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Differences in classroom motivational climate: causes, effects and implications for teacher education. A multilevel study

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Título: Diferencias en el clima motivacional en el aula: causas, efectos e implicaciones para la formación docente. Un estudio multinivel.
Resumen: La investigación sobre el clima motivacional en el aula (CMC) ha mostrado diferencias significativas entre las aulas en CMC. Sin embargo, no se sabe si el conocimiento motivacional de los docentes y las metas y expectativas relacionadas con sus alumnos contribuyen a tales diferencias y, en consecuencia, a los efectos de la CMC en los alumnos. Para responder a esta pregunta, un modelo multinivel de las relaciones entre a) el conocimiento y las características motivacionales de los profesores, b) las metas y expectativas de los estudiantes (SGE), c) la percepción de CMC, y d) la atribución de los estudiantes de la mejora motivacional percibida a los maestros (APMIT) se probó utilizando métodos de ecuaciones estructurales. Un total de 2.223 estudiantes de secundaria y preparatoria y sus 95 profesores participaron en el estudio.
Palabras clave: Clima motivacional en el aula; Conocimiento motivacional de los docentes; Metas de los docentes sobre los estudiantes; Expectativas de los docentes; Orientación motivacional de los estudiantes.

Abstract: Research on classroom motivational climate (CMC) has shown significant differences between classrooms in CMC. However, it is not known *whether teachers' motivational knowledge, and goals and expectancies related to their students contribute to such differences, and consequently, on the effects of CMC* on students. For answering this question, a multilevel model of the relationships among a) teachers' knowledge and motivational characteristics, b) students' goals and expectancies (SGE), c) perceived CMC, and d) students' a*ttribution* of perceived *motivational improvement* to *teachers* (APMIT) was tested using structural equation methods. A total of 2.223 Secondary and High School students and their 95 teachers participated in the study. Results showed that teachers' motivational quality (TMQ) has a significant *indirect* effect on differences between classrooms in CMC, and on the students' attribution of perceived improvement in motivational variables to teachers, but also that teachers' characteristics differ in their contribution to TMQ, and so, to CMC.
Keywords: Classroom motivational climate; Teachers' motivational knowledge; Teachers' goals on students; Teachers' expectancies; Students' goal-orientations.

Introduction

The objective of this work is to study the effect of different teachers' and students' motivational and cognitive variables *on classroom motivational climate*. Since Ames introduced the concept of *classroom motivational climate* (Ames, 1992), researchers have gathered evidence on "*sets*" of teaching patterns that influence students' motivation to learn (Meece, Anderman & Anderman, 2006). However, many of the studies carried out on this topic were conceptualized around the related concept "classroom goal structures" (CGS), defined by the kind of motivational goal mainly stressed by the teacher, one of the characteristics of classroom motivational climate (Meece, Anderman & Anderman, 2006; Midgley, 2002; Midgley et al., 2000). The main assessment instruments used in these studies were the scales developed by Midgley et al. (2000). These scales assessed CGS from students' perceptions of the degree of importance given by their teachers (*mainly through explicit messages*) to: a) effort and understanding (mastery goal structure); b) getting right answers, high scores on tests and good grades (performance-approach structure); and c) avoiding mistakes in front of people and not to do worse than others (performance-avoidance structure). However, these scales did not take into account other specific teaching patterns –different from teacher's messages- which contribute to classroom motivational climate, and which should be modified in case that such climate was not adequate for fostering learning motivation (Alonso-Tapia & Fernández, 2008; Wentzel, 1995).

Due to the described fact, Alonso-Tapia and Pardo (2006) revised the main teaching patterns that, according to different authors, teachers use along the learning sequence, and analysed the particular effectiveness of each pattern for enhancing learning motivation. Thereafter, considering that the classroom motivational climate is the result of the particular configuration of such teaching patterns, Alonso-Tapia and Fernández (2008) developed the CMC Questionnaire (CMCQ). This instrument allows assessing how students perceive the degree in which a teacher uses the teaching patterns or strategies shown in Figure 1. It was considered that the combined use of such patterns, measured by the score on the whole scale, was a way of operationalizing the perceived CMC, and of determining whether it could be considered more or less learning oriented.

Validation studies on the CMCQ have demonstrated that the greater the degree in which students perceive that CMC is learning oriented, the greater the degree in which they attribute to his/her teacher their perceived improvement in the following motivational variables: interest, perceived ability, disposition to effort, success expectancies, self-regulation, resilience, satisfaction with teacher work, and the greater their achievement (Alonso-Tapia & Fernández, 2008; Alonso-Tapia, 2017; Alonso-Tapia, Nieto, & Ruiz, 2013; Alonso-Tapia & Villasana 2014; Villasana & Alonso-Tapia, 2015). Moreover, Alonso-Tapia & Fernández (2008) showed also that the CMCQ was superior CGS assessed by the scales developed Midgley et al. (2000) for predicting students' perception of the above-mentioned motivational effects.

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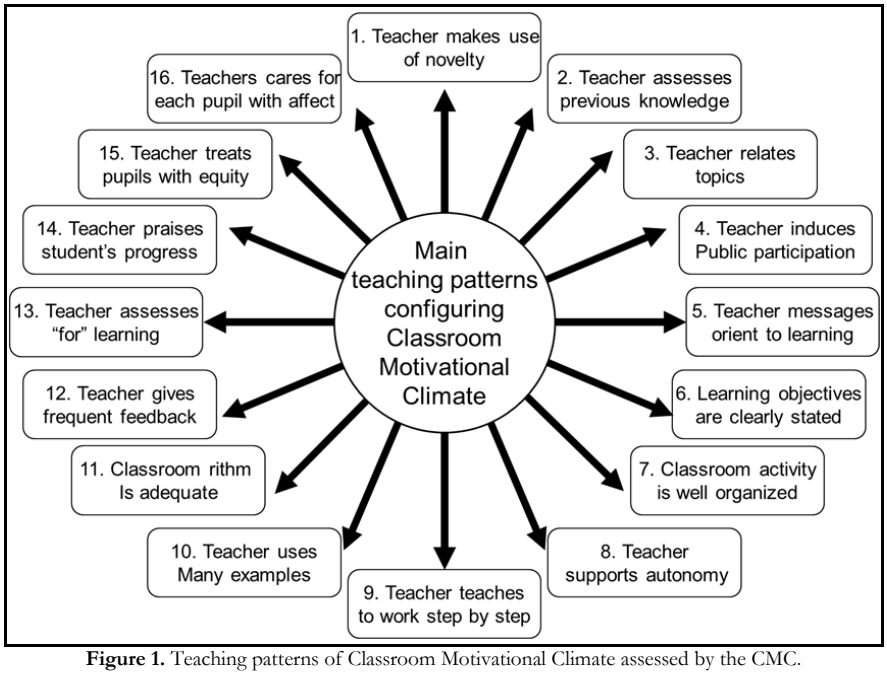

Figure 1. Teaching patterns of Classroom Motivational Climate assessed by the CMC.

Fernández (2009) has shown too that when CMCQ scores for the students of a same class are averaged, there are significant differences between CMCQ means of different classrooms: some teachers create a good CMC while others do not. This finding raises two *important questions*: 1) why do teachers' teaching patterns produce such differences between classrooms in CMC? If we knew the answer to this question, we could develop teacher training programs with greater effectiveness. 2) Does a different CMC –as a characteristic of the group- influence students' Attribution of Motivational Improvement to their Teacher? It is important also to answer this question, because existing evidence has shown the important role played by *each student's perception* of CMC, but not the role played by *the CMC as a group characteristic,* estimated from the students' averaged perception, in explaining students' improvement in the above mentioned variables. However, as shown by Marsh & Seaton (2015) when describing the "big-fish-little-pond phenomenon", group characteristics –for example, competence-, can and often have effects different from those for the same characteristic at individual level: competence at individual level favours achievement, whereas as a group characteristic tends to damage the achievement.

The CMC created by a teacher may differ from the CMC created by other teachers depending on the degree: 1) in which they know how to do it, 2) in which they expect to be able to do it, 3) in which creating such a climate is a priority personal objective, 4) in which they have deep interest on the student as a person, and 4) in which they have developed automatized behavioural patterns that conform a learning-oriented CMC, no matter whether they are aware of their adequacy. Haselhuhn, Al-Mabuk and Gabriele (2007), based on evidence gathered from 97 teachers, suggested that specific classroom practices and teaching behaviours depend on teacher's knowledge and beliefs. However, they assessed the "dependent variable" asking teachers to rate their own CGS, a fact that may have provided a view of CMC that does not correspond to the students' view. This fact means that we cannot be sure that differences in CMC perceived by students, and whose power for predicting improvement in different motivational variables is high, depends on the teachers' characteristics above mentioned. Therefore, we decided to establish whether it was the case or not. Our *general objective* is, then, *to study: 1) what is the role of teachers' motivational knowledge and motivational characteristics -grouped in the variable TMQ- in determining differences in perceived CMC*, 2) *whether -and in what degree- students' goals and expectancies influence perceived CMC and/or mediate the effect of TMQ, and 3) whether CMC, as a group characteristic, has positive effects on the attribution of perceived motivational improvement and satisfaction to teachers, as it happens with the individual perception of CMC*. To achieve this objective, we have developed the working model described in the next section, and have carried out this study to see whether it is valid or not.

Theoretical model

Figure 2 shows the *hypothesized relationships* between students' goals and expectancies (SGE), the CMC and the effects of this climate in the *attribution of perceived motivational improvement to teacher's* work (APMIT). Next, Figure 3 shows the *hypothesized relationships* between teachers' characteristics -grouped in the variable Teacher's motivational quality (TMQ)-, and the mean scores of his/her group of pupils on SGE, CMC and APMIT. Which are the reasons on which this model relies?

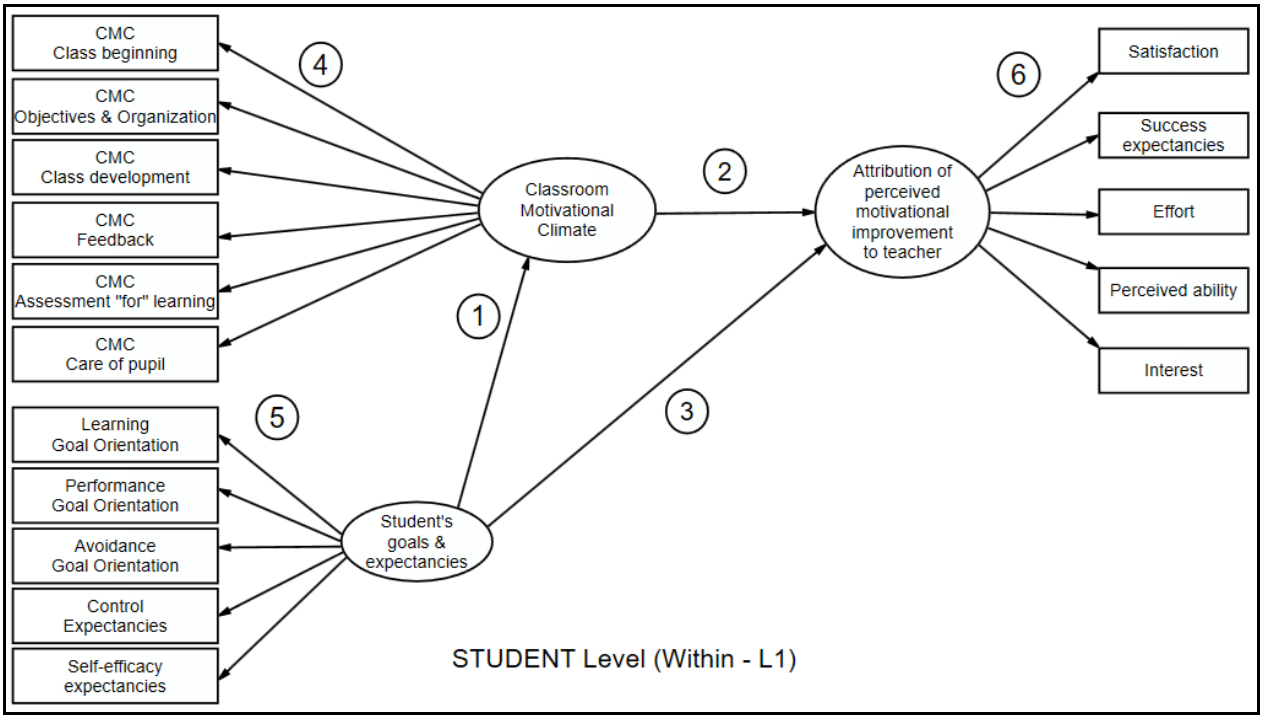

Figure 2. Base model. Multilevel regression analysis with latent variables. Level 1: Student effects.

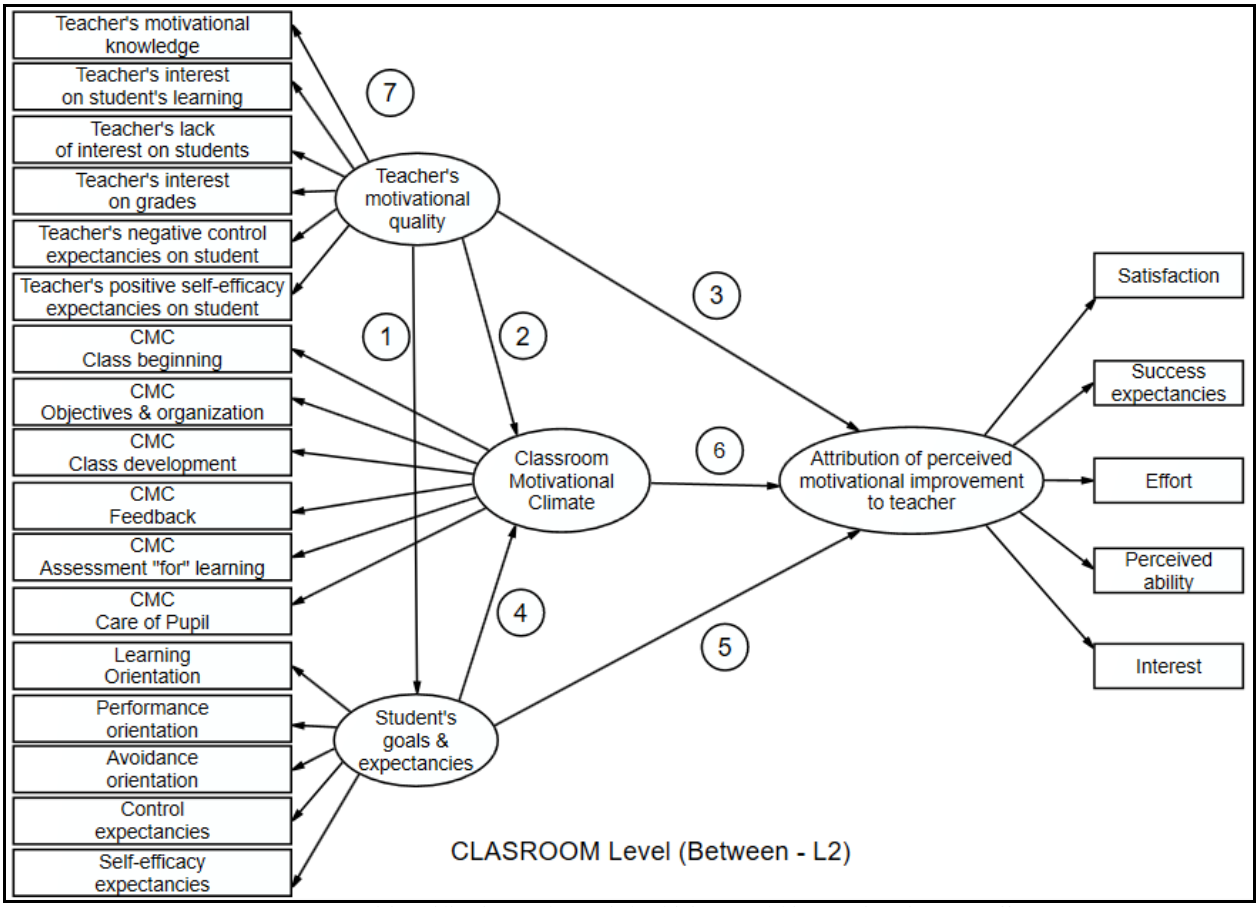

Figure 3. Base model. Multilevel regression analysis with latent variables. Level 2: Classroom effects.

Student's variables

Differences in students' *goal orientations* –learning (LG), performance approach (PG) or performance avoidance goals (AG)- (Elliot, 2005), and in *self-efficacy* -the belief about the own capacity or ability to successfully perform some activity (Bandura, 1997)- *and control expectancies* -the expectancies of achieving a result on the base of self-responsibility and effort (Rotter, 1966)- could make students more or less sensitive to teaching patterns favouring learning motivation. Consequently, such differences could affect the perception of CMC (arrow 1 in Figure 2), as shown by Alonso-Tapia and Pardo (2006). Nevertheless, the degree in which goals and expectancies influence the perception of CMC might be moderated by the group in which they are to share expectancies and goals. Since classroom groups may differ in these characteristics, the effect of teacher's quality on the CMC and APMIT group scores may be mediated by average SGE. However, this possibility compels to consider teacher's variables and their effect at classroom level.

Teacher's variables

There are differences in the degree in which teachers promote a learning-oriented CMC (Fernández, 2009; Haselhuhn et al., 2007). These differences, from our point of view, may be due to the following variables shown in the figure as indicators of *teacher's motivational quality* (TMQ) (Set of arrows 7 in Figure 3).

Teacher's motivational knowledge

Teachers may be aware of the action patterns which configure a learning-oriented CMC and so, can differ in the degree in which the conscious use of such patterns creates this CMC. These differences will then directly affect observed differences between classrooms in perceived CMC. Haselhuhn et al. (2007) assessed motivational knowledge asking teachers to select the term that best represented their familiarity with one of four approaches to motivation: behavioural, cognitive, psychodynamic, or humanistic. However, this form of assessing motivational knowledge presupposes that being familiarized with a theory implies knowing how to apply such knowledge and the reverse, but this supposition is not necessarily true. Teachers can know a theory without being able to apply it in a correct way -as it happens, for example, when they act on the base of the self-fulfilling prophecy (Brophy, 1983)-, and can know that particular teaching patterns are motivating without connecting this knowledge to a specific theory. Moreover, they can even be able to use teaching patterns that motivate to learn because they have learned and automated such patterns without being explicitly aware of their motivating power. Hence, a better form of assessing motivational knowledge is asking teachers to rate the importance they give to the use of behavioural patterns that, according to students, create a learning-oriented CMC. This is the procedure used in our study.

Teacher's motivational priorities (goals) in relation to students' progress

Even if teachers are aware of how to create a learning-oriented CMC, they can differ in the degree in which they act according to such knowledge because their priorities related to students can vary, as priorities reflect their values and goals (Butler, 2012). A first priority that can affect teacher's teaching is *to help students to achieve mastery*. According to Ames and Ames (1984), this priority is associated to the belief that student's learning is due to a large extent to teaching strategies, and that these can be learned. Therefore, if teachers hold this belief, they can try to help students to learn from their failures. A second priority is *to help students to achieve good grades*. According to Cooper (1983), this priority is associated to the belief that students' successes and failures are indicators of teacher's own value, a belief associated to teaching behaviours aimed at controlling classroom processes in a rather rigid way, what often does not favour learning motivation. Finally, for some teachers the priority is to do their work with the least possible effort –their main goal is *work avoiding* (Butler, 2012)-, without worrying about students' learning or grades. On the opposed side, there are teachers interested in the student as a person. These teachers *look for establishing personal relations with the students* (Butler, 2012), and *take responsibility for student progress and wellbeing*, especially if they consider that it is always possible to learn how to help these students. We consider that these two last priorities may constitute the opposite poles of the same dimension.

Teacher's efficacy and self-efficacy expectancies in relation to teaching efficacy

Even if teachers have adequate motivational knowledge and their priority is to motivate their students to learn, they may not act in accordance to such knowledge and priorities unless they expect to be able to achieve the intended outcome (Bandura, 1997). However, the context might moderate such expectancies, especially if teachers focus their attention on external factors on which they do not have control. So, it was considered important for this study to assess the degree in which the sense of efficacy was positive –based on self-efficacy- or negative –based on external and uncontrollable factors-.

As already said, it is expected that teachers' motivational quality (TMQ), configured by the teachers' characteristics just described, influence the teaching patterns that configure the perceived CMC at classroom or group level (CMC, path 2 in Figure 3) and through CMC, the attribution of motivational improvement to teachers made by the group (APMIT). However, it might happen that the CMC, as it is assessed, does not capture all the action patterns than may affect stu-

dents' motivation, learning and satisfaction. If it was the case, improvement in action patterns not measured by our CMC assessment instrument could be directly related to APMIT (path 3 in Figure 3), without the mediation of assessed CMC. On the other side, it may also happen that CMC, as it is assessed, does not depend on the teachers' motivational characteristics just described. There may be more teachers' characteristics that influence the way they act, or that action patterns are learned habits that do not depend on teachers' conscious motivational knowledge, priorities and expectancies. In this case, the value of regression weights from teachers' quality on CMC and on the rest of variables would not be statistically significant.

Classroom motivational climate (CMC)

Perceived CMC, as a characteristic of the individual student, and –when averaged- CMC as a characteristic of the group, are central and related variables in the model, as the second will be estimated from the first. The degree in which individual students perceive that CMC is learning oriented can be estimated from their perception of the sixteen sets of teaching patterns that take place along the learning sequence. These patterns are grouped in six categories for the sake of simplifying the analysis: a) class beginning, b) objectives and organization, c) class development, d) feedback, e) assessment "for" learning, and f) care of pupil. As for the CMC of each group, it will be estimated averaging the CMC of the students of each classroom.

According to evidence provided by previous studies (Alonso-Tapia & Fernández, 2008), it is expected that the greater the learning-oriented CMC, the greater will be the degree in which students will attribute to teacher's work their academic and motivational improvement (arrow 2 in Figure 2 and arrow 6 in figure 3).

Attribution of perceived motivational improvement to teachers (APMIT)

Students perceptions of improvement in: interest, perceived ability, effort, success expectancies, and satisfaction with teachers' work, configure a set of specific motivational characteristics that, according to preliminary evidence (Alonso-Tapia & Fernández, 2008; Alonso-Tapia, Nieto & Ruiz, 2013), are positively associated to learning-oriented CMC. The attribution of perceived improvement of such characteristics to the teacher's work can be considered as an index of the perceived effect that the CMC –a contextual variable- has on these dependent variables. So, they were used to develop the APMIT measure that was introduced in the model as a dependent variable.

Summarizing, in order to achieve our objective, we have developed two important type of models represented in figure 2 and 3. First, we have developed a two-level *structural model,* as it considers the effect of individual as well as of group variables. This model specifies that:

a) Students' goal and expectancies play an important role in moderating the degree in which CMC is perceived as learning oriented, and that this perception is positively associated to the positive individual effects associated to this CMC –motivational improvement.
b) Differences in teacher's motivational quality (TMQ) play a fundamental role in determining existing differences between groups in the degree in which CMC is perceived as learning oriented, and between the positive effects associated to this CMC –APMIT- .

Second, in order to test the structural model, we have developed *measurement models* specifying the relationships between latent variables and their observed indicators (set of arrows 4, 5 and 6 in Figure 2 and, accordingly, set of arrows 7 in Figure 3). Testing the adequacy of these models is necessary for supporting the inferences made about the relationships between latent variables in the structural model. It is what we have done with the aid of structural equation methods applied to multilevel analysis.

Method

Participants

A convenience sample of 2,223 Secondary and High School students and their 95 teachers, recruited from 26 different state funded schools of Madrid (about 10% of centres in Gran Madrid), participated in the study. They were large schools—with about 800 students—, invited at random to participate in the study, which accepted voluntarily to participate in it. Being state funded schools, they are a representative sample of state schools in Gran Madrid, though they do not represent students in private schools in Madrid (18.8 %). A total of 1,119 males (50.3%), 1,080 females (48.6%) and 24 subjects whose sex was not identified, comprised the students' sample. The mean age was 14.66 years (*SD* =1.6). They belonged to six different academic courses (1st: 427; 2nd: 420; 3rd: 600; 4th: 449; 5th: 255 and 6th: 72). Though teachers were invited to tell their age and gender, none of them told their age and only 10% reported their gender (64% were females and 36%, males).

Materials

In order to test our hypotheses, the following instruments were used.

Classroom Motivation Climate Questionnaire (CMCQ)

(Alonso-Tapia & Fernández, 2008). This questionnaire was designed to cover sixteen kinds of teaching patterns that, according to the theoretical review, could affect the students' motivation to learn. Two items were written to assess each pattern, forming a parcel. To avoid acquiescence effects, one

was positive and the other negative. Each item had to be answered in a five-point Likert scale, and so the score of each pattern, that included two items, ranged from 1 to 10. As previously explained, the sixteen parcels were grouped to obtain six scales that are indicators from which the general score in learning-oriented CMC is estimated. Its reliability index ω (McDonalds, 1999) is very good (ω = .98). The original study has also provide evidence on its validity. (The CMCQ can be found in:
a) http://sohs.pbs.uam.es/test/CMC_Spanish,
b) http://sohs.pbs.uam.es/test/CMC_French,
c) http://sohs.pbs.uam.es/test/CMC_English).

Scales for assessing student's attributions

Five independent scales for assessing the Attribution of perceived motivational improvement to teacher work (APMIT) were also used. "Motivational improvement" refers to changes in student's interest, perceived ability, effort expenditure, success expectancies and satisfaction with teacher work.

They had to be answered in a five-point Likert scale. The first four scales have three items and their *reliabilities* are: ω_{INT} = .91; ω_{PAB} = .93; ω_{EFF} = .94; ω_{SUC} = .92. Finally, the satisfaction scale, with reliability ω_{SAT} = .94, has four items. Table 1 includes item examples of these scales. The five scales were used for estimating the degree of student's attribution of perceived motivational improvement to teacher work and to test whether this attribution depends mainly on CMC or on the potential moderating role of students' and teachers' variables. All these scales had been developed and used and validated in previous studies (Fernández, 2009; Alonso-Tapia, Nieto & Ruiz, 2013).

Table 1. Item examples of scales assessing the role attributed to teacher in perceived resilience and motivational change.

Scale	Item example
Interest	If I am very interested in this subject, it is due to the way we work with this teacher.
Perceived ability	A good quality of this teacher is that she makes me feel able enough to learn by myself.
Effort	Thanks to the way this teacher encourages me, I try to learn more and more.
Success expectancies	Taking into account the way in which this teacher teaches, it is unlikely for me to get good marks. (-)
Satisfaction	If one could choose the teacher, I would suggest my peers to choose my own one without doubting it at all.

Students' Motives and expectancies" (SGE)

This is an abbreviated version of the MEVA questionnaire (Alonso-Tapia, 2005). It includes two parts. The first is composed by three scales assessing goal orientations GO described in the literature (Elliot, 2005): *learning orientation (LO)* (ω = .96)*, performance orientation (PO)* (ω = .95) and *avoidance orientation (AO)* (ω = .91). The second is formed by two scales for assessing *self-efficacy* (ω = .94) and *control expectancies* (ω = .96). SGE was used for testing the hypothesized relations between these variables and CMC, as well as their relative weight in predicting APMIT.

Teacher's motivational quality (TMQ)

It is the combination of two questionnaires*:* (1) *Teacher's motivational knowledge* (TMK). This questionnaire was developed on the base of the information provided by the CMC. It includes 39 items assessing the motivational importance that teachers give to the teaching patterns that, according to students' point of view (Alonso-Tapia & Fernández, 2008), contribute to motivating them for learning. As the analyses for determining its characteristics have not been published, they will be described in the data analysis and results sections, (2) *Teacher's expectancies and motivational goals on students* (TEMGOS). This questionnaire contains two sub-questionnaires. The first one includes ten items assessing three teachers' goals on students: a) Learning, b) indifference (lack of interest in student learning) and c) performance (grades). The second questionnaire includes six items assessing two kinds of expectancy on students: negative, based on external factors, and positive, based on self-concept related to teaching efficacy. Table 2 shows examples of items. The analyses for determining its characteristics will be described in the data analysis section.

Table 2. Item examples of scales assessing teachers' goals and expectancies on students.

Scale	Item example
Learning	I use as much as possible examples and real situations to motivate my students.
Indifference	No matter how much a student has progressed: if he/she does not reach the standard, he/she does not pass.
Performance (grades)	To motivate my pupils, I often emphasize the importance of achieving good grades
Negative expectancies	No matter how much I try to improve my teaching: if my pupils do not want, they do not learn.
Positive expectancies	It is easy for me to get that all my students progress in a significant way

Procedure

Each group of students was instructed to fill in the CMC and the APMIT in relation to the teacher of one of the following subjects: Language Arts, Maths, Social Sciences, Natural or Experimental Sciences, and Foreign Language. The objective underlying this selection was to obtain a sample of teachers as diverse as possible. The questionnaires were ap-

plied in group sessions during two class periods (50 minutes each one). The teachers whose CMC was assessed by their students filled their questionnaires at the same time, but not in the same classrooms in which the students were doing the task. In order to preserve confidentiality, the questionnaires were anonymous.

Data Analyses

First, preliminary confirmatory factor analyses (CFA) were carried out using SPSS-21 & AMOS-21 software to assure that the new instruments developed for this study were adequate. CFAs were estimated using the maximum likelihood method. Estimates were obtained after examining whether data were adequate for the analysis. Different types of fit indexes were used: χ^2, χ^2/df, GFI, IFI, CFI and RMSEA, as well as criteria for acceptance or rejection based on the degree of adjustment described by Hair, Black, Babin and Anderson (2010).

Second, in order to know whether the relations predicted by our model were correct, a multilevel confirmatory regression analysis model with latent variables was carried out using M-Plus software, version 7.11 (Asparouhov & Nguyen, 2013). In order to improve adjustment, the model could have been simplified after the first analysis omitting non-significant relationships. However, we considered that it was theoretically important to show just their lack of significance. Therefore, no further model was tested.

Results

Confirmatory factor analyses of the new questionnaires

CFA1: Teacher's motivational Knowledge (TMK)

Table 3 shows the adjustment indexes for CFA1. Chi-square statistic was significant, probably due to the size of the sample (Hair et al, 2010), but the ratio χ^2/df and the remaining adjustment indexes were well inside the limits that allow the model to be accepted. The reliability index ω of the general scale was very good (ω = .95).

Table 3. Teacher's Motivational Knowledge, goals and expectancies on students. Goodness of fit statistics for CFA for the baseline model.

	χ^2	Df	*p*	χ^2/df	GFI	IFI	CFI	RMSEA
CFA-1 (N =188) Teacher's knowledge	155.66	82	.000	1.89	.90	.94	.94	0.06
CFA-2 (N = 188) Teacher's goals on students	47.99	32	.034	1.50	.95	.96	.96	0.05
CFA-3 (N = 188) Teacher's expectancies on students	15.56	8	.049	1.94	.97	.94	.94	0.07

CFA2 & CFA3: Teacher's expectancies and motivational goals on students (TEMGOS)

This questionnaire was developed for this study following the same procedure used for the TMK. Table 3 shows the adjustment indexes obtained for CFA of the sub-questionnaires assessing goals (CFA2) and expectancies (CFA3). In all cases, chi-square statistic was significant, probably due to the size of the sample, but the ratio χ^2/df and the remaining adjustment indexes were well inside the limits that allow the models to be accepted. Reliabilities of the five scales were: 1) *Teacher's interest in student learning*: ω = .90; 2) *Teacher's lack of interest in students*: ω = .95; 3) *Teacher's interest in grades*: ω = .83; 4) *Teacher' negative expectancies*: ω = .90; *Teacher' positive expectancies*: ω = .80.

Multilevel confirmatory regression analysis: Adjustment of the base model

Figures 4 and 5 present the results of the multilevel confirmatory regression analysis. The values associated with the arrows from latent variables to observed variables show the degree in which the last ones are adequate indicators of the corresponding latent variable. Finally, the values associated with the arrows from latent variables to other latent variables are standardized regression coefficients (along with their p-values).

Table 4 shows the fit statistics of the proposed model. *Chi-square* statistic is significant, probably due to sample size, but the quotient $\chi^2/df = 3.58 < 5$ was inside the accepted levels and the same happened with the rest of indexes. Therefore, it can be considered that the regression model is well estimated.

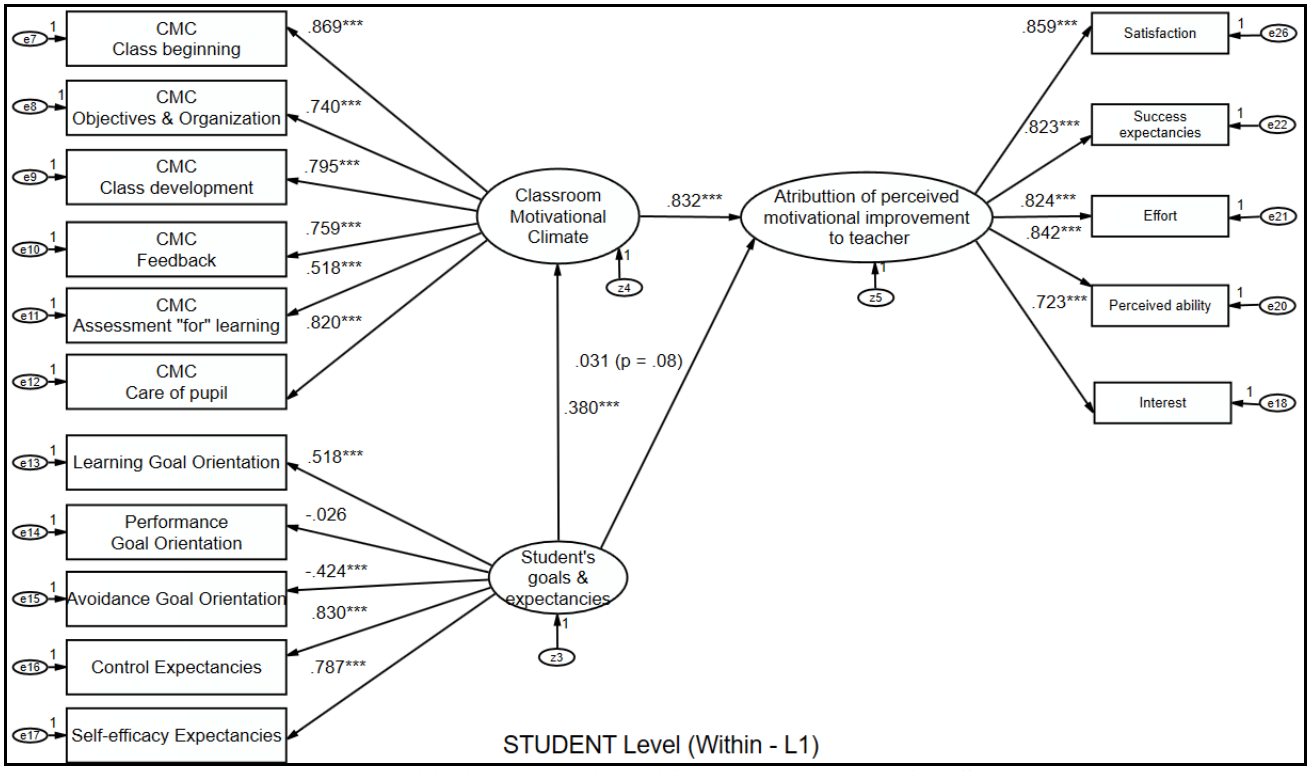

Figure 4. Multilevel regression analysis with latent variables: Level 1: Student effects.

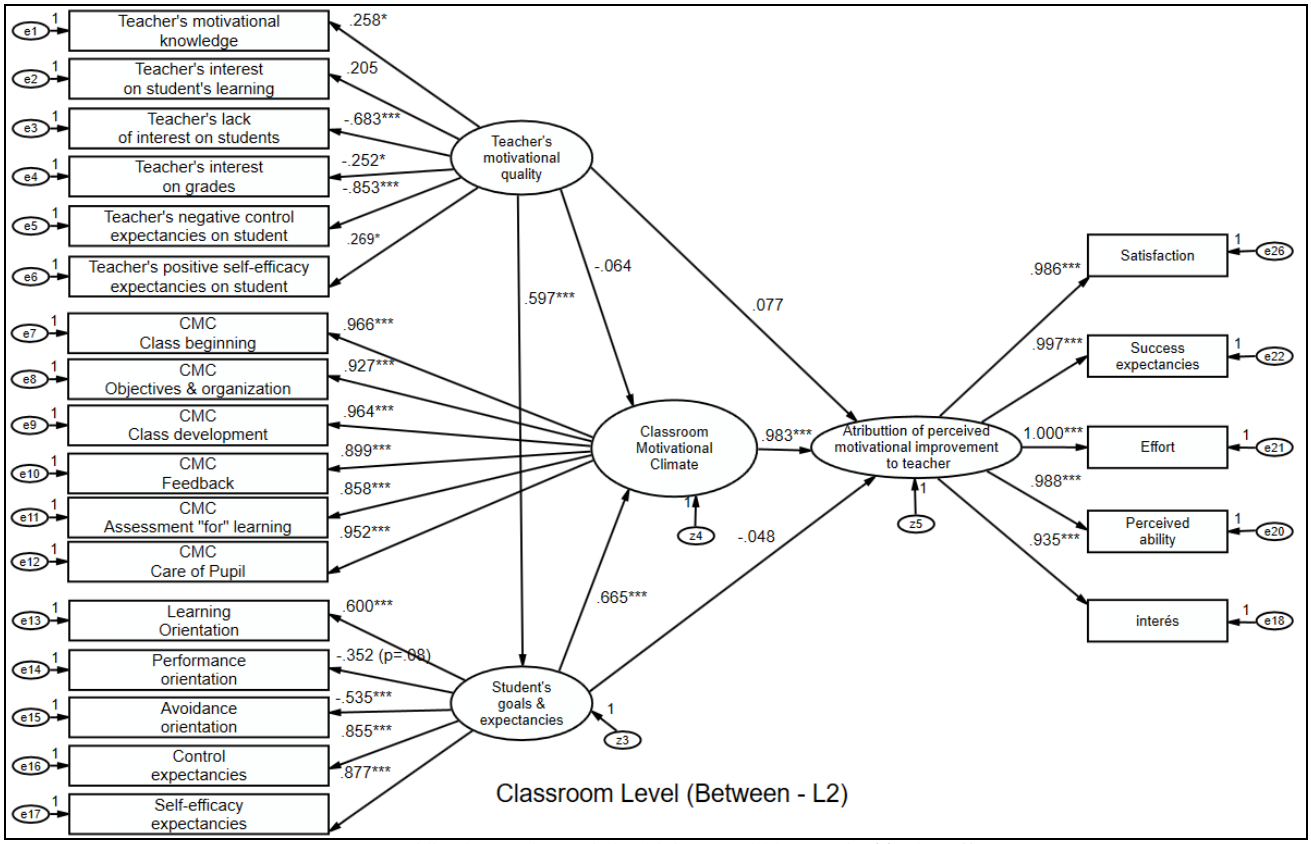

Figure 5. Multilevel regression analysis with latent variables: Level 2: Teacher effects.

Table 4. Goodness of fit statistics for Multilevel Confirmatory Regression Analyses for the baseline model (MLCRA).

	χ^2	df	*p*	χ^2/df	CFI	TLI	RMSEA	SRMR	
								Within	Between
MLCRA Base line model	1091.17	304	.000	3.58	.96	.96	.03	.03	.08

Attending to the *measurement model for each latent variable*, we can observe the following results (see Figure 5):

First, the measurement weights of *Teacher's motivational quality* on the observed variables were significant and in the expected direction only in three cases. Teacher's quality manifest mainly on teacher's interest on student progress and on low negative expectancies attributed to external and uncontrollable factors, and in less degree, in teacher's motivational knowledge. The variance explained by the rest of indicators was very low. In any case, taking together these data, it can be expected that scores in *Teacher's motivational quality* will relate positively –directly or indirectly- to CMC.

Second, as expected also, all *classroom motivational climate* indicators of CMC presented a high and significant loading.

Third, again as expected, *student's goals and expectancies* (SGE) are properly measured, in a high and positive degree, by LO and by control and self-efficacy expectancies, and also by AO, but in lower and negative degree and, contrary to our expectations, are marginally measured by PO (p = 0,08). Again, it can be expected that scores in SGE will relate positively to CMC.

Finally, as expected once more, *attribution of perceived improvement in motivational variables to teacher* (APMIT) was correctly measured by all proposed indicators, in a high and significant degree.

Consequently, it can be considered that variables to be used in the structural analysis are well estimated, what was a prerequisite for supporting the inferences about the relationships between latent variables in the structural model.

Multilevel confirmatory regression analysis, 1: Student level structural effects (Within - L1)

Step 1: Endogenous variable "Student's goal and expectancies" (SGE)

At the within class level, the coefficient value derived from regressing CMC on SGE indicate that variations in CMC depend on SGE in a significant degree (β = .38, p < .0001). The regression coefficient value derived from regressing APMIT on SGE did not reach the standard level of significance (β = .031, p = .08). However, the indirect effect of SGE on APMIT through CMC is quite high (.316), what gives a total and significant effect of .346 (p < .0001).

Step 2: Endogenous variable "Classroom motivational climate" (CMC).

SGE predicts only the 14.4% of CMC scores. Thus, 85.6% of CMC variance remains unexplained. What factors are responsible of it? In the discussion section, we will return to this point.

As for CMC effects, the regression coefficient value derived from regressing APMIT on CMC is very high and significant (β = .832, p < .0001). This value goes down (β = .468, p < .0001) if we deduct the indirect effect of SGE on APMIT but, in any case, it is highly significant. This means that, even if we do not take into account students´ initial differences in motivational goals and expectancies, the greater orientation of CMC to learning, the greater perception and attribution of motivational improvement in interest, perceived ability, effort, success expectancies and satisfaction with teacher's work.

Step 3: Endogenous variable "attribution of perceived motivational improvement to teacher" (APMIT).

The variables predicting APMIT scores account for 69.22% of its variance, a percentage that depends on CMC and on SGE, as explained in steps 1 and 2.

Multilevel confirmatory regression analysis, 2: Classroom level structural effects (Between – L2)

Before examining the results at this level, it is important to bare in mind two things: 1) scores in all the variables are "group scores", not individual scores; 2) the analysis discounts individual effects (*Within-L1*) before valuing group relations between variables.

Step 1: Exogenous variable "Teacher's motivational quality" (TMQ).

The regression coefficient value derived from regressing classroom SGE scores on TMQ indicates that variations in SGE between classrooms (SGE-G) are associated in a very significant degree to TMQ (β = .597 p < .000). This result means that students' motivational goals and expectancies between groups vary depending on TMQ, a quality manifest mainly in the way teachers convey their personal interest on the students and their expectancies on them and, in less degree, on teacher's motivational knowledge. Therefore, SGE can mediate TMQ effects on the remaining latent variables. Unexpectedly, the regression coefficient of CMC on TMQ indicate that variations in CMC between classrooms do not depend directly on TMQ (β = -.064) at all. However, the indirect effect through "students' goal and expectancies" is large and significant (.397). The same happens, also, when "attribution of perceived motivational improvement to teacher" (APMIT) is regressed on TMQ. The direct effect is

non-significant (β = .07), but the indirect effect is quite high (.390).

Step 2: Endogenous variable "Student's goal and expectancies" (SGE).

As for differences in group-SGE effects, the coefficient value derived from regressing CMC on SGE is high and very significant (β = .665, $p < .0001$). However, this value goes down (β = .268, $p < .0001$) if we deduct the indirect effect of TMQ on CMC but, in any case, it is highly significant. This means that differences between classes in the perception of CMC depend on TMQ, but that this effect is mediated by SGE.

Step 3. Endogenous variable "Classroom motivational climate" (CMC).

At the classroom level, differences in group-CMC predict differences in group-APMIT in a very high and significant degree (β = .983, $p < .0001$). However, this value goes down (β = .335, $p < .0001$) if we deduct the indirect effect of TMQ and SGE on CMC but, in any case, it is highly significant. This means that differences between classes in the attribution of motivational improvement to teacher depend on CMC, and that though this effect is due in a great part to the indirect effects of TMQ and SGE, CMC by itself plays an important role in predicting –and probably changing- the motivational characteristics of students.

Step 4: Endogenous variable "attribution of motivational improvement to teacher" (APMIT).

The variables predicting APMIT scores between classrooms explain 97% of APMIT variance, a percentage that depends mainly on the indirect effects of TMQ and SGE mediated through CMC, but also on the direct effect of CMC, as explained in steps 1, 2 and 3.

Discussion and conclusion

Role of teachers' knowledge, goals and expectancies related to their students. We were mainly interested in knowing the *role of teacher's motivational knowledge, goals and expectancies related to their students,* as factors defining TMQ, *in CMC*. Results, gathered not only from teachers –as in the study of Haselhuhn et al. (2007)-, but also from students, have shown that TMQ plays a significant role in determining differences in CMC between classrooms, though this effect is indirect, mediated by students' goals and expectancies. However, the different degree in which each variable contributes to teacher's motivational quality gives more support to some explanative hypotheses than to others.

It seems that *teachers' motivational knowledge* may be a necessary condition on which rests the creation of a learning-oriented CMC. However, its effect is very small and not sufficient to explain differences between classrooms in CMC. The same happens with the role played by *teachers' positive expectancies based on self-efficacy* and by their *interest on grades*. These variables could be considered conditions that facilitate the creation of a learning-oriented CMC, perhaps necessary but not sufficient for explaining differences between classrooms in CMC. As for *teachers' interest on student learning,* its value as indicator of teachers' motivational quality is non-significant.

These results are only partially in line with those found by Haselhuhn et al. (2007), as the effect of motivational knowledge, motivation and expectancies on students are of less magnitude than expected. The main factors that seem responsible of TMQ, and therefore of differences between classrooms in CMC, are: a) teachers' personal interest on students and, b) lack of negative expectancies on them due to the role attributed to external and non-controllable factors on students' motivation. These are important results that seem to converge with related evidence coming from other research lines already cited, such as Butler (2012), whose results showed that *teacher's relational goals*, that imply *interest in the student as a person*, predict students' perception of teacher's support, a characteristic underlying one of the components of CMC-Q –teacher cares of each pupil with affect-.

Our results on the role of teachers' expectancies support and are supported also by evidence coming from research already cited on the self-fulfilling prophecy (Brophy, 1983), teachers' misjudgements and attributions, and their effect on the messages and kind of feedback to their students (Zhou & Urhahne, 2013). It seems that, even if teachers' motivational knowledge is adequate, its practical application is mediated by teachers' misjudgements on student's knowledge or work. In these cases, the kind of messages and feedback contribute negatively to the perception of CMC as learning oriented.

Finally, in order to have a complete understanding of teachers' factors that configure the CMC, it is important to look at a result usually not considered. The sum of direct and indirect TMQ effects explains only the 43.23% of CMC-Q variance *between classrooms*, that is, there is a 54.77% of variance not explained by TMQ. This variance is usually considered as measurement error. However, its magnitude suggests the need to look for hypothetical variables that could explain it. Given that TMQ is measured through self-reports based on conscious knowledge, beliefs or experience, it can be hypothesized that differences between classrooms in CMC are due also to behavioural habits developed by teachers and applied in a more or less automatic way, without awareness of their motivational effects. This hypothesis is coherent with our results. However, to test it, it would be necessary to gather observational data and to relate it with CMC.

Role of students' motivational characteristics in the perception of CMC. We were also interested in knowing *whether students' motivational characteristics played a role in the perception of CMC*. The answer, in line with previous studies but obtained now from a very big sample, has been positive both, when considering *within* and *between* data. Taking into account how the variable

"students goal and expectancies" was estimated, our results show that the higher LO and self-efficacy and control expectancies, and the lower AO, the more is perceived CMC as learning oriented. These results have an important implication: students with lower LO and less self-efficacy and control expectancies –that is, those students whose learning and achievement motivation should be especially enhanced- are the ones who perceive the CMC as less learning oriented and so, even if their teachers create such a climate, they –likely- would not benefit from it. What can teachers do in these cases? Before answering this question, it is important to consider *CMC-oriented-to-learning effects*. Our results have shown that, CMC has a very important positive effect on the attribution to teacher of perceived motivational improvement *once deducted* the effect of students' goals and expectancies on these variables. These results imply that if students perceive such improvement –no matter their initial motivational goals and expectancies-, they attribute them to their teacher's work –the work that configures the CMC-.

Both just mentioned results must be considered together. The positive relationship between students' goals and expectancies, on one side, and CMC, on the other, suggests that it may be difficult to motivate those students more needed of help *even if* CMC is learning-oriented and precisely *because* it is learning-oriented. This can be explained if we consider that the strategies that are necessary for deep learning usually demand greater effort, and so students low in LO perceive that CMC does not help them to learn. Moreover, if a student does not know how to solve an academic task and, as a consequence, his or her self-efficacy expectancies are low, he or she will not try to do so. However, even in these cases, when these students perceive that their motivational indicators change, they recognise that this change depends on the learning-oriented CMC created by their teachers, and the same occurs with their satisfaction with teachers' work. This fact suggests that CMC *learning oriented can change students' motivation* and that, when this change happens, students recognize the role played by their teachers. How can this occur? As advanced by Alonso-Tapia & Pardo (2006), what sometimes happens is not that "*students do not learn because they are not motivated*", but that "*students are not motivated because –even trying- neither learn nor experience progress because of lack of adequate knowledge*". In these situations, if teachers help them to confront their learning difficulties through adequate support –the support that provides the learning-oriented CMC-, these students will experience progress and will attribute it to their teachers.

Educational implications. From our point of view, results coming from within and between analyses have several and related educational implications. Starting with students, given the relationships among their initial motivational characteristics, CMC and attribution of motivational improvement and satisfaction to teachers' work, teachers should be taught and trained to implement the teaching patterns that configure the CMC learning oriented. However, The CMC-Q only summarises such patterns without describing their particular characteristics, that are studied in detail under other research topics –for example, curiosity and interest arousing, autonomy support, external aids to self-assessment and self-regulation, assessment for learning, equity, care of pupils, etc.-. These CMC characteristics that have been trained separately with quite success, as some meta-analyses and reviews have shown (Lazowski & Hulleman, 2016; Harbour, Evanovich, Sweigart & Hughes; 2015). Therefore, it is likely that if they were trained together, the motivational improvement and its associated effects would be greater, on the base of our results. Besides, in these type of studies people in charge of teacher training can find the specific guide on which to base teacher training programs. Nevertheless, the assessment of the CMC, as it is operationalized by the CMC-Q, can be very useful first, for diagnosing teacher's teaching patterns that need to be changed, and second, as a variable that moderates the effectiveness of interventions carried out in intact classrooms and focused in more specific objectives. However, on which teachers' characteristics should training be focused?

According to our results, teachers should have explicit knowledge on factors determining the CMC, as it may be a necessary condition for applying it and self-regulate their work in an adequate way. However, if our hypothesis on the role of behavioural and automatic habits is correct, efforts to improve teachers' capacity for motivating their students should be addressed to change such behavioural habits –teachers' procedural knowledge- through practical training and feedback, more than to change teachers' conceptions, as having the adequate conceptual knowledge may not be sufficient, at least on the base of our results.

Nevertheless, the most important teachers' training focus, according to our results, should be teaching teachers to manage –and even prevent- the effect of negative expectancies on their pupils, and to stimulate the adoption of relational goals that imply interest in the student as a person, the variables that most contribute to TMQ. The management of negative expectancies could be tried and perhaps achieved if teachers learn to look for the précis reasons of failures in order to know the adequate help to give, what implies considering that improving is always possible. However, adopting this attitude continuously could have a great cost for teachers, a cost that the development of strong relational goals that imply interest in the student as a person could help to manage. Nevertheless, such development takes time. So, in order to avoid becoming burned out in the process, teachers should be made conscious that it is a "step by step" task.

Limitations. The main limitation of this study is that CMC is that it is based on correlational data, what prevents causal inferences. However, the significance of results suggests that they are coherent with the hypothetical inferences and explanation advanced. Therefore, it is worth considering them as good point of departure on which to base intervention studies.

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