



Classroom Motivational Climate and Academic Performance in University Students: An Instrumental and Correlational Analysis

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Abstract

Classroom Motivational Climate (CMC) refers to the patterns in teaching performance within the classroom and their relationship to student motivation. Although CMC is a relevant educational variable, it has been studied less extensively at the university level and in numerous teaching contexts. For this reason, this study addresses two primary objectives: an instrumental objective, involving the adaptation and validation of the CMC-Q questionnaire for Uruguayan university psychology undergraduates; and an empirical objective, which explores the relationships between CMC and Academic Performance (AP) within this student population. The study employed an instrumental, quantitative cross-sectional design within an observational, descriptive, and correlational framework. A total of 455 undergraduates participated. Analyses focused on the internal structure of the CMC-Q—using confirmatory factor analysis and internal consistency— and on evidence of concurrent validity. The results confirmed that the empirical data aligned with the theoretical model, showing optimal internal consistency ($\alpha > 0,80$). Additionally, evidence of concurrent validity was obtained with academic satisfaction ($r = 0,722$). Findings indicate that CMC has a significant, positive, but low correlation with AP. The CMC-Q components with the greatest predictive value on AP included inducing participation, supporting student autonomy, providing regular feedback, assessment for learning, and acknowledgment effort. These results provide elements that support the development of learning-oriented CMC's for undergraduate students.

Keywords:

classroom climate; motivation; achievement; higher education; pedagogical practice

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Clima motivacional de sala de aula e desempenho acadêmico em estudantes universitários: uma análise instrumental e correlacional

Resumo

O Clima Motivacional de Aula (CMA) refere-se aos padrões de desempenho docente em sala de aula e sua relação com a motivação dos alunos. Embora o CMA seja uma variável relevante a nível educativo, tem sido estudado em menor grau a nível universitário e em numerosos contextos de ensino. Por este motivo, este estudo se propõe a abordar dois objetivos, um instrumental, ligado à adaptação e validação do questionário CMA-Q para a população de estudantes universitários de psicologia uruguaios, e outro empírico, focada em estudar as relações entre CMA e Desempenho Acadêmico (DA) na referida amostra de estudantes. Foi desenvolvido um desenho transversal instrumental, quantitativo, de tipo não experimental, descritivo e correlacional. Participaram 455 estudantes universitários. Foram analisadas a estrutura interna do CMA-Q —análise fatorial confirmatória e consistência interna— e evidências de validade concorrente. Os resultados verificaram um ajuste adequado dos dados empíricos ao modelo teórico e consistência interna ótima ($\alpha > 0,80$). Além disso, foram obtidas evidências de validade concorrente com satisfação acadêmica ($r = 0,722$). Os achados indicam que a CMA tem uma relação significativa, positiva e baixa com a DA. Os componentes do CMA-Q com maior valor preditivo sobre DA foram o incentivo à participação, o apoio à autonomia, o feedback regular, a avaliação da aprendizagem e o reconhecimento do esforço. Os resultados fornecem elementos para contribuir para o desenvolvimento de climas motivacionais de sala de aula orientados à aprendizagem em estudantes universitários.

Palavras-chave:

clima de aula; motivação; desempenho; ensino superior; prática pedagógica

Clima motivacional de clase y rendimiento académico en estudiantes universitarios: un análisis instrumental y correlacional

Resumen

El clima motivacional de clase (CMC) refiere a los patrones de actuación docente en el aula y su relación con la motivación del estudiantado. Aunque el CMC es una variable relevante a nivel educativo, a nivel universitario y en contextos de enseñanza numerosos se ha estudiado en menor medida. Por esa razón, el presente estudio se propone dos objetivos: uno instrumental, vinculado con adaptar y validar el cuestionario CMC-Q a la población de estudiantes universitarios de Psicología uruguayos, y otro empírico, enfocado en estudiar las relaciones entre el CMC y el rendimiento académico (RA) en la muestra de estudiantes mencionada. Se desarrolló un diseño instrumental, cuantitativo transeccional de tipo no experimental, descriptivo y correlacional. Participaron 455 estudiantes universitarios. Se analizó la estructura interna del CMC-Q —análisis factorial confirmatorio y consistencia interna— y evidencias de validez concurrente. Los resultados verificaron un adecuado ajuste de los datos empíricos al modelo teórico y una consistencia interna óptima ($\alpha > 0,80$). Además, se obtuvo evidencia de validez concurrente con la satisfacción académica ($r = 0,722$). Los hallazgos señalan que el CMC tiene una relación significativa, positiva y baja con el RA. Los componentes del CMC-Q con mayor valor predictivo sobre el RA fueron el fomento a la participación, el apoyo a la autonomía, la retroalimentación regular, la evaluación para el aprendizaje y el reconocimiento del esfuerzo. Los resultados brindan elementos para contribuir al desarrollo de climas motivacionales de clases orientados al aprendizaje en estudiantes universitarios.

Palabras clave:

clima de la clase; motivación; rendimiento; enseñanza superior; práctica pedagógica

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Introduction

Classroom relationships, along with their psychological and educational correlates, have been topics of interest for professors, psychologists, and educational researchers from the educational area in the last decades (Gutiérrez & Tomás, 2019). Many international studies have analyzed classroom interactions (Hattie, 2012), showing that positive relationships between professors and students are linked to improved academic outcomes (Fraser & Walberg, 2005).

Classroom Climate (CC) is one of the most well-developed categories for studying classroom interactions. CC refers to perceptions of the social, emotional, and instructional dynamics among class participants (Bardach et al., 2020). Although research on CC spans over five decades, studies focused specifically on university settings remain limited (Alansari & Rubi-Davies, 2020). Some of the most relevant findings at the university level include significant associations between CC perceptions and factors such as academic self-efficacy (Alt, 2015), motivation and performance (Bi, 2015), participation, sense of belonging, and academic self-challenge (Kim & Lundberg, 2016). Nevertheless, further studies are required to provide additional evidence on the predictive value of CC for student learning outcomes and to explore ways to enhance it.

The social, emotional, and instructional dimensions of CC have been studied using different methodologies and theoretical frameworks (Evans et al., 2009). One line of research on CC, focused specifically on motivational aspects, is known as Classroom Motivational Climate (CMC) (Ames, 1992).

Classroom Motivational Climate (CMC)

Among socio-cognitive approaches to motivation, one of the most theoretically developed perspectives is the Achievement Goal Theory (AGT) (Urda & Kaplan, 2020), which integrates cognitive and emotional drivers that shape behavior toward certain goals in social interaction situations (Ames, 1992). AGT has supported the development of conceptual and methodological advances, including recent efforts focused on educational interventions (Anderman, 2020). Derived from AGT, CMC refers to the influence of classroom structures on students' motivation (Robinson, 2023).

Based on the proposal of Epstein (1989), Ames (1992) developed the TARGET system to identify teaching practices that define CMC. TARGET is an acronym for six parameters of motivational action: Task, Authority, Recognition, Grouping, Evaluation, and Time. *Tasks* are key elements for classroom learning, designed to offer

optimal challenge and variety to sustain students' interest. *Authority* refers to teaching practices that promote student autonomy. *Recognition* highlights the importance of acknowledging students' efforts and achievements. *Grouping* focuses on encouraging collaborative work among students, fostering a context of cooperation. *Evaluation* practices are intended to include criteria, strategies, and frequencies that support students' learning processes. Finally, the system emphasizes *Time* management that is appropriately flexible and aligned with task requirements and the characteristics of the students. However, some researchers have proposed adding social relationships as an additional element of the TARGET system, therefore, an updated version of the acronym is suggested: TARGETS. TARGETS. This approach emphasizes the importance of fostering positive interpersonal relationships and mutual respect in the classroom (Chazan et al., 2022).

CMC is a relevant contextual variable due to its positive and significant relationships with other psychological variables, such as learning-oriented motivation (Alonso-Tapia & Ruiz-Díaz, 2022), academic self-concept (Gutiérrez et al., 2019), basic psychological needs (Gutiérrez & Tomás, 2018), academic engagement (Tomás et al., 2016), as well as students' competence, self-esteem, and self-efficacy (Givens Rolland, 2012).

According to the systematic review carried out by Chiarino et al. (2024), one of the most used instruments to study CMC in Ibero-America is the CMC-Q (Classroom Motivational Climate Questionnaire) (Alonso-Tapia & Fernández Heredia, 2008). This questionnaire has been frequently applied in the Spanish middle school, demonstrating optimal reliability and internal consistency, as well as cross-cultural validity in some South American and European Countries (Alonso-Tapia & Ruiz-Díaz, 2022). The conceptual model underlying the CMC-Q includes 16 patterns of professor performance: use of novelty, connecting to prior knowledge, linking subjects, inducing participation, delivering learning-oriented messages, clarifying objectives, clarifying organization, supporting student autonomy, step-by-step instruction, frequent exemplification, maintaining an adequate pace, providing regular feedback, assessment for learning, positive reinforcement, equal treatment, and providing emotional support.

Several studies have used the CMC-Q to assess CMC and its relationship with academic performance (measured through final course grades) in higher education. For instance, Abello et al. (2021) conducted a study with Colombian undergraduates and found a significant, positive though low, relationship between CMC and AP ($R^2 = 2,25\%$). However, this investigation reported only the global value of CMC, without specifying which elements of the model could have a stronger predictive impact on AP. Further research to explore which specific CMC patterns most influence university students' academic outcomes would provide valuable insights in this area.

Academic Performance (AP)

Academic Performance (AP) is a frequently studied concept in educational research, characterized by its complexity in both definition and measurement (Ramírez, 2014). AP is a multi-dimensional and multi-determined variable that aims to describe students' learning outcomes (Gutiérrez-de-Rozas et al., 2022) and remains a central topic for Educational Psychology (Winne & Nesbit, 2010).

There are several methods for measuring AP. In the scientific literature, the most frequently used measures are scores from tests, examinations, or final course grades (Karadağ, 2017). Nevertheless, other investigations have also used the mean or average score of students' academic activities as a measure of AP (Richardson et al., 2012).

It should be emphasized that AP is influenced by multiple cognitive, meta-cognitive, motivational, and contextual variables (Winne & Nesbit, 2010). Several meta-analyses have examined the relationship between personal and contextual variables and AP. In higher education, Richardson et al. (2012) found correlations between AP and psychological variables such as academic self-efficacy ($r = 0,31 / R^2 = 0,10$) and achievement motivation ($r = 0,32 / R^2 = 0,10$). Other meta-analyses have studied relationships between AP and institutional contextual variables, such as school climate ($r = 0,29 / R^2 = 0,09$) (Dulay & Karadağ, 2017).

Given the available evidence, a deeper understanding of contextual factors—such as CMC—and their relationship with AP could inform the development of pedagogical and policy practices aimed at improving the quality of higher education. This study focuses on two main objectives. The first phase addresses an instrumental objective, which involves adapting and validating the CMC-Q for Uruguayan undergraduate Psychology students. The second phase pursues an empirical objective, examining the relationships between CMC and AP within this student sample.

Methodology

Design

The study employed an instrumental, quantitative cross-sectional design within an observational, descriptive, and correlational framework. (Ato et al., 2013), aiming to understand reality and produce knowledge that contributes to educational development (Gibbons et al., 1997).

Participants

A convenience non-probability sampling method was used (Otzen & Manterola, 2017). The sample size was calculated through G*Power 3.1.9.7 software (Faul et al., 2009), which suggested a minimum of 300 cases for the proposed statistical analyses (Kyriazos, 2018).

A total of 455 undergraduates participated in the study (female = 85,6 %, male = 13,3 %, other = 1,1 %), with ages ranging from 19 to 64 ($M = 27,18$; $SD = 9,84$). Of the participants, 48,80 % were from the capital city, Montevideo, while 51,20 % live in other Uruguayan cities. Selection criteria included academic progress and socio-demographic distribution. For academic progress, participants were required to have completed a minimum of 45 credits, based on the curriculum of the Psychology Degree (PELP, 2013). The gender distribution in the sample mirrors that of the active student population within the Faculty (DGPlan, 2022).

The students were enrolled in the same Mandatory Curriculum Unit (UCO) during the third semester of the Psychology Degree at Universidad de la República (Uruguay). This UCO course is typical in terms of course structure (lectures offered to large groups), assessment systems (two mandatory, partial assessments), and general academic outcomes (Dirección de Licenciatura, 2021). The UCO consisted of lectures for groups of 300 undergraduates, divided into three time shifts, with two assigned professors for each group. Weekly 120-minute classes were delivered through Zoom platform, without a roll call. Assessments included two questionnaires with brief open-ended questions aimed at encouraging students to articulate and reflect on conceptual developments from the Psychology of Learning, applied to problem-solving in educational context.

Instruments and measures.

Classroom Motivational Climate. The *Classroom Motivational Climate Questionnaire (CMC-Q)* was used to assess CMC (Alonso-Tapia y Fernández Heredia, 2008). This is a 32-item self-report questionnaire using a 5-point Likert scale, ranging from “strongly disagree” to “strongly agree”. The instrument has a unidimensional structure, exploring 16 patterns of teaching behavior and their relationship with student motivation. Each pattern is measured by 2 items—one positively phrased and one negatively phrased. Scores on the CMC-Q range from a minimum of 32 to a maximum of 160. The authors of the original instrument reported acceptable psychometric properties ($GFI = 0,904$; $CFI = 0,952$; $IFI = 0,952$; $RMSEA = 0,057$) and optimal internal consistency across multiple studies, most

frequently conducted at the middle school level ($\alpha = 0,93$ to $0,98$) (Alonso-Tapia & Ruiz-Díaz, 2022).

Academic satisfaction related to pedagogical behavior. The Academic Satisfaction Scale was used to measure satisfaction with Pedagogical Behavior. This unidimensional instrument, closely related to the CMC-Q consists of 8 items scored on a 4-level Likert scale, ranging from “Never” to “Always”. Scores on this scale range from a minimum of 8 to a maximum of 32. The version adapted and validated in Argentina demonstrated acceptable internal consistency ($\alpha = 0,84$) (Medrano & Pérez, 2010). In this study, the psychometric properties of the instrument were tested through confirmatory factor analysis, which indicated acceptable adjustment rates (CFI = $0,986$; TLI = $0,981$; SRMR = $0,057$). Additionally, an internal consistency estimate yielded an optimal value ($\alpha = 0,83$).

Academic Performance (AP). The AP was measured using the grades obtained by undergraduates in the UCO course, where final grades were calculated as the average two partial assessments administrated by the professors. The study had access to the grades obtained by the students in each individual assessment, and the final grades were extracted from academic records. The grading scale ranges from 1 to 12, with 3 as the minimum passing grade (60%). This scale categorizes performance into three levels: insufficient (1-2), acceptable (3-8), and very good (9-12).

Procedure

This study was approved by the Ethics Committee of the School of Psychology at Universidad de la República. Informative sessions were held with professors and students, and participation was both free and voluntary.

First, the CMC-Q was linguistically and culturally adapted following the guidelines of Beaton et al. (2000). Items were reviewed and adjusted by two experts. A pilot test was then conducted with a sample of 33 Psychology undergraduates to gather qualitative feedback on the clarity and relevance of the items in the university context. To facilitate this, a form was provided with space for open-ended responses, allowing students to suggest alternative expressions or words that could improve item comprehension without altering their meaning. Based on participants' feedback, certain adjustments were made to better fit the Uruguayan university context. For example, “task rubric” was used in place of “task instructions”, and “elicit answer” instead of “ask,” among other specific variations.

The final questionnaire was administered through a self-completed online form. Participants filled out the form during the last month of the curricular unit (June 7th to July 5th, 2021). Data collection occurred during the Covid-19 pandemic, under

strict social distance measures, with all university conducted remotely. A total of 455 complete responses were collected.

Data analysis

Statistical analyses were conducted using Mplus 7, SPSS Statistics 25, and AlphaTest programs. First, outliers were removed through univariate and multivariate analyses. Cases with $-Z$ scores outside the ± 3 range (Tabachnick & Fidell, 2001) were eliminated in the univariate analysis, while those with Mahalanobis distances below 0.001 (Hair et al., 2007) were removed in the multivariate analyses. This process resulted in the elimination of 29 cases, leaving a final sample size of 426.

To address the study's primary objectives, the internal structure of the CMC-Q was analyzed in the total sample using confirmatory factor analysis (CFA). The unidimensional model was tested with the maximum likelihood estimation method, and the model's adjustment was assessed according to CFI, TLI, RMSEA and SRMR indices. Values above 0.90 for CFI and TLI, and below 0.08 for RMSEA and SRMR, were considered acceptable (Jordan-Muñoz, 2021). The sample was then divided by age (younger, older), at the 50th percentile to verify model's adjustment in both sub-samples. Internal consistency was estimated for both the total sample and the sub-samples through Cronbach's alpha (Revelle & Condon, 2018), with values of 0.80 or higher deemed optimal (Prieto & Delgado, 2010). Internal consistency indices were compared between samples using the Feldt formula (Lautenschlager & Meade, 2008).

The metric equivalence of the instrument's structure was examined through factorial invariance analysis, with progressively applied restrictions. The following levels of invariance were tested: configural model (with no restrictions), metric invariance (with factorial load restrictions), scale invariance (with factorial load and intercept restrictions), strict invariance (with factorial load, intercept and item uniqueness restrictions) and latent variable mean invariance (with factorial load, intercept, item uniqueness and factor latent variable mean restrictions) (Dimitrov, 2010). Invariance was assessed by comparing CFI and RMSEA values, with changes below 0.01 for CFI and 0.015 for RMSEA indicating adequate metric equivalence (van Zyl & ten Klooster, 2022).

To address the empirical objective, three types of analyses were carried out: descriptive, correlation, and regression analyses. First, a descriptive analysis showed univariate statistics on CMC and AP, as well as means scores for CMC components across different AP groups (see Table 4). Second, bivariate correlations were

calculated using Pearson's correlation coefficient (Hernández-Sampieri et al., 2022), examining total scores from each instrument and AP values (see Table 5).

Third, simple and multiple linear regression analyses were conducted, with CMC as the independent variable AP as the dependent variable. In the first model, the total CMC score was used to predict AP. A second model analyzed the components of the CMC-Q individually, selected using backward stepwise regression (Hair et al., 2007). The final model grouped the CMC-Q components according to the framework proposed by Bardelli and Huertas (2022). Only students who completed all course assessments were included in these analyses ($n = 369$), to ensure consistent AP values.

Results

Adaptation and validation of CMC-Q to Uruguayan undergraduates

First, the one-dimensional structure of the CMC-Q was assessed using confirmatory factor analysis (CFA) to test the theoretical model's fit to the empirical data collected in this study. The results indicated acceptable model fit indices. The sample was then divided by age (younger, older), using the 50th percentile as the cutoff. Adequate model fit was confirmed for both age groups (see Table 1).

Table 1.

CMC-Q's adjustment indices

	Chi2	gl	CFI	TLI	RMSEA	SRMR
Total	316.556	104	0.953	0.946	0.067 [0.059-0.076]	0.033
Younger students	212.455	104	0.946	0.938	0.066 [0.053-0.079]	0.039
Older students	255.873	104	0.941	0.932	0.082 [0.053-0.079]	0.038

Source: Authors' own elaboration.

Additionally, for both the total sample and the age-based sub-samples, the parameters were statistically significant, with most values exceeding 0.70, indicating strong factor loadings. Internal consistency indices were also estimated for all three samples, reaching optimal values that were similar across groups, with no statistically significant differences observed (see Table 2).

Table 2.

Parameters values per sample

CMC-Q components	Total	Older students	Younger students
C1	0.727	0.757	0.699
C2	0.678	0.652	0.709
C3	0.753	0.843	0.634
C4	0.703	0.720	0.682
C5	0.743	0.759	0.737
C6	0.766	0.798	0.721
C7	0.825	0.862	0.787
C8	0.668	0.670	0.666
C9	0.789	0.820	0.757
C10	0.758	0.837	0.659
C11	0.747	0.807	0.672
C12	0.580	0.656	0.480
C13	0.694	0.673	0.720

C14	0.729	0.743	0.719
C15	0.757	0.786	0.715
C16	0.764	0.794	0.743
α [IC 95 %]	0.947 [0.940-0.954]	0.955 [0.946-0.963]	0.935 [0.922-0.946]
Chi		8.007	
Gl		2	
P		0.018	

Source: Authors' own elaboration.

The one-dimensional structure of the CMC-Q underwent factorial invariance analysis to assess its metric equivalence across age groups (younger and older students). Different levels of restriction were progressively applied to the model. The results confirmed that the model demonstrated metric equivalence between the two sub-samples, indicating consistent measurement properties across age groups.

Table 3.

CMC-Q factorial invariance analysis.

Model	Chi2	gl	CFI	Δ CFI	RMSEA	Δ RMSEA
Configural	239.662	104	0.943	-	0.076 [0.063-0.088]	-
Metric	483.230	224	0.943	0	0.071 [0.063-0.080]	0.005
Scalar	460.558	224	0.948	-0.005	0.068 [0.059-0.077]	0.008

Strict	524.588	256	0.941	0.002	0.068	0.008
					[0.059-0.077]	
Means	491.882	238	0.944	-0.001	0.068	0.008
					[0.060-0.077]	

Source: Authors' own elaboration.

After examining the factorial structure and reliability of the CMC-Q, evidence of its external validity was assessed. To this end, the concurrent validity of the CMC-Q was evaluated using another instrument which assesses academic satisfaction with the pedagogic environment, due to the conceptual affinity between these constructs. The analysis revealed a statistically significant correlation ($r = 0.722$, $p < 0.001$). Given that the explained variance exceeds $r = 0.708$ (Hair et al., 2007), we can assert that these instruments measure similar constructs.

Relations between CMC and AP

After confirming that the CMC-Q met the adequate psychometric requirements to assess the CMC in the specific application context, univariate and multivariate analyses were conducted to explore the relationship between the CMC and the AP.

Concerning the CMC, scores ranged from 93 to 160, with a mean of 138 (SD= 14.22). Concerning AP (final grades), scores ranged from a minimum of 2 and to a maximum of 12, with a mean of 7.11 (SD= 2.61). Table 4 describes the means of the assessed variables for low, medium and high AP groups.

Table 4.

CMC and AP means for the total sample, discriminated by AP groups

Variables	Measurements	Total sample (n = 369)	Low AP group (Grades 1 - 2) (n = 25)	Medium AP group (Grades 3 - 8) (n = 179)	High AP group (Grades 9 - 12) (n = 165)
CMC	Novelty	M = 8.69	M = 8.44	M = 8.66	M = 8.77

Previous knowledge	M = 8.11	M = 8.16	M = 7.96	M = 8.27
Relating topics	M = 8.63	M = 8.40	M = 8.56	M = 8.74
Inducing participation	M = 9.26	M = 9.24	M = 9.12	M = 9.41
Learning-oriented messages	M = 8.88	M = 8.48	M = 8.82	M = 9.01
Clarity of learning objectives	M = 8.41	M = 8.40	M = 8.21	M = 8.64
Clarity of organization	M = 8.25	M = 8.04	M = 8.07	M = 8.49
Support to students' autonomy	M = 9.03	M = 9.12	M = 8.82	M = 9.24
Step-by-step performance	M = 8.47	M = 8.24	M = 8.29	M = 8.71
Frequent exemplification	M = 8.72	M = 8.52	M = 8.58	M = 8.91
Adequate pace	M = 8.24	M = 8.50	M = 8.13	M = 8.40
Regular feedback	M = 9.05	M = 9.16	M = 9.00	M = 9.09
Assessment for learning	M = 8.44	M = 8.04	M = 8.18	M = 8.79
Positive reinforcement/ Effort Acknowledgment	M = 7.99	M = 7.76	M = 7.80	M = 8.23
Equal treatment	M = 8.80	M = 8.44	M = 8.73	M = 8.94

	Affection and emotional support	M = 8.89	M = 8.72	M = 8.75	M = 9.05
	CMC-Q final score	M = 137.93	M = 135.68	M = 135.69	M = 140.70
AP	Test 1	M = 7.24	M = 4.92	M = 5.68	M = 9.28
	Test 2	M = 6.69	M = 1.80	M = 5.07	M = 9.19
	Final grade	M = 7.11	M = 2.00	M = 5.56	M = 9.55

Source: Authors' own elaboration.

Descriptive statistics show high mean scores for CMC across all ap groups, with a slight progressive increase from low to high ap groups. The highest scoring CMC components were Inducing participation (M = 9.26; SD= 1.04), Regular feedback (M = 9.05; SD= 1.01) and Support to students' autonomy (M = 9.03; SD= 1.15). On the other hand, the lowest scoring CMC components were Positive reinforcement/ Effort acknowledgment (M = 7.99; SD= 1.63), Previous knowledge (M = 8.11; SD= 1.24) and Adequate pace (M = 8.24; SD= 1.32).

Next, cPearson correlation coefficients were calculated to examine associations among the assessed variables. Table 5 displays the correlation statistics.

Table 5.
 Correlations among CMC, AS and AP.

	CMC	AS	Test 1	Test 2	Final grade
CMC	1	0.722***	0.146***	0.121***	0.155***
AS		1	0.129***	0.116***	0.136***
Test 1			1	0.511***	0.800***
Test 2				1	0.895***
Final grade					1

*** p < 0.001

Source: Authors' own elaboration.

Note. CMC = Classroom Motivational Climate. AS = Academic Satisfaction

The correlation analyses revealed a significant, positive, and very strong relationship between CMC and AS, as well as between partial tests and final grades. Additionally, there were significant but low positive correlations between CMC and the various measurements of AP.

To further explore the predictive value of CMC, three linear regression analyses were conducted, with students' final grades as the dependent variable. The first analysis used the total CMC-Q score as the predictor, showing that CMC-Q's total score significantly and positively predicted final grades, explaining 2.4% of the variance ($R^2 = 0.024$; $\beta = 0.155$; $p < 0.001$).

A second regression analysis was conducted by grouping the CMC-Q components according to the framework proposed by Bardelli & Huertas Martínez (2022). The authors categorized the CMC-Q components into four groups:

- a) CMCg1: "Organization and sequencing of learning situations" – includes Clarity of learning objectives, Clarity of organization, Adequate pace and Step-by-step performance.
- b) CMCg2: "Content selection and presentation" – includes Novelty, Frequent exemplification, Relating topics and Previous knowledge.
- c) CMCg3: "Learning to learn orientation" – includes Inducing participation, Support of students' autonomy, Regular feedback and Assessment for learning.
- d) CMCg4: "Affective support" – includes Equal treatment, Positive reinforcement/ Effort acknowledgment, Affection and emotional support and Learning-oriented messages.

Among these groups, only CMCg3 significantly and positively predicted AP, explaining 3.2% of the variance ($R^2 = 0.032$; $\beta = 0.178$; $p < 0.001$).

Finally, the predictive value of each CMC-Q component was analyzed independently in relation to final grades. The components *Assessment for learning* ($\beta = 0.184$), from CMCg3, and *Positive reinforcement/ Effort acknowledgment* ($\beta = 0.086$), from CMCg4 explained the most variability in final grades when considered independently, with a combined R^2 of 0.052 ($p < 0.001$).

Discussion

The results confirm that the CMC-Q is a valid and reliable instrument for assessing Classroom Motivational Climate (CMC) in the context of Uruguayan Psychology undergraduates. The data showed an adequate adjustment of empirical data to the theoretical model, along with optimal internal consistency ($\alpha > 0.80$) consistent with findings from previous studies in Ibero-American high school settings (Alonso-Tapia and Ruiz-Díaz, 2022). Additionally, evidence of concurrent validity with AS in the pedagogic environment was obtained ($r = 0.722$). These findings contribute to the cross-cultural validity of the CMC-Q, supporting its use in various Latin American university contexts, particularly in settings with high professor-student ratios and technology-based instruction.

Among the study's findings, slight differences emerged concerning specific CMC patterns. The components with the highest mean scores were *Inducing participation*, *Support to students' autonomy*, and *Regular feedback*. These components are grouped under CMCg3 "Learning to learn orientation" in the framework proposed by Bardelli and Huertas (2022). This grouping highlights aspects of classroom interaction that involve motivational support from professors, which has a significant impact on the quality of the instruction (Robinson, 2023). High scores on CMC scales, particularly for components with a relational focus, may reflect the positive relational qualities of teaching staff within a university context characterized by large class sizes. This finding aligns with the results from Kim & Lundberg (2016), who point out that the quality of student-professor rapport in university classrooms contributes to numerous positive outcomes.

Regarding the predictive value of CMC on AP, the study found a positive, significant, but low relationship between CMC (total CMC-Q score) and AP (final grades) in Uruguayan psychology undergraduates, with a correlation of $r = 0.155$ ($R^2 = 2.24\%$). This relationship closely mirrors findings from Abello et al. (2021) with Colombian undergraduates, who reported a similar effect size ($R^2 = 2,25\%$).

However, when we examine the predictive value of the CMC-Q components individually in relation to AP, the "Learning to learn orientation" group (CMCg3) proposed by Bardelli & Huertas Martínez (2022) was the only group with a significant positive predictive effect on AP, explaining 3.2% of the variance ($R^2 = 0.032$). Additionally, the components *Assessment for learning* and *Positive reinforcement/Effort acknowledgment* were the individual CMC elements with the highest predictive value for AP, collectively explaining 5.2% of the variance ($R^2 = 0.052$). These findings underscore five key dimensions of the TARGET model (Ames, 1992; Chazan et al., 2022) that are associated with authority, acknowledgment, groups, assessment and social relations. These dimensions are

closely linked to instructional quality (Robinson, 2023) and classroom interactions (Givens Rolland, 2012).

Although these align with previous studies, the relationship between CMC and AP remains somewhat inconclusive. It is important to consider the limitations of using final grades as a measure of AP. Grades can be influenced by factors such as instructor bias, varying assessment formats, and inconsistent grading criteria across different professors, introducing potential error in AP measurement. This limitation is supported by Pintrich et al. (1993), who argue that grades are not entirely reliable indicators of AP or learning. Therefore, employing assessment tools with continuous values that approximate a normal distribution, and are tied to objective indicators of AP, may offer a more robust alternative to address this limitation.

Beyond the challenges associated with measuring AP, it is also important to remark that AP is conditioned by numerous personal and context factors (Richardson et al., 2012). Given this, it is reasonable to expect that CMC would explain only a small portion of the variance in AP (Urda & Kaplan, 2020).

Limitations and directions ahead

This study has several limitations. First, an intentional (non-random) sample was used, consisting of participants who were readily accessible for the researchers. Future studies could aim to use a random sample to improve the generalizability of the findings. Additional limitations relate to the characteristics of the sample and study context; future research could expand to include students from different academic years, disciplines, universities and/or countries, allowing for an exploration of variations in social-demographic, institutional, disciplinary, or cultural factors.

As a cross-sectional study, this research does not allow for causal inferences. Longitudinal or quasi-experimental studies would be valuable for expanding our understanding of CMC in the context of large-group university education, as these designs could provide insights into causal relationships over time.

A key limitation involves the methods used for measuring and predicting AP. While final grades were used as an AP metric, as discussed earlier, this approach has limitations that may obscure the relationship between AP and contextual variables like CMC. Standardized tests could provide a less discretionary and potentially more objective measure of AP. Given that AP is influenced by multiple variables, it would be beneficial to design models including other personal and contextual factors related to students, professors, and institutions.

It is also important to point out that data collection occurred during a unique period—emergency remote teaching amid the Covid-19 pandemic—where other

factors may have impacted the variables studied. Future research should examine CMC in the context of distance or digital learning, which has singular features and may require a revised conceptual framework for the CMC-Q.

Moreover, future studies would benefit from going beyond self-report measures by integrating additional methods such as focus groups, in-depth interviews, and classroom observations. Including professors' perspectives, using mixed-method designs and/or triangulating different data collection techniques could contribute to a more multidimensional, dynamic, and nuanced understanding of CMC and its effects.

Finally, it is recommended that future research explore psychological variables that may mediate the relationship between CMC and AP, such as students' self-perception of AP, academic engagement, and learning motivation. Investigating these mediating factors could provide a more comprehensive understanding of the mechanisms through which CMC influences academic outcomes and would be a promising direction for further research.

Conclusions

The CMC-Q is a suitable instrument for use in university education contexts. This research provides evidence to support its internal and concurrent validity on a university level in Uruguay, particularly in settings characterized by large-group teaching and technology-based instruction. CMC showed a significant, positive, yet low predictive relationship with AP. The CMC-Q components with the strongest predictive value for AP were *Inducing participation*, *Support of the students' autonomy*, *Regular feedback*, *Assessment for learning* and *Positive reinforcement/Effort acknowledgment*. These results highlight specific patterns of teaching behavior that, when targeted for intervention and improvement, may lead to enhanced educational outcomes in large-group university settings.

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