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The prediction of teacher credibility on student motivation: Academic engagement and satisfaction as mediating variables☆

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ABSTRACT

Students' perceptions of teachers' behavior in the classroom affect the teaching-learning process, impacting on various variables such as academic motivation, considered one of the most relevant factors in student learning. Student motivation is a relevant link between teacher behavior and student learning, so it is important to analyze students' perceptions of teacher behavior and its relationship with academic motivation. In this sense, students' perceptions of teacher credibility constitute one of the most relevant elements in the teaching-learning process. The objective of the study was to predict student motivation based on their perceptions of teacher credibility, mediated by their engagement and satisfaction. 487 students from the University of Cádiz participated and were administered the Credibility Scale, the Classroom Engagement Scale, the Academic Satisfaction Scale and the State Motivation Scale. The data were analyzed using a partial least squares structural equation modeling (PLS-SEM). The results show positive relationships between teacher credibility and engagement, satisfaction and motivation; between engagement and satisfaction and motivation and between satisfaction and motivation. Likewise, engagement has a mediating effect on the relationship between teaching credibility and motivation; satisfaction has a mediating effect on the relationship between teaching credibility and motivation; engagement has a mediating effect on the relationship between teacher credibility and satisfaction and satisfaction has a mediating effect on the relationship between engagement and motivation. Finally, through the predictive validity of the model, it is determined that teacher credibility, engagement and satisfaction predict motivation. The practical implications of the study involve enriching teaching by managing the credibility of teachers so that students are engaged, satisfied and motivated in the classroom.

La predicción de la credibilidad docente sobre la motivación de los estudiantes: el compromiso y la satisfacción académica como variables mediadoras

Palabras clave:
credibilidad docente
compromiso académico
satisfacción académica
motivación académica
modelo de ecuaciones estructurales
validez predictiva

RESUMEN

Las percepciones de los estudiantes sobre las conductas de los docentes en el aula afectan al proceso de enseñanza-aprendizaje, impactando en diversas variables como la motivación académica, considerada como uno de los factores más relevantes del aprendizaje del alumnado. La motivación de los estudiantes supone un vínculo relevante entre el comportamiento del profesorado y el aprendizaje del estudiantado, por lo que es importante analizar las percepciones del alumnado sobre las conductas de los docentes y su relación con la motivación académica. En este sentido, las percepciones de los estudiantes sobre la credibilidad docente constituyen uno de los elementos más trascendentes del proceso

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de enseñanza-aprendizaje. Así, el objetivo del estudio ha consistido en predecir la motivación académica de los estudiantes a partir de sus percepciones sobre la credibilidad docente, mediada por su compromiso y su satisfacción académica. La muestra ha quedado constituida por 487 estudiantes de la Universidad de Cádiz a los que se les han administrado la Escala de Credibilidad, la Escala de Compromiso en el Aula, la Escala de Satisfacción Académica y la Escala de Motivación Estado. Los datos se han analizado empleando un modelo de ecuaciones estructurales de mínimos cuadrados parciales (PLS-SEM). Los resultados muestran relaciones positivas de la credibilidad docente con el compromiso, la satisfacción y la motivación académica; del compromiso académico con la satisfacción y la motivación académica y de la satisfacción académica con la motivación académica. Asimismo, el compromiso académico tiene un efecto mediador en la relación entre la credibilidad docente y la motivación académica; la satisfacción académica tiene un efecto mediador en la relación entre la credibilidad docente y la motivación académica; el compromiso académico tiene un efecto mediador en la relación entre la credibilidad docente y la satisfacción académica y la satisfacción académica tiene un efecto mediador en la relación entre el compromiso y la motivación académica. Finalmente, a través de la validez predictiva del modelo, se determina que la credibilidad docente, el compromiso y la satisfacción académica predicen la motivación académica. Las implicaciones prácticas del estudio suponen enriquecer la docencia mediante la gestión de la credibilidad del profesorado para que los estudiantes estén comprometidos, satisfechos y motivados en el aula.

Introduction

One of the most determining elements in the teaching-learning process is the students' perceptions of teacher credibility (Finn et al., 2009). This consists of the student's perception of whether the teacher is credible or not (McCroskey, 1992) and is made up of three dimensions: (1) competence, which refers to the perception of the teacher's knowledge or mastery in relation to the subject they teach; (2) goodwill, which refers to the level at which students perceive that the teacher shows interest in the well-being of the student body and (3) trust, which refers to the perception of the teacher's trustworthiness and kindness (McCroskey & Teven, 1999). Teacher credibility affects to the students' academic engagement, satisfaction and motivation, among others (Froment et al., 2020).

Academic engagement consists of the degree of active participation of students in the different activities proposed for the learning development (Christenson et al., 2012) and partly depends on the teacher's behavior. In other words, teacher behavior is a key factor in increasing levels of academic engagement (Amerstorfer & Freiin von Münster-Kistner, 2021). In this sense, students' perceptions of teacher credibility correlate positively with their academic engagement (Derakhshan, 2021; Imlawi et al., 2015; Rezvani & Miri, 2021; Zheng, 2021). Likewise, academic engagement is related to the students' academic satisfaction (Fisher et al., 2018; Hensley et al., 2021; Lane et al., 2021; Salanova et al., 2005) and academic motivation (Bravo, 2013).

Academic satisfaction is defined as the student's self-assessment of their results and experiences in the academic field (Inzunza et al., 2015). According to Gruber et al. (2012), teachers' behavior is a crucial element for students' academic satisfaction. Thus, students' perceptions of teacher credibility are positively associated with their academic satisfaction (Gaffney & Gaffney, 2016; Zhu & Anagondahalli, 2018). Likewise, students' academic satisfaction is associated with their academic motivation (Elliott & Shin, 2002). At the same time, academic satisfaction mediates the relationship between teacher credibility and students' academic motivation and also the association between academic engagement and motivation (Harahap et al., 2021; Justin et al., 2019; Subandi & Hamid, 2021).

The academic motivation of students is defined as a trait and as a state. Motivation as a trait is a general and lasting predisposition in all situations where learning is conducive, while motivation as a state refers to a specific learning situation regarding a particular lesson, task or content. This means it is situation-dependent and changeable (Brophy, 1986). According to various studies, students consider that their state motivation is determined by their perceptions of the teachers' behavior in the classroom (Chan et al., 2021; Jiang et al., 2021; Shakir, 2021). Along these lines, students' perceptions of teacher credibility are positively associated with their academic motivation (Froment, Bohórquez et al., 2021; Kulkarni et al., 2018; Pogue & AhYun, 2006).

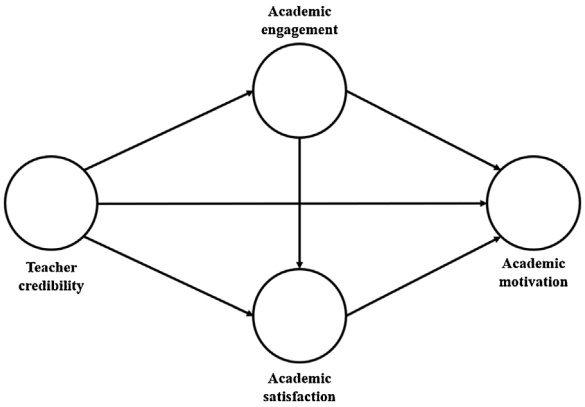

Figure 1. Research model.

There are different researches that have analyzed the effect of teacher credibility on the teaching-learning process in a multivariate way (Derakhshan, 2021; Karimi & Ziaabadi, 2019; Pishghadam et al., 2021; Zhu & Anagondahalli, 2018). However, it is worth noting that no studies that use multivariate techniques to analyze the variables that are the object of this study have been found. Likewise, we haven't found any studies of similar characteristics carried out in the Spanish university context. Therefore, as can be seen in the research model proposed in Figure 1, the objective of this study is to predict the academic motivation of students based on their perceptions of teacher credibility, mediated by their academic engagement and satisfaction. Thus, according to the univariate associations as well as the mediation effects stated by the abovementioned studies, the following research hypotheses are formulated: (H1) There is a positive relationship between teacher credibility and students' academic engagement; (H2) There is a positive relationship between teacher credibility and students' academic satisfaction; (H3) There is a positive relationship between teacher credibility and students' academic motivation; (H4) There is a positive relationship between the students' academic engagement and academic satisfaction; (H5) There is a positive relationship between the students' academic engagement and academic motivation; (H6) There is a positive relationship between the students' satisfaction and motivation; (H7) Academic

engagement has a mediating effect on the relationship between teacher credibility and students' academic motivation; (H8) Academic satisfaction has a mediating effect on the relationship between teacher credibility and students' academic motivation; (H9) Academic engagement has a mediating effect on the relationship between teacher credibility and the students' academic satisfaction and (H10) Academic satisfaction has a mediating effect on the relationship between academic engagement and academic motivation of students.

Method

Participants

The sample has been made up of 487 students from the University of Cádiz through a non-probabilistic sampling and according to accessibility criteria. The participants study the Degree in Early Childhood Education (67.1%) and the Degree in Primary Education (32.9%), with 33.9% enrolled in the first year, 44.4% in the second year and 21.8% in the third year. The mean age of the participants is 20.79 (*SD* = 4.73), 87.1% are women and 12.9% are men.

Instruments

Teacher credibility

In order to analyze the students' perceptions of *teacher credibility*, the Spanish version of the *Credibility Scale* (Froment et al., 2019) has been used. This instrument presents 18 bipolar adjectives, six for each dimension (*competence, goodwill and trust*). The student must indicate their perception of the teacher according to values that range from 1 to 7, taking into account that the closer the number is to the adjective, the greater certainty there will be in the assessment made by the student. The scale has been subjected to a reliability analysis, obtaining the following Cronbach's alpha values: $\alpha = .94$ for the global scale; $\alpha = .87$ for *competence*; $\alpha = .88$ for *goodwill* and $\alpha = .90$ for *trust*.

Academic engagement

To assess *academic engagement*, the Spanish version of the *Classroom Engagement Scale* (Núñez & León, 2019) has been applied. This instrument is made up of 12 items, three for each dimension (*agentic*, *behavioral*, *emotional*, and *cognitive engagement*). To respond to the items, participants must select values ranging from 1 = strongly disagree to 7 = strongly agree. The scale has been subjected to an internal consistency analysis, obtaining the following Cronbach's alpha values: $\alpha = .88$ for the global scale; $\alpha = .85$ *for agentic engagement*; $\alpha = .84$ for *behavioral engagement*; $\alpha = .85$ for *emotional engagement* and $\alpha = .77$ for *cognitive engagement*.

Academic satisfaction

To assess *academic satisfaction*, the *Academic Satisfaction Scale* has been applied (Vergara-Morales et al., 2018). This unifactorial instrument is composed of 7 items. To respond to them, participants must select values ranging from 1 = strongly disagree to 7 = strongly agree. The scale has been subjected to a reliability analysis, obtaining a Cronbach's alpha value of $\alpha = .92$.

Academic motivation

To assess *academic motivation*, the Spanish version of the *State Motivation Scale* (Froment, García et al., 2021) was used. This unifactorial instrument is composed of 12 bipolar adjectives, with values ranging from 1 to 7, taking into account that the closer the number to the adjective, the greater certainty in the assessment of the students' feelings towards the lesson. The scale has been subjected to an internal consistency analysis, obtaining a Cronbach's alpha value of $\alpha = .90$.

Procedure

For data collection, collaboration from teachers who teach at the Faculty of Educational Sciences of the University of Cádiz has been requested. Furthermore, participants have been informed of the purpose and nature of the study. The participants have voluntarily completed the four instruments and have been guaranteed the anonymity and confidentiality of their responses. To reduce the reactivity of the students' responses, the teachers were asked to leave the classroom. The instruments have been administered in the classroom by both researchers in pencil and paper format following the following order: *Credibility Scale, Classroom Engagement Scale, Academic Satisfaction Scale* and *State Motivation Scale*. The estimated duration of the application of these instruments has been 25 minutes. The data collected has been processed in a database for further analysis.

It should be noted that this research has the ethical permission of the University of Cádiz, considering the criteria established by the Bioethics Committee of aforesaid university in terms of guaranteeing respect for the dignity, integrity and identity of the individuals participating in the study.

Data analysis

In order to analyze the relationship between *teacher credibility, academic engagement, academic satisfaction and academic motivation*, a structural equation model has been applied using the partial least squares technique (PLS-SEM), a variance-based model that is mainly used in the field of education (Ghasemy et al., 2020). Partial least squares models are defined by two sets of linear equations: the measurement model, which describes the link between a construct and its indicators, and the structural model, which focuses on the relationships between the constructs (Henseler, 2017). Thus, the PLS-SEM assessment has initially been carried out in two stages (Roldán & Sánchez-Franco, 2012): the assessment of the measurement model and the assessment of the structural model.

Regarding the assessment of the measurement model, indicator reliability, internal consistency, convergent validity, and discriminant validity measures have been applied (Hair, Hult et al., 2019). Regarding the reliability of the indicators, they must be above .50 (Hair et al., 2014). Regarding the internal consistency, the composite reliability (CR), whose values must be above .70 (Hair, Hult, Ringle et al., 2017), and the Dijkstra-Henseler statistic (rho_A), whose values must be above .70 (Dijkstra & Henseler, 2015) have been taken into account. With regards to convergent validity, the average variance extracted (AVE), whose values must be above .50 (Hair et al., 2018) has been applied. And, with regard to discriminant validity, the Fornell and Larcker criterion (1981) and the Heterotrait-Monotrait (HTMT) ratio have been applied. The first establishes that the square root of the AVE of each latent variable must be greater than the correlations that it has with the rest of the latent variables of the model, and the second establishes that its values, on the one hand, must be below .90 (Henseler et al., 2015) and, on the other hand, the confidence intervals must not include the value 1 in any of the combinations of the constructs (Hair, Hult et al., 2019).

Regarding the assessment of the structural model, the sign, size and significance of the coefficients of the structural model have been assessed (Roldán & Sánchez-Franco, 2012). In this sense, a bootstrapping technique (5,000 samples) has been applied for *t* statistics, *p* values and 95% bias-corrected confidence intervals (Hair et al., 2011). Likewise, the values of the coefficient of determination (R^2) have been evaluated, and the Q^2 predictive relevance test has been performed using the blindfolding technique (Hair, Hult et al., 2019). Regarding the coefficient of determination, R^2 values of .75, .50 or .25 for the endogenous construct can be described

as important, moderate and weak, respectively (Hair et al., 2011) and, in relation to the predictive relevance, Q^2 values above 0, .25 and .50 respectively show situations of small, medium and great predictive relevance of an exogenous construct over an endogenous construct (Hair, Risher et al., 2019).

Subsequently, the mediation effects of the structural model have been examined using the bootstrapping method with bias-corrected confidence estimates and a 95% confidence interval for indirect effects (Hayes, 2013). In order to establish the types of the existing mediation effects, the guidelines established by Nitzl et al. (2016) have been taken into account. They establish three types of mediation: complementary (both the indirect effect and the direct effect are significant and point in the same direction); competitive (the indirect effect and the direct effect are both significant but point in opposite directions) and indirect (the indirect effect is significant, but not the direct effect). Next, the goodness of fit of the structural model has been assessed according to the standardized root mean squared residual index (SRMR), which is the only recommended criterion to assess the goodness of fit in PLS-SEM (Henseler et al., 2016), where a value smaller than .08 would indicate a good fit of the model (Hu & Bentler, 1999).

Finally, an assessment of the predictive validity of the model has been carried out by means of out-of-sample cross-validation (hold-out sample) (Shmueli et al., 2016). Specifically, PLSpredict has been applied in the SmartPLS version 3.2.7 software (Ringle et al., 2015), obtaining cross-validated prediction errors and prediction error summaries statistics such as the root mean square error (RMSE) and the mean absolute error (MAE) to assess the predictive performance of the model for the endogenous construct and its indicators. In order to execute PLSpredict, with respect to the number of sections (folds), k = 16 has been set, taking into account that $N = 487$, thus fulfilling the minimum sample of 30 cases per section and, in relation to the number of repetitions, $r = 10$ has been set (Cepeda-Carrión et al., 2016). To assess the predictive performance of the model, the two reference points established by Shmueli et al. (2019): 1) the Q^2 value, which compares the prediction errors of the PLS model with simple mean predictions, whose values above 0 indicate that the prediction errors of the PLS model results are smaller than the prediction errors produced when only mean values are used, so the model would offer appropriate predictive performance and 2) PLS-SEM results should have lower prediction error (in terms of RMSE and MAE) and Q^2 values greater than the linear regression model (LM).

The main reason for the use of PLS-SEM is that this technique allows assessing the predictive power of the exogenous variables over the endogenous variable both inside and outside the sample (Shmueli et al., 2019). Likewise, PLS-SEM does not make any type of assumption regarding the distribution of the data (Hair et al., 2011) and it is the method to use when the objective of the research is the explanation and prediction of key constructs (Hair, Hult, Ringle, Sarstedt et al., 2017). Thus, PLS-SEM allows two research purposes to be fulfilled (Henseler, 2018): (1) explanatory, to understand the causal relationships between variables and (2) predictive, with the aim of predicting values for individual cases. For the assessment of the model, the Smart-PLS version 3.2.7 software was applied (Ringle et al., 2015).

Results

Measurement model

As Table 1 shows, regarding the reliability of the indicators, these are significant in their constructs ($p < .05$) and present outer loadings above .50, so the reliability of the items is considered appropriate. With regards to internal consistency, both the composite reliability (CR) and the Dijkstra-Henseler statistic (rho_A) values exceed .70, so the constructs have adequate reliability. According to convergent validity, the values of the average variance extracted (AVE) exceed .50, thus indicating that the variance extracted by the factor is greater than the variance associated with the error.

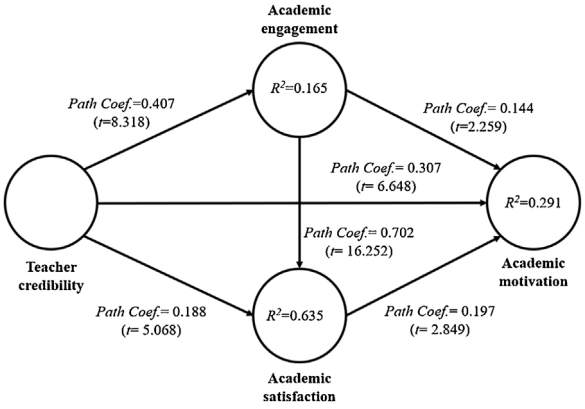

Figure 2. Assessment of the structural model.

As Table 2 shows, following the Fornell and Larcker criterion (1981), the square root of the AVE of each latent variable is greater than the correlations it has with the rest of the latent variables in the model.

Regarding the Heterotrait-Monotrait (HTMT) ratio, Table 3 shows that satisfactory values are obtained as they are smaller than .90, thus indicating that each variable differs from the other. Likewise, the confidence interval of the HTMT statistic does not include the value 1 in any of the combinations of the constructs, thus highlighting the discriminant validity.

Structural model

First, following Hair, Risher et al. (2019), possible collinearity problems have been verified by examining the values of the variance inflation factor (VIF) of all the sets of predictor constructs of the structural model. VIF values below 3.3 have been obtained, so collinearity between predictor constructs is not a concern (Diamantopoulos & Siguaw, 2006).

Regarding the assessment of the sign, size and significance of the coefficients of the structural model, Table 4 indicates that *teacher credibility* is positively related to the students' *academic engagement* ($\beta = .407$, $p < .05$), *academic satisfaction* ($\beta = .188$, $p < .05$) and *academic motivation* ($\beta = .307$, $p < .05$), so that H1, H2 and H3 are accepted. Likewise, *academic engagement* is positively related to *academic satisfaction* ($\beta = .702$, $p < .05$) and *academic motivation* ($\beta = .144$, $p < .05$), so that H4 and H5 are accepted. Finally, *academic satisfaction* is positively related to the students' *academic motivation* ($\beta = .197$, $p < .05$), so that H6 is accepted.

According to the values of the coefficient of determination (R^2), Figure 2 shows that the model has weak predictive power on *academic engagement* by obtaining a value of R^2 below .25 ($p < .05$); moderate predictive power on *academic motivation* when presenting an R^2 value between .25 and .50 ($p < .05$) and significant predictive power on *academic satisfaction* when including an R^2 value between .50 and .75 ($p < .05$). Likewise, regarding the Q^2 test of predictive relevance, the model has a small predictive relevance on *academic engagement*, obtaining a Q^2 value of .161; a medium predictive relevance on *academic motivation* when presenting a Q^2 value of .281 and a great predictive relevance on *academic satisfaction* when including a Q^2 value of .623.

Table 1
Outer loadings, internal consistency and average variance extracted

Construct/Indicators	Outer loadings	CR	rho_A	AVE
Competence (COM)		.904	.880	.612
COM1	.828			
COM2	.645			
COM3	.779			
COM4	.820			
COM5	.779			
COM6	.828			
Goodwill (BV)		.915	.894	.644
BV1	.820			
BV2	.871			
BV3	.650			
BV4	.869			
BV5	.770			
BV6	.815			
Trust (CON)		.924	.902	.670
CON1	.817			
CON2	.842			
CON3	.835			
CON4	.838			
CON5	.796			
CON6	.781			
Agentic Engagement (CAGE)		.909	.853	.769
CAGE1	.890			
CAGE2	.877			
CAGE3	.865			
Behavioral Engagement (CCOM)		.906	.844	.763
CCOM1	.881			
CCOM2	.891			
CCOM3	.848			
Emotional Engagement (CEMO)		.916	.863	.785
CEMO1	.870			
CEMO2	.887			
CEMO3	.900			
Cognitive Engagement (CCOG)		.869	.797	.690
CCOG1	.780			
CCOG2	.904			
CCOG3	.803			
Satisfaction (SAT)		.940	.931	.692
SAT1	.829			
SAT2	.750			
SAT3	.891			
SAT4	.879			
SAT5	.795			
SAT6	.829			
SAT7	.842			
Motivation (MOT)		.919	.909	.509
MOT1	.760			
MOT2	.729			
MOT3	.729			
MOT4	.767			
MOT5	.749			
MOT6	.616			
MOT7	.609			
MOT8	.593			
MOT9	.662			
MOT10	.553			
MOT11	.762			
MOT12	.819			

Note. CR = composite reliability; rho_A = Dijkstra-Henseler statistic; AVE = average variance extracted.

Regarding mediation effects, Table 5 indicates that *academic engagement* mediates the relationship between *teacher credibility* and *academic motivation* ($\beta = .058$, $p < .05$); that *academic satisfaction* mediates the relationship between *teacher credibility* and *academic motivation* ($\beta = .037$, $p < .05$); that *academic engagement* mediates the relationship between *teacher credibility* and *academic satisfaction* ($\beta = .285$, $p < .05$) and that *academic satisfaction* mediates the relationship between *academic engagement* and *academic motivation* ($\beta = .138$, $p < .05$), so H7, H8, H9 and H10 are accepted. According to the types of mediation effects, it is established that these are complementary in all cases since both the indirect and direct effects are significant and point in the same direction.

Finally, regarding the assessment of the goodness of fit of the structural model, an SRMR value of .07 has been obtained, thus indicating a good fit as it is below .08.

Predictive validity

Based on the assessment of the predictive validity of the model, Table 6 indicates that the values of Q^2 are above 0 at both construct and indicator levels, so the model has adequate predictive performance. Similarly, all the RMSE and MAE values of the PLS model are lower than the LM model and the Q^2 values for the indicators of the PLS model are higher than those generated for the

Table 2
Correlations between the square roots of the AVE of each variable

Fornell-Larcker criterion									
	COM	BV	CON	CAGE	CCOM	CEMO	CCOG	SAT	MOT
COM	.782								
BV	.634	.803							
CON	.714	.778	.819						
CAGE	.235	.366	.351	.877					
CCOM	.202	.209	.233	.313	.873				
CEMO	.350	.398	.429	.377	.778	.886			
CCOG	.198	.253	.286	.354	.642	.653	.831		
SAT	.394	.447	.433	.401	.653	.812	.574	.832	
MOT	.452	.393	.393	.334	.332	.392	.303	.455	.700

Note. COM = competence; BV = goodwill; CON = trust; CAGE = agentic engagement; CCOM = behavioral engagement; CEMO = emotional engagement; CCOG = cognitive engagement; SAT = satisfaction; MOT = motivation.

Table 3
Correlations of similarity between the latent variables

Heterotrait-Monotrait Ratio (HTMT)									
	COM	BV	CON	CAGE	CCOM	CEMO	CCOG	SAT	MOT
COM									
BV	.714								
CON	.800	.870							
CAGE	.271	.420	.401						
CCOM	.234	.240	.267	.368					
CEMO	.402	.456	.489	.440	.890				
CCOG	.234	.302	.337	.435	.785	.788			
SAT	.431	.490	.471	.451	.736	.896	.666		
MOT	.501	.434	.431	.379	.379	.441	.360	.490	

Note. COM = competence; BV = goodwill; CON = trust; CAGE = agentic engagement; CCOM = behavioral engagement; CEMO = emotional engagement; CCOG = cognitive engagement; SAT = satisfaction; MOT = motivation.

Table 4
Hypothesis assessment

Hypothesis	Relation	Path coefficients	*p* value	*t* value	95% BCCI	Conclusion
H1	CD→CO	.407	.000	8.318	[.310; .502]	Accepted
H2	CD→SA	.188	.000	5.068	[.118; .266]	Accepted
H3	CD→MO	.307	.000	6.648	[.214; .396]	Accepted
H4	CO→SA	.702	.000	16.252	[.609; .777]	Accepted
H5	CO→MO	.144	.024	2.259	[.010; .263]	Accepted
H6	SA→MO	.197	.004	2.849	[.055; .326]	Accepted

Note. CD = teacher credibility; CO = academic engagement; SA = satisfaction; MO = motivation; BCCI = bias-corrected confidence interval.

Table 5
Mediation effects

Hypothesis	Relation	Indirect effect	*p* value	*t* value	95% BCCI	Conclusion
H7	CD→CO→MO	.058	.038	2.073	[.006; .116]	Accepted
H8	CD→SA→MO	.037	.018	2.366	[.011; .073]	Accepted
H9	CD→CO→SA	.285	.000	9.345	[.227; .348]	Accepted
H10	CO→SA→MO	.138	.005	2.819	[.041; .233]	Accepted

Note. CD = teacher credibility; CO = academic engagement; SA = satisfaction; MO = motivation; BCCI = bias-corrected confidence interval.

LM model, thus indicating that the model has predictive validity. Therefore, the proposed model has enough predictive power to predict values for new cases for the endogenous variable. This means that exogenous variables of the model can predict *academic motivation* in additional samples that are separate from the data set used to test the research model. In short, this predictive validity offers additional support for the research model formulated in this study.

Discussion

The objective of this research has been to predict the academic motivation of students from their perceptions of teacher credibility, mediated by their academic engagement and academic satisfaction. This study has revealed that teacher credibility is positively related to students' academic engagement, satisfaction, and motivation. These results coincide with previous research that hold that students' perceptions of teacher credibility affect their academic engagement (Derakhshan, 2021; Imlawi et al., 2015; Rezvani & Miri, 2021; Zheng, 2021), their academic satisfaction (Gaffney & Gaffney, 2016; Zhu & Anagondahalli, 2018) and their academic motivation (Froment, Bohórquez et al., 2021; Kulkarni et al., 2018; Pogue & AhYun, 2006). As Boren and McPherson (2018) indicate, teacher credibility is one of the most important factors in the relationship between teacher behavior and student learning. Therefore, the credibility they convey must be taken into account and properly managed by teachers to enhance their students' learning (Myers & Martin, 2018).

It has been found that academic engagement is positively associated with the academic satisfaction and academic motivation of students, also highlighting that, among all the variables under

Table 6
Assessment of the predictive validity

Construct prediction									
	Q^2								
Motivation (*MOT*)	.203								
Indicators prediction									
	PLS			LM			PLS-LM		
	RMSE	MAE	Q^2	RMSE	MAE	Q^2	RMSE	MAE	Q^2
MOT1	1.146	.916	.154	1.182	.933	.099	-.036	-.017	.055
MOT2	1.076	.866	.169	1.110	.887	.116	-.034	-.021	.053
MOT3	1.114	.899	.122	1.139	.901	.082	-.025	-.002	.040
MOT4	1.319	1.066	.086	1.335	1.081	.063	-.016	-.015	.023
MOT5	1.301	.963	.097	1.332	.984	.053	-.031	-.021	.044
MOT6	1.342	1.067	.067	1.382	1.096	.009	-.040	-.029	.058
MOT7	1.256	1.008	.054	1.284	1.019	.011	-.028	-.011	.043
MOT8	1.354	1.089	.081	1.385	1.106	.038	-.031	-.017	.043
MOT9	1.195	.936	.116	1.216	.954	.085	-.021	-.018	.031
MOT10	1.367	1.085	.101	1.372	1.096	.094	-.005	-.011	.007
MOT11	1.420	1.111	.062	1.442	1.132	.032	-.022	-.021	.030
MOT12	1.268	.993	.059	1.288	1.017	.029	-.020	-.024	.030

Note. MOT = motivation; RMSE = root mean squared error; MAE = mean absolute error; PLS = partial least squares; LM = linear regression model.

study, the greatest effect occurs between academic engagement and academic satisfaction. Likewise, the academic engagement shows mediating effects between the teacher credibility and the academic motivation of the students, and the teacher credibility and the academic satisfaction of the students. These results coincide with previous studies that indicate that students' academic engagement is positively related to their academic satisfaction (Fisher et al., 2018; Hensley et al., 2021; Lane et al., 2021) and with their academic motivation (Bravo, 2013; Dogan, 2015). As Gray and DiLoreto (2016) point out, a greater academic engagement of the student means higher levels of academic satisfaction, and as a consequence an increase and balance in the levels of academic motivation, unlike those students less engaged with their learning. Regarding academic satisfaction, a positive association was found with the academic motivation of students. In addition, a mediating effect of academic satisfaction has been evidenced in the relationship between teacher credibility and students' academic motivation and, in the relationship between students' academic engagement and academic motivation, coinciding with previous research (Harahap et al., 2021; Justin et al., 2019; Subandi & Hamid, 2021). According to Rodgers and Withrow-Thorton (2005), students who are satisfied with their learning experiences will tend to present and maintain adequate levels of academic motivation.

As future research, it is suggested to analyze the effect of student perceptions on various teacher behaviors such as self-disclosure, clarity or support for autonomy in other variables of the teaching-learning process. As Goldman et al. (2017) state, by examining student perceptions of teacher behavior, their needs, expectations, and desires can be better understood. Regarding the limitations of the study, it must be highlighted that the sample was mainly made up of women. Thus, a greater participation of men would have allowed additional analyses that would have enriched the findings obtained. For this reason, it is proposed that future research analyze whether there are significant differences by gender both in students' perceptions of teacher credibility and in their learning. Likewise, the cross-sectional design of the study means a limitation to itself since it makes it impossible to establish the dependence between variables, so it is proposed that future studies analyze the effect of teacher credibility on the teaching-learning process longitudinally. Finally, it is worth noting that other types of tests that measure similar and differentiated constructs have not been used to assess convergent and divergent validity criteria. In the same way, other types of tests that use other assessment formats have not been used. Therefore, it is possible that, at least in part, the relationships are due to the assessment format since the tests have been taken consecutively and in the same response format. For these reasons, it is suggested that future studies consider different ways of measuring the constructs in order to increase the validity of the entire investigation.

Despite these limitations, this study has important practical implications for teachers by helping them become aware of the importance of their behavior to increase the academic engagement, satisfaction and motivation of their students, so teachers can consider the findings of this research to enrich their teaching practice. In short, this study suggests that, for students to be engaged, satisfied and motivated in class, teachers must be perceived as credible people, so it is essential that they establish and maintain their credibility to strengthen student learning (Xie & Derakhshan, 2021).

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