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ORIGINAL

University Teacher Credibility as a Strategy to Motivate Students

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ABSTRACT

University students' motivation can be affected by several factors, one being their perceptions of teacher behaviour in the classroom. This study aimed to predict university students' state motivation from their perceptions of teacher credibility. The participants were 344 students from the University of Seville. A structural equation model was used with the partial least squares method (PLS-SEM), a technique based on variance, employed to test, and validate the proposed hypotheses. The results reveal, on the one hand, a positive effect of teacher credibility on state motivation and, on the other hand, that teacher credibility has predictive power and predictive relevance for state motivation. Likewise, there is evidence of predictive validity in that teacher credibility can predict values for new cases of state motivation. Strategies are provided for a university faculty to manage their behaviour in the classroom to increase their students' state motivation, highlighting the use of PLS-SEM as a data analysis tool suitable for application in higher education.

Keywords CREDIBILITY, STRUCTURAL EQUATION MODELING, STUDENT MOTIVATION, PREDICTIVE VALIDITY

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1 INTRODUCTION

Student motivation is considered one of the most relevant factors in student learning (Zheng, 2021a). According to Wlodkowski (1978; 1985), motivation has directive and stimulating properties, arousing, and instructing individuals to choose or continue to perform a particular behavior. Later, Brophy (1987a) underlined the tendency in students' motivation to find meaningful and valuable academic activities to achieve benefits. Motivation occurs when students attempt to master the content, concepts, or skills they are taught while reading, performing activities, or participating in classroom discussions (Brophy, 1987b).

Specifically, student motivation has been defined as a trait and a state. Trait motivation is a general and lasting predisposition toward learning; that is, referring to a general

level of motivation in all learning situations. State motivation refers to a specific learning situation, a particular class, task, or content, such that it depends on the situation and is changeable (Brophy, 1986). Student state motivation in the classroom is influenced by environmental or contextual variables, one of the main ones being the teacher's behavior (Jiang, Lee, Wan, & Chen, 2021). Thus, students' perceptions of instructors' behaviors in the classroom are relevant for their learning process (Xie & Derakhshan, 2021), so it is crucial to consider teachers' communication behaviours when motivating students (Chan, Maneewan, & Koul, 2021).

One teacher's behaviour that affects students' state motivation is their perception of teacher credibility (Teven & Hanson, 2004), defined as the student's perception of whether the teacher is believable (McCroskey, 1992). It is an essential variable in the student's perception of the teacher and has a transcendental influence on the teaching-learning process (McCroskey, Valencic, & Richmond, 2004), affecting different variables such as student engagement (De-Besa, Froment, & Gil-Flores, 2023), willingness to attend classes (Zheng, 2021b) and to communicate in class (Lee, 2020) and perceptions of classroom justice (Sun, 2022). Teacher credibility comprises three dimensions: competence, goodwill, and trust (McCroskey & Teven, 1999) . Teacher competence refers to the perception of the teacher's knowledge or mastery of the subject they teach; teacher goodwill consists of the teacher's level of interest in their well-being as perceived by the students, and trust refers to the perception of the teacher's reliability and kindness (McCroskey, 1992; Teven & McCroskey, 1997). Some studies highlight a positive association between teacher credibility and student state motivation, noting that when teachers are perceived as credible, students are more motivated in the classroom (Alrabai, 2022; Froment, Bohórquez, & García, 2021; Frymier & Thompson, 1992; Kulkarni, Afshan, & Motwani, 2018; Martin, Chesebro, & Mottet, 1997). Similarly, Amiryousefi and Mirkhani (2019) have stated that when students perceive their teachers as believable, their motivation to engage with learning materials and tasks increases. Moreover, Froment, García-González, and Cabero-Almenara (2022) found that students' perceptions of instructors' credibility through social networking sites had an impact on their academic motivation. However, other studies found no significant relationship between teacher credibility and university students' state motivation (Karimi & Ziaabadi, 2019; Zhang, 2009)

Although there are recent studies that have examined the effect of teacher credibility on student learning through multivariate analysis (Alrabai, 2022; Kim, Merrill, Xu, & Kelly, 2022; Pishghadam, Derakhshan, Zhaleh, & Al-Obaydi, 2023), research focused on analyzing the variables considered in this research in the Spanish university context using multivariate techniques is limited (Froment & Besa, 2022) , hence this study becomes relevant since it will allow the establishment of the effect of teacher credibility on a variable associated with student learning that has not been addressed in depth in our universities. Likewise, it should be noted that this study addresses how students' perceptions of teaching practice affect their learning process, that is, according to specific classes, so this study will allow us to examine, unlike previous studies, the influence of instructor credibility in Spanish university classrooms. Finally, considering the contradictory findings of the impact of university students'

perceptions of teacher credibility on their state motivation, this study aimed to predict university students' state motivation from their perceptions of teacher credibility. As Myers and Martin (2018) conclude in this regard, it is important to analyze teacher credibility to achieve beneficial and relevant outcomes not only for themselves but also for their students. Thus, according to the proposed theoretical framework, the following research hypotheses are established:

- Hypothesis 1 (H1): Teacher credibility will have a positive effect on university students' state motivation.
- Hypothesis 2 (H2): Teacher credibility will predict university students' state motivation.

2 METHODS

2.1 Participants

A non-probabilistic sample design according to accessibility (Gil-Escudero & Martínez-Arias, 2001) was used to recruit the participants of the present study: 344 students from the University of Seville studying Degrees in Pedagogy, Primary Education, Psychology, and Work Relations and Human Resources. It should be noted that different degrees from the field of Social Sciences were chosen to have a sample that is as heterogeneous as possible and, with this, enrich the research. The students had a mean age of 21.18 (SD = 2.58), 257 were females (74.7%), and 87 were males (25.3%).

2.2 Instruments

The Spanish version of the State Motivation Scale for university students was used (Froment, García, Bohórquez, & Checa, 2021) . This instrument assesses how college students feel in a certain class. The scale is one-factor with 12 bipolar adjectives, with values ranging from 1 to 7. The closer the number is to the adjective, the greater certainty there will be about the evaluation of their feelings. Concerning the internal consistency of the instrument, a value of Cronbach's alpha of .96 was obtained.

The Spanish version of the Teacher Credibility Scale was used to assess teacher credibility (Froment, García, Bohórquez, & García-Jiménez, 2019). This instrument presents 18 bipolar adjectives, six for each dimension (Competence, Goodwill, and Trust). In this case, the students describe their perception of the teacher from 1 to 7; the closer the number is to the adjective, the greater certainty there will be about the evaluation of the teacher. The scale was subjected to a reliability analysis, obtaining a value of Cronbach alpha for the global scale of .96, and values of Cronbach alpha for the three dimensions: Competence .93, Goodwill .93, and Trust .94.

2.3 Procedure

The participants completed the two instruments voluntarily after giving their informed consent. We explained the objectives of the study and informed them of their anonymity. Sim-

ilarly, we urged sincerity in their responses, indicating that there were no right or wrong answers. The scales were administered in pencil and paper in the classroom by research experts in the following order: Teacher Credibility Scale and State Motivation Scale. Total administration time was approximately 25 minutes. The collected data were processed in a database for further analysis.

The criteria established by the Ethics Committee of the University of Seville were followed, guaranteeing respect for the dignity, integrity, and identity of the participants in the study. The Committee states that research in which there is no manipulation of people or animals does not require explicit permission from the institution.

2.4 Data Analysis

Concerning the objective of the study, a structural equation modeling (SEM) was applied to predict university students' state motivation from their perceptions of teacher credibility. We used the technique of partial least squares (PLS-SEM) (Wold, 1985). This SEM model is based on the variance (Roldán & Sánchez-Franco, 2012) , and is used mainly in the field of education (Ghasemy, Teeroovengadum, Becker, & Ringle, 2020; Lin 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 evaluation was initially carried out in two stages (Roldán & Sánchez-Franco, 2012): the evaluation of the measurement model and the structural model. Subsequently, the predictive capacity of the holdout-sample model was evaluated (Shmueli, Ray, Velasquez-Estrada, & Chatla, 2016).

The main reason for using PLS-SEM is that it will allow evaluation of the predictive capacity of the exogenous variable (teacher credibility) on the endogenous variable (state motivation) both inside and outside the sample (Shmueli et al., 2019). Therefore, it is appropriate to use PLS-SEM because, in addition to allowing in-sample prediction, it evaluates whether the exogenous variable can predict the behaviour of the endogenous variable in samples separated from the initial data set used to test the theoretical research model (Shmueli et al., 2016). In this sense, PLS-SEM uses the case values of the holdout sample of the independent construct applying the estimates of the model parameters that were obtained from the training sample (portion of the global dataset that is used to estimate the model parameters) to generate predictions of the dependent construct (Cepeda-Carrión, Henseler, Ringle, & Roldán, 2016).

Likewise, PLS-SEM is the recommended method when the research objective is to explain and predict key constructs (Hair, Hult, Ringle, Sarstedt, & Thiele, 2017). Thus, PLS-SEM fulfils two research purposes (Henseler, 2018): (1) explanatory, to understand the causal relationships between variables and (2) predictive, to predict values for individual cases. Smart-PLS 3.2.7 software (Ringle, Wende, & Becker, 2015) was used to evaluate the model.

3 RESULTS

The main results of this study provide significant data on the evaluation of the measurement model, the structural model, and the predictive validity.

3.1 Evaluation of the Measurement Model

Concerning the evaluation of the measurement model, we calculated reliability measures of the indicators, internal consistency, convergent validity, and discriminant validity (Hair, Hult, et al., 2019). The reliability of the indicators was significant in their constructs ($p < .001$), presenting outer loadings > .70, so the reliability of the items is considered appropriate (Roldán & Sánchez-Franco, 2012). Regarding internal consistency, the constructs obtained Cronbach's alpha values (α) above the minimum threshold of .70 (Nunnally, 1978); composite reliability (CR) values that exceeded the suggested value of .70 (Hair et al., 2017), and Dijkstra-Henseler (rho_A) statistical values that also exceeded the recommended value of .70 (Dijkstra & Henseler, 2015), so the constructs have adequate reliability. Concerning the convergent validity, the average variance extracted (AVE) was applied, with the constructs exceeding the suggested value of .50 (Hair, Sarstedt, Ringle, & Gudergan, 2018), indicating that the variance extracted by the factor is greater than the variance associated with the error (see Table 1).

Concerning discriminant validity, we applied the criterion of Fornell and Larcker (1981), which establishes that the square root of the AVE of each latent variable should be greater than its correlations with the rest of the model's latent variables, and the Heterotrait-Monotrait ratio (HTMT) obtaining a satisfactory value lower than the suggested .85 (Henseler, Ringle, & Sarstedt, 2015), indicating that each variable differs from the other (see Table 2). Likewise, the confidence interval of the HTMT statistic does not include the value .90 in any of the combinations of the constructs, revealing the discriminant validity of the constructs (Franke & Sarstedt, 2019).

3.2 Evaluation of the Structural Model

First, we tested for possible collinearity problems in the model by examining the values of the variance inflation factor (VIF) of all the sets of predictor constructs in the structural model (Hair, Risher, Sarstedt, & Ringle, 2019). We obtained VIF values < 3, so collinearity between predictor constructs was not problematic (Hair, Black, Babin, & Anderson, 2014).

Roldán and Sánchez-Franco (2012) suggest evaluating the sign, size, and significance of the structural model coefficients, the effect-size values (f2), the values of the coefficient of determination (R2), and the Q2 test of predictive relevance using the blindfolding technique. Following Hair et al. (2011), this study applied a bootstrapping technique (5,000 samples) for t-statistics, p-values, and 95% confidence intervals with corrected bias, which allow evaluation of the statistical significance of the relationship between the variables of the structural model. As seen in Table 3, teacher credibility has a positive effect on state motivation ($p < .001$), so H1 is accepted. Likewise, the effect of teacher credibility on state motivation was large, with a value of f2 > .35 (Cohen, 1988). Teacher credibility also had

Table 1 Evaluation of the Measurement Model

Construct/Indicators	Outer loadings	α	CR	rho_A	AVE
Competence (CO)		.940	.952	.941	.769
CO1	.876***				
CO2	.901***				
CO3	.871***				
CO4	.876***				
CO5	.867***				
CO6	.869***				
Goodwill (GW)		.931	.946	.935	.745
GW1	.892***				
GW2	.883***				
GW3	.791***				
GW4	.911***				
GW5	.827***				
GW6	.867***				
Trust (TR)		.944	.955	.945	.780
TR1	.884***				
TR2	.869***				
TR3	.870***				
TR4	.906***				
TR5	.908***				
TR6	.863***				
State motivation (SM)		.968	.972	.969	.740
SM1	.901***				
SM2	.877***				
SM3	.812***				
SM4	.863***				
SM5	.793***				
SM6	.841***				
SM7	.780***				
SM8	.878***				
SM9	.919***				
SM10	.875***				
SM11	.889***				
SM12	.885***				

***$p < .001$

Table 2 Discriminant validity

Fornell-Larcker criterion					Heterotrait-Monotrait (HTMT) ratio				
	CO	GW	TR	SM		CO	GW	TR	SM
CO	.877				CO				
GW	.574	.863			GW	.612			
TR	.717	.769	.883		TR	.763	.822		
SM	.625	.618	.575	.860	SM	.653	.648	.601	

CO: Competence; GW: Goodwill; TR: Trust; SM: State Motivation

on the one hand, moderate predictive power on state motivation, with an R2 between the values .25 and .50 (Hair, Ringle, & Sarstedt, 2011) and, on the other hand, average predictive relevance for state motivation, with a Q2 between the values .25 and .50 (Shmueli et al., 2019).

Table 3 Evaluation of hypotheses

H	Relation	Effect	p-value	t-value	CI	f2	R2	Q2	Conclusion
H1	CR → SM	.678	.000	17.298	[.594;.747]	.849	.459	.454	Accepted

CR: Credibility; SM: State Motivation; CI: Confidence Interval

3.3 Evaluation of Predictive Validity

The predictive validity of a model refers to its capacity to produce accurate predictions of new observations, either temporal or cross-sectional (Evermann & Tate, 2016; Shmueli & Koppius, 2011). Predictive validity generally indicates that a given set of measures of a particular construct (exogenous variable) can predict the endogenous variable (Straub, Boudreau, & Gefen, 2004). In this regard, the R2 statistic is often interpreted as a measure of the model's predictive power, but this interpretation is not entirely correct because R2 only indicates the model's in-sample explanatory power but not its out-of-sample predictive power (Shmueli, 2010). Focusing only on the R2 value to assess the model's predictive power limits the possibility of generalising its results to other samples (Sharma, Shmueli, Sarstedt, Danks, & Ray, 2021). Therefore, one should also estimate the predictive power of the out-of-sample model (Nitzl & Chin, 2017). To address this issue, Shmueli et al. (2016) developed PLSpredict, a procedure that allows us to evaluate the predictive power of an out-of-sample model effectively.

Following Shmueli et al. (2016), predictive validity (out-of-sample prediction) was evaluated by cross-validation with holdout samples. Specifically, the PLSpredict algorithm was applied in SmartPLS software version 3.2.7. (Ringle et al., 2015), thus obtaining prediction errors with cross-validation and statistical summaries of prediction errors, such as the root mean square error (RMSE) and the mean absolute error (MAE) to evaluate the model's predictive performance for the endogenous construct and its indicators.

Based on these statistics, the two reference points established by Shmueli et al. (2019) were used to evaluate the model's predictive performance:

(1) The Q2 value, which compares the prediction errors of the PLS model with simple mean predictions. Values of $Q2 > 0$ indicate that the prediction errors of the PLS model results are smaller than the prediction errors produced when only the mean values are used. Consequently, the PLS-SEM model has an appropriate predictive performance. As seen in Table 4, the Q2 values are greater than 0 both at the construct and indicator levels, so the model's predictive performance is adequate.

(2) The linear regression (LM) model approach regresses all exogenous indicators on each endogenous indicator to generate predictions. Compared to the LM results, PLS-SEM

results should have a lower prediction error (in terms of RMSE and MAE) and Q2 values greater than LM. As shown in Table 4, all RMSE and MAE values of the PLS model are lower than those of the LM model, indicating that the model has high predictive power. In addition, the Q2 values for the PLS model indicators are higher than those generated for the LM model. Therefore, H2 is accepted.

Consequently, this study finds sufficient evidence to support the predictive validity (out-of-sample prediction) of the proposed research model in order to predict values for new cases of state motivation. Thus, teacher credibility can predict state motivation in additional samples separate from the dataset used to test the theoretical research model (Dolce, Vinzi, & Lauro, 2017). As a result, this predictive validity offers additional support for the research model tested in this work.

Table 4 Evaluation of predictive validity

Construct prediction									
						Q^2			
State motivation (SM)						**.455**			
Prediction of indicators									
	PLS			**LM**			**PLS-LM**		
	RMSE	MAE	Q2	RMSE	MAE	Q2	RMSE	MAE	Q2
SM1	1.213	.915	.352	1.216	.927	.349	-.003	-.012	.003
SM2	1.233	.955	.339	1.272	.973	.296	-.039	-.018	.043
SM3	1.218	.931	.283	1.255	.951	.238	-.037	-.020	.045
SM4	1.155	.911	.326	1.192	.938	.281	-.037	-.027	.045
SM5	1.341	1.064	.309	1.375	1.104	.273	-.034	-.040	.036
SM6	1.187	.897	.323	1.196	.908	.312	-.009	-.011	.011
SM7	1.199	.960	.278	1.234	.985	.236	-.035	-.025	.042
SM8	1.187	.928	.356	1.199	.931	.343	-.012	-.003	.013
SM9	1.270	.972	.361	1.278	.981	.353	-.008	-.009	.008
SM10	1.235	.946	.330	1.245	.959	.320	-.010	-.013	.010
SM11	1.201	.913	.378	1.208	.920	.370	-.007	-.007	.008
SM12	1.146	.906	.418	1.161	.916	.403	-.015	-.010	.015

RMSE: Root Mean Squared Error; MAE: Mean Absolute Error; PLS: Partial Least Squares; LM: Linear Regression Model

4 DISCUSSION AND CONCLUSIONS

This research aimed to predict university students' state motivation from their perceptions of teacher credibility. The findings indicate that teacher credibility has a positive effect on university students' state motivation, thus coinciding with several previous studies (Froment, Bohórquez, & García, 2021; Frymier & Thompson, 1992; Kulkarni et al., 2018; Martin et al., 1997; Pogue & Ahyun, 2006). As Liu (2021) states, student motivation is an essential link between teacher behaviours and student learning.

Likewise, the predictive capacity of teacher credibility on state motivation was verified, thus suggesting that new cases could be predicted for university students' state motivation

based on new data for teacher credibility. As indicated by several studies in this regard, university students consider that their motivation is, to some extent, determined by their perceptions of teachers' behaviours in the classroom (Amiryousefi & Geld, 2021; Chan et al., 2021; Christophel & Gorham, 1995; Gorham & Christophel, 1992; Gorham & Millette, 1997; Shakir, 2021). Thus, teachers can promote students' state motivation by exhibiting certain behaviours and employing specific strategies in the classroom (Wheeless, Witt, Maresh, Bryand, & Schrodt, 2011). In this sense, several studies highlight that to improve university students' state motivation, teachers must use a competent socio-communicative style, be close, disclose personal information relevant to course content, explain clearly, communicate with the students outside of class to discuss academic issues, and avoid behaviours that reflect burnout or verbal aggression (Christensen & Menzel, 1998; Hussain, Azeem, & Abid, 2021; Khan, Shah, & Ahmad, 2015; Myers & Rocca, 2001; Zardeckaite-Matulaitiene & Paluckaite, 2013; Zhang & Sapp, 2008; Zhang & Zhang, 2005).

Regarding the methodological aspect of the study, the results show that using SEM to explore in more depth university students' perceptions of their teachers' behaviour and its impact on the teaching-learning process is an appropriate approach. As indicated by Lin et al. (2020), as educational research questions become more complex, they must be evaluated with more sophisticated tools, such as structural equations. In this research, PLS-SEM was mainly used because it allows evaluation of the prediction of both in-sample and out-of-sample key constructs, whereas with CB-SEM, this cannot be done due to the indeterminacy of the factor (Rigdon, 2012). In short, in CB-SEM, any evaluation of the structural model's predictive power is highly problematic because of the indeterminacy of the scores of the latent variables (Becker, Rai, & Rigdon, 2013). Thus, this is an excellent opportunity for higher education researchers to use the PLS-SEM capabilities to test theoretical models from a predictive perspective (Ghasemy et al., 2020).

Concerning limitations of the study it should be noted that only students from the University of Seville participated, so future studies could replicate this research with students from different universities, both public and private, to carry out comparative analyses. Likewise, in this research only students from the field of Social Sciences participated, so it is suggested that future research analyse the effect of teacher credibility on the learning process of students who come from other areas of knowledge and, in this way, be able to determine similarities or differences. Likewise, although the sample comprised mainly women as in the education field it responds to the type of population under study, greater participation of men in the study would have allowed us to conduct additional analyses that would have enhanced the results. In this regard, we propose that future research analyse, on the one hand, possible significant differences in university students' state motivation and, on the other hand, the effect of the students' sex on their perceptions of teacher credibility. Similarly, we suggest as a future line of research to establish and analyze more complex models using PLS-SEM that examine the impact of university students' perceptions on teacher behaviour in the teaching-learning process, including moderating and mediating variables. Finally, we recommend, as a future line of research, the incorporation of other constructs and establishing bidirectional analyses that can help to understand how the student's pro-

file, motivation and profile as a learner can have an impact on the teacher's behaviour and on some credibility variables studied (for example, the teacher's kindness or concern for the student's welfare).

Despite these limitations, this study presents important practical implications for teachers, helping them to become aware of the importance of their behaviour both inside and outside the classroom to increase university students' state motivation. Thus, teachers interested in enhancing their students' motivation in the classroom can consider the findings of this study to enrich their teaching practice. In short, this study suggests that, for university students to be motivated in the classroom, teachers should be perceived as credible people. Considering not only the findings of this research but also the impact of teacher credibility on other factors of the teaching-learning process (Finn et al., 2009; Froment, Bohórquez, & García, 2020), it is essential for teachers to establish and maintain their credibility throughout the academic year (Teven & Hanson, 2004) to increase university student learning (Thweatt & Mccroskey, 1998).

5 AUTHORS' CONTRIBUTIONS

- Garcia, A.J.: Acquisition of funds, project management, resources, supervision, writing (review and editing).
- Froment, F.A.: Data curation, formal analysis, research, methodology, original draft writing.
- Bohorquez, M.R.: conceptualization, resources, visualization.

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