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Instructors' teaching styles: relation with competences, self-efficacy and commitment in pre-service teachers

Abstract. Instructors' teaching styles in higher education are an issue of major importance because these interactions affect students' self-perceptions, involvement, and achievement. This study aimed to test a theoretical model of relations between perceived teaching styles (autonomy-support, structure, and control) and competences, self-efficacy, and commitment in pre-service teachers; to assess the invariance of the model in two samples; and to analyze the mediated relations between these variables. Measures were collected from 842 Spanish pre-service teachers. As main research implications, teaching styles predicted acquired competences, competences predicted teaching self-efficacy, and self-efficacy predicted commitment to the profession. This model was equivalent in two samples of childhood and primary education pre-service teachers. Competences and self-efficacy mediated the relationships between variables. As practical implications, this study clearly shows the need for different interventions to enhance adequate instructors' teaching styles and to foster among novice pre-service teachers the acquisition of professional competences, initial self-efficacy, and a good level of commitment to their profession.

Keywords Autonomy support. Structure. Control. Competences. Self-efficacy.

Introduction

Teacher commitment, defined as the psychological attachment to the teaching profession, is a positive predictor of teaching dedication and longevity of teaching career, a barrier against burnout and motivation to leave teaching, and the key to the dedication to improving students' learning achievement (Chesnut and Burley 2015; Lamote and Engels 2010). Research on pre-service teachers has operationalized commitment as career choice satisfaction, reasons for choosing the teaching profession, and planned effort and planned persistence in the teaching profession (DeAngelis et al. 2013; Watt and Richardson 2008).

As for the antecedents of teacher commitment, almost a quarter of a century ago, Coladarci (1992) stated that teachers' self-efficacy was a strong and positive predictor of commitment to teaching. Recent research corroborating this relation in multiple samples and countries is abundant (for a synthesis, see the meta-analysis by Chesnut and Burley 2015). These studies conceived self-efficacy as judgments about the individual capabilities to bring about desired outcomes in student learning and achievement (Tschannen-Moran and Woolfolk Hoy 2001).

A factor influencing teachers' efficacy and commitment is professional competence, defined as a set of individual characteristics including knowledge, abilities, and beliefs that are needed for effective teaching (Kunter et al. 2013). As these competences are teachable and learnable, competence-based education aims to generate a learning environment wherein the pre-service teacher can develop the necessary capacities to effectively function in the teaching profession (Struyven and De Meyst 2010).

Therefore, some authors assert that classroom interactions during pre-service preparation are an excellent context for acquiring professional competences (Rots et al. 2010), to

configure self-efficacy as part of a sense of themselves as teachers (Bruinsma and Jansen 2010; Ronfeldt et al. 2013), and to shape teaching commitment (DeAngelis et al. 2013; Ronfeldt et al. 2013; Rots et al. 2014).

The present study analyzed the relationships between three modalities of student-teacher interaction, professional competences, personal self-efficacy, and professional commitment in two samples of pre-service teachers of early childhood and primary education.

Autonomy support, structure, and control

De Meyer et al. (2014) contend that teachers' ways of interacting with students is of great educational importance, as it affects students' emotions, engagement, learning, and achievement. However, as Wallace et al. (2014) admit, this is one of the most neglected aspects of pre-service teacher instructional practice. These interactions in the classroom were analyzed from several perspectives, one of which is the support of students' basic psychological needs. According to the self-determination theory (SDT), teacher autonomy support, structure, and control can promote (or hinder) the satisfaction of three basic psychological needs for autonomy, competence, and relatedness (Assor 2012; Jang et al. 2010; Lechuga 2014; Liu et al. 2014).

The first instructional style that fosters these needs is autonomy support. Autonomy supportive teachers offer students the possibility to choose between different alternatives, they consider the students' perspective, acknowledge their emotions and thoughts, provide them with meaningful rationale for tasks, involve them in decision making, and minimize the use of pressure and control (Assor 2012; Guay et al. 2016; Reeve 2009).

A further component of teacher instructional style, related to autonomy support, is structure. Structure refers to the degree to which teachers provide students with clear expectations, explicit information, optimal challenges, feedback, and appropriate guidance to effectively attain desired educational outcomes (Aelterman et al. 2013; Guay et al. 2016; Jang et al. 2010; Mouratidis et al. 2013). Teachers who provide structure offer sufficient guidance during the learning process, set clear rules, mark the boundaries of activities, and behave contingently. The lack of structure leads to a permissive, laissez-faire, and even chaotic learning context (Mouratidis et al. 2013). In the above studies, teacher-provided structure positively correlated both with autonomy support and achievement.

Autonomy supportive teaching is contrasted with "autonomy-suppressing teacher behaviors" (Assor 2012) or "psychologically controlling teaching" (Benita et al. 2014; Soenens et al. 2012). Controlling teachers apply pressuring tactics to persuade students to think, feel, or behave in certain ways, (Assor 2012; Wijnia et al. 2014). These pressuring or intrusive strategies include implicit or explicit threats of punishments, rewards, orders, guilt induction, and expressions of disappointment (Aelterman et al. 2013; Soenens et al. 2012). In these studies, controlling teaching negatively correlated with persistence.

Few studies have assessed autonomy support in pre-service teachers. A study in the USA found that perceived autonomy support was a positive predictor of mastery approach goals (Ciany et al. 2011), whereas a study among Belgian undergraduates showed that autonomy support and structure were positive predictors of autonomous motivation and negatively predicted controlled motivation (Baeten et al. 2013).

Teachers' competences

As Feiman-Nemser (2008) asserts, when we refer to teacher training, we generally mean research on how people learn how to teach and develop their practice over time. As this author acknowledges, learning to teach includes different approaches, such as teacher preparation (DeAngelis et al. 2013), teacher capacities (McDiarmid and Clevenger-Bright 2008), teacher quality (Kunter et al. 2013), professional identity (Lamote and Engels 2010; Southerland and Markauskaite 2012) and, more often, professional competences.

Numerous authors (Caena 2014 a, b; Kunter et al. 2013; Struyven and De Meyst 2010; Southerland and Markauskaite 2012; Wal et al. 2014) have conceptualized teachers' competences mainly as the interplay between an integrated set of personal characteristics—including knowledge and understanding, skills and abilities, and beliefs and values—that are needed for effective performance in various teaching contexts. In line with this educational research, the European Commission (2011 a, b; 2013) also considers that teacher competences are best described as a complex combination of knowledge, skills, and values.

According to this approach, competences are not innate, but learnable and thus, teachable (Kunter et al. 2013; Wal et al. 2014). Therefore, competence-based education intends to create opportunities in a meaningful learning environment wherein pre-service and in-service teachers can develop performance-oriented capabilities consisting of clusters of knowledge structures, skills, and attitudes necessary to constantly adapt their profession to an ever-changing environment.

Teaching efficacy

Teacher personal efficacy beliefs (or teacher self-efficacy) have been defined as judgments about their individual capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated (Bandura 1997; Wookfolk Hoy et al. 2009). Teacher self-efficacy has been operationalized as a multidimensional construct including several factors such as efficacy for instructional strategies, for classroom management, and for student engagement (Chang et al. 2010; Thadani et al. 2015).

Teachers construct their self-efficacy beliefs through the integration of information drawn from four sources: mastery experiences, vicarious learning, social persuasion, and interpretation of physiological states (Bandura 1997). However, pre-service teachers may specially benefit from vicarious experiences, that is, the observation of competent and credible models (Chang et al. 2010; Rots et al. 2010; Tschannen-Moran and Wookfolk Hoy 2007). As these authors assert, all pre-service teachers undergoing training have had a long “career” as pupils/students. Furthermore, through the images formed during teacher training (from the professional literature to observing their own teachers teaching, observing peers teaching during in-class simulations, and observing veteran teachers during early field experience), pre-service teachers begin to obtain information about the nature of teaching tasks (Tschannen-Moran and Wookfolk Hoy 2001). Verbal persuasion occurs when the pre-service teacher is convinced by others that he or she possesses the capabilities and skills necessary for succeeding and overcoming challenges in different professional situations (Moulding et al. 2014). Verbal persuasion offers information about the nature of teaching tasks, contributes to increase a teacher's skills for overcoming situational obstacles, and

provides specific feedback about performance (Tschannen-Moran and Wookfolk Hoy 2007). Finally, through the interpretation of their physiological and emotional cues, positive feelings enhance personal self-efficacy and increase the likelihood that teachers will choose to engage in challenging teaching tasks. Rots et al. (2010) found that the degree to which pre-service teachers have attained the basic competences positively predicted self-efficacy.

Teaching commitment

For some researchers, teaching commitment is a factor of teacher's professional identity, among other components such as their career decision-making, motivation, job satisfaction or emotions (Lamote and Engels 2010; Thomson and Palermo 2014).

Although there is no unanimously accepted definition of teacher commitment, the most extensively cited is that of Colodarci (1992), who considers commitment to teaching as an indicator of a teacher's psychological attachment to the teaching profession, including the two components of teacher attrition and choice of profession. This characterization of teaching commitment is shared by many authors (Chesnut and Burley 2015; Lamote and Engels 2010; Rots and Alterman 2008; Rots et al. 2007, 2010; Thomson and Palermo 2014). Several authors have studied teachers' organizational commitment, defined as the relative strength of an individual's identification with the values and goals of a particular organization, intention to exert effort on behalf of the organization, and desire to remain in the organization (Chesnut and Burley 2015).

Teaching commitment for in-service teachers has been operationalized as: planned effort in the teaching profession, that is, additional energy investment, teacher involvement in children's academic achievement and social integration, planned persistence (or retention) in the teaching profession versus teachers' interest in changing occupations if they were offered an opportunity, and teachers' satisfaction with their profession (Rots and Aelterman 2008; Rots et al. 2007, 2010).

Several researchers on pre-service teachers' professional commitment have contended that the underlying purpose of teacher education programs is to form the pre-service teachers' professional identity (Lamote and Engels 2010; Thomson and Palermo, 2014). In the literature on pre-service teacher commitment, some studies have focused on aspects of psychological attachment, value of the profession, longevity of teaching career, and promoting the entrance of pre-service teachers into the profession (see Chesnut and Burley 2015). Pre-service teachers are committed to their career choice rather than to the career itself. Thus, when studying pre-service teachers, the most frequent operationalizations and indicators of teaching commitment were: the intention to enter (or not) the teaching profession (Rots et al. 2014; Thomson and Palermo 2014), career choice satisfaction (Lamote and Engels 2010; Watt and Richardson 2008; Watt et al. 2014), planned effort in the teaching profession (Eren 2012; Watt and Richardson 2008; Watt et al. 2014), and planned persistence in teaching, or the determination to remain (or not) in the teaching profession (Eren 2012; Thomson and Palermo 2014; Watt and Richardson 2008; Watt et al. 2014).

In a classical study, Coladarci (1992) stated that teachers' personal sense of efficacy is a potent and positive predictor of commitment to teaching. More recent empirical and theoretical studies corroborated this finding (Bresó et al. 2011; Chesnut and Burley 2015; Rots et al. 2007, 2010; Thadani et al. 2015; Visser-Wijnveen et al. 2012; Zhang et al. 2014).

The Spanish context

According to the International Standard Classification of Education, the ISCED 2011, elaborated by the UNESCO (2012), “Level 0” programs of early childhood education target children below the age of entry into Level 1 of education, primary education. Level 2 corresponds to lower secondary education, and Level 3 is upper secondary education.

The ISCED Level 0 programs can be referred to in many ways, such as play school, reception, pre-primary education, pre-school or “*educación inicial*” (UNESCO 2012). According to this institution, this Level 0 of *early childhood education* includes two categories: early childhood educational development, in the age range of 0 to 2 years; and pre-primary education programs, targeting children from age 3 until the age when they start primary education (UNESCO 2012).

As in the characterization of the ISCED 2011, in Spain, there are three basic levels of non-university education: “*educación infantil*” (0-6 years), primary education (6-12 years), and secondary education (12-18 years). The educational level of “*educación infantil*” comprises two stages: the first stage includes children up to 3 years, and the second stage ranges from 3 to 6 years (Ministerio de Educación 2007a). The teachers of “*educación infantil*” can perform these two stages of early childhood education. According to the previously revised ISCED 2011, in the present study, we refer to this educational level as early childhood education, and to these teachers as early childhood teachers.

In Spain, specialized teachers teach each of these levels of education. Since the introduction of the European Higher Education Area, both early childhood education and primary education teachers undertake a 4-year degree, mainly in the Faculty of Education.

The curriculum for early childhood education and for primary education teachers is quite standard in all of the education faculties across Spain, given that 87.5% of the curriculum is prescriptive for both degrees (Ministerio de Educación 2007 a, b).

Regarding the training of the teaching staff, it is assumed that every society needs to have a shared understanding about what is meant by “quality” and “competence” in teaching (European Commission 2011 a, b). However, as Caena and Margiotta (2010) acknowledged, there seems to be a lack of international consensus on the best options for the policies and practices of teacher education.

This debate on the training of teachers emerged intensely in the European Union (EU), giving rise to different documents that reflect on teachers’ competences and their acquisition (Caena, 2014 a, b; European Commission 2011 a, b; 2013). This organism sent these and other documents to different member countries of the EU, also to Spain, as a member.

In Spain, a process of reflection on the competences of teachers of different levels is also being carried out. In this process of reflection, the present study is of great interest to analyze the extent to which future teachers of early childhood education and primary education consider that certain core competencies for their future profession have been acquired.

Such a precise framework of acquired teacher competences may be the basis for defining the learning outcomes of initial teacher education programs (European Commission, 2013). In this sense, we must remember that the responsibility for the preparation of pre-

service teachers was usually transferred by Society to higher education institutions (Caena and Margiotta, 2010).

The present study

The theoretical framework for the present study was derived from the model of “the cyclical nature of teacher efficacy” proposed by Tschannen-Moran et al. (1998) and Wookfolk Hoy et al. (2009). These authors hypothesized that the assessment of personal teaching competence is influenced by experiences in classroom, which determines teacher efficacy, which subsequently affects effort and persistence.

Previous research analyzed the relationships between some of these variables, but mostly in separate studies. Thus, perceived autonomy support was a positive predictor of adequate motivation (Baeten et al. 2013; Ciany et al. 2011). Furthermore, basic professional competences positively predicted self-efficacy (Rots et al. 2010). Finally, self-efficacy positively predicted commitment to teaching (Bresó et al. 2011; Chesnut and Burley 2015; Colodarcy 1992; Thadani et al. 2015; Visser-Wijnveen et al. 2012; Zhang et al. 2014). Likewise, the models of relations tested by Rots et al. (2007, 2010) are similar to this proposal. The hypothesized paths between variables in this study are depicted in Fig. 1.

Insert Fig. 1

Therefore, the research hypotheses tested by structural equation modeling (SEM) were as follows: (1) perceived provision of autonomy support, structure, and control by university instructors would significantly predict competences in pre-service teachers; (2) competences would positively predict personal self-efficacy; (3) efficacy would positively predict career choice satisfaction, planned effort, and planned persistence; (4) the relationships between variables would be similar for two samples of pre-service teachers; (5) competences and self-efficacy would mediate the relations between variables.

Overall, the current study deepens our knowledge about teachers’ professional growth by: (a) studying the provision of autonomy support, structure, and control by university instructors, three constructs scarcely studied in higher education and pre-service teachers; (b) testing the role of these variables in predicting competences, self-efficacy, and commitment to teaching; (c) analyzing these relationships using SEM, which allows us to study direct and indirect effects among variables; (d) verifying the differences between two samples of pre-service teachers. These theoretical contributions are also relevant to teachers’ learning as practical implications.

Method

Sample

Participants were 842 pre-service teachers, enrolled in a four-year program of teacher training in different faculties of education at six campuses from three state universities in northwestern Spain.

Measures

The Spanish version of the applied instruments was designed through cross-cultural scale translation (Hambleton and Patsula, 1998). The original scales were translated from English into Spanish (forward-translation) by a team of translators and expert lecturers on motivation and instruction of pre-service teachers. Using this translated version in Spanish, the scales were translated into English (back-translation). The team of translators and lecturers selected the items that matched the initial meaning as well as writing the instructions and setting the format of the scale, which was identical to the English version. Finally, the Spanish version of the scales was applied to a subsample of pre-service teachers in order to previously evaluate the clarity and adequacy of each item. In all measures, pre-service teachers scored each item on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) (see the Appendix in Supplementary electronic material).

Autonomy support, structure, and control

The students' perception of *autonomy support* provided by their university teachers was evaluated using the Teacher Provision of Autonomy Support subscale, taken from the Teacher as Social Context (TaSC) questionnaire (Belmont et al. 1992). The subscale, referring to their teachers during their degree courses, consisted of five items (e.g., "My teachers talk about how we can use the things we learn in class").

To assess the students' perception of *structure* provided by university instructors, we administered the Teacher Provision of Structure subscale, also taken from the Teacher as Social Context (TaSC) questionnaire (Belmont et al. 1992). The instrument consists of four items assessing diverse components of perceived structure in classroom (e.g., "My teachers make it clear what they expect of me in class").

Students' perception of *control* provided by their university teachers was measured using four items selected from the Psychologically Controlling Teaching scale proposed by Soenens et al. (2012) (e.g., "My teachers are less friendly with me if I do not see things their way").

Teacher competences

This variable was measured with a scale adapted from the Aspects of Competence (European Commission 2013, p. 45-46). This document presents a list of competences grouped into three factors: knowledge, skills, and dispositions. The wording of the original sentences was slightly modified to adapt them to a multiple-choice item format. Students responded to 12 items grouped into the three factors, which have been referred to in the present study as knowledge (e.g., "I believe I have knowledge about teaching and learning processes, group dynamics, and motivational issues"), skills (e.g., "I believe I have the skills needed for reflective learning, both individually and in professional communities"), and dispositions (e.g., "In general, I think I am able and committed to promoting learning for all students").

Teacher self-efficacy

Personal self-efficacy was assessed using the short form of the Teachers' Sense of Efficacy Scale (TSES) developed by Tschannen-Moran and Woolfolk Hoy (2001). In all self-

efficacy subscales, items began with the statement “When you become a teacher ...” Three 4-item subscales were applied to assess pre-service teachers’ efficacy for instructional strategies (e.g., “To what extent can you provide an alternative explanation or example when students are confused?”); for classroom management (e.g., “How much can you do to control disruptive behavior in the classroom?”); and for student engagement (e.g., “How much can you do to motivate students who show low interest in schoolwork?”).

Teaching commitment

Professional commitment was assessed by three subscales that tapped career choice satisfaction, planned effort, and planned persistence (Watt and Richardson 2008). The career choice *satisfaction* subscale consists of two items (e.g., “How satisfied are you with your choice of becoming a teacher?”). The next two subscales began with the statement “When you become a teacher ...” The *planned effort* subscale consists of four items (e.g., “How much effort will you put into your teaching?”). The *planned persistence* subscale also includes four items (e.g., “How sure are you that you will stay in the teaching profession?”).

Data collection and analyses

All measures were collected during May of 2015, at the end of the academic year. The research participants responded individually to the questionnaire in their classrooms in the presence of their teachers. Permission from all appropriate university authorities to collect data was obtained. Participants were informed about the aim of the current study. All participants took part in the study voluntarily, and no extra credit or incentives were given for their participation. Participants were guaranteed complete confidentiality and were assured that the results would not affect their grades.

In the present study, data analyses involved three main steps. After the preliminary analyses, the first set of confirmatory factor analyses (CFA) tested the adequacy and equivalence of the measurement model for separate samples (childhood and primary pre-service teachers). Secondly, different SEM analyses were applied to test the hypothesized structural model and its equivalence for two samples. Finally, the mediated effects between variables were also analyzed using bootstrap. See, for example, Liu et al. (2014), Meng et al. (in press), and Tuononen et al. (2016) for recent applications of SEM analysis to higher education.

The CFA and SEM model fit was evaluated with the following indices (Byrne, 2010): the χ^2 , the main index for evaluating the global significance of a model, although it is very sensitive to sample size in complex models; the indicator χ^2/df , which is considered to be acceptable when values are below 5; the Tucker Lewis index (TLI) and the comparative fit index (CFI), with values above .90; and the root mean square error of approximation (RMSEA), with values ranging from .08 to .05 or less, which are considered to be reasonable. These fit indexes are among the most widely reported in the SEM literature. We performed the CFA and SEM analyses using the AMOS 22 package (Arbuckle 2013; Byrne 2010).

Results

The latent variables assessed were: instructors' teaching styles (autonomy support, structure, and control) with 12 indicators; competences (knowledge, skills, and dispositions) with 12 indicators; teacher self-efficacy (for instructional strategies, classroom management, and student engagement) with 12 indicators; and teaching commitment (satisfaction, planned effort, and planned persistence) with 10 indicators. Thus, a total of 46 indicators was applied to assess the variables. However, one of the limitations of SEM analysis is that the number of indicators must be less than 30 (Byrne 2010). Thus, to reduce the number of indicators for SEM analysis, the subscales of Competences and Self-efficacy were parceled by grouping items according to their respective factors. Thus, for SEM analysis, each of these two latent variables consisted of three indicators corresponding to their factors. In preliminary analyses (descriptive statistics and correlations), the means for the 12 items that compose (respectively) the Competences and Self-efficacy subscales were used. Many authors have synthesized in a single indicator the different teaching competences (see Rots and Aelterman 2008; Rots et al. 2007, 2010) and the three factors of self-efficacy assessed by the TSES (see Bruinsma and Jansen 2014; De Neve et al. 2015; Moulding et al. 2014; Tschannen-Moran and Woolfolk Hoy 2007; Zhang et al. 2014).

Preliminary analyses

The sample of this study included 842 pre-service teachers ($M = 23.16$ years of age; $SD = 4.1$ years). A total of 407 research participants (48.3%) were enrolled in the Early Childhood Education degree (i.e., the "childhood" sample), and 435 students (51.7%) were enrolled in the Primary Education degree (i.e., the "primary" sample). As for gender, 81.2% were women (91.4% in the childhood sample and 71.7 % in the primary sample).

First, we calculated the descriptive statistics (see Table 1). For both samples, the mean scores were highest in planned effort, satisfaction, and planned persistence. The lowest values were in control.

Insert Table 1

Mean differences (t -test) between samples indicated that the childhood sample obtained values significantly higher in provided structure, planned effort, and planned persistence.

Thereafter, the correlations between variables were calculated (Table 2). The two samples showed identical patterns of correlations: control was negatively related to the rest of the variables, which were positively correlated with one another. The correlations between control and satisfaction, planned effort, and planned persistence were low or nonsignificant. The remaining correlations were all significant.

Insert Table 2

Measurement model: invariance

In order to test the robustness of the evaluation instruments and the factorial invariance for the two samples, we performed different CFAs. The unconstrained or baseline model for the two samples showed good fit to the data ($\chi^2 = 1259.4$, $df = 638$, $p < .001$; $\chi^2/df = 1.97$, TLI = .934, CFI = .952, RMSEA = .034). These indices suggest that the number of factors and the pattern of their structure were similar across the childhood and primary

samples. Constraining the factor loadings across the two samples resulted in acceptable fit ($\chi^2=1296.6$, $df = 658$, $p<.001$; $\chi^2/df = 1.97$, TLI = .943, CFI = .951, RMSEA = .034), suggesting that factor weights were invariant across the two groups of pre-service teachers. Constraining intercepts to be equal across groups yielded no significant changes in fit ($\Delta FI = .000$), and the model fit the data well ($\chi^2 = 1327.6$, $df = 686$, $p < .001$; $\chi^2/df = 1.94$, TLI = .954, CFI = .951, RMSEA = .033). Invariance testing across the two samples suggested that the measurement model fit the data in similar ways for the two samples.

Structural model: invariance

We then tested the structural model across the two groups of childhood and primary pre-service teachers. The hypothesized model depicted in Fig. 1, with factor loadings and structural links freely estimated, showed a very good fit to the data for both samples ($\chi^2 = 1266.7$, $df = 668$, $p < .001$; $\chi^2/df = 1.89$; TL = .948; CFI = .954; RMSEA = .033). This result indicated the adequacy of the structural model for both educational levels of pre-service teachers. This model was also found to fit the data adequately for the childhood sample ($\chi^2 = 705.6$, $df = 334$, $p < .001$; $\chi^2/df = 2.11$, TLI = .936, CFI = .943, RMSEA = .052) and for the primary sample ($\chi^2 = 561.1$, $df = 334$, $p < .001$; $\chi^2/df = 1.68$, TLI = .960, CFI = .965, RMSEA = .040). Fig. 2 shows the standardized paths for each sample.

In the second step, all the structural links were constrained to be equivalent across both samples. This represented the specific test of the invariance of the relationships among constructs across groups (Byrne 2010). The fit of the constrained model was still acceptable ($\chi^2 = 1309.3$, $df = 695$, $p < .001$; $\chi^2/df = 1.884$, TLI = .948, CFI = .953, RMSEA = .032). Constraining structural links resulted in no changes in TLI ($\Delta TLI = .000$) and in gains for CFI ($\Delta CFI = .001$) and RMSEA ($\Delta RMSEA = .001$). These indexes suggested that the structural relationships among the assessed constructs were equivalent for pre-service early childhood and primary teachers.

Insert Figure 2

The analysis of the direct effects (see Fig. 2) showed that competences were positively predicted by perceived autonomy support and structure, and were negatively predicted by control. Competences positively predicted self-efficacy. Finally, self-efficacy positively predicted satisfaction, planned effort, and planned persistence.

Mediational analyses

In the next step, we examined whether competences and self-efficacy fully or partially mediated the relations between the remaining variables. The AMOS 22 software computes an estimation of indirect effect and the significance of a specific effect that can then be tested by bootstrapping confidence intervals based on randomly selected samples (Byrne 2010; Arbuckle 2013). For the whole sample ($n = 842$), the full mediational model depicted in Fig. 2 (Model 1) was compared with a partial mediational model in which all direct paths between variables were included (Model 2). This analysis revealed that only two additional direct paths were significant in Model 2. So, the direct ($\beta = .200$) and indirect ($\beta = .133$) paths from autonomy support to self-efficacy were significant; analogously, direct ($\beta = .354$) and indirect

($\beta = .159$) paths from competences to satisfaction were also significant. In both cases, these results imply partial mediation among variables (see the top of Table 3).

Insert Table 3

As for the full mediation (see the bottom of Table 3), competences fully mediated the negative relations from control to self-efficacy. Self-efficacy fully mediated the relations from competences to planned effort and planned persistence. Competences and self-efficacy both fully mediated the positive relationships from autonomy support to satisfaction, planned effort and planned persistence, and fully mediated the negative relationships from control to satisfaction and planned effort. In all these cases, the direct effects were nonsignificant. The mediated effects of teacher-provided structure were nonsignificant.

Discussion

The current study provides two main contributions to research in higher education. First, from a theoretical perspective, this study simultaneously assessed various relevant constructs in the context of higher education. As mentioned in the introduction, autonomy support, structure, control, competences, self-efficacy, and commitment are all variables extensively studied in the academic context. However, these constructs have scarcely been assessed simultaneously in higher education, and even fewer studies have analyzed their relationships in samples of pre-service teachers. This issue is dealt with in the following section on theoretical implications. Second, from an applied perspective for higher education, the results of this study underscore the need for implementing an array of classroom interventions, given that all the measured variables were largely under the influence of the instructors. These interventions are discussed in the section on higher education implications.

Theoretical implications

First, pre-service teachers who thought their university instructors supported their autonomy, offered clear classroom rules and regulations, and exercised less control tended to consider they had acquired more professional competences of knowledge, skills, and dispositions. This result is in consistent with scant previous research with pre-service teachers (Rots et al. 2010). To our knowledge, no previous study has simultaneously evaluated autonomy support, structure, and control in pre-service teachers. However, these results agree with previous research that found teacher-provided autonomy support and structure enhances learning and performance (Jang et al. 2010; Sierens et al. 2008), whereas control undermines achievement (Wijnia et al. 2014). Furthermore, in this study, perceived autonomy support also directly enhanced pre-service teachers' self-efficacy.

Second, the three clusters of self-rated competences positively predicted perceived self-efficacy for instructional strategies, for classroom management, and for student engagement, in line with some previous studies (Rots et al. 2010). Even though the path values from self-efficacy to competences were significant for both samples, the proportion of explained variance was low (38% for childhood and 26% for primary). This result underscores that pre-service teachers' self-efficacy depends on several other factors (Bandura 1997; Tschannen-Moran and Woolfolk Hoy 2007).

Third, self-efficacy positively predicted pre-service teachers' commitment, operationalized as satisfaction with choice of teacher profession, planned effort to be a good teacher, and planned persistence in the teaching profession. This result agrees with the findings of several previous theoretical and empirical studies (Chesnut and Burley 2015; Coladarci 1992; Rots et al. 2007, 2010). Competences are also a positive and direct predictor of satisfaction with career choice. Furthermore, the three indicators of commitment positively correlated with one another.

Finally, as for the indirect effects, perceived autonomy support exerted a positive influence on self-efficacy (by enhancing competences) and on commitment (by raising competences and self-efficacy). Likewise, competences favored professional commitment through the promotion of students' self-efficacy. On the contrary, the controlling instructional style hampered self-efficacy (by hindering the acquisition of competences) and commitment (by undermining competences and self-efficacy).

All these relationships among the assessed variables were equivalent for two samples of childhood and primary pre-service teachers.

Higher education implications

According to many authors (Aelterman et al. 2013; Jang et al. 2010; McLachlan and Hagger 2010; Vansteenkiste et al. 2012; Wallace et al. 2014), autonomy support and structure are not independent, but rather complementary dimensions of a teacher's interpersonal style, and both can, and should, exist in a mutual supportive way in the classroom. Thus, in order to enhance autonomy support and structure, these authors propose that teachers would do well by: (a) providing encouragement and clear instructions when introducing tasks, such that students feel confident that they can meet the teacher's expectations; (b) avoiding controlling statements (e.g., "should" or "go to") and behaviors; (c) becoming aware of the factors that drive them toward a more controlling teaching style; (d) recognizing the benefits of autonomy support and structure, assuming the ineffectiveness of other styles such as controlling or permissive; (e) acknowledging students' opinions and negative feelings when problems arise in classroom; (f) actively soliciting students' opinions and accepting the anger that the assigned tasks might elicit; (g) and providing students with a personally meaningful explanation for engaging in important and compulsory, even though non-interesting, learning activities. Fortunately, as Aelterman et al. (2013) and Reeve (2009) state, teachers can easily learn these and other similar instructional strategies.

To modify the psychologically controlling instructional style, teachers can be informed about what interactions constitute "controlling" teaching behaviors and their negative effects on students' emotions, engagement, and achievement (De Meyer et al. 2014; Soenens et al. 2012; Wijnia et al. 2014). This awareness of what it means to be controlling is the starting point to reduce these behaviors. De Meyer et al. (2014) and Soenens et al. (2012) also alert us about certain predictors of psychologically controlling teaching. Among these antecedents, they point out two forces: the "pressure from above", the teacher-perceived constraints at work or the pressures from authorities; and the "pressure from within", operationalized as teachers' controlled motivation for teaching relative to their autonomous motivation. These pressures distract teachers and foster an "objectifying" attitude towards

students. However, encouraging teachers to minimize the use of controlling tactics might not be easy: as De Meyer et al. (2014) recognize, the use of certain controlling behaviors is intertwined with some teachers' personality functioning.

As for the acquisition of professional competences, the European Commission (2013) contends that the ultimate purpose of systems of teacher education and professional growth must be to support the development of teacher learning. According to this organization (European Commission, 2011 a, b; 2013), a teacher educational system that enables all teachers to acquire and develop the competences they need must include three key components: stimulation of teachers' active engagement in career-long learning and competence development; assessment of the development of teachers' competences, with adequate tools based upon a shared consensus about the abilities required by teachers, in the initial teacher education program and during continuous professional development; and provision of coherent, appropriate, and relevant learning opportunities, through which all the teachers can acquire and develop the competences they need.

In order to foster novice teachers' initial self-efficacy (a relatively stable personal characteristic once set), a more detailed knowledge of the sources of teacher efficacy beliefs can assist teacher educators, principals, and other practitioners (Tschannen-Moran and Woolfolk Hoy 2007). Especially for novice teachers, De Neve et al. (2015) consider as important different behaviors and strategies, such as the support from colleagues, by improving opportunities to share knowledge and experiences with other teachers on different educational approaches and contexts. Besides, more experienced teachers may be asked to provide novice teachers with good examples of effective instructional strategies. Schools could also appoint mentors to coach novice teachers in the learning process of implementing instruction in the classroom.

To enhance commitment among pre-service teachers, Thomson and Palermo (2014) recommend that teacher preparation programs ensure that students develop a realistic comprehension of teaching, so that pre-service teachers' decisions to commit -or not- to the profession are well informed. These authors also caution teacher education programs against presenting an excessively optimistic view of the teaching profession that is far from the reality of the difficulty of teaching tasks. Analogously, Eren (2012) asserts that teacher commitment increases when the curriculum includes leadership knowledge in order to enable teachers to combine teaching with other responsibilities.

Conclusion and limitations

To conclude, this study found that the pre-service teachers' perceptions of autonomy support, structure, and control provided by their university instructors were significant predictors of teaching competences, which predict teaching self-efficacy. All these variables, directly or indirectly, predicted pre-service teachers' commitment, operationalized as satisfaction with the choice of becoming a teacher, planned effort, and planned persistence in the teaching profession. These relationships were equivalent for two samples. These and other previous similar findings have practical implications. Bearing in mind the decisive role of these constructs for teachers' professional success, researchers have presented different intervention proposals aimed at enhancing these variables in pre-service and in-service teachers.

In the present study, we tested a structural model, the sequence of which was strongly based on theory and previous research. However, the findings should be interpreted with caution owing to several limitations which may provide the source for future research.

In this study, all data were based on students' self-reports, similar to other recent studies on higher education (Meng et al. in press; Tuononen et al. 2016) and on autonomy support, structure, and control (Haerens et al. 2015; Jang et al. 2016). However, other studies have shown some more objective ways to assess these variables (see De Meyer et al. 2014; Struyven and De Meyst 2010; Wallace et al. 2014). Therefore, in future work, a multi-informant perspective (including students and observers) could be taken to gain greater insight into the relationships between variables.

The design of the present work was cross-sectional, with all variables being evaluated at the same time, as in other recent studies on higher education (Tuononen et al. 2016; Meng et al. in press) and in the analysis of autonomy support, structure, and control (Haerens et al. 2015; Solstad et al. 2015). However, we acknowledge clear benefits associated with longitudinal studies (see Holzberger et al. 2013; Jang et al. 2016; Patall et al. 2016) or experimental procedures (see Benita et al. 2014). Future longitudinal or experimental research can examine the proposed (and alternative) model of relationships, the reciprocal interactions between constructs, and causality statements.

In this study, only one of the predictors of self-efficacy was assessed. Further studies are required to analyze other sources such as mentor support (Moulding et al. 2014), the teaching practicum (Klassen and Tze 2014), or professional experience (Tschannen-Moran and Woolfolk Hoy 2007).

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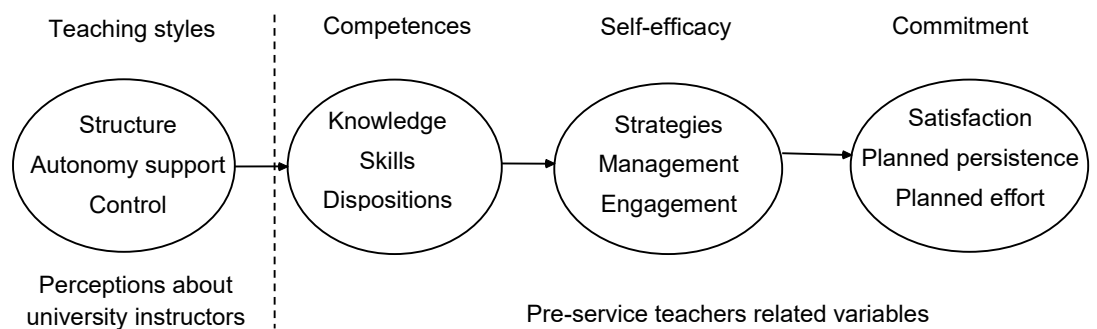


Fig. 1 The hypothesized model of relations among variables

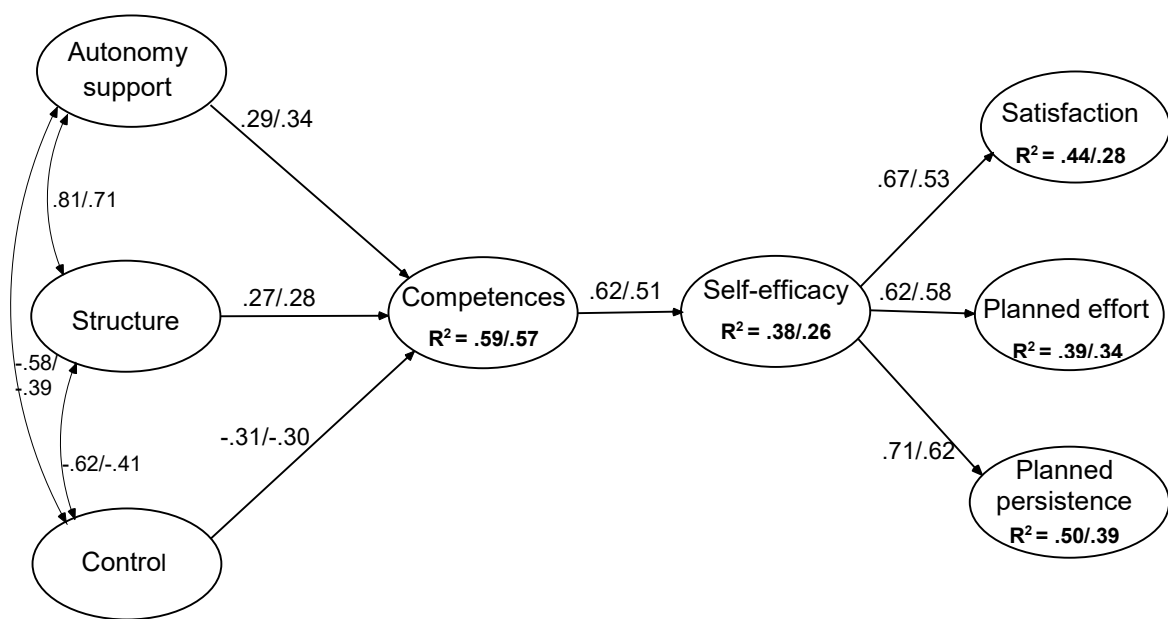


Fig. 2 Full mediational model for both samples (infant/primary)
Note: All values are standardized regression coefficients. For clarity of presentation, observed indicators were not drawn.

Table 1 Cranach's alpha, means and standard deviations (SD) of variables

	Reliability (α)	Childhood		Primary		Difference test	
		Mean	SD	Mean	SD	<i>t</i>	<i>p</i>
Autonomy Support	.84	2.87	.93	2.76	.87	1.80	.072
Structure	.75	2.91	.85	2.75	.76	2.86	.004
Control	.77	2.21	.85	2.24	.77	-.60	.552
Competences	.88	3.68	.59	3.62	.56	1.61	.107
Self-efficacy	.89	4.09	.49	4.05	.48	1.54	.124
Satisfaction	.88	4.41	.84	4.36	.88	.87	.384
Planned Effort	.94	4.51	.77	4.36	.95	2.54	.011
Planned Persistence	.82	4.24	.60	4.08	.75	3.05	.001

Table 2 Pearson correlations between variables for childhood sample (over the diagonal) and primary sample (under the diagonal)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Autonomy S.	-	.66	-.47	.58	.37	.26	.15	.22
(2) Structure	.57	-	-.50	.59	.31	.26	.16	.18
(3) Control	-.29	-.32	-	-.53	-.36	-.32	-.23	-.21
(4) Competences	.57	.49	-.40	-	.57	.52	.37	.36
(5) Self-efficacy	.32	.21	-.20	.49	-	.57	.57	.60
(6) Satisfaction	.26	.25	-.23	.38	.47	-	.48	.46
(7) Pl. Effort	.34	.27	-.23	.38	.49	.44	-	.45
(8) Pl. Persistence	.22	.14	-.09	.26	.50	.46	.30	-

Note: for both samples, $|r| \geq .10$ was statistically significant at $p < .05$; $|r| > .14$ was significant at $p < .01$.

Table 3 Effects on self-efficacy and commitment (full sample; n = 842)

Predictor → Criterion	Direct effect	Indirect effect		Total effect ^c
		Sum (<i>p</i>) ^a	CI ^b	
<i>Partial mediation</i>				
Autonomy S. → Self-efficacy	.200	.133 (.000)	.077/.207	.333
Competences → Satisfaction	.354	.159 (.000)	.101/.234	.513
<i>Full mediation</i>				
Autonomy S. → Satisfaction	-.021	.242 (.000)	.160/.352	.227
Autonomy S. → Pl. Effort	-.006	.195 (.000)	.104/.289	.189
Autonomy S. → Pl. Persistence	-.007	.243 (.000)	.138/.352	.236
Control → Self-efficacy	-.063	-.120 (.000)	-.178/-.073	-.178
Control → Satisfaction	-.012	-.170 (.000)	-.251/-.108	-.187
Control → Pl. Effort	.005	-.110 (.001)	-.181--.043	-.173
Competences → Pl. Effort	.049	.218 (.000)	.144/.306	.267
Competences → Pl. Persistence	.043	.278 (.000)	.184/.389	.321

Notes: ^(a) The probability associated to the sum of standardized indirect effects was estimated using the two-sided bias-corrected confidence interval bootstrap test of AMOS 22 (confidence level = 95%; samples = 5 000). ^(b) CI = Confidence Interval. ^(c) All the total effects were significant ($p < .001$).

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Appendix

Scales applied, in English (original) and Spanish (translated)

Teacher provision of autonomy support (Belmont et al., 1992).

Teacher provision of Autonomy support

36 My teacher gives me a lot of choices about how I do my schoolwork/ Mis profesores/as me ofrecen varias alternativas para que elija cómo hacer los trabajos.

37 When it comes to assignments, my teacher gives me all kinds of things to choose from/ En las distintas tareas, mis profesores/as me ofrecen múltiples opciones entre las que escoger.

48 My teacher talks about how I can use the things we learn in school/ Mis profesores/as me explican cómo aplicar en la práctica lo que aprendo en el aula.

49 My teacher encourages me to find out how schoolwork could be useful to me/ Mis profesores/as me animan a buscar formas de utilizar lo que aprendo.

Teacher provision of Structure

17 When my teacher tells me he/she will do something I know he/she will do it/ Cuando mis profesores/as me aseguran que van hacer algo, confío en que lo harán.

21. My teacher makes it clear what he/she expects of me in school/ Mis profesores/as me explican con claridad lo que esperan de mí en el aula.

26. My teacher shows me how to solve problems for myself/ Mis profesores/as me enseñan cómo resolver los problemas por mí mismo/a.

31. My teacher makes sure I understand before he/she goes on/ Mis profesores/as se aseguran de que he entendido todo antes de avanzar en sus explicaciones.

Teacher provided control (Soennens et al., 2012).

2 My teachers clearly show that I have hurt their feelings when I have failed to live up to their expectations/Mis profesores/as me hacen ver que les he defraudado cuando no he cumplido sus expectativas.

3 My teachers are less friendly with me, if I do not see things their way/Mis profesores/as se muestran más distantes conmigo cuando no comparto sus opiniones.

5 My teachers make me feel guilty when I dissatisfied them/Mis profesores/as hacen que me sienta culpable cuando no están satisfechos con mis resultados.

7 My teachers often interrupt me/Mis profesores/as me interrumpen constantemente.

Teacher competences (European Commission, 2013).

Knowledge. I believe I have enough knowledge about.../Creo que tengo los conocimientos necesarios sobre...

+ Teaching and learning processes, group dynamics, and motivational issues/Los diferentes procesos de enseñanza-aprendizaje, dinámicas grupales y motivación.

+ Issues of inclusion, diversity and multiculturalism/Los temas relacionados con inclusión, diversidad o multiculturalismo.

+ Effective use of technologies in learning/La utilización eficaz de las TIC para el aprendizaje.

+ Curricular knowledge (i.e., knowledge of subject specific contents)/Los contenidos de las materias a impartir como maestro/a.

Skills. I believe I have the skills needed for.../Considero que dispongo de las destrezas necesarias que me permitirán...

+ Monitoring, adapting and assessing teaching/learning objectives and processes/Supervisar, evaluar y adaptar los procesos y objetivos de enseñanza-aprendizaje.

+ Adapting and actualizing educational knowledge for professional and teaching improvement/ Adaptarme y actualizar constantemente mis conocimientos para la mejora profesional.

+ Collaborating and negotiating with colleagues, parents and social services/Colaborar y llegar a acuerdos con diferentes agentes educativos (compañeros, padres, etc.).

+ Reflective learning both individually and in professional communities/Aprender reflexivamente de forma individual y en grupos de profesionales.

Dispositions. In general, I think I am able to.../En general, considero que seré capaz de...

+ Commit to promoting learning for all students/ Implicarme para promover el aprendizaje de todos los estudiantes.

+ To promote students' democratic and civic attitudes and practices/Fomentar en los/as alumnos/as actitudes y conductas cívicas y democráticas.

+ Managing students and groups/Mantener el control de estudiantes y grupos en el aula.

+ Dispositions to team-working, collaboration and networking/Trabajar en equipo, colaborar y trabajar en red.

Self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2001).

When you become a teacher.../ Cuando seas maestro/o...

Efficacy for instructional strategies

1 To what extent can you use a variety of assessment strategies?/¿En qué medida serás capaz de utilizar diferentes estrategias de evaluación?

2 To what extent can you provide an alternative explanation or example when students are confused?/¿En qué medida serás capaz de presentar una explicación alternativa o un ejemplo cuando tus alumnos/as no entiendan algo?

3 To what extent can you craft good questions for your students?/¿En qué medida serás capaz de formular a tus alumnos/as buenas preguntas?

4 How well can you implement alternative strategies in your classroom?/¿En qué medida serás capaz de utilizar estrategias alternativas en tus clases?

Efficacy for classroom management

9 How much can you do to control disruptive behavior in the classroom?/¿En qué medida serás capaz de controlar la conducta disruptiva en tu clase?

10 How much can you do to get children to follow classroom rules?/¿En qué medida serás capaz de hacer que tus alumnos/as respeten las reglas durante las clases?

11 How much can you do to calm a student who is disruptive or noisy?/¿En qué medida serás capaz de calmar a un/a alumno/a que manifiesta conductas disruptivas en clase?

12 How well can you establish a classroom management system with each group of students?/¿En qué medida serás capaz de establecer diferentes sistemas de gestión de la clase según el grupo de alumnos/as?

Efficacy for student engagement

17. How much can you do to get students to believe they can do well in schoolwork?/¿En qué medida serás capaz de convencer a tus alumnos/as de que pueden tener éxito en la escuela?

18. How much can you do to help your students value learning?/¿En qué medida serás capaz de conseguir que tus alumnos/as valoren el conocimiento?
19. How much can you do to motivate students who show low interest in schoolwork?/¿En qué medida serás capaz de motivar a aquellos/as alumnos/as que muestren escaso interés por las tareas escolares?
20. How much can you assist families in helping their children do well in school?/¿En qué medida serás capaz de estimular a las familias para que ayuden a sus hijos/as a obtener buenos resultados escolares?

Career choice satisfaction, planned effort and planned persistence (Watt & Richardson, 2008)

Career choice satisfaction

- 9 How satisfied are you with your decision to become a teacher?/¿Hasta qué punto estás contento/a por haber decidido prepararte para ser maestro/a?
- 12 How happy are you with your decision to become a teacher? /¿Hasta qué punto estás satisfecho/a por haber elegido hacerte maestro/a?

Planned effort

When you become a teacher.../Cuando seas maestro/o...

- 5 How hard will you strive to be an effective teacher?/¿Hasta qué nivel te esforzarás para ser un/a maestro/a eficaz?
- 8 How much will you work at being a good teacher?/¿Cuánto trabajarás para ser un/a buen/a maestro/a?
- 11 How much effort will you put into your teaching?/¿Cuánto te esforzarás en tu actividad docente?
- 14 How much effort do you plan to exert as a teacher?/¿Cuánto piensas esforzarte como maestro/a?

Planned persistence

When you become a teacher.../Cuando seas maestro/o...

- 7 How certain are you that you will remain in teaching?/¿Qué certeza tienes de que podrás permanecer en la enseñanza?
- 10 How confident are you that you will stick with teaching?/¿Qué confianza tienes en que serás capaz de resistir en la docencia?
- 13 How sure are you that you will persist in a teaching career?/¿Qué seguridad tienes de que podrás persistir en la profesión docente?
- 16 How sure are you that you will stay in the teaching profession?/¿Qué seguridad tienes de que no abandonarás la profesión?