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# Students' perceptions of teacher control behaviours☆

Perry den Brok [a,*], Theo Bergen [b], Robert J. Stahl [c], Mieke Brekelmans [a]

[a] *IVLOS Institute of Education, Utrecht University, PO Box 80127, 3508 TC Utrecht, Netherlands*
[b] *Graduate School of Education, University of Nijmegen, PO Box 9103, 6500 HD Nijmegen, Netherlands*
[c] *Arizona State University, Curriculum and Instruction Graduate Programs, PO Box 871911, Tempe, AZ 85287-1911, USA*

**Abstract**

Student perceptions of the kind and extent of control in their teachers' control behaviours during learning activities were investigated. Theorists distinguish between 'student-initiated' and 'teacher-initiated' regulation of students' learning activities; or between 'strong,' 'shared' and 'loose' control of students' activities during learning tasks. Multilevel confirmatory factor analyses (LISREL) performed on perception data of 2061 secondary education students of 67 teachers support three constructs of control behaviours, at least from the students' perspective: 'strong,' 'shared' and 'loose' control. However, while similar to other constructs with the same labels, the particular items in the three constructs that emerged from students differed somewhat from those proposed by other researchers.


*Keywords:* Classroom control; Student perceptions; Teaching behaviours; Control behaviours; Learning activities

## 1. Introduction

Currently, most scholars acknowledge that learning 'is not a passive, knowledge consuming and externally directed process, but an active, constructive and self-directed process in which learners build up internal knowledge representations that

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* Corresponding author. Tel.: +31-30-2532231; fax: +31-30-2532741.
*E-mail address:* p.j.denbrok@ivlos.uu.nl (P. den Brok).

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are personal interpretations of their learning experiences' (Vermunt & Verloop, 1999: p. 258, following Bednar, Cunningham, Duffy, & Perry, 1991). *Learning* is said to be a knowledge-construction process and will be defined here as 'the performance of mental activities by students that result in (relatively) stable changes in their mental or overt behaviour or behavioural dispositions' (Boekaerts & Simons, 1995; den Brok, 2001; Shuell, 1993, 1996; Vermunt, 1992). The mental activities undertaken to achieve these changes in behaviours and dispositions have been labelled as *learning activities* (Shuell, 1996). While learning activities are always performed by students, teachers can engage in a wide range of behaviours to facilitate and *regulate* (e.g., initiate, monitor, focus, modify, control, influence, direct, correct, maintain) students' behaviours while completing their learning activities (Vermunt & Verloop, 1999). In this line of reasoning, *teaching* is described and defined in terms of the learning processes teachers aim their students to perform to achieve desired results.

However, whether students will engage in and successfully complete the activities as teachers expect may partially[1] depend on the students' *perceptions of the quality of their teachers' control behaviours*. If constructivist ideas (such as, students construct their own knowledge and perceptions of every learning situation) are taken seriously, then far more attention must be paid to students' perceptions of their teachers' behaviours within the context of classroom activities and expectations. We assume that students' perceptions of teacher behaviour do act as one set of important mediators between the actual regulating behaviours of teachers and the actual performance of learning activities by each student (den Brok, 2001; Shuell, 1996). We also assume that students will only act on those teacher behaviours that they observe and interpret (perceive) in their personal idiosyncratic ways (Shuell, 1996; Stahl, 1987). Two crucial variables that are assumed to determine the quality of teacher regulation are interpersonal teaching skills and clarity of instruction (den Brok, 2001). For instance, when teachers send vague nonverbal messages to students while giving instructions, are perceived as lacking sufficient authority or respect in the classroom, or provide unclear assignments or lesson structure, students are not likely to engage in or much less successfully complete the intended learning activities. This failure is likely because they do not comprehend what is expected from them or because they anticipate acceptable consequences even when they do not complete the activities at the criterion level.

Two dimensions seem particularly important in the whole range of possible and used teacher-regulatory actions: the *type of learning activity* (e.g., cognitive, affective or metacognitive) that is targeted for students and the *amount of teacher control* (Brekelmans, Sleegers, & Fraser, 2000; den Brok, 2001; Vermunt & Verloop, 1999). While the types of learning activities to be performed probably form the core elements in completing classroom learning tasks and their regulation by

[1] Of course, students' regulation of their own learning is determined by many other factors—see for example Vermunt (1998) or Vermetten, Vermunt and Lodewijks (2002)—, but a discussion of these goes beyond the scope of this article.

teachers, they were not the focus of this study. Here, attention is given to the other important and complementary factor in students' completion of learning tasks—i.e., the form and degree of teacher control of variables during classroom activities. More specifically, attention during this study was on *students' perceptions* of teacher acts that they interpreted as being 'regulatory'- or 'control'- oriented.

Since at least the days of John Dewey, educators have disagreed with respect to the different forms and degrees of control behaviours that teachers can, do and should exhibit in facilitating students' completion of learning tasks. Most distinguish between three graduations of teacher control (Brekelmans et al., 2000; den Brok, 2001; Simons & de Jong, 1992; Vermunt, 1992; Vermunt & Verloop, 1999): (a) *strong control*, or taking over or substituting the performance of students' completion of learning-related tasks; (b) *shared control*, or activating and facilitating students to take a very active part in guiding and completing the target learning tasks; and (c) *loose control*, or stimulating and motivating students to complete learning activities by themselves with little if any teacher involvement in regulating their behaviours as they complete the tasks. Examples of strong control (e.g., Vermunt & Verloop, 1999) are teacher behaviours such as presenting an outline, providing students with examples, and highlighting main points. In each instance, the teacher does what students could and presumably should be doing. For shared control, sometimes a further distinction is made between (a) *shared responsibility between student and teacher* and (b) *shared responsibility between student and student* (Lamberigts, den Brok, Derksen, & Bergen, 1999; van Amelsvoort, 1999). Examples of shared control are such teacher behaviours as asking questions, giving assignments or assigning tasks, and stimulating students to cooperate. Others (Shuell, 1993, 1996) distinguish between two traditional forms of control: *student-control* (i.e., student-initiated control) and *teacher-control* (i.e., teacher-initiated control).

Empirical evidence for these different constructs of regulatory involvement and behaviours is weak, as the assumed distinctions between these constructs are primarily based on literature reviews or assumption-laden theoretical reasoning. Very little empirical data verifying or refuting the existence of such distinctions have been gathered from secondary-level students. Such information would be useful and necessary, because knowledge about students' interpretation of teaching acts may assist teachers and researchers, or construct more accurate, comprehensive and detailed descriptors about students' possible reactions, and consequently, the effects that particular teaching behaviours may have on learning. While some studies have paid attention to students' perceptions of teachers' control behaviours (see Section 2), none of these investigated the structure behind and qualitative distinctions between these perceptions. Moreover, they may help to find empirical support for distinctions that already have been made by researchers or teachers. In the study reported here, students' perceptions of their teachers' control behaviours were investigated along with the kinds of empirical structures that seem to best define if not support these perceptions.

## 2. Theoretical and empirical perceptions and distinctions regarding teacher control

In a previous section, the distinction between strong, shared and loose control (e.g., Vermunt & Verloop, 1999) was mentioned. Brekelmans et al. (2000) (following Simons, 1992; Simons & de Jong, 1992) make a similar distinction, but use different labels to denote them: *taking over*, *activating* and *stimulating*. Den Brok (2001), while using the same distinction, calls the activating context and accompanying behaviours *shared control*, while Vermunt (1992) includes these within a single construct labelled, *partial steering*.

Shuell (1993, 1996) only distinguishes between two degrees of teacher regulation of learning activities. According to him, learning activities—while always being performed by the students—can be *initiated* by either the *teacher* (or other instructional agents, such as textbooks, computers, etc.) or the *student*. He acknowledges, however, that in everyday classroom situations when it comes to initiate learning activities, there will always be a distribution of responsibilities between teacher and student.

Given the constructivist claim that individuals construct their own personal knowledge and views of reality, then each learner's perceptions relative to learning situations should be very important to teachers. According to Shuell (1996), "the manner in which the learner perceives, interprets and processes information in the instructional situation (including the content being learned and the social context in which the instruction occurs) is more important than the actions of the teacher in determining what the student will learn...Ultimately, it is the perception of the student, not the intent of the teacher, that determines the effect that an instructional act has on the student's learning." (p. 734). When making sense of and assessing their teacher's regulation of their learning tasks, student perceptions may prove to be of crucial importance and may provide a different and powerful vantage point for investigating the complex interactions between teacher and learners.

Research using teacher or external observer perceptions to study teachers' regulation of students' learning is rather common, while student perceptions are infrequently used (den Brok, 2001). Besides, student perceptions have several additional advantages over teacher perceptions and classroom observations. First, student perceptions are cheaper and more efficient to gather than observational data. Second, the experience of students with the behaviour of a certain teacher is often based on a large amount of lessons, while the experience of observers is often limited to a few lessons (den Brok, 2001; Fraser, 1998). Therefore, student perceptions account better for the history characteristic of the classroom context (e.g., Doyle, 1986; Shuell, 1996). Third, student perceptions often consist of the composite judgement of all the students in a class, while a characteristic of observation or teacher perceptions is that these often consist of the judgements of one or two persons (den Brok, 2001). Therefore, student perceptions that have been averaged over a class are less subject to mood swings, personal preferences and other personal or situational factors than teacher perceptions. Finally, students have an advantage in judging classroom environments because they have encountered many

different situations and contexts, which may help to describe a differentiated picture (Wubbels & Brekelmans, 1998). Because of their advantages, student perceptions have proven to be very reliable in many research projects (d'Apollonia & Abrami, 1996). This study investigates student perceptions of *actual* teaching behaviours with respect to the *whole class*[2].

Perceptions are formed during and result from every interaction between an individual and his or her environment (Fraser, 1998). Given this is the case, student perceptions of their teacher's regulatory actions associated with different types of control can be thought of as containing individual elements as well as elements that may be consistent with those of all other students in the same class. This distinction between individual and 'class' elements of perceptions for the same teacher and teaching acts is important. Theoretically, the shared element of the perception reveals something about the teacher that is agreed upon by all students in a class, while the individual element provides information on differences in teacher treatment towards individuals, differences in norms and values held by individuals and differences in needs of individual students (den Brok, 2001). From a methodical point of view, empirical data on student perceptions, such as used in this study is sampled by asking individual students at the same time as all of their classmates. In order to separate the shared part of perceptions from the individual, idiosyncratic part, and to focus uniquely on the teacher-class level—the level at which the concepts and their related behaviours apply—multilevel statistical techniques must be used.

Numerous studies on students' perceptions of teachers and the classroom environment have been conducted in the domain of learning environments research (Fraser, 1998). While many of these studies examined student perceptions in relation to other variables, only a small number investigated the empirical structure of students' perceptions (den Brok, 2001). Most of these were carried out to investigate interpersonal teacher behaviour (Wubbels & Brekelmans, 1998). Only a very small number of all studies used the proper statistical techniques to account for the nested structure of the data (thereby acknowledging the social context in which individual perceptions are formed), such as multilevel structural equation modelling (Hox, 1995; Muthén, 1994).

Moreover, a limited number of studies actually investigated students' perceptions of the type of control behaviours teachers used during learning activities. An Australian study (Taylor, Fraser, & Fisher, 1997) used a questionnaire to evaluate the degree to which teachers used constructivist notions in their teaching. Their instrument, the Constructivist Learning Environment Survey (CLES), measured different elements of constructivism, including the amount of control and its sharing by teachers and students. Using factor analyses on individual and aggregated (class)

[2] There are different types of student perceptions. One distinction has been made between the perceptions of *actual* or *experienced* teaching and the perceptions of *preferred* or *ideal* teaching (Fraser, 1998). A second distinction has been made between student perceptions of teaching with respect *to the whole class* in contrast to perceptions of teaching with respect *to the student's own, personal roles* in a learning situation or of the role of subgroups (McRobbie, Fisher, & Wong, 1998).

student data, they made a distinction between 'shared control' by teachers and students and 'student negotiation' (a scale similar to the concept of loose teacher control). Because their instrument did not include items referring to more teacher-centred behaviours, they could not distinguish a component indicating strong teacher control. A recent study in the Netherlands (den Brok, 2001) used an instrument with items referring to the type or degree of control in teacher regulation of learning activities. This study, while distinguishing between three forms of control (taking over, shared control and stimulating), found moderate to weak correlations between the three forms, both at the individual as well as the class (aggregated) level. This finding supported the idea that students apparently do distinguish between three types or degrees of control in teacher regulation.

A major critique of the research on student perceptions is that they did not employ statistical techniques that justified the multilevel structure of the data, even though some researchers studied the different levels separately. Aggregating (or disaggregating) data is not a solution and has important disadvantages, because it may lead to spurious correlations or biased outcomes (den Brok, 2001; Hox, 1995). Moreover, the studies assumed a similar structure behind data at the (individual) student level and the teacher level, while concepts and behaviours were formulated at and applied uniquely to the (aggregated) teacher level. It has been shown that different (theoretical) structures may exist for different levels of perception data (den Brok, 2001; Hox, 1995; Muthén, 1994). The present study overcame these 'weaknesses' by using multilevel structural equation modelling to study students' perceptions. In elaborating the structure, we are guided by and try to find empirical support for theoretical distinctions made by researchers.

## 3. Research question

The following research question was investigated: what structure, if any, underlies students' perceptions of their teachers' control behaviours exhibited during the completion of students' learning activities?

## 4. Method

### *4.1. Sample*

Questionnaire data from 2061 students taught by 67 Secondary Education teachers in the southeastern part of the Netherlands were obtained. The group consisted of 946 male students (45.9%) and 1115 female students (54.1%). The majority of students (84.8%) were located in the upper half of Secondary Education: their age ranged between 15 and 18 years. A small percentage (12.7) of students were located in the first three grade levels of Secondary Education. Teachers of all subjects, physical education not included, participated. About one third of the teachers were female.

The sample was representative of the Dutch population[3] of secondary school students in terms of student gender (47.4% males), while the students in the sample were somewhat older than the population students (66.2% of the population students were located in the upper three years of secondary education, the majority of the population students was between 15 and 17 years of age). Moreover, students in our sample were located in two educational streams, intermediate general education and pre-university education, while these make up only a small part of the entire Dutch secondary school system. This means that outcomes can only be generalized to the population to a limited degree.

### 4.2. Instrument

Student perceptions of teacher regulation of students' learning activities was measured by a set of 14 Likert-like items that referred to the extent and forms of teacher behaviours in regulating classroom learning activities. The items were selected from a larger 33-item instrument that was aimed at mapping teachers' instructional behaviour, the *Questionnaire on Teacher Instructional Behaviour* (QIB) (Lamberigts & Bergen, 2000). The QIB was designed as a research instrument for mapping teaching behaviour and is used as an evaluation instrument to obtain information on the effect of teacher training programs. The original questionnaire had four a-priori scales. Two subscales measure more general basic teaching skills, namely (1) clarity in instruction and assignments and (2) control of classroom activities and students' learning processes. Two other subscales measure teaching behaviours that are consistent with teaching for active learning, namely (3) teacher initiated regulation of student learning and (4) student-initiated regulation of student learning. Reliability of these four a-priori scales was sufficient for the present sample: it ranged from 0.70 (control of classroom activities) to 0.78 (teacher-initiated regulation) at the student level and between 0.88 (control of classroom activities) to 0.92 (teacher-initiated regulation) at the class level. In earlier research, the QIB displayed similar reliabilities, both at the individual as well as at the aggregated (class) level (Lamberigts & Bergen, 2000; Lamberigts et al., 1999).

Students provided answers on all 33 items of the instrument. For the present study, analyses were performed on a selected subset of 14 items out of the total instrument.

The 14 items used in this study were selected jointly and in deliberation by the first two authors of this paper based on face validity of their content. This is to say that each item was assumed to refer to a certain amount of teacher control in regulating student learning activities. Further support for this selection was sought by performing an exploratory factor analysis (with SPSS) on all 33 items that were completed by the 2061 students that participated in the study. Eigenvalues of the first five factors extracted in these analyses were 7.837, 3.687, 1.988, 1.485 and

[3] Information was obtained from the website of the Dutch Central Bureau of Statistics (CBS), which contains information on a number of student characteristics over a period of several years (see http://www.cbs.nl).

Table 1
Items for control in teacher regulation used in the analyses (in order of amount of control from strong to loose)

| Items |
|---|
| 4. S/he makes clear at the beginning of the lesson what will happen during that lesson. |
| 12. At the end of the lesson s/he repeats the most important points. |
| 7. S/he provides strategies for learning for a test. |
| 9. S/he provides strategies for making homework. |
| 13. During the lesson s/he provides strategies on how to plan for school work. |
| 30. S/he stimulates that we take responsibility for our work. |
| 22. S/he appreciates when we show initiative. |
| 3. S/he stimulates us to help each other when working on assignments. |
| 11. S/he lets us think in small groups on how to work on a certain assignment. |
| 21. When we work together, s/he stimulates us to take responsibility for each other. |
| 26. S/he stimulates us to discuss the results of our work with other students. |
| 25. S/he lets us decide by ourselves at what pace to work on an assignment. |
| 16. In his/her lesson we can decide by ourselves how to work on assignments. |
| 33. In his/her lessons you can plan your work independently. |

1.263, respectively. As can be seen, after the third factor extracted, the eigenvalues only drop marginally, while they drop below 1.0 after the fifth factor, suggesting that three factors structured the data. Of these, the first two factors referred to teacher clarity and classroom management. Example items of these factors were 'In his/her class it is always clear what needs to be done' (clarity factor) and 'S/he makes sure we pay attention to him/her' (classroom management factor). After omitting the items of these first two factors, the pool of items consisted of 16 items, of which 13 items were part of the previous selection based on face validity.

The 14 items, displayed in Table 1, deal with different degrees or forms of teacher regulation activities. Some items refer to providing strategies, providing an orientation on the lesson, or actively involving students in the lesson. Other items deal with stimulating cooperative learning, or independent performance of learning activities. Using a five-point Likert-like scale, students indicated their views of their teachers' control behaviours. Item values vary from '1.0', revealing the students perceive the indicated behaviour is used 'Hardly Ever', to '5.0', revealing the students perceive the indicated behaviour is used 'Very Often' by their respective teacher.

### 4.3. Analysis

After initial selection on the basis of face validity, descriptive statistics and intra-class correlation coefficients (ICC) were calculated (see Table 2) using the SPLIT-2 program (Hox, 1999). The intra-class correlation coefficient reports the ratio between class variance and total variance (Snijders & Bosker, 1999), and as such provides an estimate of degree to which the item is capable of making distinctions between classes and teachers, as compared to distinctions between students within a class. Since we are interested in control behaviours and perceptions of a teacher

Table 2
Descriptive statistics and intra-class correlations of the selected items

| Items | Mean | S.D. | ICC |
|---|---|---|---|
| 4 | 2.96 | 1.38 | 0.24 |
| 12 | 1.96 | 1.05 | 0.08 |
| 7 | 2.51 | 1.29 | 0.22 |
| 9 | 2.09 | 1.16 | 0.22 |
| 13 | 1.77 | 0.98 | 0.16 |
| 30 | 3.30 | 1.03 | 0.06 |
| 22 | 3.37 | 1.01 | 0.12 |
| 3 | 2.80 | 1.21 | 0.23 |
| 11 | 2.70 | 1.24 | 0.12 |
| 21 | 2.40 | 1.11 | 0.15 |
| 26 | 2.40 | 1.26 | 0.22 |
| 25 | 2.78 | 1.15 | 0.12 |
| 16 | 2.84 | 1.22 | 0.11 |
| 33 | 2.89 | 1.11 | 0.14 |

*Note*: For the content of the items, see Table 1.

by the whole class, the instrument should particularly be able to map differences at the class level. Items with an ICC value of below 0.10 were excluded from further analyses (see den Brok, 2001). This was the case for items 12 and 30. Subsequent analyses were performed on the remaining 12 items.

The next step consisted of formulating and testing a number of multilevel structural equation models, using a procedure by Hox (1995) and Muthén (1994). Using the SPLIT-2 program, correlation matrices were computed for the individual and class level[4]. These matrices are reported in Table 3.

Then, using the correlation matrix at the class level, an exploratory factor analysis was performed with SPSS in order to obtain proper starting values for the structural equation models to be analysed. Three factor analyses were performed, one with one factor, one with two and one with three factors. This was done, because earlier research either found one or three different amounts of control in teacher regulation (den Brok, 2001; Lamberigts et al., 1999) or hypothesized the existence of two or three amounts of control (Brekelmans et al., 2000; Shuell, 1996; Simons & de Jong, 1992; Taylor et al., 1997; Vermunt & Verloop, 1999). Third, a number of confirmatory multilevel factor models (structural equation models) were formulated with LISREL. These models were tested with the multigroup option available in LISREL (Hox, 1995; Jöreskog & Sörbom, 1989) (see Appendix A). The existing structural equation modelling software—as used in the present study—is not specifically designed for performing multilevel analyses. One problem

[4] The SPLIT-2 program computes an aggregated correlation matrix for the teacher-class level, and a deviation matrix at the individual or student level. At the individual level, the matrix represents correlations between deviation scores of the student from the aggregated class mean. Furthermore, the program provides additional statistics, such as intra-class correlation coefficients for the variables analysed, as well as a constant that is necessary for scaling between the two levels in the analyses.

Table 3
SPLIT-2 correlation matrix of the selected items (individual level above diagonal, class level below diagonal)

| | It3 | It4 | It7 | It9 | It11 | It13 | It16 | It21 | It22 | It25 | It26 | It33 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| It3 | | 0.216 | 0.229 | 0.255 | 0.328 | 0.204 | 0.114 | 0.361 | 0.242 | 0.087 | 0.353 | 0.197 |
| It4 | 0.533 | | 0.236 | 0.289 | 0.245 | 0.247 | 0.078 | 0.186 | 0.200 | 0.134 | 0.171 | 0.183 |
| It7 | 0.486 | 0.417 | | 0.504 | 0.261 | 0.415 | 0.071 | 0.236 | 0.186 | 0.099 | 0.225 | 0.186 |
| It9 | 0.521 | 0.424 | 0.847 | | 0.336 | 0.526 | 0.092 | 0.266 | 0.170 | 0.108 | 0.238 | 0.195 |
| It11 | 0.548 | 0.485 | 0.345 | 0.262 | | 0.288 | 0.113 | 0.302 | 0.228 | 0.133 | 0.311 | 0.194 |
| It13 | 0.485 | 0.281 | 0.711 | 0.752 | 0.393 | | 0.080 | 0.229 | 0.129 | 0.094 | 0.237 | 0.156 |
| It16 | 0.102 | −0.028 | −0.113 | −0.214 | 0.100 | −0.100 | | 0.099 | 0.190 | 0.280 | 0.118 | 0.340 |
| It21 | 0.741 | 0.454 | 0.605 | 0.660 | 0.511 | 0.639 | −0.139 | | 0.294 | 0.084 | 0.283 | 0.171 |
| It22 | 0.572 | 0.327 | 0.372 | 0.307 | 0.525 | 0.323 | 0.333 | 0.495 | | 0.132 | 0.216 | 0.216 |
| It25 | 0.275 | 0.150 | 0.064 | 0.119 | 0.074 | 0.049 | 0.513 | 0.048 | 0.185 | | 0.174 | 0.401 |
| It26 | 0.763 | 0.345 | 0.404 | 0.385 | 0.602 | 0.492 | 0.051 | 0.628 | 0.515 | 0.179 | | 0.191 |
| It33 | 0.443 | 0.269 | 0.238 | 0.257 | 0.125 | 0.219 | 0.563 | 0.264 | 0.446 | 0.763 | 0.282 | |

*Note*: For the content of the items, see Table 1.

Table 4
Structures tested at the teacher-class level parts of the multilevel factor models

| Model | Structure |
|---|---|
| Model 1 | Model with one factor, not distinguishing between different amounts of control in teacher regulation. All items load on one and the same factor. |
| Model 2a | Model with two uncorrelated factors, distinguishing between teacher-initiated regulation and student-initiated regulation. All items load on both factors. |
| Model 2b | Similar model as model 2a, but correlations (psi) allowed between the factors. |
| Model 3a | Model with 3 uncorrelated factors, distinguishing between three different amounts of control (strong, shared, loose). All items load on all three factors. |
| Model 3b | Similar model as model 3a, but correlations (psi) allowed between the factors. |

with the program is that the class-level correlation matrices they use (see Table 3) are still a combination of individual level and class level (co)variance (Muthén, 1994). This means that if one wants to focus *uniquely* at the class level—as is the case here—the individual level correlations should be taken along in the analyses and a model should be formulated for this part of the data as well. However, because the theories presented did not formulate models for the individual deviations of students from the shared class perception of teacher control, no particular structure was formulated for the individual level part of the model.[5] For the teacher-class level of the models, different structures were tested (see Table 4).

For each model of Table 4, different model statistics were computed for model fit, such as Chi-squared (with degrees of freedom and *p*-value), Goodness of Fit Index (GFI), Root Mean Square Residual (RMR) and Standardized Root Mean Square Residual (SRMR). When two models showed equal or near-equal fit, the most economical model (the model with the least number of relationships specified) was chosen. Analyses for each model started out with the starting values computed in the exploratory factor analyses as fixed values. Next, item loadings were freed until no further fit improvement could be reached.

## 5. Results

To see whether students made (a) no distinctions between different amounts of teacher control in regulation, (b) distinctions between teacher-initiated and student-initiated regulation, or (c) distinctions between three different types of teacher control ('strong', 'shared' or 'loose' control), fit indices for each model in Table 4 were computed. The fit for each model is presented in Table 5. As reported in Table 5, the data do not support a model with only one factor or perceived amount of control. While model fit for models with two factors, teacher-initiated regulation and student-initiated regulation, was better, it was still not satisfactory. A three-factor

[5] A model in which no particular structure is formulated but just correlations between items are estimated is also called a saturated model (Hox, 1995).

Table 5
LISREL model fit statistics of different multilevel structural equation models

| | $\chi^2$/df/$p$-value | GFI | RMR | SRMR |
|---|---|---|---|---|
| Model 1 | 102.50/64/<0.01 | 0.813 | 0.182 | 0.151 |
| Model 2a | 66.71/55/0.13 | 0.871 | 0.132 | 0.114 |
| Model 2b | 66.59/54/0.12 | 0.871 | 0.123 | 0.112 |
| Model 3a | 51.37/60/0.88 | 0.902 | 0.067 | 0.062 |
| Model 3b | 51.29/57/0.81 | 0.903 | 0.063 | 0.067 |

model best fit these data. Because fit is nearly similar for a model with three uncorrelated factors as compared to a model with three correlated factors, the simpler and more economic model with uncorrelated factors was selected (model 3a). With a nonsignificant $p$-value of the Chi-squared statistic, a GFI that reached the prescribed value of 0.90 and RMR values close to 0.05, the fit of this model was satisfactory. This meant that three distinct types of control seemed to underlie students' perceptions of teacher regulation.

In order to interpret the content of the factors of model 3a, further inspection of the factor loadings was necessary. These factor loadings are displayed in Table 6. The five items that loaded most strongly on the first factor were 's/he stimulates us to help each other when working on assignments' (item 3), 's/he lets us think in small groups on how to work on assignments' (item 11), 's/he appreciates it when we take initiatives' (item 22) and 's/he stimulates us to discuss the result of our work with other students' (item 26). All of these items either pertained to situations where students either shared control with other students or with the teacher. This factor was labelled *shared control*. Three items loaded strongly on the second factor:

Table 6
Estimated factor loadings (standardized) of model 3a

| Item | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| 3 | 0.76 | 0.38 | 0.20 |
| 4 | 0.61 | 0.26 | – |
| 7 | 0.27 | 0.87 | – |
| 9 | 0.23 | 0.93 | – |
| 11 | 0.83 | – | – |
| 13 | 0.31 | 0.80 | – |
| 16 | – | −0.57[a] | 0.87 |
| 21 | 0.64 | 0.58 | – |
| 22 | 0.69 | – | 0.33 |
| 25 | – | – | 0.84 |
| 26 | 0.77 | 0.26 | – |
| 33 | 0.17[a] | 0.30 | 1.00[a] |

*Note*: For the content of the items, see Table 1. Values below 0.20 are not reported.
[a] Freely estimated factor loadings.

Table 7
Percentages of variance explained by model 3a in each of the items

| Item | Percentage explained |
|---|---|
| It3 | 5 |
| It4 | 3 |
| It7 | 7 |
| It9 | 12 |
| It11 | 7 |
| It13 | 14 |
| It16 | 9 |
| It21 | 4 |
| It22 | 8 |
| It25 | 2 |
| It26 | 6 |
| It33 | 6 |

*Note*: For the content of the items, see Table 1.

's/he provides strategies for learning for a test' (item 7), 's/he provides strategies for making homework' (item 9) and 'during the lesson, s/he provides strategies on how to plan for school work' (item 13). These items all referred to regulation with *strong* teacher *control*. Finally, three items loaded strongly on the last factor: 's/he lets us decide by ourselves at what pace to work on an assignment' (item 25), 'in his/her lesson we can decide by ourselves how to work on assignments' (item 16) and 'in his/her lessons you can plan your work independently' (item 33). Because all items referred to regulation with a strong role for the student and a weak role for the teacher, this factor was regarded as the *loose control* factor. One item is associated with two factors at the same time, namely 'when we work together, s/he stimulates that we take responsibility for each other' (item 21). Apparently, in the perception of students, this form of regulation includes both elements of shared control as well as strong control by the teacher. The item 'in his/her lesson we can decide by ourselves how to work on assignments' (item 16) also loaded on two factors: negatively on the strong control factor and positively on the loose control factor.

While model 3a shows satisfying overall fit, the three factors do explain different amounts of variance in the items. In Table 7, percentages of variance explained by the model for each of 12 items are reported. As shown, the percentages explained range between 2% and 14%. The largest amount of variance was explained for the item, 's/he provides strategies on how to plan for school work' (item 13). The least was explained for the item, 's/he lets us decide by ourselves in what pace we work on an assignment' (item 25). The percentages of variance seemed rather low. However, this was not surprising as most of the variance in the items was located at the student level (see ICC in Table 2), and no model was specified for this level. Moreover, it seemed likely that more factors, other than control in teacher regulation, underlie the answers on each of the items.

## 6. Discussion

Teachers are urged to facilitate students' learning and academic performance and achievement. At the same time, they are well aware of the need to manage the classroom and maintain acceptable discipline. They also are encouraged to provide adequate directions, to monitor and adjust and to take appropriate actions to ensure students get on and stay on task and to achieve at an acceptable level. Those with classroom experience know that what they intend is not always interpreted by all students in ways consistent with their intentions. In other words, teacher facilitative behaviours may be perceived by students to be regulatory or controlling behaviours and intended regulatory behaviours may be viewed by students as going beyond being regulatory such that they are perceived as being controlling or 'too' controlling. While much focus has been placed on what teachers intend by their behaviours and what teaching behaviours teachers actually use, too little data are available about students' perceptions of these and how they organize their perceptions into constructs about who is 'in control' in their classrooms and what they consider to be teacher and student controlling behaviours in those classrooms.

In this study, the empirical structure behind students' perceptions of teacher control in the regulation of learning activities was investigated. The literature suggested either a model that distinguished between three types of control (strong, shared and loose), two types of control (teacher-initiated and student-initiated) or no distinctions in control. The results of this study support the distinction between three unique constructs of teacher control behaviours as determined by students' perceptions of their teachers' behaviours. These three constructs closely resemble similar distinctions made in the literature. Within the set of items studied, students distinguished between *strong teacher control*, mainly consisting of teachers providing students with strategies to perform their learning activities, *shared-teacher control*, emphasizing sharing of responsibility between students and between student and teacher, and *loose control*, focusing on students own decision making during the performance of learning activities. The *shared-control* factor included items that referred to situations in which students were asked to work cooperatively as well as items that referred to situations in which students showed initiative during whole class situations.

Another important aspect of the results of this study is that they are uniquely based on student perceptions. While valuable, we have no data as to whether similar structures can be found for teacher perceptions, teacher and student perceptions of ideal teaching or perceptions of observers. Far too little quality research has been done in these areas. Given the literature, a similar, if not identical, three-part structure is assumed for the perceptions of teachers and students (den Brok, 2001). Moreover, perceptions were based on teacher tendencies, e.g., behaviours displayed over a longer period of time, rather than on behaviours displayed in specific situations or during certain moments. Meanwhile, it is very possible for teachers to be perceived as displaying behaviours in all three control categories simultaneously.

No conclusions from this or any other study can be drawn with respect to relative importance, order or phasing of the individual control behaviours.

While the study provided support for the existence of three qualitatively different categories of teacher control in students' perceptions, some comments should be made about the design of the study. First, the analyses were performed on a selected subset of items, while students completed a larger set of items. Therefore, it remains unclear to what extent context effects may have occurred during completion of the items. Nevertheless, it seems very likely that such effects may have occurred and may have influenced the outcomes of this study. Second, the sample used was only representative of the Dutch population of the upper half of secondary education and in the intermediate and higher education streams in the Netherlands. Further research to confirm, refine or reject these findings need to be conducted with students of different age groups, nationalities, subject areas and cultural backgrounds. Such research could also include qualitative information, such as interview data, in order to generate categories and criteria for distinctions made, more precise information on students' interpretation processes and the effect of such distinctions on their intentions and reactions in the classroom.

Information about students' perceptions of teacher control behaviour can serve as a powerful feedback tool for teachers in order to stimulate reflection about their own instructional behaviour. Teachers and teacher trainers can use this information to be aware of and attend to students' perceptions of and subsequent reactions to the behaviours they display. Teachers may then use their own observations and perceptions to consider how these diverge from or converge with the perception of their students and how their control behaviours may be altered. However, these possible alterations must be considered in light of one's definition of teaching, 'good' teaching and 'effective' teaching. Until these definitions are constructed and justified, then it will be difficult for teachers to determine at any particular moment which of the three types of control are appropriate.

In future, efforts to investigate students' perceptions of teaching should be broadened to other teacher behaviours and concepts. One critical dimension of these investigations is to determine whether 'structures' such as the three factor structure emerging from this study are actually the way students have organized their perceptions or are solely theoretical constructs that emerged as artefacts of these data and this particular way of analysing data such as those we examined. Like many studies, the instrument used in the study to investigate students' perceptions of teacher control behaviours could be improved by including a larger number of items and items referring to a broader and more diverse range of behaviours that students or teachers consider as being intended to or perceived to be 'controlling'.

Finally, there is a need for caution. Student perceptions of teacher behaviours are nothing more and nothing less than that; that is, their personal assessment and views of behaviours. Their perceptions do not inform us of the actual intentions of teachers; the quality, frequency or function of these teacher behaviours either individually or in conjunction with other teacher behaviours, the effectiveness of these behaviours, or the attitude of students about their teacher, specific behaviours, the tasks to be completed or their personal ability levels or desires to complete the

tasks at an acceptable level. They do not provide data about how well and how much students actually learned and what the roles of these perceptions were in helping or hindering their completion of learning tasks and academic achievement. Students may perceive teachers who are task-oriented as being too controlling while those who allow them to 'goof around,' 'waste time' or get 'off task' as being 'loose' in their control behaviours. If this is so, then judgments must not be made that 'strong teacher regulation' is less desirable or is inconsistent with 'constructivist' teaching than 'loose' control behaviours. The results of studies like that reported here provide constructs that are important for educators to consider within one or more of the many contexts that exist within every classroom setting.

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## Appendix A. Multilevel modelling in LISREL

Multilevel models can be formulated within LISREL by using the multi-group option. In this option two groups (data sets) are distinguished, for one group a model at the individual level is formulated, for the other group a complete model (both individual and class level model) is formulated. The groups use the correlation matrices computed by the SPLIT-2 (Hox, 1995) software as input data.

Our strategy of analysis is based on a general procedure for multilevel covariance analysis developed by Muthén (1994, see also Hox, 1995). Muthén's multilevel structural equation model assumes sampling at two levels, with both between group (group level) and within group (individual level) covariation. The starting point is a decomposition of the total scores into a between group component $Y_B$ (the disaggregated group means), and a within group component $Y_W$ (the individual deviations from the corresponding group means). This leads to additive and uncorrelated scores for the two levels. Corresponding to these scores we have two covariance matrices: the between groups covariance matrix $S_B$ and the within groups covariance matrix $S_W$. Muthén (1994) shows that the multi–group option of conventional structural equation modeling (SEM) software can be used to analyze these matrices jointly at both levels. Since the between groups matrix $S_B$ reflects both within and between structures, the between groups model requires a special setup. For details we refer to Muthén (1994) or Hox (1995).

In itself LISREL provides no special commands or options for multilevel confirmatory factor analysis. However, one can use the multigroup option to perform multilevel analyses. This is done by entering the within-class (individual level) covariance matrix in one group and enter the between-class (group level) matrix in the second group. These matrices are displayed in Table 3.

Specification of the models for the within class parts of the models (group 1) is rather straightforward:

$$\begin{pmatrix} \text{Item1} \\ \text{Item2} \\ \text{Item3} \\ \vdots \\ \text{Item33} \end{pmatrix} = \begin{pmatrix} \lambda_{\text{item1}} \\ \lambda_{\text{item2}} \\ \lambda_{\text{item3}} \\ \vdots \\ \lambda_{\text{item33}} \end{pmatrix} * \begin{pmatrix} F1 \\ F2 \\ F3 \end{pmatrix} + \begin{pmatrix} \varepsilon_{\text{item1}} \\ \varepsilon_{\text{item2}} \\ \varepsilon_{\text{item3}} \\ \vdots \\ \varepsilon_{\text{item33}} \end{pmatrix}$$

In the above specification, the $\lambda_{\text{item1}}$ to $\lambda_{\text{item33}}$ represent factor loadings of the subscales (sectors) of the QIB on factors $F1$ to $F3$ (eta 1 to eta 3). For identification of the model, the factor loading of one item—namely that of the item with the highest loading on the factor in the exploratory analyses—has to be set to 1.0 for each factor. Factors $F1$ to $F3$ in the above setup factors that account for individual differences of students from the class mean on the items. The vector $\varepsilon_{\text{item1}}$ to $\varepsilon_{\text{item33}}$ represents measurement errors (theta-eps) at the student level. Between factors at the within level covariance can be found, which in LISREL-setup is represented by psi's. These psi's are not displayed here to keep the representations simple.

Set-up at the between (class) level is more complicated. This is because the matrix entered at the between level is a combination of the pooled within level covariance matrix and the between level matrix. In order to obtain proper factor loadings and error terms at the between level the within level model has to be entered at the between level as well.

The set-up of the model at the between level:

$$\begin{pmatrix} \text{Item1} \\ \text{Item2} \\ \text{Item3} \\ \vdots \\ \text{Item33} \end{pmatrix} = \begin{pmatrix} \lambda_{\text{item1}} \\ \lambda_{\text{item2}} \\ \lambda_{\text{item3}} \\ \vdots \\ \lambda_{\text{item33}} \end{pmatrix} * \begin{pmatrix} F1 \\ F2 \\ F3 \end{pmatrix} + \begin{pmatrix} \varepsilon_{\text{item1}} \\ \varepsilon_{\text{item2}} \\ \varepsilon_{\text{item3}} \\ \vdots \\ \varepsilon_{\text{item33}} \end{pmatrix} + C \begin{pmatrix} \beta_{\text{item1}} \\ \beta_{\text{item2}} \\ \beta_{\text{item3}} \\ \vdots \\ \beta_{\text{item33}} \end{pmatrix} * \begin{pmatrix} F1_{\text{b}} \\ F2_{\text{b}} \end{pmatrix} + \begin{pmatrix} \Psi_{\text{item1}} \\ \Psi_{\text{item2}} \\ \Psi_{\text{item3}} \\ \vdots \\ \Psi_{\text{item33}} \end{pmatrix}$$

The first part of this set-up is equal to the within level (in fact the within structure is entered into the between part of the model). A scalar $C$ is entered to correct for unequal group sizes. Factors $F1_{\text{b}}$ and $F2_{\text{b}}$ are the class–level factors (for example strong, shared and loose control), while $\beta_{\text{item1}}$ to $\beta_{\text{item33}}$ are class–level factor loadings of the items on these factors. Errors at the between level are represented by the vector of psi-variables.

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