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Influence of the teacher role on academic performance in primary education

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The extant academic literature indicates that both teaching styles and teacher-student relationships exert a significant influence on academic achievement. However, the interrelationship and joint influence of these factors on academic achievement remain underexplored areas of research. This article examines the role of the teacher as a "significant other" in primary education from the perspective of the student. The objectives of this study are threefold: (1) to analyze the relationship between teaching styles and academic achievement, (2) to analyze the relationship between teacher-student relationships and academic achievement, and (3) to determine the influence of the interrelationship between teaching styles and the teacher-student relationships on academic achievement. Structural equation models are estimated with four latent variables: two for the teaching styles (directive and participative) and two for the teacher-student relationships (affective and learning). Student achievement is assessed through the administration of proficiency tests in the following subject areas: Language Communication, English, Mathematics, and Science-Technology. The data presented in this study are derived from a census of 21,126 students in an outermost region of the European Union who were enrolled in the sixth grade of primary education during the 2018/2019 academic year. The findings indicate that the interrelationship between a participative style and teacher-student relationships exerts a positive influence on academic achievement. In contrast, the interrelationship between a directive style and teacher-student relationships has been found to have a negative effect. These findings underscore the influence of social interaction processes within the classroom on academic performance.

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Introduction

The processes of social interaction in the classroom have significant implications for students' overall school experiences (Bredo and Henry, 1996; Cohen, 1972; Delamont, 1984; Turner, 1983). In this context, teachers exert a significant influence on the educational outcomes of their students (Brophy, 1986; Grossman and Oplatka, 2020; Tierney and Kolluri, 2020; Valdner, 2014). This paper examines the impact of the teacher's role as a "significant other" from the student's perspective, focusing on teaching styles and teacher-student relationships.

While there is evidence that both teaching styles and teacher-student relationships are related to academic achievement, the interrelationship and joint influence of these factors remain understudied. This study aims to fill this gap by analyzing how different teaching styles and the quality of teacher-student relationships jointly influence academic performance in primary education. The findings presented here contribute to the broader analysis of the effects of classroom social interaction on academic achievement and provide insights that could inform educational practices and policies.

Literature review

The role of the teacher as "significant other". The importance of teachers in shaping students' educational experiences is a key tenet within the field of education (Clotfelter et al., 2006). In addition, there have been scientific contributions from other researchers (Cadima et al., 2010). It can be concluded that the teacher is seen as a "significant other" for the students. This concept refers to the social actors who influence the individual's perception through the processes of social interaction (Berger and Luckmann, 1995; Mead, 1972). The teacher is a figure with whom students interact for educational purposes, but they also communicate concerns, personal problems, or future expectations to the teacher (Galbo, 1989). The role of the teacher has a significant impact on a number of key factors, including student well-being, motivation, engagement, expectations, and achievement (Abello et al., 2020; Brophy, 1986; Chen et al., 2022; Creemers and Kyriakides, 2006; Daly et al., 2021; Ferrare, 2020; Hanushek, 2011; Kolluri and Tierney, 2020; Leder, 1987; Pollard, 1990; Valdner, 2014; Van den Broeck et al., 2020).

In order to analyze the role of the teacher as a "significant other," it is necessary to rely on the students' interpretation, as it allows us to identify the behaviors they perceive as relevant in their interaction with the teacher. Their perceptions contribute to a deeper understanding of their schooling and influence their educational response (Kunter and Baumert, 2006; Mantzicopoulos and Neuharth-Pritchett, 2003; Ralph, 2021; Thijs and Fleischmann, 2015; Van Uden et al., 2014; Wubbels and Brekelmans, 2005).

The study of the role of teachers is based on two key dimensions that affect their interactions with students in the classroom: the teaching style they use and the relationships they maintain. The academic literature indicates that both are associated with performance outcomes (Cohen, 1972; Filippello et al., 2020; Opdenakker and Van Damme, 2006; Thijs and Fleischmann, 2015).

Teaching styles and academic performance. The term "teaching style" is used to describe the strategies that educators use to facilitate the achievement of specific learning goals. Such strategies are manifested in the specific practices that are carried out in the classroom (Schwerdt and Wuppermann, 2011). A number of classification systems have been developed to define different teaching styles. In accordance with the above suggestions, two main categories have been delineated: those that are teacher-centered and those that are student-centered (Tobiason, 2021). In a teacher-centered approach, the teacher takes a leading role, directing the classroom dynamics by presenting content or directing activities to be carried out. In contrast, in student-centered approaches, students are expected to play an active role in the learning process, engage in cooperative learning, and participate in decision-making processes that affect the group. Although there is general agreement about the impact of instructional practices on academic achievement, there is no consensus about which practices are most effective (Chatoupis, 2009; Cordero and Gil-Izquierdo, 2018; Hattie, 2009; Kyriakides et al., 2013; Sang et al., 2020).

Given the effectiveness of teacher-centered approaches, both Zuzovsky (2013) and Bietenbeck (2014) conclude that these styles are associated with higher scores on Math and Science proficiency tests. Both use information from the TIMSS-2007 student questionnaires, in all participating countries and in the United States, respectively. In turn, Lavy (2016) compares and contrasts Israeli students' perspectives on instructional practices with their test scores in English, Hebrew, Mathematics, and Science in grades 5 and 8. The results, derived from the *Growth and Effectiveness Measures for Schools* (GEMS-2002 and 2005), indicate that the implementation of directive strategies has a more pronounced impact on academic achievement than participative strategies. Furthermore, research conducted in Australian schools highlighted the importance of instructional explanations within teacher-directed learning approaches, demonstrating significant impacts on science achievement (Cairns and Areepattamannil, 2022).

The academic literature also shows a correlation between learner-centered pedagogy and student achievement. Wolf and Fraser (2008) investigated eighth-grade students' perceptions of various science teaching practices. To this end, they employed the *What Is Happening In This Class?* (WIHIC) questionnaire. The results indicate a correlation between positive performance outcomes and the engagement in collaborative work, task-based learning, and reflective problem-solving practices. In contrast, Echazarra et al. (2016) analyze students' perceptions of the use of different teaching styles and their relationship to performance in Mathematics, using information from the PISA-2012 assessment. The highest-achieving students indicate that the most effective teaching practices include analytical thinking, problem solving using multiple methodologies, and applying knowledge in a variety of contexts. Similarly, Hidalgo-Cabrillana and Lopez-Mayan (2018) relate students' perceptions of instructional practices to their Mathematics and Language Communication tests. The 2009 General Diagnostic Evaluation for fourth grade indicated that student-centered styles were associated with higher achievement.

Teacher-student relationship and academic performance. The performance of specific roles creates linkages in social interaction processes (Blumstein, 2001; Kolluri and Tierney, 2020; Roseneil and Ketokivi, 2016). In education, the role of the teacher contributes to the creation of bonds that shape their relationships with students (Mantzicopoulos and Neuharth-Pritchett, 2003; Pianta, 1994). The academic literature points to the importance of teacher support for student well-being, motivation, engagement and achievement (Anderson et al., 2022; Goldman and Goodboy, 2014; Mantzicopoulos and Neuharth-Pritchett, 2003; OECD, 2019b; Sammons et al., 2016; Thijs and Fleischmann, 2015; Van Uden et al., 2014; Wubbels and Brekelmans, 2005).

Relationships between teachers and students have been analyzed in terms of the affective support (security, respect, listening, trust, etc.) and learning support (attention to academic development: understanding of subjects, answers to doubts, adaptation of content…) that students receive from teachers (Pianta, 1994; Skaalvik and Skaalvik, 2013).

Federici and Skaalvik (2014) use the *Self Description Questionnaire* to examine both types of relationships based on the responses of Norwegian students in grades eight and ten. Their results suggest that students with higher Math scores perceive greater affective and learning support. Meanwhile, the PISA 2018 report found that in most countries, students who perceived teacher support scored significantly higher in Language Communication skills (OECD, 2019b). Similarly, Ma et al. (2018) in a study conducted in China with 8th grade students in the subject of English, conclude that the quality of teacher-student relationships positively influences academic performance.

The interrelationship between teaching styles and teacher-student relationships. The role of teaching styles and the teacher-student relationship in performance requires an examination of the interrelationship between the two dimensions. The use of certain teaching styles influences the teacher-student relationship (Cardenal et al., 2023; Grasha, 1994; Thijs and Fleischmann, 2015). In particular, student-centered styles are more conducive to the development of positive relationships than teacher-centered styles (Anderson et al., 2022; Chatoupis and Emmanuel, 2003; Goldman and Goodboy, 2014; McCombs, 2004; Opdenakker and Van Damme, 2006; Zins, 2004).

Research on the effects of this relationship suggests that teaching styles that foster relationships with learners increase their interest, involvement, engagement, motivation, and well-being (Chatoupis, 2009; Chen et al., 2022; Genesee et al., 2006; Kulinna and Cothran, 2003; Roberts and Friedman, 2013; Zee and Koomen, 2020).

However, research examining the impact of these variables on performance has been conducted independently, with one strand of research examining the impact of teaching styles on performance and another strand examining the impact of relationships on performance. Cornelius-White (2007) conducted a meta-analysis of the effects of learner-centered styles and relationships on several areas of learning. In terms of achievement, she found positive effects of both teaching styles and relationships in Mathematics and Language Communication. On the other hand, Doherty and Hilberg (2008) analyze the impact of the *Five Standards Pedagogical* System (Tharp, 2000), a pedagogical approach that focuses on students and the relationships they form with teachers. Positive effects on performance in Math, Science and Language Communication have been shown.

To our knowledge, there are no studies that analyze the effects of teaching styles and student-teacher relationships together, as we do in this study.

Hypotheses. The research questions we consider in this study address the relationship between students' perceptions of the teacher's role and their academic performance: Is perceived teaching style independent of performance? Is perceived relationship with teacher independent of performance? Does the perception of the teacher's role influence performance? Our hypotheses are as follows:

H1: Students' perceptions of teaching styles (directive and participative) are related to their performance.

H2: Students' perception of their relationship with teachers (affective and learning) is related to their performance.

H3: Students' perceptions of teacher role influence their performance (Fig. 1).

Since the role of the teacher involves both teaching styles (directive and participative) and the student-teacher relationship (affective and learning), the latter hypothesis can be further elaborated in the following hypotheses.

H3.1: Teaching style (directive and participative) has a direct impact on student performance.

H3.2: The affective relationship mediates the direct influence of the teaching style (directive and participative).

H3.3: The learning relationship mediates the direct influence of the teaching style (directive and participative).

The first two hypotheses are based on the existing consensus on the relationship between teaching styles (Cordero and Gil-Izquierdo, 2018) and teacher-student relationships (OECD, 2019b) with academic performance. Hypothesis 3 examines the interrelationship between the two dimensions of the teacher role and their influence on performance (Opdenakker and Van Damme, 2006).

Methodology

Database. The database used is the 2018/2019 Diagnostic Evaluation carried out in an outermost region of the European Union, the Canary Islands. This is an instrument carried out by the Canarian Agency for University Quality Assurance and for Educational Assessment (ACCUEE, in its Spanish spelling) –an autonomous body attached to the Ministry of Education of the Government of the Canary Islands–, whose objective is to evaluate the Canary Islands education system. This source of information is annual and, in the school year under study, has the character of a census. It was applied to all students in the Canary Islands who were in the 6th year of primary education and the 4th year of compulsory secondary education, the last years of primary and secondary education, respectively. The diagnostic evaluation consists, on the one hand, of contextual questionnaires filled in by students, families, teachers and school management. On the other hand, competency tests are administered, as in international assessments such as PISA, PIRLS or TIMSS. The results of these tests are collected on a continuous scale (standardized to a mean of 500 and a standard deviation of 100) and on an ordinal scale, which is recategorized into four performance levels (1: low, 2: medium-low, 3: medium-high, and 4: high).

This research uses data from students in the 6th grade of primary education, with a total of 21,126 students. Table 1 shows their distribution according to their level of performance in the four competencies assessed: Language Communication, English, Mathematics and Science-Technology.

Student performance follows a normal distribution. Level 1 (Low) and Level 4 (High) students are more than one standard deviation away from the mean, while Level 2 (Lower-Middle) and Level 3 (Upper-Middle) students are less than one standard deviation away.

Method. In order to define the role of the teacher, a series of questions were selected from the questionnaire completed by the students. Two latent variables for teaching styles (directive and participative) and two latent variables for the teacher-student relationship (affective and learning), measured on a continuous scale and standardized to mean 0 and standard deviation 1, were then established using confirmatory factor analysis. A structural equation model (SEM) was then estimated, the result of which indicated that teaching styles influence the teacher-student relationship. The theoretical background, methodological details, validation of the scales, and results of these operations were thoroughly developed and validated through rigorous analysis,

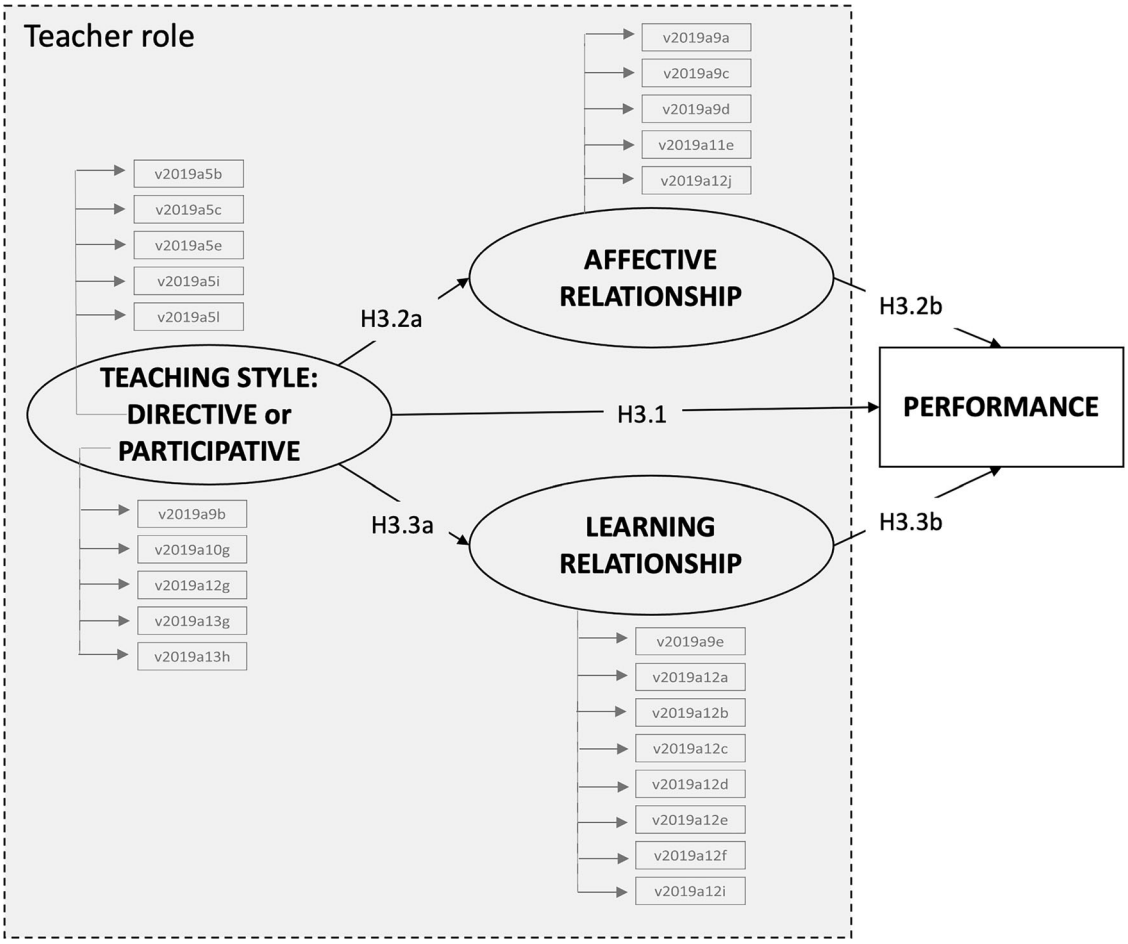

Fig. 1 Hypothesis 3.

Table 1 Distribution of students according to their level of performance.

Competencies	Categories	Frequencies
Language Communication	Level 1	15.5
	Level 2	34.3
	Level 3	34.0
	Level 4	16.2
English	Level 1	16.6
	Level 2	34.3
	Level 3	32.2
	Level 4	16.9
Mathematics	Level 1	15.3
	Level 2	37.3
	Level 3	31.0
	Level 4	16.4
Science-Technology	Level 1	16.2
	Level 2	34.4
	Level 3	32.8
	Level 4	16.6

ensuring the robustness of our findings (Cardenal, Díaz-Santana and González-Betancor, 2023).

As a first approach to hypotheses H1 and H2, a descriptive analysis was carried out. For this purpose, the teacher role variables were recoded into three ordinal categories (High, Medium, and Low), distributing one-third of the population into each level, which allowed us to compare them to academic performance levels. To explore these relationships, non-parametric tests (Kruskal-Wallis and Dunn's test) were applied, given the ordinal nature of the categorized variables.

This analysis was not part of the SEM model, but rather a preliminary, exploratory step with a descriptive purpose. Our goal was not to estimate parameters such as means or standard deviations, but rather to compare distributions across performance levels and offer an intuitive view of the relationship between students' perceived teacher roles and academic performance. It also served to visualize patterns prior to the estimation of SEM models and to support the pedagogical interpretation of the findings, without assuming normality. This approach was particularly appropriate given that the perception variables used in this stage were ordinal, not continuous.

Finally, hypothesis H3 was tested by estimating SEM models that measure the influence of the teacher's role on academic performance. These models allowed us to estimate the influence of the independent variables (direct effects), the relationships between the independent variables (indirect effects), and the joint influence of all the independent variables (total effect) on the dependent variable (Bielby and Hauser, 1977). These effects were represented by their standardized coefficients. The estimation method used was the quasi-maximum likelihood method, adjusted with the Satorra-Bentler statistics, which allowed estimation in the absence of joint normality in the distributions of the variables.

In addition to the variables studied, control variables considered relevant in the literature (gender, ISEC, relative age and nationality) were included, especially at this stage of

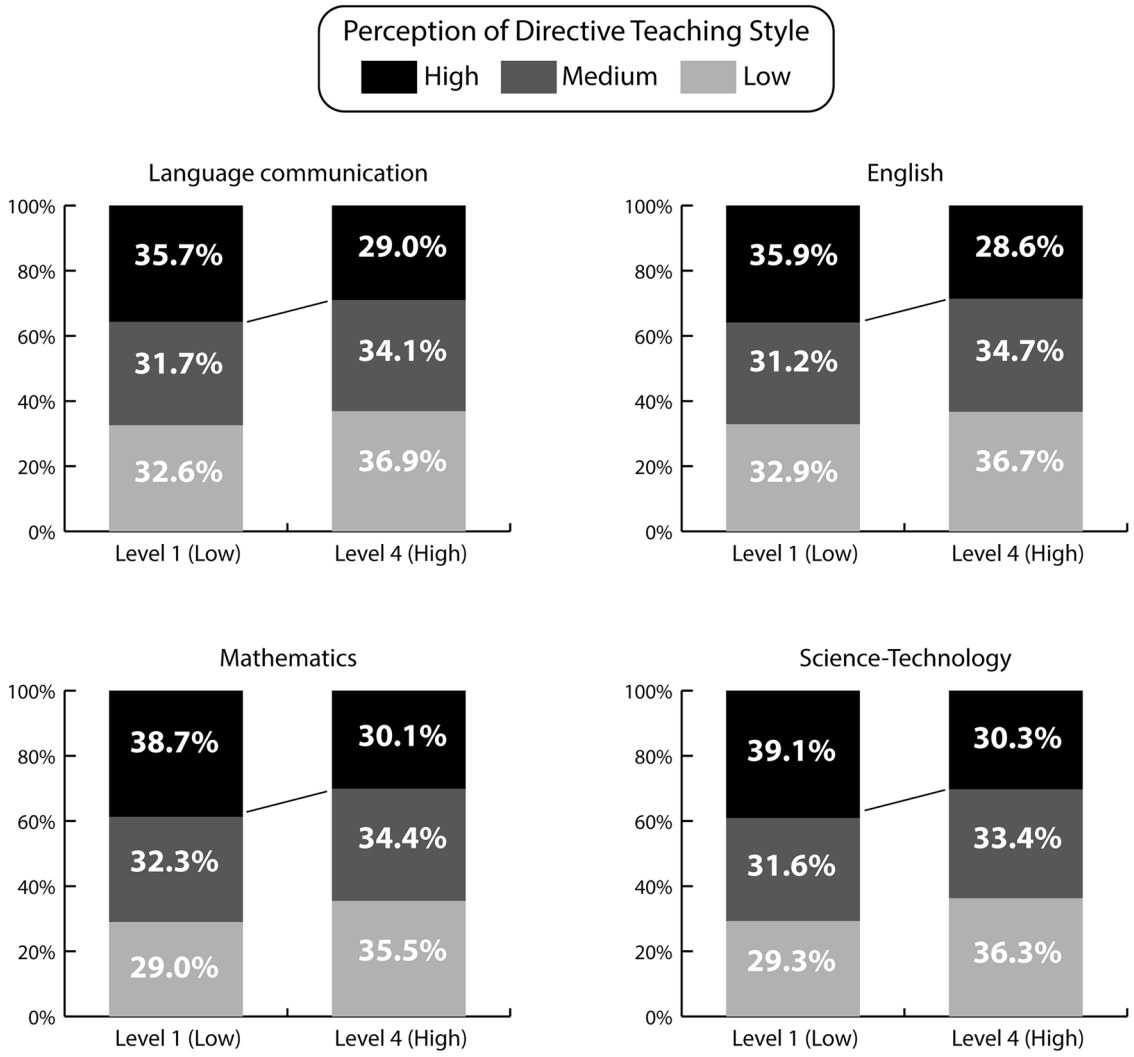

Fig. 2 Perceptions of directive teaching style by academic performance.

education (González-Betancor and López-Puig, 2015b, 2015a) in order to avoid omitting relevant variables.

Calculations and statistical analyses were performed using StataSE 17 (StataCorp, 2021).

Results

Descriptive analysis. Below are the grouped bar charts that relate Academic Performance (x-axis) to Teacher Role (y-axis). These results are presented in sets of four charts, one set for each Teacher Role variable. The graphs present a comparison between low performers (Level 1) and high performers (Level 4). Within each proficiency level, the degree of perception (high, medium, and low) of the corresponding teacher role variable is shown.

Figure 2 shows the distribution of directive style by proficiency level. The lowest performing students (Level 1) perceive a high use of directive style more frequently than the highest performing students (Level 4).

In language skills, the perception of a high use of directive style is 7% higher among the lowest performing students (Language Communication: 35.7%—English: 35.9%) than among the highest performing students (Language Communication: 29%—English: 28.6%). As far as scientific competencies are concerned, the difference reaches 9%: students with level 1 who perceive a high use of directive style represent 38.7% in Mathematics and 39.1% in Science-Technology, while for students with level 4 it decreases to 30.1% and 30.3% respectively. Therefore, the presence of a high directive style among the lowest performing students is somewhat higher in Science than in Language.

In Fig. 3 the participative teaching style is analyzed. In this case, the opposite phenomenon occurs: the better the performance (level 4), the higher the perception of a high use of the participative teaching style.

The differences between the top and bottom performers in terms of perceived high use of the participative style are 3% in Language Communication and 4% in English. For scientific literacy, the differences are 1% in Mathematics and 3% in Science-Technology. In Mathematics, the difference is smaller than in the other competencies.

Figure 4 shows how a high affective relationship is perceived more by higher performing students.

Specifically, a greater presence of the high affective relationship is observed in the students with the best performance in language skills: the perception is 8% higher than that of the students with the worst performance. In scientific skills, the difference decreases to 5%.

Figure 5 shows the learning relationship. Higher performing students are more likely than lower performing students to perceive the learning relationship as high.

The high learning relationship is 5% higher for students with better performance in Language Communication and 3% higher

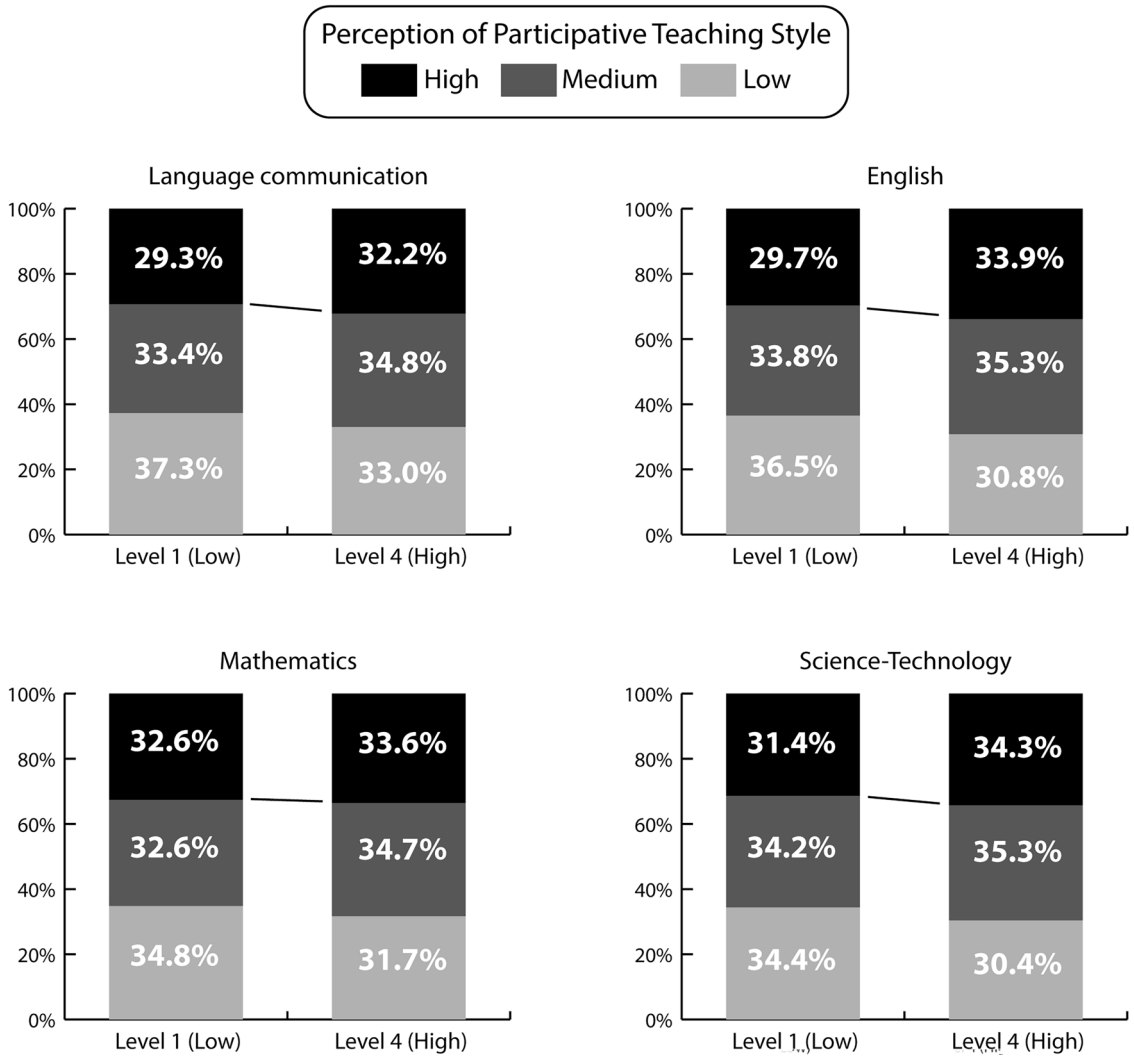

Fig. 3 Perceptions of participative teaching style by academic performance.

in English. In the scientific competencies, the differences are 3% in Mathematics and 2% in Science-Technology. Therefore, in Language Communication, the high learning relationship of the best performing students is more frequent than in the other competencies.

Non-parametric contrasts. Tables 2–5 show the results of the Kruskal-Wallis tests contrasting perceptions of the teacher's role at all levels of performance (1: low, 2: medium-low, 3: medium-high, and 4: high) of the four competencies.

Directive style (Table 2) shows significant differences in both language skills (Language Communication: $Chi^2 = 38.74$, $p = 0.000$; English: $Chi^2 = 55.35$, $p = 0.000$) and in scientific skills (Mathematics: $Chi^2 = 75.74$, $p = 0.000$; Science-Technology: $Chi^2 = 73.72$, $p = 0.000$). For all competencies, the mean ranks decrease as the level of performance increases: the lower the perceived directive style, the better the performance. Dunn's test shows that in Language Communication and English, the directive style is perceived differently at all performance levels, except between the low (level 1) and medium-low (level 2) levels, where the differences are not statistically significant. In Mathematics and Science-Technology, the only contrast that does not show significant differences is between levels 3 and 4 (medium-high and high performance).

In the Participative style (Table 3) significant differences are observed in all competencies except Mathematics ($Chi^2 = 3.33$, $p = 0.344$). On this occasion, the perception of the participative style is associated with better performance, as the average ranks increase with each level of performance. In Language Communication, there are differences both between Level 1 and the rest and between Level 3 and 4. In English there are differences between level 1 and the rest, while in Science-Technology there are differences between level 4 and the lower levels.

The two tables above confirm Hypothesis 1 that students' perceptions of teaching styles are related to their performance. This relationship is negative in the directive style for all four competencies, while in the participative style, the relationship is positive in the competencies of Language Communication, English, and Science-Technology. There are no significant differences in Mathematics.

Regarding the affective relationship (Table 4), there are significant differences in all the competencies (Language Communication: $Chi^2 = 51.80$, $p = 0.000$; English: $Chi^2 = 54.46$, $p = 0.000$; Mathematics: $Chi^2 = 34.13$, $p = 0.000$; Science-Technology: $Chi^2 = 39.15$, $p = 0.000$). The higher the perceived affective relationship, the better the performance. In Language Communication, differences are observed between all levels of performance except the two highest (3/4). In English, differences are observed between all levels. In Mathematics, the only contrast

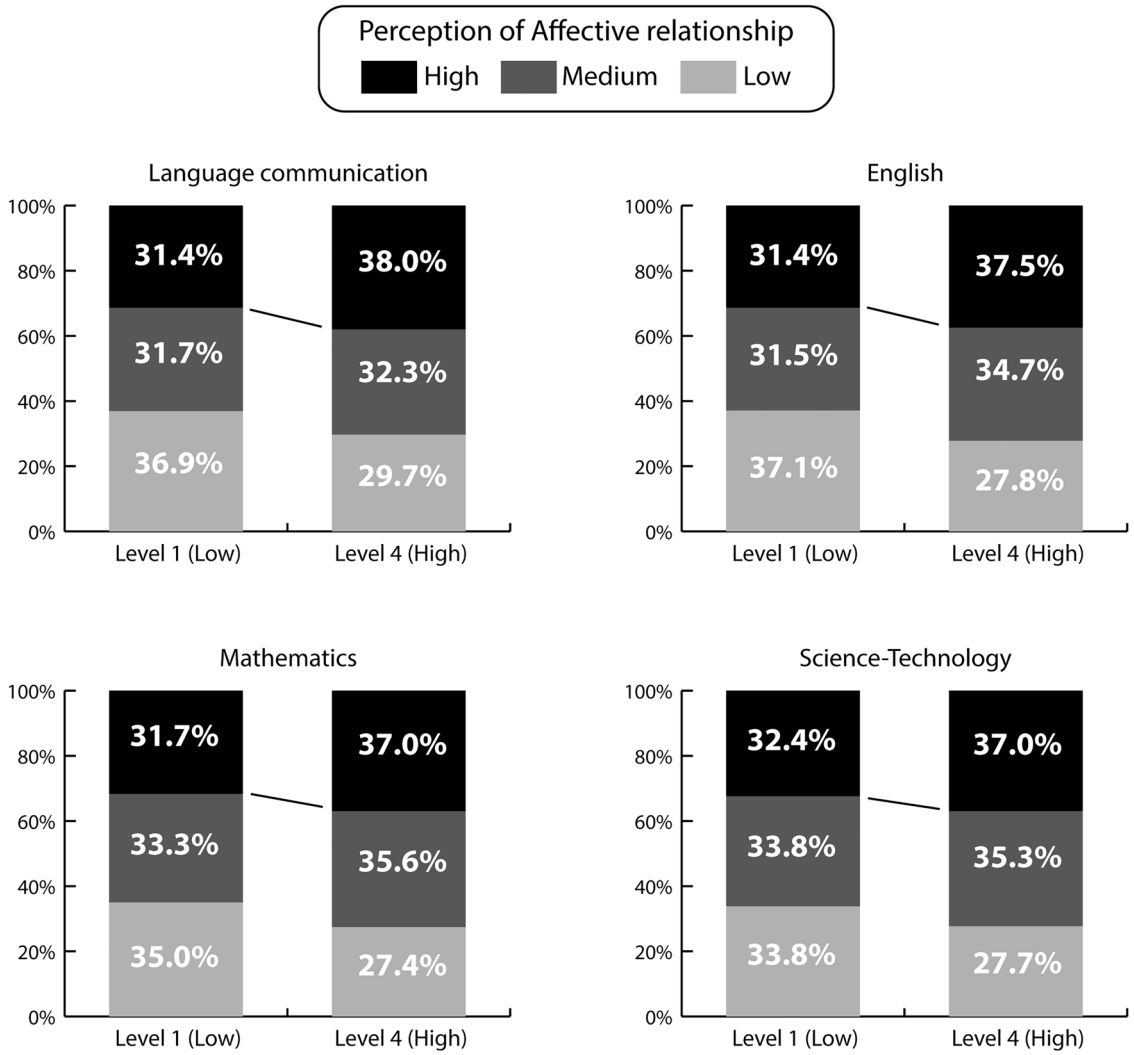

Fig. 4 Perceptions of affective relationship by academic performance.

that shows no differences is 2/3. In Science-Technology, there are differences between all groups except 1/2.

The learning relationship (Table 5) also shows differences in all competencies (Language Communication: $Chi^2 = 39.85$, $p = 0.000$; English: $Chi^2 = 21.24$, $p = 0.000$; Mathematics: $Chi^2 = 11.61$, $p = 0.009$; Science-Technology: $Chi^2 = 16.66$, $p = 0.001$). The perception of this type of relationship increases at each level of performance. Differences in Language Communication are observed between all groups except for contrast 3/4. In English, there are differences between level 1 and the other groups. In Mathematics, there are only differences between levels 1/4 and 2/4. Finally, in Science-Technology, differences are observed between levels 1/3, 1/4 and 2/4.

Tables 4 and 5 allow us to accept Hypothesis 2, that students' perception of the affective and learning relationship is positively related to their performance in the four competencies.

SEM models. The following tables present the SEM models to test Hypothesis H3 and its sub-hypotheses H3.1, H3.2 and H3.3. Table 6 shows the estimation of the four models for directive style, one for each competency, as well as the goodness of fit of each model. Table 7 shows the same information for the participative style. All models show a good fit, as the indices for both teaching styles have adequate values (RMSEA < 0.05; CFI > 0.9; TLI > 0.9; $R^2_{Total} > 0.60$).

Table 6 shows that the directive style directly and negatively influences performance (H3.1), but positively influences the affective relationship (H3.2a) and the learning relationship (H3.3a), in all four competencies. In contrast, the direct effect of the affective and learning relationship is significant only in English, being positive in the case of the affective relationship (H3.2b) and negative in the case of the learning relationship (H3.3b). Therefore, the indirect effect of directive style is only mediated by the affective relationship (H3.2) and by the learning relationship (H3.3) in English. The coefficient of the directive style mediated by the affective relationship is finally positive (0.115**), while that mediated by the learning relationship is negative (−0.100*). These results allow us to accept hypothesis H3.1 for the directive teaching style in the four competencies, and hypotheses H3.2 and H3.3 only in English.

Finally, the total effect of directive style on performance is reported, taking into account the interrelationship with the affective relationship and the learning relationship (H3). In the four competencies, their joint influence is negative (Language Communication: −0.025*; English: −0.035**; Mathematics:

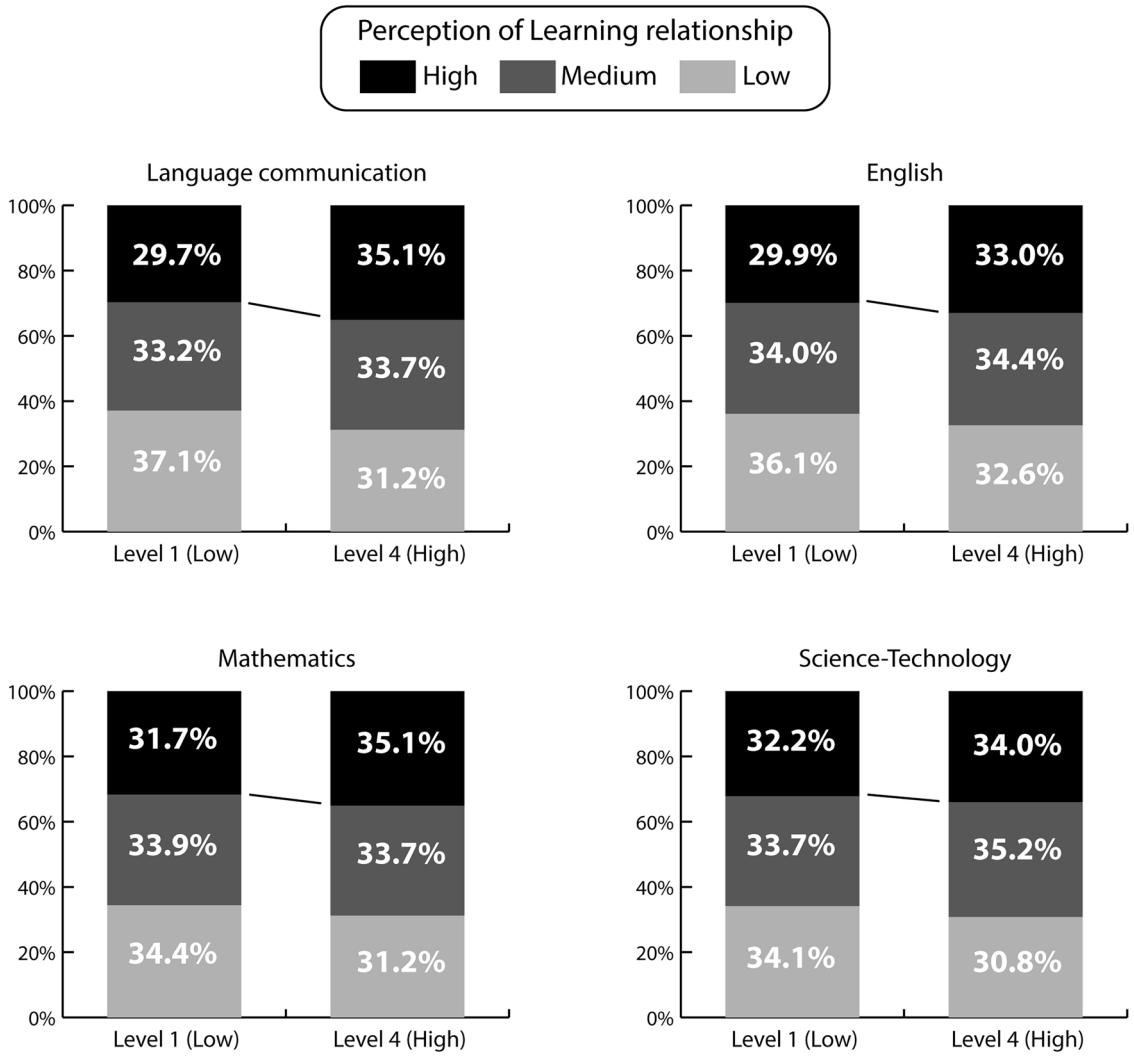

Fig. 5 Perceptions of learning relationship by academic performance.

Table 2 Non-parametric tests for directive teaching styles and performance levels.

DIRECTIVE	Average range				Chi^2 (p)	Dunn ($p < 0.1$)
	Level 1	Level 2	Level 3	Level 4		
Language Communication	8665.5	8573.2	8349.3	7955.3	38.741 **(0.0001)**	1/3; 1/4; 2/3; 2/4; 3/4
English	8680.6	8672.4	8322.4	7928.8	55.346 **(0.0001)**	1/3; 1/4; 2/3; 2/4; 3/4
Mathematics	9057.2	8526.8	8150.5	8081.5	75.741 **(0.0001)**	1/2; 1/3; 1/4; 2/3; 2/4
Science-Technology	9073.3	8553.8	8238.6	8070.3	73.722 **(0.0001)**	1/2; 1/3; 1/4; 2/3; 2/4

Variables with significant differences are in bold.

Table 3 Non-parametric tests for participative teaching style and performance levels.

PARTICIPATIVE	Average range				Chi^2 (p)	Dunn ($p < 01$)
	Level 1	Level 2	Level 3	Level 4		
Language Communication	7872.8	8445.1	8613.4	8390.5	41.450 **(0.0001)**	1/2; 1/3; 1/4; 3/4
English	7944.8	8483.4	8508.2	8631.2	34.297 **(0.0001)**	1/2; 1/3; 1/4
Mathematics	8276.6	8423.7	8401.4	8517.1	3.330 (0.3435)	-
Science-Technology	8241.9	8389.1	8461.2	8715.7	14.353 **(0.0025)**	1/4; 2/4; 3/4

Variables with significant differences are in bold.

Table 4 Non-parametric test for affective relationship and performance levels.

AFFECTIVE	Average range				Chi² (p)	Dunn (p < 0.1)
	Level 1	Level 2	Level 3	Level 4		
Language Communication	7949.1	8403.7	8670.7	8796.0	51.797 **(0.0001)**	1/2; 1/3; 1/4; 2/3; 2/4
English	8016.9	8429.1	8636.7	8927.6	54.458 **(0.0001)**	1/2; 1/3; 1/4; 2/3; 2/4; 3/4
Mathematics	8133.3	8404.2	8565.5	8873.8	34.127 **(0.0001)**	1/2; 1/3; 1/4; 2/4; 3/4
Sciencie-Technology	8246.1	8361.3	8627.9	8948.8	39.149 **(0.0001)**	1/3; 1/4; 2/3; 2/4; 3/4

Variables with significant differences are in bold.

Table 5 Non-parametric test for learning relationship and performance levels.

LEARNING	Average range				Chi² (p)	Dunn (p < 0,.1)
	Level 1	Level 2	Level 3	Level 4		
Language Communication	7998.9	8422.4	8647.6	8735.1	39.845 **(0.0001)**	1/2; 1/3; 1/4; 2/3; 2/4
English	8122.5	8554.9	8609.7	8612.5	21.242 **(0.0001)**	1/2; 1/3; 1/4
Mathematics	8299.8	8428.8	8524.7	8724.0	11.613 **(0.0088)**	1/4; 2/4
Science-Technology	8364.0	8406.0	8592.4	8803.3	16.659 **(0.0008)**	1/3; 1/4; 2/4

Variables with significant differences are in bold.

−0.041**; Science-Technology: −0.053***). These coefficients support, for this style, Hypothesis H3: The students' perception of the teacher's role affects their performance, in this case negatively.

Table 7 shows that the participative style has a negative effect on performance (H3.1), but a positive effect on both the affective relationship (H3.2a) and the learning relationship (H3.3a). The direct effect of the affective relationship is positive for all four competencies (H3.2b). However, the learning relationship has a negative effect only in English (H3.3b). The indirect effect of the participative style is mediated by the affective relationship (H3.2) in all competencies (Language Communication: 0.403*; English: 0.543**; Mathematics: 0.652**; Science-Technology: 0.531**), while it is only mediated by the learning relationship (H3.3) in English (−0.250**).

To facilitate the interpretation of the mediation pathways, the following path diagram (Fig. 6) presents the main standardized estimates between the latent constructs. For the sake of clarity, control variables (gender, ISEC, relative age, and nationality) have been excluded from the diagram but were included in all models. Detailed estimates for these covariates are reported in the corresponding results tables. This visual representation highlights the direct and indirect effects between teaching styles, teacher-student relationships, and academic performance across the different subject areas.

The total effect of the participative style, taking into account the interaction with the affective relationship and the learning relationship, on performance (H3) is positive in Language Communication (0.023*), English (0.035***), and Science-Technology (0.034**), while it is not significant in Mathematics. These results partially confirm hypothesis H3: Students' perception of the teacher's role is associated with their academic performance. In the case of the participative teaching style, it has a positive influence on performance in all competencies except in Mathematics.

While the total effects may appear modest, the decomposition provided by the SEM framework reveals a more nuanced picture. In the case of the participative style, for example, a small negative direct effect is compensated by a stronger positive indirect effect mediated by the affective relationship. This highlights the value of the mediation model in uncovering mechanisms that would remain hidden if only total effects were considered.

Finally, four control variables were included in all models. In terms of gender, females perform better in Language Communication and English and males in Mathematics, while there are no differences in Science-Technology. The SES (Socio-Economic and Cultural Index) is positively related to performance in all four skills. The quarter of birth indicates that the younger the age, the lower the performance in all four skills. Finally, students born in a non-Spanish-speaking country (European or other) perform worse than those born in Spain in Language Communication and in Science-Technology. In English, those born in Spain perform better than those born in a Spanish-speaking country, but worse than those born in a non-European country. In Mathematics, those born in a Spanish-speaking country score lower than those born in Spain.

Discussion

Our findings suggest that the learner's perspective allows for an adequate analysis of the processes of social interaction in the classroom. Kunter and Baumert (2006) contrasted teachers' and students' perspectives on teaching practices and concluded that students' perceptions are as valid as teachers'.

Regarding the study of teaching styles and performance alone (H1), our results indicate a negative relationship with the directive style and a positive relationship with the participative style. These results are not consistent with research indicating a stronger effect of teacher-centered approaches (Bietenbeck, 2014; Cairns and Areepattamannil, 2022). On the contrary, the results are consistent with Hidalgo-Cabrillana and Lopez-Mayan (2018), as they show how students who perceive a high use of the participative style perform better.

Regarding the analysis of teacher-student relationships and performance alone (H2), our results are in line with the existing consensus (Van Uden et al., 2014; Wubbels and Brekelmans, 2005). Students' perceived teacher support, or lack thereof, has an impact on their educational achievement (Pianta, 1994).

One of the most important contributions of this research is the study of the interrelationship between teaching styles and the teacher-student relationship (H3). Its analysis allows us to understand the impact of the teacher's role on the students' school experience (Opdenakker and Van Damme, 2006). SEM

Table 6 Results of the SEM models for directive style on performance in the four competencies.

		COMPETENCIES			
	Hypothesis: VARIABLES OF INTEREST	Lang.Comp.	English	Mathemat.	Science-Tech.
DIRECT EFFECTS	H3.1: Directive	**-0.075*** **	**-0.050** **	**-0.062*** **	**-0.088*** **
	H3.2a: Directive → Affective	**0.411*** **	**0.412*** **	**0.409*** **	**0.412*** **
	H3.2b: Affective	-0.053	**0.280** **	0.146	0.174
	H3.3a: Directive → Learning	**0.477*** **	**0.478*** **	**0.477*** **	**0.481*** **
	H3.3b: Learning	0.150	**-0.210***	-0.082	-0.076
	CONTROL VARIABLES (Reference category)				
	Sex (Female)				
	Man	-0.139***	-0.107***	0.039***	-0.004
	ISEC	0.199***	0.415***	0.273***	0.284***
	Quarter of birth (Q1)				
	Q2	-0.007	-0.031***	-0.038***	-0.028**
	Q3	-0.048***	-0.045***	-0.063***	-0.065***
	Q4	-0.078***	-0.086***	-0.063***	-0.090***
	Country of birth (Spain)				
	Spanish-speaking country	-0.012	-0.047***	-0.035***	-0.003
	European country	-0.021*	0.014	0.009	-0.036***
	Other country	-0.032**	0.029***	-0.003	-0.031**
INDIRECT EFFECTS	H3.2: Directive → Affective → Competency	-0.022	**0.115** **	0.060	0.072
	H3.3: Directive → Learning → Competency	0.072	**-0.100***	-0.039	-0.039
TOTAL EFFECTS	H3: Directive → Competency	**-0.025***	**-0.035** **	**-0.041** **	**-0.053*** **
GoF	$X^2_{(291)}$ (p<.05)	2621.06	2682.05	2706.42	2718.73
	RMSEA	0.031	0.031	0.031	0.031
	IFC	0.930	0.930	0.927	0.928
	TLI	0.922	0.923	0.919	0.920
	R^2_{Total}	0.607	0.658	0.615	0.619

$p < 0.10$ (*); $p < 0.05$ (**); $p < 0.01$ (***).
Shaded rows refer to control variables.

models confirm that both directive and participative teaching styles have a positive influence on the affective and learning relationship (Grasha, 1994; Thijs and Fleischmann, 2015).

However, the effect of the participative style on both types of relationships is greater than that of the directive style in all four competencies. The greater influence of the participative style on teacher-student relationships is consistent with Anderson et al. (2022), who suggest that student participation improves relationships with teachers. The differences in teacher relationships created by one teaching style or another affect the generation of different interaction dynamics in the classroom (Chatoupis and Emmanuel, 2003; Wang et al., 2016).

On the other hand, the direct effect of directive style is negative in all four competencies, while teacher-student relationships affect only English: the affective relationship positively and the learning relationship negatively. The indirect effects (Table 6) show that the coefficient of the directive style mediated by the affective relationship in English is positive (0.115**). Comparing this result with the direct effect of directive style (−0.050**), it can be seen that its negative influence is offset by affective relationships. However, the coefficient of this style mediated by the learning relationship has its negative sign reinforced by another negative sign (−0.100*).

This apparent contradiction –where the directive style may strengthen the affective relationship but still lead to worse academic performance– can be understood as a tension between affective proximity and instructional rigidity. In contexts like English, a directive teacher may be perceived as caring or structured, which supports affective closeness. However, this style may simultaneously restrict students' autonomy or engagement in the learning process, as reflected in the negative role of the learning relationship (Lee and Boo, 2022). Therefore, affective bonds alone are not sufficient to compensate for the instructional limitations of directive teaching practices (Dalton-Puffer and Nikula, 2006; Roorda et al., 2017).

The direct influence of the participative style is negative in all four competencies. The affective relationship is also positive in all four competencies, in contrast to the directive style, where it is significant only in English. In turn, the influence of the learning relationship is consistent with the results of the directive style. Moreover, the indirect effects of the participative style (Table 7) mediated by the affective relationship are positive in all competencies (Language Communication: 0.403*; English: 0.543**; Mathematics: 0.652**; Science-Technology: 0.531**), so that the direct and negative effects of the participative style are compensated by its indirect effects mediated by the affective relationship. The effect of the participative style mediated by the learning relationship, on the other hand, remains negative in English (−0.250**), thus accentuating the negative coefficient of the direct influence.

Comparing the indirect effects of the two teaching styles on performance, the importance of the affective relationship can be

Table 7 Results of the SEM models for participative style on performance in the four competencies.

		COMPETENCIES			
	Hypothesis: VARIABLES OF INTEREST	Lang.Comp.	English	Mathemat.	Science-Tech.
	H3.1: Participative	**-0.472*** **	**-0.259***	**-0.531*** **	**-0.366****
	H3.2a: Participative → Affective	**0.959*** **	**0.961*** **	**0.960*** **	**0.960*** **
	H3.2b: Affective	**0.420***	**0.565****	**0.679*** **	**0.553****
	H3.3a: Participative → Learning	**0.934*** **	**0.936*** **	**0.935*** **	**0.936*** **
	H3.3b: Learning	0.099	**-0.267****	-0.129	-0.141
DIRECT EFFECTS	CONTROL VARIABLES (Reference category)				
	Sex (Female)				
	Man	-0.140***	-0.108***	0.039***	-0.004
	ISEC	0.198***	0.416***	0.275***	0.287***
	Quarter of birth (Q1)				
	Q2	-0.008	-0.032***	-0.035***	-0.026**
	Q3	-0.047***	-0.044***	-0.061***	-0.063***
	Q4	-0.079***	-0.086***	-0.063***	-0.088***
	Country of birth (Spain)				
	Spanish-speaking country	-0.013	-0.049***	-0.036***	-0.005
	European country	-0.023**	0.013	0.008	-0.036***
	Other country	-0.029**	0.031***	-0.001	-0.030**
INDIRECT EFFECTS	H3.2: Participative → Affective → Competency	**0.403***	**0.543****	**0.652****	**0.531****
	H3.3: Participative → Learning → Competency	0.092	**-0.250****	-0.121	-0.132
TOTAL EFFECTS	H3: Participative → Competency	**0.023***	**0.035*** **	0.000	**0.034****
GoF	$X^2_{(291)}$ (p<.05)	3712.54	3786.27	3749	3854.06
	RMSEA	0.037	0.037	0.037	0.038
	IFC	0.912	0.914	0.912	0.910
	TLI	0.903	0.904	0.902	0.900
	R^2_{Total}	0.936	0.947	0.939	0.939

$p < 0.10$ (*); $p < 0.05$ (**); $p < 0.01$ (***).
Shaded rows refer to control variables.

observed. Especially in the participative style, since the coefficients are significant in all four competencies. These findings are consistent with Goldman and Goodboy (2014), who highlight the influence of student-centered strategies on the creation of emotional bonds, as well as the relationship of these bonds with student learning and well-being.

Finally, the total effects show how the interrelationship between teacher role dimensions influences the overall effect of teaching style on performance by modulating its direct effect through the type of teacher-student relationship. The joint mediated effect of the directive style is negative in all four competencies. In contrast, the joint mediated effect of the participative style is positive in Language Communication, English, and Science-Technology. The absence of significant total effects for the participative style on mathematics performance may be explained, at least in part, by the influence of other variables included in the model –particularly those related to students' social background–. These variables tend to have a strong and consistent association with academic outcomes and may therefore attenuate the unique contribution of the interrelationship between teaching styles and teacher-student relationships (Bittmann, 2022; Caro et al., 2016; Kelz and Krammer, 2024). Additionally, it is important to consider the specific characteristics of the mathematics domain, which often requires high levels of procedural and conceptual understanding and may be less responsive to relational or participative teaching styles compared to other subjects (Cordero and Gil-Izquierdo, 2018; Lavy, 2016; Zuzovsky, 2013).

These aggregate effects underscore the importance of the teacher's role as a "significant other" for learners (Van Uden et al., 2014). Although the academic literature points to the influence of teaching styles and the teacher-student relationship independently on achievement (Cornelius-White, 2007; Doherty et al., 2003; Doherty and Hilberg, 2008; Hattie, 2009), to our knowledge the effect of their interrelationship has not been studied. Our results indicate that the joint influence of directive style and the relationships it generates negatively affects performance, in contrast to the positive joint influence of participative style and relationships. These findings add to the contributions that point to the positive associations observed in the mediation between student-centered teaching styles and teacher-student relationships on educational outcomes (Chatoupis, 2009; Chen et al., 2022; Genesee et al., 2006; Kulinna and Cothran, 2003; Roberts and Friedman, 2013; Zee and Koomen, 2020).

Although the directionality assumed in our model is grounded in established theoretical frameworks, we acknowledge that the cross-sectional nature of our data limits the possibility of confirming causal order. It is conceivable, for instance, that academic performance may also influence how students perceive their relationship with teachers or interpret teaching practices. Future research using longitudinal or experimental designs would be

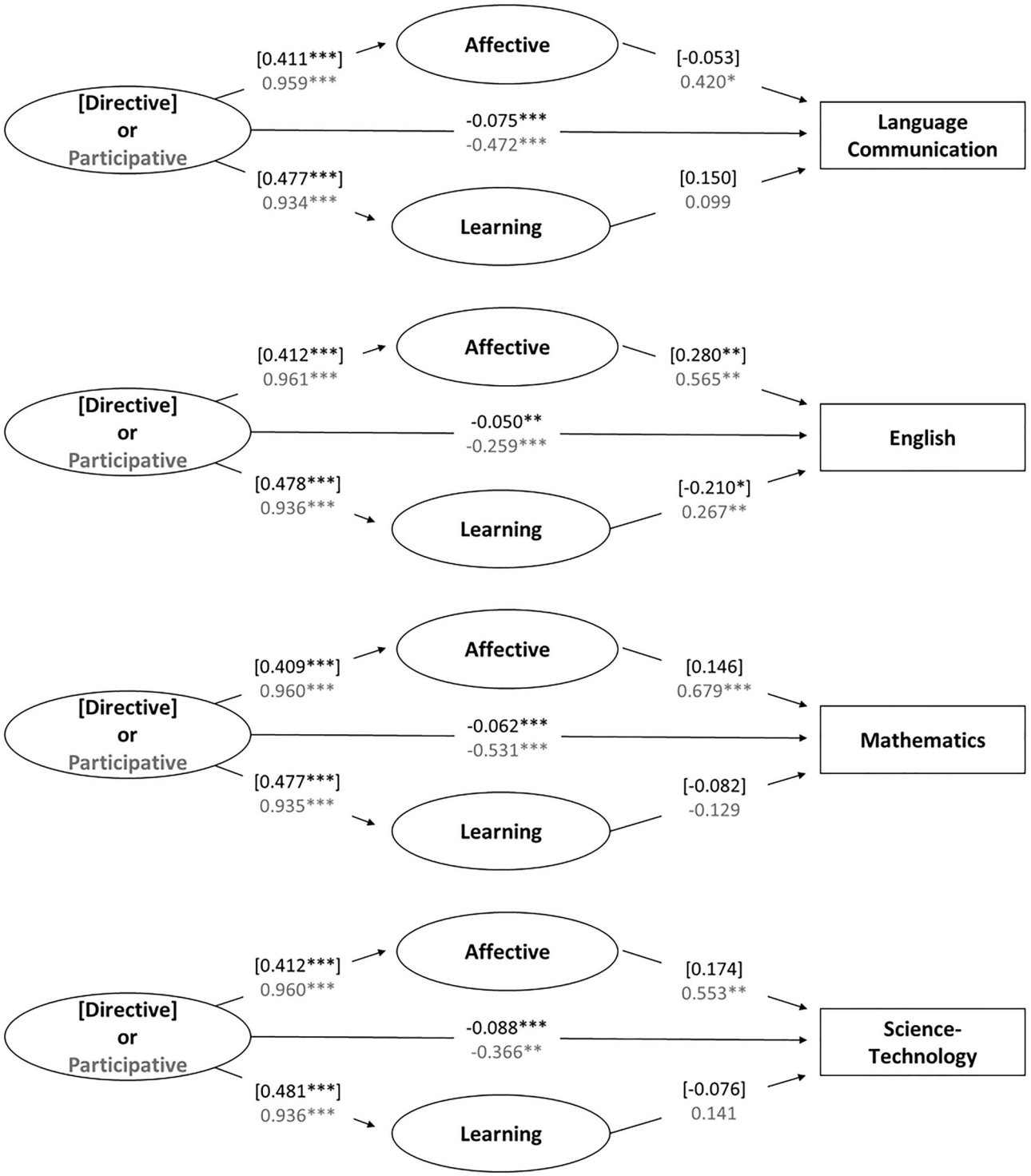

Fig. 6 Path diagram of the structural model: Effects of teaching styles and teacher-student relationships on academic performance. Note. Standardized coefficients are shown. $p < 0.10$ (*); $p < 0.05$ (**); $p < 0.01$ (***). Control variables were included in the model but are not displayed in the diagram.

necessary to test alternative causal pathways and verify the temporal sequence of these associations.

Conclusions

The main contribution of this research is to demonstrate the importance of social interaction and, in particular, the role of the teacher as a "significant other" in the educational experience of students (Hanushek, 2011; Tierney and Kolluri, 2020; Valdner, 2014; Van den Broeck et al., 2020). The classroom is the context in which these interaction processes are materialized, and the place of teachers and their heterogeneity in the way they manifest their role is noteworthy (Cadima et al., 2010; Clotfelter et al., 2006; Cohen, 1972). The use of certain teaching practices and ways of relating to students creates different social scenarios that lead to different educational outcomes.

The influence of students' perceptions on their academic performance underscores the importance of the classroom as a context for social interaction (Galbo, 1989). Therefore, students' interpretation of their school opportunities or expectations is derived from the meaning they give to teachers' actions. In this respect, the importance of the teacher's role as a social reference actor in students' self-concept is noteworthy; the way in which students interpret their behavior has an impact on their educational experience.

The results regarding the interrelationship between the teaching styles and the teacher-student relationship show that the implementation of the participative teaching style improves the teacher-student relationship to a greater extent than the directive style. And, in turn, the joint effects between this teaching style and the relationships it creates favor performance. The affective relationship plays a significant role in the two teaching styles analyzed, especially in the participative style and, therefore, in the configuration of spaces for social interaction that promote school success (Federici and Skaalvik, 2014; OECD, 2019a; Pianta, 1994). In this way, the teachers' search for student involvement and participation, as well as showing attention, interest and affection, favor academic performance. These results constitute the most important finding of this study: the mediated pathways between teaching styles, teacher-student relationships, and academic performance reveal significant associations. In particular, the mediated effect of the directive style through relationships is negatively associated with performance, while the mediated effect of the participative style is positively associated.

The main limitation of this research was the lack of a questionnaire specifically designed to analyze the role of teachers. Nevertheless, the latent variables generated for teaching styles and the teacher-student relationship have made it possible to measure their influence on educational performance. Additionally, we did not have access to certain contextual variables such as school policies, school infrastructure, teacher experience, teacher training, or parental involvement, which could also influence academic performance. This limitation highlights the need for future studies that integrate multilevel data to better capture the complexity of school environments (Creemers and Kyriakides, 2006).

Moreover, the student perspective is inherently subjective and, like all perceptual data, susceptible to bias (Cook-Sather, 2002; Källberg and Roos, 2025). Students with higher academic achievement tend to rate teachers more positively, and differences in student characteristics –such as social background or gender– can affect how teaching behaviors are perceived and interpreted. Furthermore, students' ability to critically analyze and reflect on instructional quality varies, potentially limiting the accuracy of their evaluations. While such biases do not invalidate the insights gained from student reports, they underscore the importance of complementing these data with additional perspectives –such as teacher self-assessments or external observations– to provide a more comprehensive picture of instructional effectiveness.

Despite these limitations, student perceptions remain a valuable source of information for understanding the teaching-learning process. This perspective captures the experience from the viewpoint of the learner, allowing the identification of teacher behaviors that students perceive as meaningful to their educational experience (Wubbels and Brekelmans, 2005). Moreover, focusing on students' perceptions of teacher behavior enables an exploration of school effects linked to social interaction processes. This, in turn, allows for an analysis of the teacher's role as a "significant other" in the school context and their potential impact on student performance (Valdner, 2014; Van den Broeck et al., 2020).

Although this study was conducted with data from the Canary Islands, –an outermost region of the European Union– the underlying processes of social interaction examined may be relevant beyond this specific context. However, education systems vary considerably across countries, and cultural and institutional factors may condition how teaching styles and relationships affect academic performance. Therefore, these findings should be interpreted with caution when extrapolating to other settings, and future research is needed in different educational systems to validate and refine these conclusions.

Nevertheless, the principles of social interaction and the critical role of teachers as "significant others" in shaping student achievement are likely to hold relevance across a variety of educational contexts. The observed associations between participative teaching styles, strong teacher-student relationships, and academic performance may inform educational practices, policies, and research in other settings. By highlighting the importance of fostering inclusive, engaging, and supportive classroom environments, this research contributes valuable insights toward improving educational outcomes across diverse cultural and institutional frameworks.

Data availability

The data that support the findings of this study are owned by the Canarian Agency for University Quality Assurance and Educational Assessment (ACCUEE) and were used under license for the present research. Due to legal and institutional restrictions, the dataset is not publicly available. However, researchers may request access to the data directly from the ACCUEE through its official website at https://www3.gobiernodecanarias.org/educacion/accuee/bbdd, subject to approval of a formal request.

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Author contributions

Octavio Díaz-Santana: contributed to Conceptualization, Methodology, Formal analysis, Investigation, Visualization, and Writing—original draft. María Eugenia Cardenal: contributed to Conceptualization, Resources, Validation, Writing—review and editing, and Supervision. Sara M. González-Betancor: contributed to Conceptualization, Methodology, Validation, Project administration, Funding acquisition, Writing—review and editing, and Supervision. The first draft of the manuscript was prepared by Octavio Díaz-Santana. All authors reviewed and edited subsequent drafts. All authors read and approved the final version of the manuscript.

Competing interests

The authors declare no competing interests.

Ethical approval

This study did not involve any data collection by the authors and therefore did not require ethical approval.

Informed consent

This article does not contain any studies with human participants performed by any of the authors.

Additional information

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