 presents the outcomes of the multilevel analyses for confidence.

Despite the low amounts of variance at the teacher and class levels, teacher Proximity still has a significant effect on confidence: the more co-operative teachers are perceived, the more confident their students are. Teacher Proximity explains only a modest amount of variance (1.2 percent of the total variance). Its effect is considerable in terms of the regression coefficient - a gain of one standard deviation in Proximity corresponds to twice the difference between prior and actual confidence. Teacher Influence is not related to confidence.

[Table 7 about here]

5.4 Effort

Close to 90 percent of the variance in effort is related to the student level, with nearly 10 percent at the teacher level. Background variables reduce the variance at the teacher level to zero (see Table 8).

[Table 8 about here]

Both teacher Influence and Proximity are positively related to effort: the more dominant and cooperative a teacher is perceived, the more effort students are willing to put into the subject. The two interpersonal variables explain about 5 percent of the total variance. No variance, however, is explained at the teacher level, and about 20 percent at the class level. This means that teachers may be able to motivate their students better in one class as compared to another class. The effect of Proximity is twice as large as the effect of Influence in terms of regression coefficients. A difference of one standard deviation in Proximity is equivalent to the difference between prior and actual effort, while a difference of one standard deviation in Influence corresponds to half that difference.

6. Discussion

This study has attempted to investigate the contribution of teacher interpersonal behaviour to students' subject-specific motivation. Although some indications for the direction of influence have been generated the design however does not permit final conclusions about the effect of teacher behaviour on student motivation. The relationships that have been found can be interpreted the other way around: motivated students permit teachers to show a particular type of behaviour instead of the interpretation that teacher behaviour prompts student motivation.

For the variables pleasure and effort, relatively large differences were found between teachers, as compared to differences between classes of teachers. Somewhat smaller differences between teachers were found for confidence, whereas differences in relevance were virtually absent between teachers, but existed mainly between classes. This means that teachers can affect the amount and quality of effort and pleasure to the same degree in all of their classes, but they can affect their students' perceptions of relevance more in some classes than in other. Apparently, relevance is determined by other factors as well, such as the type of education (university-oriented vs lower general education), teaching methods and curricula.

For all of the subject-specific motivation variables – pleasure, relevance, confidence and effort – small to modest (in terms of effect sizes) associations with teacher Proximity were found. These results are in line with those of earlier studies (den Brok, 2001; Brekelmans, Wubbels & den Brok, 2002; Wubbels & Brekelmans, 1998; Wubbels & Levy, 1993). For some of the variables – pleasure,

relevance and effort – teacher Influence also was positively related. The largest (statistical) effect of the teacher influence dimension was found for effort, and no effect was found for confidence. Earlier research (den Brok, 2001) showed that influence was negatively related to confidence. It seems that teachers can stimulate their students' effort by controlling the communication, but this has hardly any effect on their students' pleasure, relevance or confidence. Teacher Proximity has the largest effect on effort and confidence. Interestingly, effort is often regarded as something that is internal to the person, whereas confidence is seen as something that is external (Weiner, 1986). The outcomes of this study thus show that teachers can affect internally as well as externally-related factors of motivation.

In general, teacher Proximity seems to be of greater importance for student motivation than teacher Influence. These outcomes are in line with prior research on the relationship between teacher interpersonal behaviour and student outcomes (den Brok, 2001; Wubbels & Brekelmans, 1998; Wubbels & Levy, 1993).

By including several covariates and conducting multilevel analyses, the present study was able to estimate the effects of teaching on students' subject-related attitudes more precisely than some of the prior research. On the one hand, they show similar trends to that reported in the past - such as a positive association between student motivation and teacher Influence and Proximity. Nonetheless, they indicate that the amounts of variance explained by these variables are smaller than estimated before, are different for each motivational aspect, and mainly relate to differences between classes of teachers, rather than differences between teachers. This suggests that teachers may be able to better motivate students in one class than students in another. Moreover, they show that although these effects may be small in a relative sense, in terms of regression coefficients they can still be regarded as substantial.

Unfortunately, the study itself suffered from a number of limitations. Because interpersonal behaviour was the only teaching variable included in the models, its effects may have been overestimated in the results. However, preliminary analyses (den Brok, 2001) indicate that this behaviour remains important after other behaviours have been added, a finding that is in line with prior research (Goh, 1994; Henderson, 1995; Rawnsley, 1997). Second, the number of teachers included in the sample is relatively small. Research with larger samples is needed in the future.

The results of our study can have implications for both every day teaching as well as for educational research. For teachers, it is important to realise that a safe environment, characterised by high amounts of Proximity (through helpful/friendly and understanding behaviours and a limited amount of dissatisfied and correcting behaviours), is important for strengthening students' motivation for their subject. As prior research shows strong and positive associations between cognitive outcomes and student motivation outcomes (e.g. Creemers & Scheerens, 1994) teachers may at the same time improve student cognitive outcomes. Also, it is important for teachers to realise that by focussing on one motivational element – for example relevance of the subject – they may as well affect other motivational elements. While the four motivation elements can be regarded as separate entities conceptually and empirically, they affect each other (over time) as well; evidence for this can be found in Tables 5 to 8, where statistically significant effects are reported for several prior subject-specific motivation elements.

A third and final attribute of our study with practical implications is the use of student perceptions. Knowledge by teachers on students' perceptions may help teachers in gauging the effect of their behaviours. Given the strong link between students' perceptions and educational outcomes, such perceptions may even be of more practical implication than teachers' own perceptions or perceptions of external observers. Prior research, for example, has shown that no links could be found between teachers' perceptions of their own behaviour and students' cognitive and affective learning outcomes (e.g. Wubbels & Levy, 1993). The Model for Interpersonal Teacher Behaviour may help teachers in creating a language and analysis framework for their observations.

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Notes

¹ To this end the eight scores are represented as vectors in a two dimensional space, each dividing a section of the model of interpersonal behaviour in two and with a length corresponding to the height of the scale score. We then compute the two coordinates of the resultant of these eight vectors.

² Theoretical dimension scores according to the ideal circumplex model are computed as follows:
 Influence = $(.92*DC) + (.38*CD) - (.38*CS) - (.92*SC) - (.92*SO) - (.38*OS) + (.38*OD) + (.92*DO)$;
 Proximity = $(.38*DC) + (.92*CD) + (.92*CS) + (.38*SC) - (.38*SO) - (.92*OS) - (.92*OD) - (.38*DO)$.

³ Dutch secondary education is organised into several school types or tracks, that more or less represent ability levels. These tracks are lower general (vocational) education (called VMBO or MAVO), higher general education (called HAVO) and pre-university education (called VWO).

⁴ Information was found on the website of the Dutch Bureau of Statistics: <http://www.cbs.nl>

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Appendix A

Factor analyses conducted on the ASE.

Factor analyses were conducted on the four ASE scales, which were divided into two subtests for technical reasons (see Kuhlemeier, et al., 1990). Thus, each scale was represented by two indicators, consisting of half of the items. Some restrictions were included in these models, such as equal factor loadings and error components for the subtests of each component. Four models were tested, equivalent to those of Kuhlemeier and colleagues (1990): a model with one overarching motivation factor (1), a model with four independent factors (2), a model with four correlated factors (3) and a model with one general (pleasure) and three specific factors (4). Error measurements and factor loadings of the two subsets of each component were restricted to be equal. Factor loadings were also kept equal. Below, fit measures are provided for each of the four models.

Model	Chi-squared/ df	GFI	SRMR
1. One general factor	1549.30 / 58	.49	.39
2. Four uncorrelated factors	1635.60 / 52	.63	.42
3. Four correlated factors	119.28 / 40	.88	.063
4. One general & 3 correlated factors	146.54 / 40	.84	.081

Model 3 showed best fit. These results are in line with those of Kuhlemeier et. al. (1990), who also found the model with four correlated factors to fit the data best. Estimated correlations between the subscales by model 3 are displayed below.

	Pleasure	Relevance	Anxiety
Relevance	.69		
Anxiety	.63	.49	
Effort	.74	.67	.16

Earlier research (Kuhlemeier et. al., 1990) has shown that anxiety can be considered as a relatively separate component of subject-specific motivation. This study also showed lowest correlations between the anxiety scale and the other scales. The lowest correlation can be found between the effort and the anxiety scale, while the highest correlation can be found between the pleasure and effort scale.

*Table 1**Number of items and a typical item for the QTI-scales*

<i>Scale</i>	<i>Number of items</i>	<i>Typical item</i>
DC Leadership	10	S/he is a good leader
CD Helpful/friendly	10	S/he is someone we can depend on
CS Understanding	10	If we have something to say s/he will listen
SC Student responsibility/freedom	9	S/he gives us a lot of free time in class
SO Uncertain	9	S/he seems uncertain
OS Dissatisfied	11	S/he is suspicious
OD Admonishing	9	S/he gets angry
DO Strict	9	S/he is strict

Table 2

Reliability, Multilevel λ and Cronbach's α (Class Level) of the QTI

Scale	λ	α
DC	0.95	0.94
CD	0.94	0.97
CS	0.93	0.98
SC	0.90	0.91
SO	0.94	0.93
OS	0.92	0.92
OD	0.93	0.94
DO	0.94	0.92

Note. See Figure 1 for the meaning of the scales.

Table 3

Intraclass Correlations of the QTI-scales

Scale	ICC
DC	0.46
CD	0.55
CS	0.47
SC	0.41
SO	0.41
OS	0.40
OD	0.42
DO	0.41

Note. See Figure 1 for the meaning of the scales.

Table 4

Factor Loadings for the Unequally Spaced Circumplex Model

	Factor 1	Factor 2
DC	1.00	0.56
CD	0.25	1.15
CS	0.02	1.00
SC	-0.44	0.53
SO	-1.00	-0.16
OS	-0.05	-0.73
OD	0.25	-0.78
DO	0.56	-0.58

Note. See Figure 1 for the meaning of the scales.

Table 5

Pleasure, significant (at $\alpha=.05$) regression coefficients and variance components.

		Empty model	Teaching model	Effect size
Student level	Constant	3.327	1.676	
	Relevance-dev		-0.056	-0.037
	Effort-dev		0.119	0.083
	Reading-dev		0.050	0.064
	Rep crd Eng		0.128	0.056
	Rep crd Dutch		-0.096	-0.033
	Rep crd Math		-0.060	-0.029
Class level	Effort-av		0.220	0.154
	Reading-av		0.023	0.040
	Lesson minutes		-0.003	-0.029
Teacher level	Influence		0.135	0.025
	Proximity		0.407	0.115
Variance	Teacher	10.7	1.0	
	Class	3.4	3.8	
	Student	85.9	60.3	
	Explained	-	34.9	
-2*log(like)	1480.4	1813.1		
Difference log (df)	-	362.6 (12)		

Reading=initial reading comprehension; rep crd eng=report card grade for EFL; rep crd Math=report card grade for Math; lesson minutes=number of lesson minutes per week; dev=individual difference from the class mean; av=class mean.

Table 6

Relevance, significant (at $\alpha=.05$) regression coefficients and variance components.

		Empty model	Teaching model	Effect size
Student level	Constant	3.938	2.614	
	Relevance-dev		0.127	0.099
	Pleasure-dev		-0.038	-0.046
	Reading dev		0.026	0.039
	Rep crd Math		-0.045	-0.026
	Rep crd Eng		0.070	0.036
Class level	Relevance-av		0.092	0.075
	Reading-av		0.052	0.106
Teacher level	Influence		0.088	0.018
	Proximity		0.124	0.041
Variance	Teacher	0.6	0	
	Class	12.1	5.0	
	Student	87.3	74.6	
	Explained	-	20.4	
-2*log(like)		1628.6	1453.0	
Difference log (df)		-	175.6 (9)	

Reading=initial reading comprehension; rep crd Math=report card grade for Math; rep crd Eng= report card grade for EFL; dev=individual difference from the class mean; av=class mean.

Table 7

Confidence, significant (at $\alpha=.05$) regression coefficients and variance components.

		Empty model	Teaching model	Effect size	
Student level	Constant	3.838	2.052		
	Conf-dev		0.257	0.360	
	Relevance-dev		-0.107	-0.150	
	Effort-dev		-0.108	-0.159	
	Reading-dev		0.058	0.155	
	Rep crd Eng		0.091	0.084	
	Rep crd Math		-0.099	-0.102	
	Gender		-0.159	-0.069	
Class level	Conf-av		0.168	0.269	
	Reading-av		-		
Teacher level	Proximity		0.138	0.082	
	Variance	Teacher	5.2	1.4	
		Class	0	1.5	
		Student	94.8	45.3	
		Explained	-	51.8	
-2*log(like)	2205.1	1503.9			
Difference log (df)	-	701.2 (10)			

Reading=initial reading comprehension; conf=confidence; rep crd eng=report card grade for English; rep crd Math=report card grade for Math; gender=student gender (male=baseline); dev=individual difference from the class mean; av=class mean.

Table 8

Effort, significant (at $\alpha=.05$) regression coefficients and variance components.

		Empty model	Teaching model	Effect size
Student level	Constant	2.951	2.015	
	Effort-dev		0.249	0.372
	Pleasure-dev		-0.023	-0.051
	Conf-dev		-0.172	-0.245
	Reading-dev		0.020	0.054
	Rep crd Eng		0.084	0.079
	Rep crd Dutch		-0.061	-0.045
Class level	Effort-av		0.303	0.453
	Lesson minutes		-0.003	-0.062
Teacher level	Influence		0.160	0.061
	Proximity		0.228	0.137
Variance	Teacher	10.4	0	
	Class	3.0	4.0	
	Student	86.6	70.0	
	Explained	-	26.0	
-2*log(like)		1782.8	1557.0	
Difference log (df)		-	226.8 (10)	

Reading=initial reading comprehension; conf=confidence; rep crd eng=report card grade for EFL; rep crd Dutch=report card grade for Dutch; lesson minutes=number of lesson minutes per week; dev=individual difference from the class mean; av=class mean.

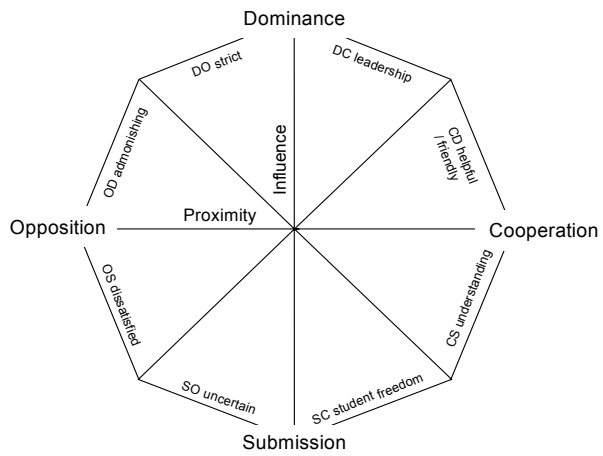


Figure 1. The Model for Interpersonal Teacher Behaviour.

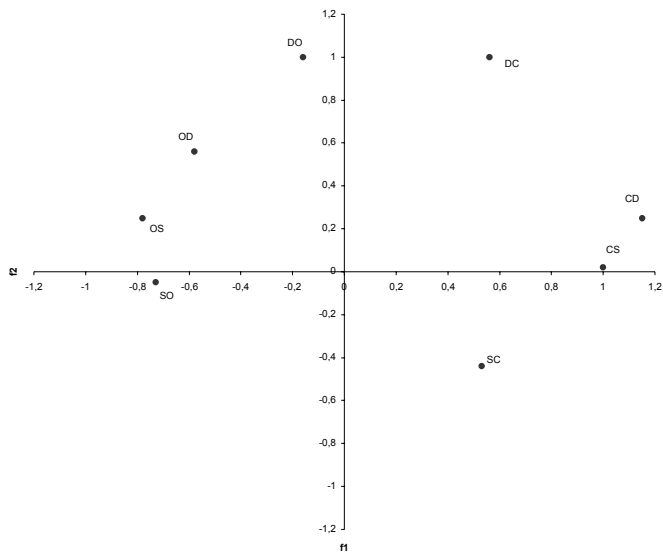


Figure 2. Graphical Presentation of the Class-level Factor Loadings.