




What makes a student feel vital? Links between teacher-student relatedness and teachers' engaging messages

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Abstract

Recent studies suggest that teacher messages can affect students' well-being. Using a multilevel, variable, and person-centred approach, this study aimed to identify profiles of students according to their teachers' use of engaging messages and analyse the relation among these profiles and teacher-student relatedness and students' subjective vitality. A total of 1209 students participated in the study. At the student-level, profile analysis indicated the existence of four different profiles: the *few messages* profile, the *autonomous motivational appeals* profile, the *loss-framed messages* profile, and the *gain-framed messages* profile. At the teacher level, profile analysis indicated the existence of two profiles: the *variant* and the *invariant* profiles. Results showed that overall, at both levels of analysis, teachers' engaging messages related with teacher-student relatedness (either positively or negatively) with clear differences among profiles. Moreover, also at both levels of analysis, teacher-student relatedness related with students' subjective vitality. Main findings and implications for practice are discussed.

Keywords Subjective vitality · Mixture structural equation model · Message framing · Self-determination · Well-being · Teacher-student relatedness

Introduction

On average, secondary students spend 905 h per year in the classrooms with their teachers (OECD, 2014); thus, it may seem unsurprising to state that teachers are one of the most relevant social agents regarding students' vitality and well-being (Eccles & Roeser, 2011; Furrer et al., 2014; King, 2015; León & Liew, 2017; Liu et al., 2017; Mouratidis et al., 2011). Among the main promoters of students' vitality and well-being, extensive research has highlighted the importance of teacher-student relationships (Bakadorova & Raufelder, 2018; Behzadnia, 2020; Chatzisarantis et al., 2019; Chirkov & Ryan, 2001; Khalkhali &

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Golestaneh, 2011; King, 2015; Manzano, 2022; Wang et al., 2021; Zheng, 2022). However, most research rarely focus on the antecedents of such relation and the mechanisms underlying such link (Froiland et al., 2019; Zee et al., 2013). Instead, the common approach among researchers has been to add knowledge on how teacher-student relationships affect diverse outcomes. In other words, new ways in which teachers can develop and build such positive relationships have not been explored.

A recent promising line of research has started to explore the impact teacher messages can have on students which, although relevant, has mainly explore their link with learning-related outcomes (Caldarella et al., 2020; León et al., 2017; Putwain & Remedios, 2014; Putwain et al., 2017; Santana-Monagas et al., 2022a, b) with very little known about their impact on students' well-being. Therefore, the present study sought to provide new insights into how teachers' messages, specifically, the advice messages teachers use to engage students in school-related tasks (Santana-Monagas et al., 2022a, b), relates with teacher-student relatedness and students' well-being.

Teacher's engaging messages

When approaching students, teachers rely on numerous strategies to promote students' engagement (Felicetti & Cabrera, 2022). Among these strategies, teachers typically advise students on what actions they could take to achieve certain outcomes. These kinds of messages have been defined as teachers' engaging messages (Santana-Monagas et al., 2022a, b). In such messages, teachers highlight the possible consequences of getting involved (or not) in a certain activity and the motives to do so.

In this sense, teachers can either highlight the favourable outcomes related to an activity or the unfavourable outcomes to not engaging in such activity (Rothman & Salovey, 1997). For instance, teachers can encourage their students by telling them that if they work hard, they will obtain good grades (gain-framed messages) or that, if they do not, they will fail the subject (loss-framed messages). Both messages use grades as a motive to engage in school tasks; however, they are framed differently.

With respect to the motives to engage in a certain activity (referred to as motivational appeals), teachers can appeal to different kinds of motivations to engage students. For example, teachers can tell their students that if they pay attention during class, they will learn interesting facts, or they can tell them that if they pay attention during class, they will receive a house-point. Whereas the first message appeals to an autonomous motive, that is, interest, the second message relies on a controlled motive such as a reward (Ryan & Deci, 2017, 2020).

Under educational contexts, the study of teacher messages is scarce but promising. Such studies have focused mainly on exploring loss-framed messages, providing evidence on the negative impact these can have on student. Specifically, they have been commonly related to students' negative emotions such as anxiety, distress, worry, and hopelessness following avoidance behaviours such as disengagement, strategic withdrawal of effort, and procrastination (Belcher et al., 2021; Nicholson et al., 2019; Putwain & Remedios, 2014; Putwain et al., 2017, 2019, 2021). Contrastingly, the impact of gain-framed messages remains largely understudied, with only a few studies examining such messages in relation with student's learning outcomes (Santana-Monagas et al., 2022a, b; Symes & Putwain, 2016) that do not examine the influence of gain-framed messages on students' well-being.

Regarding motivational appeals, research on controlled and autonomous motivations have revealed that although they both can initiate students' behaviour, they do not

contribute equally to students' wellness, vitality, and thriving. Research has shown that when students feel autonomously motivated, they report higher levels of well-being (Chirkov & Ryan, 2001; Haerens et al., 2018; Sheldon et al., 2009). Contrastingly, when moved by controlling forces, students can experience fear of failure and contingent self-worth and are more likely to encounter psychological ill-being and maladaptive behaviour (Bartholomew et al., 2018; Liu et al., 2017; Oostdam et al., 2019). Given the evidence stated, we could expect that relying on one or another motive might have an impact on students' well-being. In other words, it could be that relying on certain motivations within teacher messages relate with students' well-being, both in a positive and in a negative way. In this sense, teacher-student relatedness (from now on: TS-relatedness) could have an influence.

The power of teacher-student relationships

Relatedness has been examined across a wide variety of perspectives and theories, all agreeing that it comprises the establishment of meaningful, caring, warming, and respectful relationships. Teachers who build such relationships with their students actively demonstrated their interest in students' well-being and academic achievement (Martin & Dowson, 2009). From the self-determination approach (Ryan & Deci, 2020), relatedness has been identified as a basic need for student's optimal functioning. It implies feeling bonded to, supported, and accepted by others (Behzadnia, 2020; Lavigne et al., 2011; Ryan & Deci, 2020). It has been proven to be so fundamentally important that a simple threat of disapproval from others elicit similar neural reactions to those who face during real physical pain (MacDonald & Leary, 2005).

Specially among adolescents, this need plays an important role when it comes to adapting to new social situations (La Guardia & Ryan, 2002), such as those faced during the transition to secondary school. Previous research has already established the many positive implications that positive teacher-student relationships bring on students in terms of engagement, motivation, self-regulation, and well-being (Furrer & Skinner, 2003; García-Moya et al., 2015; King, 2015; Liu et al., 2015; Poulou & Norwich, 2020; Raufelder et al., 2015; Wubbels, 2017). However, there is little scientific evidence on how teachers' messages may affect both TS-relatedness and student's well-being. In other words, the mechanisms and predictors among the link between TS-relatedness and student's well-being have not been explored in depth (Froiland et al., 2019; Zee et al., 2013). In this sense, it could be possible that teachers' who demonstrate concern and care towards their students by relying on messages that try to engage them in school-task and advise them on what actions they could take to succeed might fulfil student's need of relatedness with the teacher as they might feel supported by them. Considering the link among TS-relatedness and student's well-being, it might also be expected that such messages affect students' well-being through this enhance feeling of relatedness. So far, some approaches have gathered evidence towards the effect that teacher's feedback messages can have on students' well-being (Mouratidis et al., 2010; Schwab et al., 2022). However, less emphasis has been placed in the role teacher engaging messages can have and in the mediating role of teacher-student relatedness. Moreover, such studies have been conducted in the primary education and sport settings, despite to the fact that TS-relatedness declines drastically as student's advance in the education system and enter the secondary education (Anderman, 2003; Baker, 2006; Neel & Fuligni, 2013; Spilt et al., 2012).

Subjective vitality

The concept of subjective vitality is rooted in the self-determination theory (Ryan & Deci, 2008). It refers to the conscious experience of possessing energy, feeling alive, and enthusiastic about a certain activity (Greenglass, 2006; Ryan & Frederick, 1997). Due to its link with numerous positive outcomes, it has been considered an important aspect of eudaimonic well-being (Salama-Younes, 2011). From this perspective, well-being is conceived as a process of self-realisation, growth, and personal development, concepts closely linked to the formal educational process undertaken in schools. Unlike its hedonic perspective, it is not understood as a state of happiness, but it rather refers to feeling satisfied with the kind of live people are actually living (Ryan & Martela, 2016). Given subjective vitality's functionality as an indicator of health and motivation outcomes, it has been identified as the indicator for "excellence" of eudaimonic well-being (Vergara-Torres et al., 2020).

Existing research recognises the critical role teachers have on students' well-being. For instance, aspects such as teachers' fairness (Choi et al., 2019), their autonomy-supportive practices (Behzadnia, 2020; Chatzisarantis et al., 2019), and quality teacher-student interactions have proven to impact students' well-being and vitality (Blackwell et al., 2020; DuBois & Silverthorn, 2005; Hamre & Pianta, 2006; Ryan & Deci, 2017). Moreover, research has also highlighted the importance that teacher messages can have on triggering emotions on students (Belcher et al., 2021; Putwain et al., 2021; Schwab et al., 2022). Given the important repercussions messages and teachers can have on students, paying attention to this aspect of teaching could offer some important understanding on how teachers could influence students' well-being. Although this promising line of research has gathered some interesting evidence (Santana-Monagas et al., 2022a, b), research to date has not yet determined how teacher engaging messages could affect students optimal functioning, subjective vitality, and well-being.

The present study

The present study follows a multilevel Structural Equation Mixture Model (SEMM) approach. This method integrates both variable-centred (i.e. structural equation models (SEM)) and person-centred (i.e. latent profile analysis (LPA)) approaches. Variable-centred approaches group variables, whereas person-centred approaches group persons (Lubke & Muthén, 2005). When complementing both approaches, researchers can obtain "the best of both worlds" and identify variable effects on a set of persons (Berlin et al., 2014; Morin et al., 2017).

Moreover, variables measured in educational contexts are often located at two levels of analysis: student-level variables that have a unique value for each student (i.e. student's vitality) and teacher-level variables that have the same value for all students in a same class (i.e. class-average students' vitality) and that are built from the aggregation of students' responses (Marsh et al., 2012). Given that teachers have found to adapt their messages when approaching students (Flintcroft et al., 2017), we can find data located at two levels. In one hand, messages the teacher deliver to a specific student and, in the other hand, teachers' overall tendency to rely on certain messages when approaching the whole class (Morin et al., 2014; Santana-Monagas et al., 2022a, b; Stapleton et al., 2016). These types of design, where the multilevel nature of data is considered, allow researchers to

acknowledge how teacher variables can explain student outcomes beyond what their own individual characteristics indicate (Marsh et al., 2012; Morin et al., 2014; Stapleton et al., 2016).

Thus, the present study aims to: (a) examine the different profiles of students according to their teacher's use of engaging messages both at the student and teacher-level, that is, profiles of students according to the engaging messages their teacher uses with them (student level) and profiles of students according to teacher's tendency to rely on engaging messages with the whole class (teacher level); (b) examine how such profiles relate with TS-relatedness and students' well-being; and (c) further understand the usage of teachers' engaging messages; difference in grade belonging among students was also examined. Thus, we hypothesise the following: (H1) Based on previous works examining profiles of students according to their perceptions of their teachers' engaging messages (Santana-Monagas et al., 2022a, b), we expect to find at least three profiles at the student level and 2 at the teacher level; (H2) in regard with our second aim, similar to previous studies (Mouratidis et al., 2011; Schwab et al., 2022), we expect to find relations among teacher engaging messages and students' subjective vitality through TS-relatedness. The nature of such relation (positive or negative) will depend on the nature of the different profiles; and (H3) finally, we also expect to find different patterns of message usage across the different grades as it has already been reported that teachers adapt their messages to specific students (Flintcroft et al., 2017); thus, we might expect they do so to specific age ranges.

Method

Participants

Data were collected from a total of 954 students (464 females, 43 not reported; mean age = 16.63, $SD = 1.22$) from ten secondary schools of the island of Gran Canaria, Spain. They were drawn from 64 classes between 9 and 12th grade. Schools belonged to both rural and urban environments, and students came mostly from middle class backgrounds. The sampled schools presented no potential ethnic differences as most of the students were from the Canary Islands, Spain.

Procedure

First, schools were contacted by phone and asked for their collaboration in the study. Therefore, the sample corresponds to those schools and teachers that were willing to participate. During the data collection, which took place during the academic year 2018–2019, we explained the objectives of the research to students, emphasising the voluntary and confidential nature of their participation. Participants were told that returning filled questionnaires would imply their acceptance to participate, whereas returned blank questionnaires were interpreted as a withdrawal from the study. Instruments were administered in classrooms by researchers during a teaching period when the assessed teacher was not present. For engaging messages, students were asked to rate their current teacher so that the students in a class rated the same teacher. To diminish potential bias, all students were studying the same subject (i.e. mathematics) and, thus, attended an equal number of hours of classes per week.

Instruments

To analyse reliability, McDonald's omega values were estimated because of its higher accuracy over Cronbach's alpha (McNeish, 2018). Items were rated following a seven-point Likert scale (1 = does not correspond; 7 = fully corresponds). All items were made specific to the compulsory subject of mathematics.

Teachers' engaging messages

To evaluate teachers' engaging messages, students completed 32 items of the scale developed by Santana-Monagas et al. (2022b). Items were preceded by the phrase *My teacher tells me that* and divided into 4 factors: gain-framed autonomous messages (e.g. *If I work hard I will enjoy this subject*), loss-framed autonomous messages (e.g. *Unless I work hard I will miss the opportunity to learn interesting facts*), gain-framed controlled messages (e.g. *If I work hard I will feel important*), and loss-framed controlled messages (e.g. *Unless I work hard I will feel sad*). This scale has proved reliable and valid in previous studies (Santana-Monagas et al., 2022a, b).

Teacher-student relatedness

To assess students' relatedness with teachers, students completed a subscale from the Spanish version of the *Échelle de Satisfacción des Besoins Psychologiques* validated to the educational context (León et al., 2011). The subscale consisted in a total of five items preceded by the phrase *In Maths class* (e.g. *I feel comfortable with my teacher*). Previous works have provided evidence of reliability and validity of the scale (Moreno-Murcia et al., 2018).

Subjective vitality

Students completed the Spanish version of the subjective vitality scale (Castillo et al., 2017). Items were preceded by the phrase *In Math class* (e.g. *I feel very energetic*). This scale has proved reliable and valid in previous studies (Mouratidis et al., 2011).

Data analyses

All analyses were conducted with *Mplus* 8.7 (Muthén & Muthén, 1998–2022). To estimate the variable scores and to overcome possible measurement errors, instead of using the mean of the items, factor scores were used. To interpret these scores, we standardised them with a mean of 0 and a SD of 1 (Collie et al., 2020; Justice et al., 2011); if data are above 0 and with a low *p*, we can observe that the value is different from the mean. The robust maximum likelihood (MLR) estimator was used for estimating the models using at least 250 random start values, each allowing 50 initial stage iterations. Missing data was handled with the full information maximum likelihood approach.

Multilevel Mixture SEM

To analyse the relations among variables, a Multilevel Structural Equation Mixture Model (ML-SEMM) analysis was performed. When relying on ML-SEMM, researchers can examine the estimation of model parameters as well as the classification of individuals into

clusters based on the posterior class membership (Vermunt & Magidson, 2005), at both levels of analysis (i.e. at the student level and at the teacher level).

To inform about the similarity observed among students' ratings in a same class, that is, their agreement when assessing a construct related to their class experience (i.e. teachers' use of engaging messages when approaching the whole class (Lüdtke et al. (2009)), ICC values are calculated. This step is key as high ICC values inform about the reliability of the teacher-level variable in relation to sampling error, that is, the reliability to estimate teachers' overall tendency to rely on certain engaging messages. In multilevel studies, these values oscillate between 0.10 and 0.30 (Marsh et al., 2008). Nonetheless, when working with naturalistic data, ICC values should be interpreted with flexibility (Heene et al., 2011).

Latent profile analysis

Latent profile analysis was performed to estimate and decide the number of profiles. This approach does not rely on random values (e.g. a standard deviation above the mean) but on the fit of models with a different number of profiles. To decide the number of profiles, we attended both the statistics criteria and the theoretical grounding of results (Collie et al., 2020). The following fit indices were used to decide the number of profiles: Log-Likelihood (LL), Akaike Information Criteria (AIC), Sample Size Adjusted Bayesian Information Criteria (SSA-BIC), and Likelihood Ratio Test (LRT). The lower the value of the first three indices, the better the fit, while the level of significance of LRT informed us whether the fit of a model with k cluster was better than the fit of a model with $k-1$ profile. A low p value indicated that the solution with k groups fits better than a model with $k-1$ groups (Lo et al., 2001). Following Collie et al. (2020), elbow plots were built to visualise the flattening of the indices. These plots show an appropriate solution at the point where a clear elbow is visible (Morin et al., 2016). In addition, because solutions with small numbers of participants (e.g. 1 to 5% of total sample) may not represent a unique latent subgroup (Marsh et al., 2009), we also analysed the percentage of cases in the smallest latent subgroup of each model.

To identify the number of profiles at both levels of analysis and following Collie et al. (2020) and Mäkikangas et al.'s (2018) recommendations, a two-step procedure was followed. First, we estimated the number of clusters at the single student-level conforming to a single level profile analysis. At this level of analysis, 1 to 7 solutions were tested. Then, to explore the profiles of classes at the teacher level, we carried out a multilevel latent profile. At this level, profiles at the teacher level (i.e. students at the student level and aggregates of students' responses at the teacher level) are estimated and arranged with the frequency of profiles at the student level. In other words, these profiles are estimated based on the proportion of student-level profiles on the teacher-level profiles (Collie et al., 2020). At the teacher level, a range of 1 to 4 profile solutions were tested.

To examine whether there were any differences among clusters regarding the predictive value of teachers' engaging messages on teacher-student relatedness and of teacher-student relatedness on students' vitality, two mixture SEMs were carried out, one at each level of analysis. Teacher-level variables were constructed from the aggregation of students' responses, and student-level variables were modelled using class-mean-centred data (Marsh et al., 2012; Morin et al., 2014). The 95% confidence intervals around the point estimate of the standardised coefficient were estimated. When confidence intervals do not cross zero, these are significant at $p < 0.05$. To compare the composition of the profiles

based on students' educational grade at the student-level, we employed the *Mplus* AUXILIARY option.

Results

Preliminary analyses

The mean, standard deviation, ICC values, and correlations among variables are shown in Table 1. ICC values show that a considerable proportion of the variability observed among classroom variables was attributed to the differences between classrooms.

Student level

Table 2 presents fit indexes for the latent profile analysis at the student level. Models between six to seven profiles were characterised by a group with a very low percentage of subjects. LRT value discarded the five-profile solution. Finally, the model with four profiles showed lower LL, AIC, and SS-BIC values than the model with three and two profiles. Elbow plots (Fig. 1) showed a steady flattening of the slope after the 4-profile solution. Therefore, a 4-profile solution was retained as it represented the data the finest. Theoretically, the 4-profile solution was also maintained as it best described the differential use of teachers' messages. A 3-profile solution described three profiles with opposite experiences: a profile of students that described a high use of all messages, a profile of students whose teacher barely relied on messages, and a profile describing all messages in the mean. Furthermore, a 5-profile solution did not add further information on the messages teachers used with their students' as it described two very similar profiles. Therefore, following both statistical and theoretical reasoning, the 4-profile solution was retained.

The following profiles were found: profile 1, *few-messages* (FM) included 468 students who informed about their teacher using very few messages of all kinds (49%); profile 2, *autonomous motivational appeals* (AMA) was composed of 222 students whose teacher relied mostly on autonomous motivational appeals, both gain and loss-framed, but with a higher proportion of these last ones (23.3%); profile 3, *loss-framed messages* (LFM) consisted of 142 students whose teacher relied on loss-framed messages, both autonomous and controlled motivational appeals, with a higher proportion of these last ones (14.9%); and profile 4, *gain-framed messages* (GFM) included 122 students whose teacher relied mostly on gain-framed messages with higher proportion of the controlled motivational appeals (12.8%). Student-level profile analysis results are displayed in Fig. 2.

Regarding relations among profiles, results for path 1 (teachers' engaging messages → TS-relatedness) showed that through all the profiles, the kind of messages that had the strongest positive predictive value on teacher-student relatedness was gain-controlled messages (see Table 3). Gain-autonomous messages only reached statistical significance once for the FM profile. When comparing the predictive value of loss-framed messages across profiles, we can observe that the relation being either positive or negative depended on the characteristics of the profile students belonged to. For instance, for the profiles FM and AMA, loss-autonomous messages related negative with teacher-student relatedness, whereas for the profile LFM, this relation was positive. The same was the case of loss-controlled messages. These messages related positively with teacher-student relatedness in the case of the profile FM, whereas this relation was positive in the case of

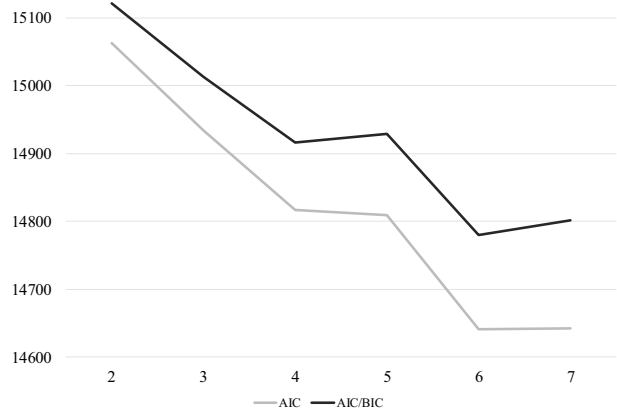
Table 1 Means, standard deviations, and correlations among variables

	Mean	SD_w	SD_b	ω	ICC	1	2	3	4	5	6
1. Gain-autonomous messages	3.99	1.30	0.78	0.91	0.27	–	0.84*	0.86*	0.47*	0.64*	0.85*
2. Loss-autonomous messages	2.95	1.28	0.49	0.91	0.13	0.45*	–	0.77*	0.70*	0.37*	0.54*
3. Gain-controlled messages	3.60	1.41	0.70	0.89	0.20	0.73*	0.42*	–	0.71*	0.68*	0.78*
4. Loss-controlled messages	2.13	1.19	0.42	0.92	0.11	0.27*	0.71*	0.34*	–	0.35*	0.41*
5. Relatedness with teachers	4.24	1.57	0.85	0.94	0.23	0.41*	0.14*	0.34*	0.03	–	0.77*
6. Subjective vitality	2.99	1.54	0.49	0.95	0.09	0.43*	0.19*	0.40*	0.11*	0.50*	–

* $p < 0.05$, $N = 954$ (below diagonal), SD_w = standard deviation within (student-level), SD_b = standard deviation between (teacher-level), ICC = intra-class correlation, ω = Mc Donalds' omega

Table 2 Goodness of fit for each model of the student-level profile analysis

Profiles	Parameters	LL	AIC	SSA-BIC	LRT <i>p</i>	% Smallest group
1	9	-2448.256	4914.512	4929.675	-	-
2	35	-7496.334	15,062.669	15,121.634	0	11
3	47	-7419.799	14,933.599	15,012.78	0	13
4	59	-7349.34	14,816.68	14,916.078	0.04	12
5	71	-7333.569	14,809.139	14,928.753	0.33	11
6	83	-7237.283	14,640.567	14,780.397	0.20	5
7	95	-7226.021	14,642.042	14,802.089	0.79	5

Fig. 1 Elbow plot for single level latent profile analysis

the profile GFM. Regarding path 2 (TS-relatedness \rightarrow subjective vitality), for all profiles, teacher-student relatedness positively predicted students' vitality, being this relation the highest for the LFM profile followed by the GFM profile, the FM, and lastly, by the AMA profile.

Concerning the proportion of message profiles across students' educational grade belonging (see Table 4), results showed that teachers of grade 9 students tend to rely mostly on gain-framed messages. However, as students' progress through grades, this trend starts to change. In such a way, teachers from grade 10 students tend to rely on all kinds of messages, whereas for the higher levels (grades 11 and 12), teachers start to barely rely on such messages.

Teacher level

Table 5 displays the fit indices of the profiles at the teacher-level latent profile analysis. Results showed that the four-profile solution was characterised by a group with a very low percentage of subjects. The three-profile solution showed a better fit, a higher percentage of smallest group, and the elbow plot illustrated a modest flattening of the slope after the two-profile solution (see Fig. 3), indicating that this solution was the best from a statistical point of view. However, when it came to the theoretical grounding of results, a three-profile described two remarkably similar profiles, not adding further distinct information of the differential use of

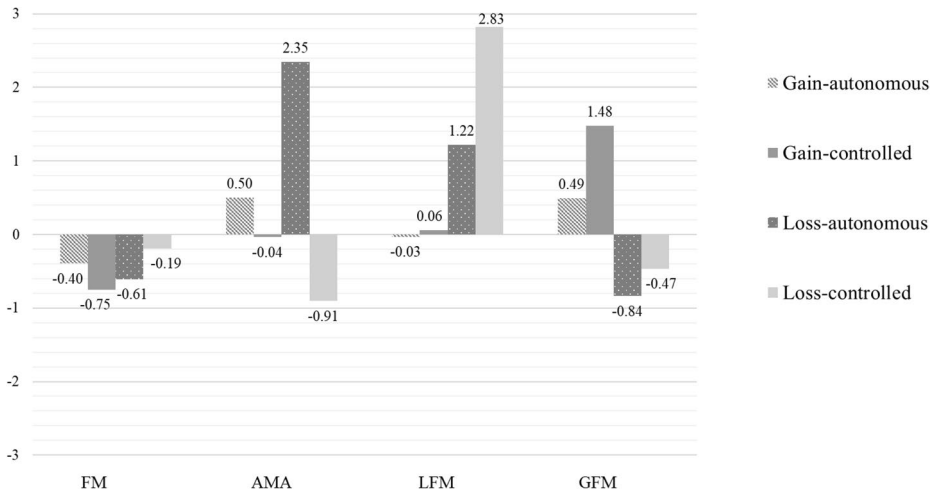


Fig. 2 Student-level profile analysis results. *Note.* FM = Few messages; AMA = Autonomous motivational appeals; LFM = Loss-framed messages; GFM = Gain-framed messages

teacher messages. Therefore, the three-profile solution was discarded, and a two-profile solution was retained.

The two-profile solution is illustrated in Fig. 2. The *invariant* profile represented 34.6% of the sample and described a group of teachers using very few messages (66.7%) followed by another group of teachers relying mostly on gain-framed messages (24.9%). Finally, it also described a very small proportion of teachers relying on loss-framed messages (2.4%) and autonomous motivational appeals (6.1%). The *variant* profile (65.4%) described a set of teachers relying on all kinds of messages, mostly gain-framed messages (42.2%) and few messages (22.8%), followed by a similar percentage of teachers that relied on autonomous motivational appeals (20.4%) and loss-framed messages (14.7%). Results of the teacher-level latent profile analysis are displayed in Fig. 4.

Regarding relations among profiles (see Table 6), results for path 1 showed different patterns across profiles for certain messages. In profile *invariant*, gain-autonomous messages showed the strongest relation with TS-relatedness, whereas for the profile *variant*, this relation did not reach statistical significance. Loss-controlled messages had a very similar predictive value across the two profiles. Contrastingly, loss-autonomous messages and gain-controlled messages showed opposite trends among profiles. In this respect, gain-controlled messages related negatively with TS-relatedness in the *invariant* profile, whereas it related positively in the *variant* profile. As regards to loss-autonomous messages, these related positively with TS-relatedness in the *invariant* profile, whereas it related negatively in the AM profile. Regarding path 2, only for the profile *invariant*, TS-relatedness predicted student subjective vitality. Overall, when comparing results at both levels, it could be observed stronger relations at path 1 among variables at the teacher level.

Discussion

The present study aimed to: (a) examine the different profiles of students according to their perceptions of their teacher’s use of engaging messages with students and with the class as a whole, (b) examine how such student profiles relate with TS-relatedness

Table 3 Mixture SEM results for the student level

		Profiles											
		FM			AMA			LFM			GFM		
		β	SE	95% CI	β	SE	95% CI	β	SE	95% CI	β	SE	95% CI
Path 1: TEM → TS-relatedness	Gain-autonomous	0.20	0.06	0.08/0.30	0.21	0.15	-0.03/0.45	-0.03	0.13	-0.29/0.19	0.15	0.10	-0.05/0.35
	Loss-autonomous	-0.31	0.07	-0.45/-0.20	-0.21	0.11	-0.39/-0.03	0.15	0.06	0.03/0.25	0.03	0.09	-0.12/0.19
	Gain-controlled	0.25	0.07	0.10/0.37	0.20	0.10	0.04/0.37	0.40	0.12	0.17/0.60	0.34	0.12	0.14/0.54
	Loss-controlled	0.13	0.06	0.01/0.24	-0.08	0.11	-0.27/0.10	0.09	0.07	-0.06/0.21	-0.16	0.07	-0.26/-0.05
Path 2: TS-relatedness → subjective vitality		0.46	0.04	0.39/0.52	0.33	0.11	0.15/0.51	0.63	0.05	0.54/0.70	0.59	0.07	0.48/0.70

TEM = teachers' engaging messages, TS-relatedness = teacher-student relatedness, FM = few messages, AMA = autonomous motivational appeals, LFM = loss-framed messages, GFM = gain-framed messages

Table 4 Profile composition regarding grade belonging

	Proportion across grades (%)			
	Grade 9	Grade 10	Grade 11	Grade 12
FM	14.5	32.5	23.5	29.1
AMA	32.5	39.6	13.3	14.6
LFM	34.7	38.7	17.1	9.6
GFM	50	39.9	4.4	5.6

FM=few messages, AMA=autonomous motivational appeals, LFM=loss-framed messages, GFM=gain-framed messages

Table 5 Goodness of fit for each model of the teacher-level profile analysis

Profiles	Parameters	LL	AIC	SSA-BIC	% Smallest group
1	62	-7629.841	15,383.682	15,488.134	-
2	79	-7550.627	15,259.254	15,392.345	0.80
3	96	-7477.895	15,147.79	15,309.521	1.57
4	113	-7421.034	15,068.068	15,258.439	0.30

and well-being, and (c) to examine differences in the usage of such messages across grades. Four main findings can be drawn from the present work. Regarding H1, results confirmed our hypothesis as, at the student level, four profiles were identified (i.e. FM, AMA, LFM, and GFM). At the teacher level, two profiles were identified: the *invariant* profile and the *variant* profile. Second, overall, at both levels of analysis, teachers' engaging messages related with TS-relatedness, and this, in turn, related with students' subjective vitality, further confirming our H2. An interesting result highlighted that not all kinds of messages related positively to teacher-students' relatedness, and, in some cases, the nature of the relation being positive or negative depended on the characteristics of the profile students belonged to. Third, a further finding which was not hypothesised showed that in general, when comparing both levels of analysis, stronger relations among variables were found at the teacher level. Finally, regarding the composition of profiles at the student-level and confirming H3, results demonstrated that teachers tend to rely on engaging messages more frequently with lower grade students (i.e. grade 9 and 10), whereas for grades 11 and 12, the trend is to use very few messages. Altogether, the present findings address several gaps in the literature: First, it examines an understudied teaching practice (i.e. teachers' engaging messages) as an antecedent of TS-relatedness and as a promoter of students' well-being (Froiland et al., 2019; Zee et al., 2013) adding knowledge to research that has not been comprehensive in this way; second, it examines in more depth the predictive value that gain-framed messages can have on students' well-being (Putwain & Symes, 2016; Santana-Monagas et al., 2022a, b; Symes & Putwain, 2016) which until now has been barely examined; and finally, it follows a person and variable-centred approach to complement previous studies on teachers' engaging messages that have follow either one or another approach but not (Santana-Monagas et al., 2022a, b) which help us identify variable effects on a set of persons (Berlin et al., 2014; Morin et al., 2017). Main findings and practical implications are discussed below.

Table 6 Mixture SEM results for the teacher level

		Profiles					
		Invariant			Variant		
		β	SE	CI	β	SE	95% CI
Path 1: TEM → TS-relatedness	Gain-autonomous messages	0.86	0.13	0.65/1.06	0.08	0.26	-0.35/0.50
	Loss-autonomous messages	0.49	0.11	0.32/0.67	-0.42	0.13	-0.62/ -0.21
	Gain-controlled messages	-0.63	0.13	-0.84/-0.42	0.48	0.20	0.16/0.80
	Loss-controlled messages	0.23	0.05	0.15/0.32	0.31	0.07	0.19/0.42
Path 2: TS-relatedness → vitality		0.69	0.09	0.54/0.84	0.33	0.28	-0.13/0.79

TEM = teachers' engaging messages, TS-relatedness = teacher-student relatedness, FG = few gain-framed messages, AM = all messages

Fig. 3 Elbow plot for multilevel latent profile analysis

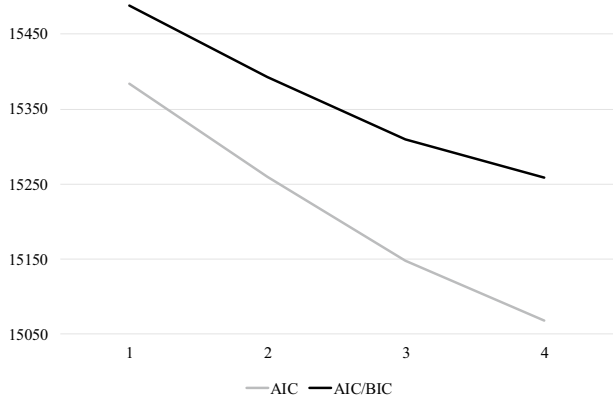
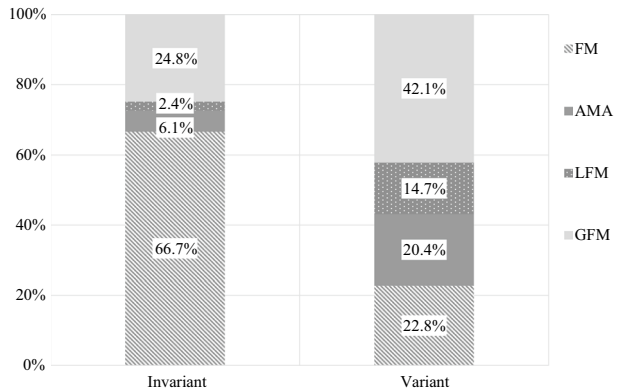


Fig. 4 Teacher-level profile analysis results. *Note.* FM = Few messages; AMA = Autonomous motivational appeals; LFM = Loss-framed messages; GFM = Gain-framed messages



Student level

The present findings provided evidence of the existence of four distinct profiles and thus confirm our hypothesis. Three similar profiles emerged, characterised by teachers usage of two distinct messages: The AMA profile was characterised by students who reported their teacher relying on gain-framed autonomous messages but specially on loss-autonomous messages; the LFM profile where most students reported their teacher to rely on loss-autonomous messages and, in a bigger proportion, on loss-controlled messages; and lastly, the GFM profile, which described students who reported their teacher as relying on gain-framed autonomous and controlled motivational appeals. The last profile was characterised by teachers with a usage of all messages below average and represented almost half of the sample (49%). These results are consistent with Santana-Monagas et al. (2022a) findings, as they also identified two of the profiles found in the present study (i.e. FM and GFM), providing evidence of the stability of such profiles.

Regarding relations among variables, substantial differences can be observed among profiles. For the FM profile, all messages had similar predictive value on TS-relatedness, with gain-framed messages (both autonomous and controlled) displaying stronger relations in this and the rest of the profiles. This finding lines up with previous research examining the higher effect that focusing on the positive has compared to

that of negative (Martínez-Zelaya et al., 2022). In this sense, positive words are better evaluated and maintain for longer in the memory (Unkelbach et al., 2008); thus, it could be that gain-framed teacher messages are further recalled after they have been sent, reinforcing the feelings of relatedness with the teacher. An unexpected result showed that loss-controlled messages had a positive predictive value, although rather low, with TS-relatedness, whereas loss-autonomous messages were negatively related with relatedness. As previous research has highlighted, the higher the frequency of loss-framed messages, the stronger impact these can have on students (Putwain et al., 2021). In this sense, it could be that, for teachers that rely less-frequently on these kind of messages, when they do so and rely on loss-controlled messages such as *“If you don’t study, you’ll make your parents feel angry”* could be interpreted by students as a sense of concern from the teacher towards them, as there are not used to such messages, and thus, making them think their teacher really desires the best for them (Connell & Wellborn, 1991; Taylor & Ntoumanis, 2007). Contrastingly, when loss-framed messages are accompanied by an autonomous motivational appeal, relying on messages such as *“If you don’t pay attention, you won’t study what you want”* even with a low frequency might instead be interpreted by students’ as an attack towards them, as a critic or intrusion (MacGeorge et al., 2008) and, thus, in line with previous studies (Belcher et al., 2021; Putwain & Remedios, 2014), negatively predicting TS-relatedness.

In respect with the rest of the profiles (i.e. AMA, LFM, GFM), gain-controlled messages such as *“If you work hard, you will feel proud”* displayed the highest predictive value on TS-relatedness with strongest relations for the profile LFM. This result lines up with previous research demonstrating the positive relation among gain-framed messages and student outcomes (Santana-Monagas et al., 2022a, b) and among positive information in general (Martínez-Zelaya et al., 2022; Unkelbach et al., 2008). Moreover, like profile FM results, loss-autonomous messages had a negative relation with TS-relatedness for the profile AMA. For this profile, the frequency of such messages was approximately 2.5 points above average, indicating a high frequency which could be responsible for the nature of such relation (Putwain et al., 2021). However, for profile LFM, this relation was positive. Such result could be explained attending the features of such profile, where loss-controlled messages are situated almost 3 points above average and doubles those of loss-autonomous messages. In this sense, it could be that for students’ whose teachers rely mostly on loss-controlled messages, when they do so on a loss-autonomous message, these could be interpreted as a sign of the teacher being supportive and caring as their normal trend is not to be so. Finally, unlike results for the FM but in consistency with previous results on loss-framed messages and teachers’ motivational approach (Bartholomew et al., 2018; Codina et al., 2018; Putwain & Symes, 2011; Putwain et al., 2017), loss-controlled messages for the GFM profile related negatively with TS-relatedness. Given that teacher’s general trend in profile GFM is to rely mostly on gain-framed messages (both controlled and autonomous), it could be that loss-controlled messages are perceived by students more harshly as they are not used to hear such messages from their teacher. Therefore, the present findings highlight the fact that messages can have different predictive values on TS-relatedness based on the overall usage of messages from teachers. Thus, when approaching the study of teacher messages, it is important to examine the usage of all messages together, as the frequency to which certain messages are reported may affect the predictive value of other messages.

In respect to path 2 and like previous studies (García-Moya et al., 2015; León et al., 2015), across all profiles and specially for those characterised by a strong message frame (LFM and GFM), TS-relatedness had a positive predictive value with student’s vitality. In

this line, Furrer et al. (2014) and Furrer and Skinner (2003) found that positive relationships among teachers and students have an energising function as they fulfil student's need for relatedness (Ryan & Deci, 2017). Proving once again that, students who feel that their teacher really cares about them and who feel supported by them report higher levels of well-being.

Finally, regarding the distribution of messages across grades, results highlight how teachers tend to rely more often on gain-framed messages with the lower grade students (i.e. grade 9) and all kinds of messages with grade 10 students, whereas for grades 11 and 12, teachers' trend is to barely rely on engaging messages. In line with previous studies (Flintcroft et al., 2017), research has provided evidence that teachers adapt their messages to students. For instance, teachers have been reported to rely more frequently on loss-framed messages and controlling strategies in classes with low engagement (see Putwain et al., 2021). Grades 11 and 12 are not part of the compulsory curriculum, and thus, students in such grades have willingly decided to enrol in such courses. It could be that those students display high levels of engagement and, thus, teachers might perceive that there is no need to rely on engaging messages. In a similar line, it could be that teachers of lower grade students perceive them as less engaged and needier of guidance and, thus, rely more often on such messages. It could also be that they rely more often on gain-framed messages with grade 9 students as teachers are less constraint and pressured by time or final stage exams.

Teacher level

Analysis at the teacher level revealed two different profiles of students. The *Invariant* profile represented the 34.6% of the sample and is described students that reported their teacher's as tending to barely rely on messages. The *variant* profile represented the 65.4% of the sample and describes a group of students who reported their teachers' as having an overall tendency to rely on all kinds of messages, both controlled and autonomous and both gain and loss-framed. Like results at the student level, this finding lines up with previous works examining profiles of teachers in respect to their message usage (Santana-Monagas et al., 2022a, b), which also found two profiles of teachers with similar characteristics to that of the present, proving the stability of such profiles. Regarding relations among teachers' engaging messages and TS-relatedness, again important differences could be observed among the predictive value the different messages had across profiles.

For the *invariant* profile, like previous studies highlighting the importance of focusing on more autonomous goals for optimal functioning (Ryan & Martela, 2016), autonomous messages had the strongest predictive value on the class overall TS-relatedness, followed by loss-controlled messages. More specifically, this result suggests that engaging messages that rely on autonomous motivational appeals have a strong predictive value on a class of students when teachers' overall tendency is to barely rely on such messages. It could be that this low tendency of relying on engaging message affects the value students grant to the actual messages they receive. Students could perceive such messages as something unusual from teachers, worth paying attention to and thus, as a sign that the teacher really cares about them. An unexpected result from this profile revealed that gain-controlled messages had a strong negative predictive value with TS-relatedness. Given the novelty of the present findings, we cannot compare these results to previous studies to help us explain this result. However, considering the strong predictive value that autonomous motivational appeals have on TS-relatedness for teacher profiles that barely rely on engaging messages, it could be that gain-controlled

messages such as “If you all work hard, I’ll give you free time” negatively affects TS-relatedness as these do not involve any sense of connectedness, warmth, or security but rather imply simple classroom control strategies. Another possible explanation could be that this profile represents a group of teachers that have been arranged with a “good” group of students in terms of performance, motivation, and engagement. Thus, it could be that for such students, gain-controlled messages have opposite effect to that of the intended as these are two far away from students’ internalisation process and, thus, quality motivation. Previous studies have gathered some evidence towards this effect, where highly autonomous students feel unrelated to teachers as they, by their own, are able to meet their own needs (Zee et al., 2013). However, given the limited research available regarding teachers’ engaging messages, we recommend readers to interpret these results with caution.

In regard with profile *variant*, results revealed that the highest predictive values were observed among controlled messages, both gain and loss-framed. In this sense, teachers’ tendency to rely on all kinds of messages indistinctively with the whole class could be interpreted as a lack of credibility or ability, given that they try to engage their students with all their possible resources but without a clear tendency. Students might feel disconnected with the teacher as they could think that they do not really know them to properly engage them. In such cases, students might feel motivated in a more controlled manner and, thus, controlled messages appealing to rewards or punishments might influence positively TS-relatedness. Moreover, similar to results at the student-level, relying more often than not on loss-autonomous messages with the whole class such as “If you don’t work hard, you won’t be able to get the job you want” could be perceived by students as an “attack” to them, as a critic or intrusion (MacGeorge et al., 2008), especially if, as explained, teachers are perceived as having a low ability and, thus, negatively predicting TS-relatedness.

Finally, regarding path 2, when comparing both profiles, only for the *invariant* profile did TS-relatedness predictive positively students’ vitality. These could be due to the big variability observed in profile *variant*. Additionally, when comparing both levels of analysis, results revealed that relations among teachers’ engaging messages and TS-relatedness were higher at the teacher-level than to that of the student-level analysis. This suggests that teachers’ engaging messages have a strongest predictive value on TS-relatedness when they are used towards the whole class, instead of directing them towards a specific student. In fact, previous studies have found that positive relationships increase student’s sense of belongingness to school (Connell & Wellborn, 1991; Furrer & Skinner, 2003; Hughes et al., 2008). It could be that teachers’ engaging messages used with the whole class promote a stronger sense of belonging to a group led by the teacher. In this sense, trying to engage students collectively might make them feel part of team with shared experiences about interests, objectives, and difficulties for which the teacher will support them and thus might foster more strongly their TS-relatedness.

Limitations and future perspectives

Although making an interesting contribution to the field, the present study faces some limitations. First, data was cross-sectional, and thus, causal relations cannot be reached. Future research may expand these results by conducting longitudinal research to establish whether changes in teachers’ engaging messages lead to changes in students’ outcomes. Second, it would be interesting to examine the relationship between teachers’ engaging messages and students’ outcomes at different educational levels and grounded in different subjects to observe if the same profiles emerge and whether they relate similarly to TS-relatedness and student’s subjective vitality. Finally, even though mixed structural equation models

represent a good approach to detect the influences among variables and help to reach a clearer understanding of variable influences (Berlin et al., 2014; Morin et al., 2017), information could be lost when categorising into clusters continuous variables. Besides, like exploratory factor analysis, when conducting mixed structural equation models, researchers must choose the number of clusters that best represent the data, which could increase subjectivity and, thus, altering the margin of error (Marsh et al., 2009).

Conclusion

The present findings are of relevance, since they highlight a new resource teachers can rely on to improve both students' sense of relatedness and well-being, adding evidence on the relevance teacher messages have. One of the main conclusions that can be drawn from the present findings is the fact that teachers' engaging messages predict students' well-being through their enhancement of TS-relatedness and that, among the different messages, gain-framed messages outperformed the rest in terms of their predictive strength with TS-relatedness. Moreover, it can also be concluded that the predictive value of certain messages can depend on teachers' overall tendency to rely on one or another message. In other words, the usage of messages as a whole is more determinant than the predictive value of each type of message separately. This finding has important repercussions to teaching practice as it enriches the knowledge on teachers' engaging messages, proving not only the importance that certain messages can have but also how these are used in combination with others. Thus, a message that a priori might have proven to be beneficial for students might not be so beneficial when it is combined with others. Accordingly, when examining the predictive value that certain teacher messages can have on student outcomes, it is important for researchers to not only explore their effect independently, but also in conjunction. This knowledge could serve to better design and explore the effectiveness of interventions targeting teacher engaging messages.

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Declarations

Conflict of interest The authors declare no competing interests.

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- Santana-Monagas, E., Núñez, J. L., Loro, J. F., Huéscar, E., & León, J. (2022a). Teachers' engaging messages: The role of perceived autonomy, competence and relatedness. *Teaching and Teacher Education*, 109, 103556. <https://doi.org/10.1016/j.tate.2021.103556>
- Santana-Monagas, E., Putwain, D. W., Núñez, J. L., Loro, J. F., & León, J. (2022b). Do teachers' engaging messages predict motivation to learn and performance? *Revista De Psicodidáctica (English Ed.)*, 27(1), 86–95. <https://doi.org/10.1016/j.psicoe.2021.11.001>

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- León, J., Núñez, J. L., & Liew, J. (2015). Self-determination and STEM education: Effects of autonomy, motivation, and self-regulated learning on high school math achievement. *Learning and Individual Differences, 43*, 156–163. <https://doi.org/10.1016/j.lindif.2015.08.017>
- Núñez, J. L., & León, J. (2015). Autonomy support in the classroom: A review from self-determination theory. *European Psychologist, 20*(4), 275–283. <https://doi.org/10.1027/1016-9040/a000234>
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- Moreno-Murcia, J. A., Huéscar, E., Finn, G., León, J., & Núñez, J. L. (2021). Controlling style, relatedness and cohesion in university students: A six countries comparison. *Current Psychology, 12*.

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Most relevant publications in the field of Psychology of Education:

- Santana-Monagas, E., Putwain, D. W., Núñez, J. L., Loro, J. F., & León, J. (2022b). Do teachers' engaging messages predict motivation to learn and performance? *Revista De Psicodidáctica (English Ed.), 27*(1), 86–95. <https://doi.org/10.1016/j.psicoe.2021.11.001>
- Santana-Monagas, E., Núñez, J. L., Loro, J. F., Huéscar, E., & León, J. (2022a). Teachers' engaging messages: The role of perceived autonomy, competence and relatedness. *Teaching and Teacher Education, 109*, 103556. <https://doi.org/10.1016/j.tate.2021.103556>

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Most relevant publications in the field of Psychology of Education:

- Moreno-Murcia, J. A., Silveira, Y., y Belando, N. (2015). Questionnaire evaluating teaching competencies in the university environment. Evaluation of teaching competencies in the university. *New Approaches in Educational Research, 4*(1), 54–61.
- Huéscar, E., Moreno-Murcia, J. A., Espín, J. (2020). Teachers' interpersonal styles and fear of failure from the perspective of physical education students. *PLoS ONE, 15*(6), e0235011. <https://doi.org/10.1371/journal.pone.0235011>
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León, J., Núñez, J. L., & Liew, J. (2015). Self-determination and STEM education: Effects of autonomy, motivation, and self-regulated learning on high school math achievement. *Learning and Individual Differences*, 43, 156–163. <https://doi.org/10.1016/j.lindif.2015.08.017>

Núñez, J. L., & León, J. (2015). Autonomy support in the classroom: A review from self-determination theory. *European Psychologist*, 20(4), 275–283. <https://doi.org/10.1027/1016-9040/a000234>

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