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Classroom Emotional Climate: Nature, Measurement, Effects and Implications for Education[☆]

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ABSTRACT

Classroom emotional climate (CEC) is a variable that is been connected with academic skills, satisfaction, psychological wellbeing. However, its definition, the limits of the construct and the relationship with others classroom factors are not clearly established. This study we develop and validate an instrument, the *Classroom Emotional Climate Questionnaire* (CEC-Q), to assess the CEC and analyze the relationships between different components of *classroom climate* as well as their relative role for predicting students' satisfaction with teachers' socioemotional support and with sense of community. A total of 749 Secondary and High School students formed the sample. Students completed five questionnaires: Classroom Emotional Climate Questionnaire (CEC-Q); Classroom Motivational Climate Questionnaire (CMC-Q); Disruption Management Climate Questionnaire (DMC-Q); Sense of Community Questionnaire (SoC-Q); Satisfaction with Teacher's way of treating students Questionnaire (SAT-TWTS). For validating the CEC-Q structure, several models were tested trough confirmatory factor analyses, and for testing construct validity, correlation and regression analysis were realized using children's sense of community and satisfaction with teacher's socio-emotional support as external criteria. Results support hypotheses related to CEC-Q structure, to discriminant validity in relation to the other components of classroom climate, and to concurrent validity in relation to external criteria. These results underlie the importance of acting on CEC-Q and CMC components to favor students' emotional satisfaction and sense of community.

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Clima emocional de clase: naturaleza, medida, efectos e implicaciones para la educación

RESUMEN

El clima emocional de clase (CEC) es una variable que se ha conectado con competencias académicas, satisfacción y bienestar psicológico. Sin embargo, aún no están claramente establecidos ni su definición, ni los límites del constructo ni la relación con otros factores del aula. En este estudio se desarrolla y valida un instrumento, el Cuestionario de CEC (CEC-Q), para evaluar el CEC y analizar las relaciones entre los diferentes componentes del *clima de clase*, así como su capacidad para predecir la satisfacción de los estudiantes con el apoyo emocional del docente y con su sentido de comunidad. Setecientos cuarenta y nueve estudiantes de secundaria forman la muestra. Completan cinco cuestionarios: CEC-Q; Cuestionario de clima motivacional de clase; Cuestionario sobre gestión del clima disruptivo; Cuestionario de sentido de comunidad y Cuestionario de satisfacción del alumno con la actuación docente. Para validar la estructura del CEC-Q se ponen a prueba varios modelos mediante análisis factorial confirmatorio; para analizar la validez de constructo se realizan análisis de correlaciones y regresión utilizando el sentido de comunidad de los alumnos y la satisfacción con el apoyo docente como criterios externos. Los resultados respaldan las hipótesis relacionadas con la estructura del CEC-Q, con la validez discriminante en relación con los

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otros componentes del clima de clase y con la validez concurrente en relación con los criterios externos. Estos resultados ponen de manifiesto la importancia de actuar sobre los componentes del CEC-Q y del clima motivacional de clase para favorecer la satisfacción emocional y el sentido de comunidad de los estudiantes.

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Introduction

In a classroom, students have different experiences related to the way their teachers perceive their emotional states and needs, and to how they react to them. As far as such experiences depend on a more or less regular pattern of teachers' behavior that, in turn, depends on their socio-emotional competence (Jennings & Greenberg, 2009), they can affect students' adaptation, motivation, learning and achievement (Patrick & Ryan, 2005). For example, there is evidence showing that, in general, teacher's empathy and emotional support favor interest, effort and satisfaction with school work (Joe, Hiver, & Al-Hoorie, 2017), as well as satisfaction with the way teachers treat them (Butler, 2012). There is also evidence that when students perceive that teachers are willing to help, they behave properly in the classroom (Ryan & Patrick, 2001) and lose less classes (Moos & Moos, 1978). It also, affects to classroom interaction and academic achievements (Allen et al., 2013), academic skills tend to improve (Bellocchi et al., 2014; Ruzek et al., 2016), and exclusion and school failure tend to diminish (Kiuru et al., 2012). Finally, the greater is teachers' support, the best are students' affect and psychological wellbeing (Liu, Mei, Tian, & Huebner, 2016). All these facts point to the need of assessing classroom emotional climate if one want to have a comprehensive view of what is happening in a classroom in order to guide educational interventions. For this reason, the main objective of this study is to provide a brief and valid measure of this climate for Lower and Upper Secondary Education students.

However, assessing classroom emotional climate (CEC) rises two main problems. The first one has to do with the concept itself. First of all, it is necessary to take into account that the *classroom emotional climate* is a component of the *classroom climate* (Evans, Harvey, Buckley, & Yan, 2009). According to these authors, *classroom climate* is a multi-faceted concept, that include different dimensions: the *academic-instructional climate*, defined by the pedagogical and curricular elements of the learning environment, elements often considered and evaluated from the point of view of their motivational implications as these are indicators of the quality of such climate (Alderman & MacDonald, 2015; Ames, 1992; Villasana & Alonso-Tapia, 2015); the *disruption management climate*, defined by the set of teacher's action patterns or strategies that show is/her particular style of preventing and solving discipline problems; and the *classroom emotional-interpersonal climate*, defined by the interactions that involve emotional exchange between teacher and student, interactions that imply becoming aware of students' emotional needs and acting in a positive way in accordance with such needs. According to Evans et al. (2009), all these facets depend on teachers' actions.

Nevertheless, not all authors share this conceptualization. For example, Pianta, La Paro, and Hamre (2008) consider that teachers in classrooms with a high CEC characterize by being sensitive to students' needs and by interacting with their students in a warm and pleasant way, but also by taking into account the students' perspectives (interests and motivations), as well as by avoiding the

use of sarcasm and severe discipline practices. However, according to Evans et al. (2009), these last two characteristics belong to different classroom climate dimensions. This fact raises the problem of establishing the limits and relationships between the different components of classroom climate, as well as the effects of each one and of their interactions.

Another difference in conceptualization is set out by Gazelle (2006). This author considers that CEC refers to the classroom global atmosphere defined by the degree in which it functions without problems, an atmosphere characterized by positive and harmonic interactions or, by the contrary, by disorganization, conflict and interruptions. These conception implies that CEC refers not only to the way teachers' contribute to students' emotional wellbeing, but also to the way the interactions among the own students contribute to it. However, relations between students are best categorized as defining the social or co-living climate (Alonso-Tapia, 2017a,b). This fact raises the same problem above mentioned – establishing the limits and relationships between the different components of classroom climate.

The second problem for assessing the CEC has to do with the nature of the available instruments for this task. The content covered by the existing instruments differs according to the underlying assumptions about the nature of classroom emotional climate. For example, the Classroom Assessment Scoring System (CLASS) (Pianta et al., 2008) assess three components of classroom climate: CEC, Classroom Organizational Climate, and Classroom Instructional Climate. The CEC component includes not only facets usually referred to emotions, but also facets of the academic-motivational and discipline climates. The main problem, however, is that it is an observation code, and so, it is an expensive method in terms of time required for getting the information if big samples have to be assessed, though it has been used in research carried out with Primary and Secondary School students (Hamre et al., 2013).

Another instrument, the Teachers' Interactional Style Scale (Aunola, Lerkkanen, Poikkeus, & Nurmi, 2005) does not assess the students' perception of the CEC created by their teachers, but the perception that teachers have of their own way of relating to their students. In this case, the problem is that teachers' perception of CEC may be different from that of students and may also be biased by the tendency to protect self-esteem.

Given the described problems, it is necessary, from our point of view, a parsimonious approach to the CEC construct and its assessment. In the first place, in order to know the specific effects of each component of *classroom climate* as well as their interactions and effects, it seems reasonable to assess them separately and then, to study the way they are related. In fact, it is likely that the degree in which teachers' organize instruction in a more or less efficient motivational way (classroom motivational climate) and the way they manage discipline (Classroom Disruption Management) have affective consequences for their students, but that many of their effects are different. Therefore, it is necessary to study the relationships between them, as just said.

Second, focusing on the CEC, we agree with Evans et al. (2009), according to whom a positive CEC can be defined by the interactions that imply becoming aware of students' emotional needs and acting in a positive way in accordance with such needs. Therefore, a way of assessing the CEC is asking students to rate the degree in which their teachers: (a) become aware of their emotions, negative or positive and (b) act in accordance with such perception, trying to change the negative emotions, or to maintain the positive ones.

Third, it is true that the emotional experience of students in the classroom depend on both, teachers and peers, as recent reviews and meta-analyses have shown (Thapa, Cohen, Guffey, & Higgins-D'Alessandro, 2013; Wang & Degol, 2015). However, given the complexity and different nature of interactions of each student with teachers and peers, it is necessary to separate them. It can be done referring the CEC concept and assessment to teachers' behavior in relation to the students' emotional needs, as suggested by Evans et al. (2009), and using the terms *social climate* or *co-living climate* for assessing peers' behavior related to the student emotional needs (Moos & Moos, 1978). CEC and co-living climate are components of the classroom climate, but they are clearly different (Alonso-Tapia, 2017a,b). The interest in the present study is the climate created by teachers. Therefore, we will analyze the relation of the CEC with the social or co-living climate in other study.

Fourth, assessing CEC from the students' point of view – in this case they are observers – is preferable to assessing it from the point of view of teachers, as it avoids the potential bias related to self-report.

On the base of the above ideas, we have developed the Classroom Emotional Climate Questionnaire (CEC-Q) designing two groups of items, a group for assessing students' perception of teacher's awareness of students' emotional states, and another group for assessing the degree in which students' perceive that teachers act according to such perception. The specific objective of this paper is to realize a first study of its structural and concurrent validity.

Concerning the structural validity, due to the content of items, several models were possible: Variables could load: (1) on only one factor; (2) on two first-order factors – perception and proactive response to emotions –, loading on its part on a general one; (3) on four factors – teachers' perception of personal emotions, teachers' perception of group emotions, teachers' proactive response to personal emotions, and teachers' proactive response to group emotions –, loading on its part on a general one. Besides, asking the students how they perceive teachers' behavior in relation to the whole group or in relation to themselves might produce different results, as the question situates the student in a different perspective. Therefore, it is worth to assess whether the different perspective makes a difference or not. Therefore, the three models were tested.

As for the concurrent validity, it was decided, as a first step, to analyze the relationships of CEC: (1) with the other two components of classroom climate, the classroom academic-instructional climate, assessed considering their motivational value as classroom motivational climate (CMC) (Alonso-Tapia, 2016; Ames, 1992) and the Disruption Management Climate (DMC); (2) with the Sense of Community construct (SoC); and (3) with the students' satisfaction with teachers' way of treating them (SAT-TWTS). It was chosen to study the relationship of the CEC with the CMC because it is likely that the greater the degree the CMC is oriented to learning, the greater some of the students' emotional needs – competence and autonomy (Deci & Ryan, 2000) – are satisfied. In the same way, it may be that the type of strategies used by teachers for managing discipline that configure the DMC – aversive or constructive –, have

emotional consequences that, due to their emotional implications, contribute to students' perception of CEC. As for SoC, it has been chosen by a similar reason. McMillan and Chavis (1986, p. 9) define SoC as *a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together*. As the teacher in some way is the leader of the group, it is expected that the more positive is the CEC – the more acceptance and emotional support the teacher's behavior conveys to the students, the more the belongingness need will be satisfied and so the greater will be the SoC. Recent studies offer some support to this hypothesis (Ruzek et al., 2016). Finally, it seems reasonable that the more positive the CEC, the more satisfied will be the students with the way they are treated by their teachers. Therefore, in all those cases we expect positive and significant relations between CEC, CMC, the use of constructive strategies, and SAT-TWTS and SoC, and positive and significant relations between these last two variables and the use of negative strategies.

Method

Participants

A total of 749 Spanish students from two Lower and Upper Secondary Education public schools in Madrid, participated in the study. Public schools do not represent students in private schools in Madrid (18.8%). The sample was composed by 51% of females and 49% of males. Age range ran from 12 to 18 years old ($M = 14.78$; $SD = 1.86$). Course level distribution was as follows: Secondary School course 1st = 17.4%; 2nd = 19.4%; 3rd = 20.7%; 4th = 21.2%; High School course: 1st = 14.3%; 2nd = 6.8%. The sample was randomly divided in two subsamples for cross validation.

Students belonged to 24 different groups, four by course level. The 24 teachers of the classrooms selected to assess the classroom emotional climate taught four groups of subjects (six teachers per subject): Language/literature, Mathematics, Natural and Experimental Sciences, and Social Sciences.

Instruments

Classroom Emotional Climate Questionnaire (CEC-Q). This questionnaire was designed for the purpose of the present study. It allows assessing the students' perception of teachers' sensitivity for detecting and identifying the emotional states of their students, and of teachers' response to such states in a positive and proactive way. It includes 32 items. The content of 16 of them refers to teacher's ability for perceiving four emotions of their students: sadness, shame, worry and joy. The content of the remaining items refers to teachers' proactive response to such emotions. To avoid acquiescence effects, half of the items had a positive sense and the other half, a negative one. In half of each group of items the students have to assess how they perceive their teachers' response in relation to the group, and in the other half, in relation to him/herself. Each item had to be answered showing their degree of agreement with the content of the item in a five-point Likert scale from 1 (complete disagreement) to 5 (complete agreement). A sample of the items is shown in Table 1.

Classroom Motivational Climate Questionnaire (CMC-Q). This questionnaire, developed by Alonso-Tapia and Fernández (2008) on the previous work of Ames (1992) and Alonso-Tapia and Pardo (2006), was designed to cover 16 types of teaching strategies or patterns that could affect positively student motivation to learn.

Table 1
Content of the questionnaires used in the study

Item examples of the Classroom Emotional Climate Questionnaire	
Perception of emotions	Action response to emotions
When this teacher sees me, usually knows if I'm sad Usually, this teacher does not seem to notice if we are embarrassed (-) Generally, this teacher does not detect if we are happy or not (-) This teacher does not detect usually if something worries me (-)	If we are sad, this teacher does not do anything to cheer us up (-) When something makes me feel ashamed, this teacher usually makes me feel better When I am happy, this teacher knows how to make it so Generally, if we are worried, this teacher knows how to convey calm
<i>Items of the Sense of Community Questionnaire</i>	
My class is as if we were a family I like people in my classroom In my class everyone cares of each other	I like to make my peers feel good In my classroom I feel I belong to the group
<i>Items of the Satisfaction with teacher's way of treating students Questionnaire</i>	
In general, this teacher detects how I feel and, and it helps me feel good I feel that this teacher loves me and knows how to help me, and that makes me feel good Knowing that this teacher usually realizes how I feel, makes me feel good This teacher cares about my emotional state, and that helps me feel good	
<i>Teaching patterns assessed by the Classroom Motivational Climate Questionnaire</i>	
Teacher makes use of novelty Teacher assesses previous knowledge Teacher relates different topics Teacher induces public participation Teacher's messages orient to learning Learning objectives are clearly stated Classroom activity is well organized Teacher supports autonomy	Teacher teaches to work step by step Teacher uses many examples Classroom rhythm is adequate Teacher uses feedback that help to learn from errors Teacher assesses "for" learning Teacher praises student's progress Teacher treats pupils with equity Teacher cares from each pupil
<i>Item examples of the Disruption Management Climate Questionnaire</i>	
(This teacher) scolds the student that bothers or misbehaves (This teacher) makes a behavior-contract with the student.	

Two items were written to assess each type of pattern. To avoid acquiescence effects, one was positive and the other negative. Each item had to be answered in a five-point Likert scale, so the score for each pattern ranged from 1 to 10. Table 1 shows the 16 teaching strategies assessed. The questionnaire has only one global scale, *Classroom Motivation Climate oriented to learning* (reliability McDonald $\omega = .97$).

Disruption Management Climate Questionnaire (DMC-Q). This questionnaire was developed by Simón and Alonso-Tapia (2016). It includes 15 items referred to different strategies usually employed for managing classroom disruptive behaviors. They are grouped in five basic scales that for their part are included in two general scales, "Use of aversive strategies" and "Use of constructive strategies". Each item had to be answered in a five-point Likert scale, from 1 (complete disagreement) to 5 (complete agreement). The reliability McDonalds' ω for each scale was, $\omega_{AVS} = .77$, $\omega_{CONS} = .93$. A sample of items is shown in Table 1.

Sense of Community Questionnaire (SoC-Q). This questionnaire, with only five items, had been designed also for this study on the base of McMillan and Chavis (1986) conceptualization of the construct. Previous confirmatory analysis had shown good model fit ($\chi^2/df = 2.26$, TLI = .94, CFI = .97, RMSEA = .04). Reliability McDonalds' ω was .89. Each item had to be answered in a five-point Likert scale from 1 (complete disagreement) to 5 (complete agreement). The questionnaire is included in Table 1. Evidence about the validity of this questionnaire coming for the sample used in this study will be described in detail in the data analysis and results sections.

Satisfaction with Teacher's way of treating students Questionnaire (SAT-TWTS). This questionnaire, with only four items, had been designed also for this study. The content of the items refers explicitly to satisfaction with the CEC created by the teacher. Previous confirmatory analysis had shown good model fit ($\chi^2 = 11.39$, $p = .495$, $\chi^2/df = .95$, TLI = 1, CFI = 1, RMSEA = .0). Reliability McDon-

alds' ω was .95. Each item had to be answered in a five-point Likert scale from 1 (complete disagreement) to 5 (complete agreement). The questionnaire is included in Table 1. Though the analyses for determining its characteristics are not easily accessible, new evidence about the validity of this questionnaire coming for the sample used in this study will be described in the data analysis and results sections.

Procedure

Research Ethics Committee approved this study. Anonymity was preserved. The students filled in the questionnaires in one 50-minute session, divided according to the groups and courses to which they belonged. One of the researchers stayed in the classroom during their completion and provided precise instructions, so that students could fill in the questionnaires in relation to the teacher and subject they had to take as reference. All questionnaires except two were applied to students. Due to the length of the questionnaires to be answered, the CMC was applied to half of the groups ($n = 362$) and the DMC to the other half ($n = 386$).

Data analyses

Missing data. Missing data were substituted by central item score. This happened less to 4% of subjects. Subjects with more than 3% of unanswered items were eliminated (1% of cases).

Factorial validity. In order to determine the factorial validity of the CEC-Q, several confirmatory factor analyses (CFA) were realized. The three models above described were analyzed and compared. Then, the three models were used for cross validation analyses using the two subsamples. These analyses were carried out using the M-Plus statistical software. As data were ordered categories,

confirmatory factor analysis estimates were obtained using the WLSMV method. Fit was assessed through the fit indexes χ^2 , χ^2/df , TLI, CFI and RMSEA, following the standard criteria described by Hair, Black, Babin, and Anderson (2010).

Reliability. Internal consistency indexes of each scale – specific and general – were calculated using the MacDonald’s ω coefficient (McDonald, 1999), which is equivalent to composed reliability (Hair, Hult, Ringle, & Sarstedt, 2017), and Cronbach α . Mean variance extracted was also calculated.

Correlations and regression analyses. In order to obtain initial information on the external validity (discriminant and concurrent) of the CEC-Q, correlations between the scales of the questionnaires were calculated. So that to determine not only on conceptual but also on empirical grounds whether the scales of different questionnaires assessed different constructs (discriminant validity), the criterion proposed by Fornell and Larcker (1981) and accepted by Hair et al. (2017) was used. According to this criterion, there is discriminant validity if the average variance extracted (AVE) is greater than the square of the correlation between the constructs with which it is compared. Then, in order to know the relative weight of each variable for predicting the students’ satisfaction with the way teachers treat them (SAT-TWTS) and the sense of community (SoC), several regression analyses were performed depending on the questionnaires that had been answered by the different groups. The direct method was used to avoid maximizing sampling effects. All these analyses were realized using SPSS v.22.

Results

Confirmatory and cross validation analyses of the SoC-Q

Only one factor was expected for this questionnaire. Confirmatory factor analysis realized with the first subsample showed good model fit. Chi-square statistic was significant ($\chi^2 = 26.39$, $p < .001$), probably due to the size of the sample (Hair et al., 2010), and χ^2/df ($\chi^2/df = 5.20$) and RMSEA (RMSEA = .11) fell short of the standard limits for acceptance, but the remaining adjustment indices were well inside the limits that allow the model to be accepted (TLI = .93, CFI = .96, SRMR = .03). As some indices fell short of the limits for acceptance, a cross-validation analysis was carried out. Results showed a good fit of all indices ($\chi^2 = 45.26$, $p = .001$, $\chi^2/df = 2.26$, TLI = .94, CFI = .97, RMSEA = .04, SRMR = .04). Moreover, fit did not decreased even restrictions were imposed for parameter equality between measurement weights ($\Delta\chi^2 = 1.19$, $p = .88$), structural covariances ($\Delta\chi^2 = 1.20$, $p = .94$), and measurement residuals ($\Delta\chi^2 = 1.87$, $p = .99$). Therefore, the model is well estimated. Reliability McDonalds’ ω was .93, and Cronbach $\alpha = .81$. Mean variance extracted was .47.

Confirmatory and cross validation analyses of SAT-TWTS. Only one factor was expected for this questionnaire. Confirmatory factor analysis realized with the first subsample showed good model fit. All the adjustment indices were well inside the

limits that allow the model to be accepted ($\chi^2 = 2.1$, $p = .350$, $\chi^2/df = 1.05$, TLI = 1, CFI = 1, RMSEA = .01, SRMR = .006). Results of cross-validation analyses showed also a very good fit ($\chi^2 = 11.39$, $p = .495$, $\chi^2/df = .95$, TLI = 1, CFI = 1, RMSEA = .0, SRMR = .01). Moreover, fit did not decreased even restrictions were imposed for parameter equality between measurement weights ($\Delta\chi^2 = 4.02$, $p = .26$), structural covariances ($\Delta\chi^2 = 4.03$, $p = .40$), and measurement residuals ($\Delta\chi^2 = 9.58$, $p = .29$). Reliability McDonalds’ ω was .97 and Cronbach $\alpha = .90$. Mean variance extracted was .72.

Confirmatory and cross validation analyses of the CEC-Q. Table 2 shows the fit indexes of analyses corresponding to the different models tested. The model 2, shown in Figure 1, was the one with best fit. The figure shows the standardized estimates of measurement and structural weights this model. All the weights (λ) were significant ($p < .001$). As for the fit indexes, χ^2 was significant, probably due to sample size, but the ratio χ^2/df and the indexes TLI and CFI were well inside the limits that allow the model to be accepted. However, RMSEA fell slightly over the standard limit of acceptance. Nevertheless, the cross validation analysis (CFA4) shows that, with the exception of χ^2 , all indexes have a very good adjustment that does not decrease even if restrictions for equality of parameters between groups are imposed. So the model is well estimated.

Reliability

The MacDonald’s ω coefficients for the general scale and the two subscales show that reliability is very good: $\omega_{\text{General CEC}} = .96$; $\omega_{\text{perception of emotions}} = .94$; $\omega_{\text{response to emotions}} = .95$.

Correlations and regression analyses

Table 3 shows the correlations between the scales (lower part of the left to right diagonal), the squares of such correlations (upper part of the same diagonal), and the average variance explained (left to right diagonal). R^2 between the subscales of CEC is greater than AVE. This fact imply that in some way there is convergent, not discriminant validity between them, according to the standard criteria. However, the fact that when testing the fit of different models it has been found a better fit of the model with two subscales that with only one scale. It suggests that it is better to consider them as related but not completely identical indices of the same construct: perceiving emotions does not imply necessarily to react according to such perception.

In the same table, R^2 between each pair of constructs belonging to different questionnaires is always lower than the AVE, which is evidence of discriminant validity. Besides, according to expectancies, the scores in the different scales of CEC correlate in significant way and in the expected direction with scores in the CMCQ and in the scales of the CMD. That is, though all of the variables are indicators of classroom climate, they must not be confounded. Also according to expectancies, the different scales of CEC correlate in

Table 2
Goodness of fit statistics for the CFA and the CVA analyses

	χ^2	df	p	χ^2/df	TLI	CFI	RMSA
CFA-1: Model 1 (Spain, n = 375)	570.40	104	<.001	5.48	.95	.95	.11
CFA-2: Model 2 (Spain, n = 375)	426.40	103	<.001	4.13	.96	.97	.09
CFA-3: Model 3 (Spain, n = 375)	548.63	100	<.001	5.48	.96	.95	.11
CFA-4 (CVA of M2) (n ₁ = 375, n ₂ = 374)	690.28	330	<.001	2.09	.99	.98	.05

Note. CFA: confirmatory factor analysis, CVA: cross-validation analysis, df: degrees of freedom, and n: subsample size.

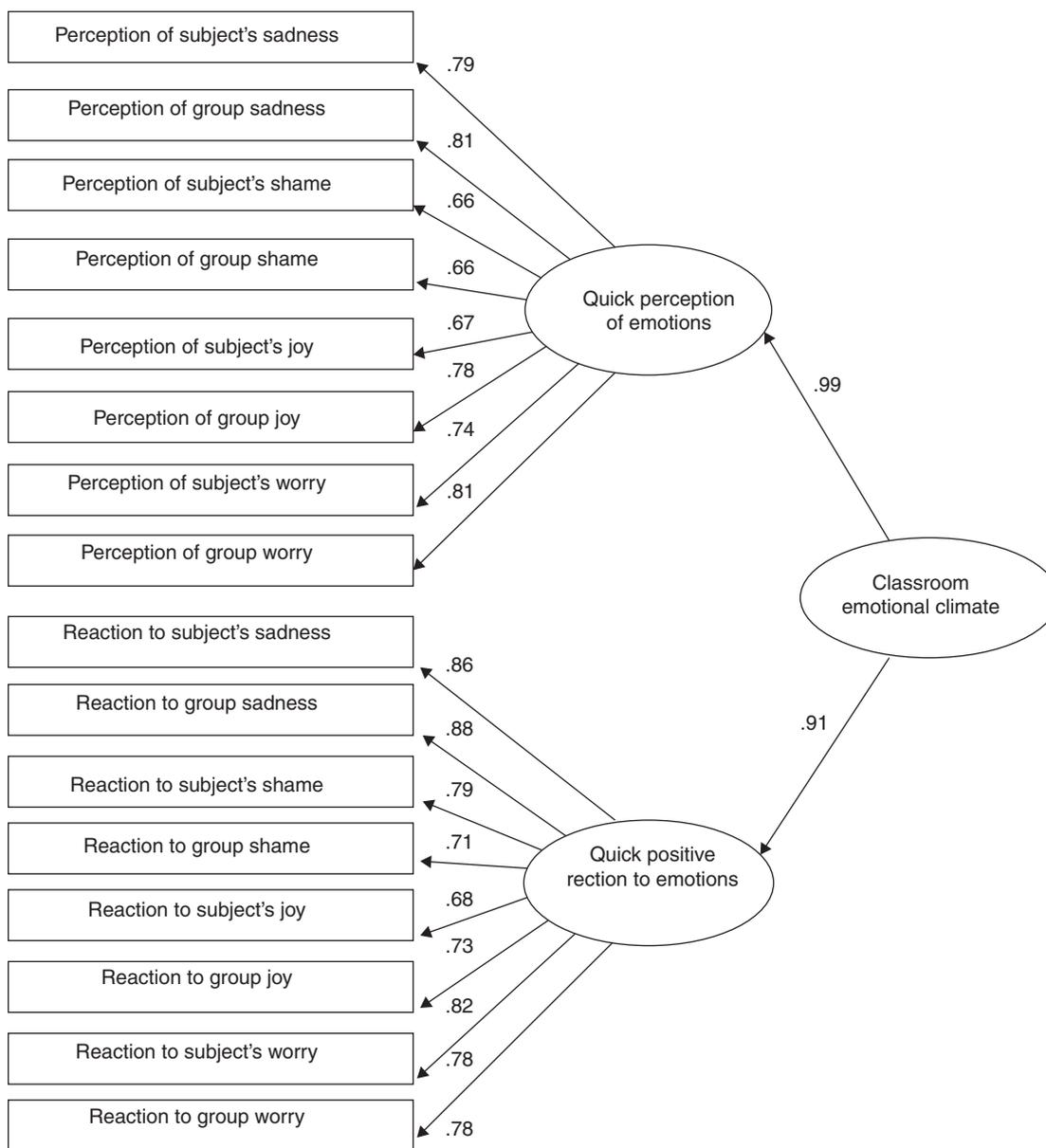


Figure 1. CEC. Hierarchical model. Confirmatory standardized solution (includes measurement and structural weights).

Table 3
Correlations between scales (lower part of the diagonal), square correlations (upper part of the diagonal) and average variance extracted (AVE) (diagonal left to right)

	CEC-Q: P	CEC-Q: R	CEC-Q: T	SoC-Q	SAT-Q	CMC-Q	Aversive S	Constructive S
	N = 749			N = 749			N = 749	
CEC-Q: P ^a	.549	.667***	.900***	.061***	.538***	.343***	.118***	.142***
CEC-Q: R	.817***	.615	.915***	.084***	.599***	.431***	.201***	.177***
CEC-Q: T	.949***	.957***	.905	.080	.627***	.434***	.172***	.173***
SoC-Q	.248***	.290***	.283***	.472	.063***	.091***	.011*	.028**
SAT-Q	.734***	.774***	.792***	.252***	.721	.394***	.143***	.167***
CMC-Q	.586***	.657***	.659***	.302***	.628***	.441		
Aversive S	-.344***	-.449***	-.415***	-.106*	-.379***		.651	.000
Constructive S	.377***	.421***	.417***	.169**	.409***		.025	.759

^a Aversive S: aversive strategies, Constructive S: constructive strategies, CEC-Q: P: classroom emotional climate – perception, CEC-Q: R: CEC reaction, CEC-Q: T: CEC total score, CMC-Q: classroom motivational climate, SAT-Q: satisfaction with teacher, and SOC-Q: sense of community.

* p < .05.
** p < .01.
*** p < .001.

Table 4
Regression analysis: standardized regression coefficients

Criterion: Satisfaction with teacher			Predictors			
Sample	R ²	p	CEC			CMC
362	.586	<.001	.581 ^{***}			.245 ^{***}
362	.587	<.001	.244 ^{***}	CEC-Perception	CEC-Reaction	.240 ^{***}
					.374 ^{***}	
Criterion: Sense of community			Predictors			
Sample	R ²	p	CEC			CMC
362	.109	<.001	.178 ^{**}			.185 ^{**}
362	.112	<.001	.006	CEC-Perception	CEC-Reaction	.176 ^{**}
					.187	
Criterion: Satisfaction with teacher			Predictors			
Sample	R ²	p	CEC	Aversive strategies	Constructive strategies	
386	.699	<.001	.772 ^{***}	-.061 [†]	.083 ^{**}	
386	.701	<.001	.307 ^{***}	CEC-Reaction	Aversive Strategies	Constructive strategies
				.507 ^{***}	-.048	.075 [†]
Criterion: Sense of community			Predictors			
Sample	R ²	P	CEC	Aversive strategies	Constructive strategies	
386	.078	<.001	.242 ^{***}	-.008	.068	
386	.080	<.001	.040	CEC-Reaction	Aversive strategies	Constructive strategies
				.220 [†]	.005	.061

[†] p < .05.
^{**} p < .01.
^{***} p < .001.

significant way and in the expected direction with scores in the SoC-Q and the SAT-TWTS, what contributes to show the CEC construct validity.

Finally, Table 4 shows the results of the regression analysis realized to answer the question about the relative weight of the different classroom climate indexes for predicting the students' satisfaction with teachers and the SoC. As can be seen, satisfaction with the teacher way of treating the students is predicted not only by the CEC, but also by the CMC in a significant way (R² = .586). The scales of the DMC have also a significant weight for predicting satisfaction, but very low. As for SoC, CEC and CMC have a significant way as predictors, but the percentage of SoC variance explained in the best case is low (R² = .109).

Discussion

The main objective of this study was the development and initial validation of a measure of classroom emotional climate, the CEC-Q. To achieve this objective, two other measures – the SoC-Q and the SAT-TWTS were developed. All these questionnaires have shown with very good fit and reliability. The main point, however, has to do with the concurrent validity of the CEC.

According to Evans et al. (2009) point of view, CEC is one of the components of classroom climate (CC), whose nature, effects and interactions with other components of CC should be established in order to evaluate its usefulness for guiding educational interventions. It is what we have intended in this paper. First, results related to discriminant validity have shown that each CC component – CEC, CMC, DMC – differs from the other, what imply that they are constructs of different nature. Second, the three components of CC relate in a significant way to satisfaction with teacher, and each one has a specific and significant

weight for predicting satisfaction. So, the three of them must not be confounded.

The positive and significant relationships between CEC and CMC can be explained, as anticipated in the theoretical section, if we consider that it is likely that the greater the degree the CMC is oriented to learning, the greater some of the students emotional needs – competence and autonomy – are satisfied. In the same way, the significant relationships between CEC and the strategies included in the DMC used for managing disruption and behavior problems can also be explained if we consider that these strategies have emotional consequences which, due to their emotional implications, can contribute to students' perception of self-worth.

In the case of the relationships between CEC and SoC, our expectancies had not be supported in the same degree that in previous case. It is true that the relationships between CEC and CMC on one side and SoC on the other have been positive and significant, but they have been very low. This may be due to the fact that SoC may depend more on peer's than on teachers' behavior. So, it is likely that co-living climate is the variable that most contribute to SoC, a hypothesis that should be tested. This possibility would explain also the fact that the use of different strategies for managing disruption and behavior problems does not contribute to predicting SoC.

The results just described have important educational implications. Previous studies have shown the importance on interventions aimed at improving CMC (Lazowski & Hulleman, 2016) and DMC (Bradshaw, Waasdorp, & Leaf, 2012). However, according to our results, this type of interventions may not be enough for improving students' emotional adjustment, satisfaction and wellbeing. Some programs are focusing on improving social interaction (Rivers, Brackett, Reyes, Elbertson, & Salovey, 2013) but it seems that it may be necessary a deeper, specific and meticulous work with teachers to allow them to learn to identify students' emotional needs and specially, to act in an adequate

way relation to then. According to the meta-analysis of Durlak, Weissberg, Dymnicki, Tylor, and Schellinger (2011), it is possible to help teachers to develop these capacities, though the final effect seems to depend also on teaching and helping students to develop socio-emotional competencies. Thus, a task for future research is to develop and test a specific model of helping teachers to develop the adequate competencies for creating a CEC that favors students' emotional satisfaction and well-being.

This study has some limitations. The main one is that it is based on a convenience sample. To choose a sample like this – often is the only option available – is adequate for a first approximation to validate a questionnaire. Nevertheless, new studies with samples more representative of students coming from different schools and from different countries are necessary. A second limitation has to do with data about concurrent validity. It is clear that CEC is part of classroom climate together with CMC and DMC, and that it relates in some degree to sense of community and with the student satisfaction with teacher way of treating the students. However, the study had not analyzed the way CEC relates – and possibly affects – the social or co-living climate, a climate that depends mainly on the interactions among the students themselves. Intervention studies are needed to test the validity of inferences made about the educational implications of our results.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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References

- Alderman, M. K., & MacDonald, S. (2015). A self-regulatory approach to classroom management: Empowering students and teachers. *Kappa Delta Pi Record*, 51, 52–56. <http://dx.doi.org/10.1080/00228958.2015.1023145>
- Allen, J. P., Gregory, A., Mikami, A. Y., Lun, J., Hamre, B., & Pianta, R. C. (2013). Observations of effective teacher–student interactions in secondary school classrooms: Predicting student achievement with the classroom assessment scoring system–Secondary. *School Psychology Review*, 42, 76–98.
- Alonso-Tapia, J. (2016). Clima motivacional de clase: características, efectos y determinantes. In F. Veiga (Ed.), *Envolvimento dos alunos na escola: perspetivas da psicologia e educação – Motivação para o desempenho académico* (pp. 9–34). Lisboa: Instituto de Educação, Universidade de Lisboa.
- Alonso-Tapia, J. (2017a). *Clima escolar y clima de clase: revisión de programas y políticas exitosas de clima escolar, y justificación para la selección de instrumentos de medición. Informe técnico 1*. Costa Rica: Ministerio de Educación Pública/Banco Interamericano de Desarrollo.
- Alonso-Tapia, J. (2017b). *Sistema de evaluación del clima escolar y del clima de clase (SEVACES-CR). Versión para Costa Rica. Informe técnico 2*. Costa Rica: Ministerio de Educación Pública/Banco Interamericano de Desarrollo.
- Alonso-Tapia, J., & Fernández, B. (2008). Development and initial validation of the Classroom Motivational Climate Questionnaire (CMC-Q). *Psicothema*, 20, 883–889.
- Alonso-Tapia, J., & Pardo, A. (2006). Assessment of learning environment motivational quality from the point of view of secondary and high school learners. *Learning and Instruction*, 16, 1–15. <http://dx.doi.org/10.1016/j.learninstruc.2006.07.002>
- Ames, C. (1992). Achievement goals and the classroom motivational climate. In D. H. Schunk, & J. L. Meece (Eds.), *Students' perceptions in the classroom* (pp. 327–348). Nueva York: Lawrence Erlbaum.
- Aunola, K., Lerkkanen, M. K., Poikkeus, A. M., & Nurmi, J. E. (2005). *Teacher interactional styles scale*. Jyväskylä: University of Jyväskylä.
- Bellocchi, A., Ritchie, S. M., Tobin, K., King, D., Sandhu, M., & Henderson, S. (2014). Emotional climate and high quality learning experiences in science teacher education. *Journal of Research in Science Teaching*, 51, 1301–1325. <http://dx.doi.org/10.1002/tea.21170>
- Bradshaw, C. P., Waasdorp, T. E., & Leaf, P. J. (2012). Effects of school-wide positive behavioral interventions and supports on child behavior problems. *Pediatrics*, 130, 1136–1145. <http://dx.doi.org/10.1542/peds.2012-0243>
- Butler, R. (2012). Striving to connect: Extending an achievement goal approach to teacher motivation to include relational goals for teaching. *Journal of Educational Psychology*, 104, 726–742. <http://dx.doi.org/10.1037/a0028613>
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268. <http://dx.doi.org/10.1207/S15327965PLI1104.01>
- Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development*, 82, 405–432. <http://dx.doi.org/10.1111/j.1467-8624.2010.01564.x>
- Evans, I. M., Harvey, S. T., Buckley, L., & Yan, E. (2009). Differentiating classroom climate concepts: Academic, management, and emotional environments. *New Zealand Journal of Social Sciences Online*, 4, 131–146. <http://dx.doi.org/10.1080/1177083X.2009.9522449>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39–50. <http://dx.doi.org/10.2307/3151312>
- Gazelle, H. (2006). Class climate moderates peer relations and emotional adjustment in children with an early history of anxious solitude: A child X environment model. *Developmental Psychology*, 42, 1179–1192. <http://dx.doi.org/10.1037/0012-1649.42.6.1179>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis*. Upper Saddle River, NJ: Pearson-Prentice Hall.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Thousand Oaks, United States: SAGE.
- Hamre, B. K., Pianta, R. C., Downer, J. T., DeCoster, J., Mashburn, A. J., Jones, S. M., & Hamagami, A. (2013). Teaching through interactions: Testing a developmental framework of teacher effectiveness in over 4,000 classrooms. *The Elementary School Journal*, 113, 461–487.
- Jennings, P. A., & Greenberg, M. T. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational Research*, 79, 491–525. <http://dx.doi.org/10.3102/0034654308325693>
- Joe, H., Hiver, P., & Al-Hoorie, A. (2017). Classroom social climate, self-determined motivation, willingness to communicate, and achievement: A study of structural relationships in instructed second language settings. *Learning and Individual Differences*, 53, 133–144. <http://dx.doi.org/10.1016/j.lindif.2016.11.005>
- Kiuru, N., Poikkeus, A. M., Lerkkanen, M. K., Pakarinen, E., Siekkinen, M., Ahonen, T., & Nurmi, J. E. (2012). Teacher-perceived supportive classroom climate protects against detrimental impact of reading disability risk on peer rejection. *Learning and Instruction*, 22, 331–339. <http://dx.doi.org/10.1016/j.learninstruc.2011.12.003>
- Lazowski, R. A., & Hulleman, C. S. (2016). Motivation interventions in education: A meta-analytic review. *Review of Educational Research*, 86, 602–640. <http://dx.doi.org/10.3102/0034654315617832>
- Liu, W., Mei, J., Tian, L., & Huebner, E. S. (2016). Age and gender differences in the relation between school-related social support and subjective well-being in school among students. *Social Indicators Research*, 125, 1065–1083. <http://dx.doi.org/10.1007/s11205-015-0873-1>
- McDonald, R. P. (1999). *Test theory. A unified treatment*. Mahwah, NJ: Erlbaum.
- McMillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology*, 14, 6–23.
- Moos, R. H., & Moos, B. S. (1978). Classroom social climate and student absences and grades. *Journal of Educational Psychology*, 70, 263–269. <http://dx.doi.org/10.1037/0022-0663.70.2.263>
- Patrick, H., & Ryan, A. M. (2005). Identifying adaptive classrooms: Dimensions of the classroom social environment. In K. A. Moore, & L. H. Lippman (Eds.), *What do children need to flourish?* (pp. 271–287). Nueva York: Springer.
- Pianta, R., La Paro, K. M., & Hamre, B. K. (2008). *Classroom assessment scoring system manual: K-3*. Baltimore, MD: Brookes.
- Rivers, S. E., Brackett, M. A., Reyes, M. R., Elbertson, N. A., & Salovey, P. (2013). Improving the social and emotional climate of classrooms: A clustered randomized controlled trial testing the RULER approach. *Prevention Science*, 14, 77–87. <http://dx.doi.org/10.1007/s11212-012-0305-2>
- Ruzek, E. A., Hafen, C. A., Allen, J. P., Gregory, A., Mikami, A. Y., & Pianta, R. C. (2016). How teacher emotional support motivates students: The mediating roles of perceived peer relatedness, autonomy support, and competence. *Learning and Instruction*, 42, 95–103. <http://dx.doi.org/10.1016/j.learninstruc.2016.01.004>
- Ryan, A. M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal*, 38, 437–460. <http://dx.doi.org/10.3102/00028312038002437>

- Simón, C., & Alonso-Tapia, J. (2016). Positive classroom management: Effects of disruption management climate on student's behavior and satisfaction with teacher. *Revista de Psicodidáctica*, 21, 65–86. <http://dx.doi.org/10.1387/RevPsicodidact.13202>
- Thapa, A., Cohen, J., Guffey, S., & Higgins-D'Alessandro, A. (2013). A review of school climate research. *Review of Educational Research*, 83, 357–385. <http://dx.doi.org/10.3102/0034654313483907>
- Wang, M. T., & Degol, J. L. (2015). School climate: A review of the construct, measurement, and impact on student outcomes. *Educational Psychology Review*, 28, 315–352. <http://dx.doi.org/10.1007/s10648-015-9319-1>
- Villasana, M., & Alonso-Tapia, J. (2015). Cross-cultural validity of the "Classroom Motivational Climate Questionnaire": Comparison between French and Spanish students. *Revista de Psicodidáctica*, 20, 227–246. <http://dx.doi.org/10.1387/RevPsicodidact.13034>