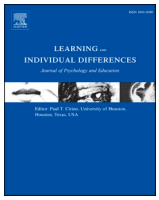
Learning and Individual Differences 110 (2024) 102420

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif



How (de)motivating teaching styles shape message framing outcomes on students' self-efficacy, emotions, and grades

Elisa Santana-Monagas [a,*], Paula da Costa Ferreira [b], Ana Margarida Veiga Simão [b], Juan L. Núñez [c]

[a] Department of Psychology, Sociology, and Social Work, University of Las Palmas de Gran Canaria, C/. Santa Juana de Arco, 1, 35004 Las Palmas, Spain
[b] CICPSI, Faculdade de Psicologia, Universidade de Lisboa, Alameda da Universidade 1649-013, Lisboa, Portugal
[c] Department of Psychology, Sociology, and Social Work, University of Las Palmas de Gran Canaria, C/. Santa Juana de Arco, 1, 35004 Las Palmas, Spain

ARTICLE INFO

Keywords:
Message-framing
Academic performance
Control-value theory
Achievement emotions
Artificial intelligence

ABSTRACT

In this study, a mixed method and prospective design was followed to achieve two objectives: code student responses to an open-ended question about their teachers' teaching and examine how this classification relates with the associations among students' self-reports on teachers' message framing (gains or losses), their self-efficacy, academic achievement emotions, and teacher reported grades. 1107 Spanish students in grades 9 to 12 participated in the study. GPT-4 was used to code the open-ended question responses on teachers' teaching style. Structural equation modeling (SEM) tested the hypothesized relations among variables accounting for the teaching styles. Results from the SEM revealed that gain-framed messages related positively with student outcomes, as opposed to loss-framed messages, but only when teachers displayed a motivating teaching style. For demotivating teachers, messages did not relate with students' outcomes except for gain-framed messages and student adaptive emotions. Directions for future research and implications for educational practice are discussed.

1. Educational relevance and implications

These findings bridge critical gaps in the field, incorporating a self-determination theory lens into a qualitative design, and concurrently addressing message framing and its interaction with teaching style on student outcomes. The study's exploration of a wide range of emotions and its direct examination of teaching's predictive value on student emotions further enrich the existing scholarship. In practical terms, the results provide valuable insights for educators, highlighting that cultivating a motivating teaching style and employing gain-framed messages can positively influence students' emotions, self-efficacy beliefs, and grades. This research not only contributes to theoretical advancements in educational psychology but also offers a tangible and straightforward resource for teachers to enhance their instructional practices and positively relation with student outcomes. The major findings discussed above underscore the significance of these insights in informing both educational theory and classroom practices. For instance, the evidence gathered could be useful to develop interventions targeting teaching practices or those targeting students' behavioural change regarding following teachers' advice. Telling a teacher how to frame their messages is simple, does not require much time, expertise, or budget. Thus, it denotes the best scenario to conduct school-based interventions.

Every teacher in the service of education seeks to cultivate adaptive emotions, instil belief in students' capabilities, and facilitate academic achievement. But how can they achieve this? Recent research in the field is recognizing emotional and cognitive processes as key for such educational outcomes (Çınar et al., 2023; Liu et al., 2021; Ren et al., 2022; Tang et al., 2021; Zyberaj, 2022). Notably, the self-determination and the control-value theory emphasize the pivotal role of the classroom environment, particularly the teacher, in promoting such processes (Linnenbrink-Garcia & Pekrun, 2011; Pekrun, 2006; Reeve & Cheon, 2021). As so, most research in the field has aimed to understand what teachers can do to ensure students' positive self-efficacy beliefs, adaptive achievement emotions and academic achievement. Among these behaviours, adopting a motivating teaching style has consistently been found essential for achieving these outcomes (Ryan & Deci, 2020; Wei et al., 2020; Zimmermann et al., 2021).

However, whereas most research has built upon this evidence on motivating teaching styles, little attention has been given to other teaching behaviour that could also promote students' academic success.

* Corresponding author.
E-mail address: elisa.santana@ulpgc.es (E. Santana-Monagas).

https://doi.org/10.1016/j.lindif.2024.102420
Received 2 August 2023; Received in revised form 5 February 2024; Accepted 8 February 2024
Available online 14 February 2024

For instance, little attention has been given to what teachers can actually say to students, despite evidence pointing towards the importance of teachers' forms of communication for students' learning experience and outcomes (Chen et al., 2020; Chesebro & Martin, 2010; Putwain et al., 2019, 2016; Santana-Monagas, Putwain, et al., 2022). Furthermore, while much research has explored the impact of loss-framed messages (i.e., messages highlighting the negative consequences of a behaviour) on students' outcomes (Putwain et al., 2019, 2017; Putwain & Remedios, 2014; Putwain & Symes, 2011), gain-framed messages (i.e., messages highlighting the positive consequences of engaging in a behaviour) have just started to be examined by researchers, offering promising results (Santana-Monagas et al., 2023; Santana-Monagas, Núñez, et al., 2022; Santana-Monagas, Putwain, et al., 2022). Nonetheless, there still exists a significant gap in knowledge regarding how these messages affect the emotional experiences and self-efficacy of students. It could be that students' emotions and self-efficacy beliefs serve as mediators in the relation between teachers' messages and students' academic performance. Therefore, the present research follows a prospective mixed method design aimed to explore how framing messages relates to students' emotions, self-efficacy, and their academic performance. Moreover, it also takes a pioneering step forward by not only investigating these relations but also by examining the intricate relationship between teachers' teaching style (motivating vs. demotivating; Moè et al., 2022) and the proposed associations. This is, how teaching style shapes the relations among message framing and student outcomes. By unravelling these dynamics, this study aims to provide a comprehensive understanding of the multifaceted impact of teachers' communication on students, offering insights that can inform educational practices and contribute to the holistic development of students.

2. Achievement emotions and self-efficacy beliefs

Achievement emotions have been defined by Pekrun (2006) as "emotions tied directly to achievement activities or achievement outcomes." (p. 317). These emotions can be categorized based on their valence (pleasant or unpleasant), as well as their degree of activation (activating or deactivating emotions; Pekrun, 2006). As a result of these emotional experiences, students' learning experiences and outcomes can either be enhanced or hampered (Pekrun et al., 2002, 2017; Putwain, Schmitz, et al., 2021). Not only has activating pleasant emotions such as enjoyment or pride (i.e., adaptive emotions), been repeatedly related to higher achievement, but have also been associated with self-regulated learning, motivation, adaptive learning strategies, and achievement (Ahmed et al., 2013; Artino & Jones, 2012; Luo et al., 2016; Pekrun et al., 2011; Putwain et al., 2018). As opposed to this, unpleasant emotions (i.e., non-adaptive emotions) such as anxiety, boredom, anger, shame, or hopelessness, have been related to increased dropout intentions (Respondek et al., 2017) and lower motivation, less effort exertion and nonadaptive learning strategies (Grazia et al., 2021). Given that pleasant emotions expand individuals' cognition and drive behaviour towards goals (Fredrickson & Branigan, 2005), instructing teachers on how to foster such emotions should be a priority. In fact, a recent meta-analysis by Camacho-Morles et al. (2021) gathered evidence towards the greater impact these emotions can have on secondary students, when compared to primary and college students, thus, proving the importance of intervening in this developmental stage.

Within the control-value theory, it has been shown that these emotions can be triggered by environmental factors, such as teaching behaviours (Goetz et al., 2020). Accordingly, it is posited that characteristics of the environment providing information pertaining to controllability play a crucial role in influencing students' emotions. Among these, the consequences of achievement encompass a key factor. These can be communicated explicitly through verbal messages by teachers, such as loss-framed messages on the consequences of not achieving success and gain-framed messages highlighting the positive consequences of achieving success. The resulting evaluation of such messages would impact students' action-control expectancies. This refers to students' sense of control over achievement-related actions and outcomes (Pekrun et al., 2007) which are often operationalized as self-efficacy (Pekrun et al., 2011): student's beliefs about their own ability to achieve success (Bandura, 2012). These beliefs have been found to be related to numerous student learning outcomes. To this extent, students with a high self-efficacy are more prone to actively engage in their own learning (Caraway et al., 2003; Liu et al., 2018; Umemoto & Ito, 2016), have higher academic performance (Diseth et al., 2012), and display a greater persistence and effort when challenged (Wright et al., 2013). It has also been proven to be an important indicator of students' success (Putwain et al., 2013). For high school and tertiary education students, these become even more important, as it can be inferred that the perceived subjective value of success and failure is heavily shaped by how academic achievements impact future career or professional opportunities. Attending to the evidence stated, research should not only explore these beliefs and emotions in relation to students' outcomes, but it should also be fundamental to link such emotions to specific teaching behaviour (i.e., verbal behaviour or teaching styles) to create effective interventions.

In the realm of control-value theory framework, appraisals of control and value are presumed to act as intermediaries, mediating the effects of the teaching environment on students' achievement emotions. Nonetheless, despite there being evidence that emotions may be affected by teachers' behaviour (Frenzel et al., 2009), there is a lack of evidence regarding the extent to which teaching directly influences the discrete emotions experienced by students (Goetz et al., 2020). If we consider the ability of messages and words to contagion and express emotions (Parkinson & Manstead, 2015) along with their immediate impact on the brain (Unkelbach et al., 2020, 2008), assessing their direct link to emotions seems certain. Moreover, research covering a broad range of emotions is still lacking since the common approach has been to focus on single emotions such as enjoyment, boredom, or anxiety (Goetz et al., 2021; Putwain et al., 2018; Tang et al., 2021). Finally, research that examines multiple teacher antecedents of students' emotions and self-efficacy beliefs concurrently, as well as their relation to learning outcomes are scarce (Tang et al., 2021). Thus, as previous studies have indicated (Hirvonen et al., 2020), the present study aims to fill in this gap by examining a further range of academic emotions, along with multiple antecedents of students' emotions.

The learning environment: Teaching Style and Message framing.

Teachers' behaviour has been found to be a strong antecedent of students' outcomes, such as emotions and self-efficacy beliefs (Ekatushabe et al., 2021; Wang et al., 2017; Zimmermann et al., 2021). Following the self-determination theory, teaching behaviours have been classified as either being motivating or demotivating (Aelterman et al., 2019; Moè et al., 2022) based on whether they support or thwart students' needs for autonomy (i.e., sense of initiative and willingness on behaviour, which is driven by interest), competence (i.e., capability to perform tasks effectively) and relatedness (i.e., feel connected and bonded with others (Ryan & Deci, 2017). A teacher that adopts a motivating style, and thus nurture students need, offers students choices, communicates clearly what is expected, provides help and assistance when needed, and shows care and attention to students' concerns, accepting expressions of negative affect, among others; Moè et al., 2022; Reeve, 2009). Contrastingly, a demotivating teacher exerts its power, uses controlling and aggressive language, criticizes students, leaves them without guidance or adopts a laissez-faire attitude (Vermote et al., 2020). Across the literature, these teaching styles have consistently found to be strong promoters of student outcomes (Ryan et al., 2022). For instance, Tang et al. (2021) and Liu et al. (2018) found that both self-efficacy and achievement emotions mediated the relation between teachers' motivating style, students' learning persistence and academic engagement. In this sense, a teacher that adopts a motivating style is more likely to have students who believe in their efficacy and academic ability, and experience more positive emotions, which can

affect their grades.

Recent research on effective teaching is starting to point at other behaviours that can be impacting students' outcomes. For instance, teachers' use of certain messages such as praise/reprimands, comfort-oriented feedback, or fear appeals (Caldarella et al., 2020; Jenkins et al., 2015; Putwain & Remedios, 2014; Rattan et al., 2012) have shown to be pertinent for students' motivation, performance, engagement, and self-efficacy beliefs. Among these, research has highlighted message framing as a key aspect of teachers forms of communication (Santana-Monagas, Núñez, et al., 2022; Symes & Putwain, 2016). These refer to the different effects that gain and loss-framed messages can have on individuals' behaviour (Rothman & Salovey, 1997). In the health context, these messages have been assessed under the lenses of many research aimed at examining how they can persuade individuals to follow medical advice and recommendations (e.g., applying sunscreen, flossing their teeth, practising sport, reducing alcohol consumption or increasing vegetable consumption; Gerend & Cullen, 2008; Gerend & Maner, 2011; Lithopoulos & Young, 2018; O'Keefe & Jensen, 2007; O'Keefe & Forrester, 2009). Results show the effectiveness of both kinds of messages in proking changes in individuals' behaviour. However, under educational settings, research on how such messages can predict students' outcomes is still very scarce.

Like such studies in the health context, teachers can also try to persuade students to follow their advice. Thus, with their messages, teachers can try to engage their students in certain activities. For instance, a teacher can tell a student "*If you pay attention to the explanation, you are going to find this easy*" or they can either tell them "*If you don't pay attention to the explanation, you are going to find this hard.*". As a result, research has provided strong evidence towards the effect that loss-framed messages have on students. For instance, these kinds of messages have been found to relate to worse performance, test anxiety and worry, avoidance goals, procrastination, or disengagement, among others (Belcher et al., 2022; Nicholson et al., 2019; Putwain et al., 2019; Putwain & Remedios, 2014; Putwain & Symes, 2011; Putwain, Symes, et al., 2021).

On the contrary, gain-framed messages have just begun to be examined under naturalistic contexts, proving their relation to students' motivation, grades, teacher-student relatedness, and students' vitality (Santana-Monagas et al., 2023; Santana-Monagas, Núñez, et al., 2022; Santana-Monagas, Putwain, et al., 2022). Nevertheless, to date there is no evidence on how these messages can impact students' emotional experiences or self-efficacy beliefs. Given that focusing on positive communication has a higher effect than focusing on the negative (Martínez-Zelaya et al., 2022), it could be important for future interventions to understand how message framing could predict students' emotions and self-efficacy beliefs, which can have an impact on their grades.

Nevertheless, messages are not effective per se but instead depend on several factors that can influence the response of students to such messages. For instance, the traits of the person delivering the messages, such as closeness, have already proven to be important for the effectiveness of advice messages (Bo Feng & MacGeorge, 2010; Feng & MacGeorge, 2006; Jang & Feng, 2018; MacGeorge et al., 2008). It could be that the adoption by teachers of a motivating or demotivating style can undermine or boost the predictive value these messages can have on students. Hence, the present study aims to examine how teacher traits (i.e., teaching style) relate to the predictive value that their messages (i.e., gain vs loss-framed messages) can have on student outcomes. Understanding this is essential for effective communication within the classroom setting, as it could help teachers to be more intentional and skilful in conveying their messages.

3. The present study

Given that students are the main recipients of teacher's behaviour, acknowledging their perspective is key to narrow the gap between theory and practice and suit research to their needs (Lynch & Salikhova, 2017). So notorious is this need that research examining this gap has neglected students' perspectives (Vanderlinde & van Braak, 2010). Thus, there is a gap for research not only conducting quantitative studies but also combining them with qualitative designs to gain a better and deeper understanding of the phenomenon under study (Johnson & Onwuegbuzie, 2004), specifically within self-determination theory research, as denoted by Ryan and Deci (2020). This involves understanding how teacher behaviour (i.e., teaching style and message framing) relates to student outcomes (self-efficacy beliefs, achievement emotions and grades). This mixed-method approach has already been proven to be useful in previous research in the field (Pekrun et al., 2002). Thus, the following research question was examined through an open-ended question:

RQ1. : How do students describe their teachers' approach to teaching (i.e., teaching style)?

One of the main disadvantages related to the use of open-ended questions is the fact that coding big samples is an arduous and time-consuming task, hence studies commonly rely on smaller sample sizes as. Fortunately, researchers can now rely on natural language processing tools (NLP) and artificial intelligence (AI) for this task. Thus, in the present study, we relied on the GPT-4 model (Kasneci et al., 2023) to systematically analyse students' answers to the open-ended question. Specifically, to address the currebt research question we asked GPT-4 to categorize students answers according to the categories identified in a recent study identifying motivating (or demotivating) teaching styles (Moè et al., 2022), based on the autonomy-supportive literature (see supplementary material and Appendix A for the description of these categories and the prompt used in GPT-4).

Furthermore, given that we were interested on the predictive value that teachers' messages and teacher-student relatedness have on students' outcomes (i.e., self-efficacy beliefs, emotions, and grades), the present study used a two-wave prospective design. Although not implying causality, a prospective design allows us to assess the predictive value of these relations among variables rather than just their associative value (Vallerand & Bissonnette, 1992). As such, teachers' messages and teaching style were measured at T1, whereas students' emotions, self-efficacy beliefs and grades were assessed at T2. Taken all together, the following research question were examined:

RQ2. : How do loss-framed messages and gain-framed messages relate to achievement emotions, self-efficacy, and grades? Fig. 1 displays the relations tested among variables.

RQ3. : What is the connection between the teaching styles employed by teachers and the aforementioned associations?

4. Method

4.1. Participants

A total of 1107 high school students from 65 classes between grades 9th to 12th participated in the study (538 females; 569 males, Mean age = 16.23; *SD* = 2.17). In the Spanish education system grades 9 and 10 are part of the compulsory education system whereas grades 11 and 12 correspond to post-compulsory secondary education (i.e., equivalent to sixth form in the UK). Students were drawn from a total of 23 different public secondary schools from the Canary Islands belonging to both rural and urban environments. The sample schools presented no potential ethnic differences as most of the students were from the Canary Islands and came mostly from middle-class families. The questionnaire was tailored for a total of six subjects in the Spanish curriculum and their respective teachers. These subjects were: Mathematics, Spanish Language and Literature, Physics and Chemistry, Biology, History of Spain, and Technology.

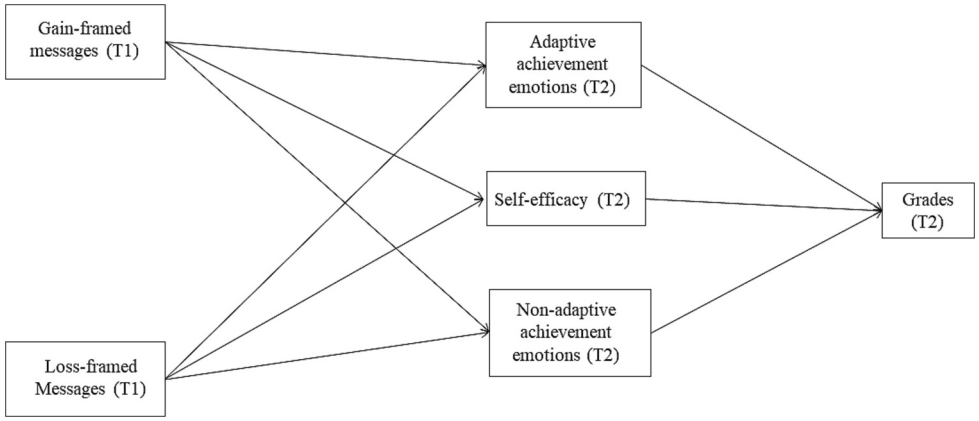


Fig. 1. Hypothesized model.

4.2. Instruments and measures

Items from all instruments were rated according to a 7-point Likert scale that ranged from "does not correspond at all (1)" to "fully corresponds to me (7)". To assess reliability of the scales used we relied on McDonald's Omega which are presented in Table 2.

4.2.1. Teaching style

To assess students' evaluations of their teachers' teaching, like previous studies (Hynninen et al., 2019), we asked them the following open-ended question at T1: ""*If you had to tell a peer how your teacher teaches, what would you say to them*?". The length of student's responses ranged from a single world to a maximum of two sentences of a total of 40 words. Overall, a total of 7.139 words were analysed. Answering the question was necessary for students to submit their questionnaires, hence, no responses were left blank. Only 10 responses included a dot as an answer ("."). These were removed for coding leading to a total of 995 answers analysed).

Coding Scheme. Answers to the open-ended question were coded following the classification system proposed by Moè et al. (2022) - hence, a deductive content analysis (i.e., theory driven). This system identifies 8 categories of teaching styles, four belonging to a motivating style and four to a demotivating style. A further category was created to classify answers that did not correspond to any of the previous established categories. The coding scheme followed is detailed in the supplementary material. To code the responses to the open-ended question the GPT-4 model (https://platform.openai.com/docs/models) was used (Brown et al., 2020). Model specificities were as followed: temperature sampling equal to 0, maximum of 20 tokens, and sampling behaviour equal to 1. Appendix A contains the entire GPT-4 prompt used.

4.2.2. Teacher messages

Teachers' messages and their frame were assessed using 32 items from the Spanish Teachers' Engaging Messages Scale (Santana-Monagas, Putwain, et al., 2022). Items were preceded by the following statement: "My teacher tells me that…." Items were grouped into two factors of 16 items: gain-framed messages (e.g., "If you work hard, you will enjoy the subject) and loss-framed messages (e.g., "If you don't work hard, you will get into trouble"). Validity and reliability of the scale has already been established by previous research (Santana-Monagas, Núñez, et al., 2022).

4.2.3. Students' achievement emotions

Like previous research (Goetz et al., 2021; Moreira et al., 2019), students' achievement emotions were assessed using 7 single items adapted from the Achievement Emotions Questionnaire (Pekrun et al., 2011). The following adaptive emotions were assessed: enjoyment (e.g., "*I enjoy this subject*") and pride (e.g., "*I am proud of the contributions I have made in this subject*"). The following non-adaptive emotions were assessed: boredom (e.g., "*I think this subject is boring*") hopelessness (e.g., *"I think I will never get good grades in this subject"*), anxiety (e.g., *"I worry that the material is too difficult for me in this subject"*), anger (e.g., "*I get angry because the material in this subject is too difficult*") and shame (e.g., "*When I say something in this subject, I feel like I am embarrassing myself.* "). Previous studies have provided evidence of its reliability and validity (Bieleke et al., 2021).

4.2.4. Self-efficacy beliefs

To measure students' self-efficacy beliefs, answer a 4-item subscale (e.g., "*I believe that I have the necessary skills to do well in school*") of the Self-Regulation of Motivation for Learning Scale (SRMLS; Paulino et al., 2016).

4.2.5. Grades

Students' academic performance was assessed by their grades in their corresponding subject. These were retrieved from the schools' official records which were facilitated by teachers anonymously (researchers only had access to information on grades, date of birth and gender). Following the Spanish educational systems, teachers give students grades based on rubrics implemented by the government. These grades vary between 1 and 10, with the latter being the highest possible grade.

4.3. Procedure

Schools were contacted via phone to request their collaboration in the study.

Questionnaires were administered online through google forms. Teachers were given the access link to the questionnaire and were asked to deliver them to students for them to complete them in their free time. In the instructions, participants were explained the voluntary nature of their participation, their right to withdraw from the survey at any time and that returning questionnaires would imply their acceptance to participated in the study. If they did not want to participate, then they did not have to complete the questionnaire. Following the Spanish law in data protection, given that all participants were above 14 years no parental consent was needed. Regarding teacher messages, students were asked to answer the questions thinking about their current teacher for the subject concerned. Given that in some cases students in a class participated with more than one teacher and subject, they were asked to complete the questionnaires for each teacher. Therefore, students in a class rated the same teacher. To make sure this was the case, and to distinguished between the questionnaires the same student filled more than once students were asked the following question at the end of the questionnaire: "What is the name of the teacher you have thought of to answer this questionnaire?". The first wave of data collection where

information on teachers' messages was collected and students were asked the open-ended question about their teachers' teaching (T1; n = 1005) took place on November 2021. The second wave collected data on students' emotions, self-efficacy beliefs, and grades, and took place on May 2022 (T2; n = 619). Overall, 488 students responded only at T1, 102 only at T2 and 517 answered at both time points. To handle missing data the full information maximum likelihood estimator was used with the remaining sample of 1107 students. With this estimation method, bias is retrieved when data are missing not a random (Little et al., 2014).

4.4. Data analysis

4.4.1. Coding

To assess the reliability of the coding, inter-rater agreement[1] between GPT-4 and one of the researchers, who independently coded a random selection of 10 % of answers, was examined. The average pairwise percent agreement was calculated with ReCal2 (Freelon, 2010). Table 1 displays the % agreement across categories. Overall, the average percentage of agreement among the researcher and GPT-4 was of 89,3 % considered satisfactory (O'Connor & Joffe, 2020).

4.5. Statistical analysis

Direct and indirect effects for the hypothesized model were estimated through structural equation modeling (SEM). Fig. 1 displays the direct effects tested among variables. Two models were tested, an overall model with the paths described in Fig. 1 (in Fig. 2, model a) and another model that accounted for the teaching style teachers were assigned by students (i.e., motivating style – *model m,* Fig. 2, demotivating style – *model d,* Fig. 2, or other – *fig. S1 on supplementary material)*. This was done using the GROUPING option in Mplus which identifies in the data set variables that contain group membership information.

The paths for the indirect effects tested are displayed in Table 3. Students were nested within their respective classes using the TYPE = COMPLEX command in Mplus. To estimate the model fit, we relied on the following goodness fit indices: the root-mean square error of approximation (RMSEA), standardized root means square residual (SRMR), comparative fit index (CFI), and the Tucker–Lewis index (TLI). A model has a good fit when RMSEA <0.08, SRMR <0.05 and CFI/TLI >0.95 (Hu & Bentler, 1999). Confidence intervals at 95 % (CIs) were estimated around beta coefficients. These are statistically significant (p < .05) when confidence intervals (upper and lower) do not contain zero. All analysis were done with Mplus 8.7 (Múthen & Muthén, 1998–2023). According to Keith (2019), standardized beta coefficients with values above 0.05 are considered of small magnitude, 0.10 as moderate, and 0.25 large. To handle missing data, the robust maximum likelihood estimator was chosen as the estimation method.

5. Results

5.1. Descriptive analysis

Table 1 displays the frequency of each teaching style category found across students' responses to the open-ended question and some examples of these. Results show that the most frequent category was "*Motivating style*" with 56.58 %. The next most frequent category was the category "*Other*" with a 33.77 % and finally, only 9.65 % of teachers were identified as "*Demotivating style*".

[1] Interrater agreement was chosen over Cohen's Kappa given there was a significant overrepresentation of the category "motivating style" (56.58 %), and a comparatively smaller representation of the "demotivating style" category (9.65 %). In these cases, the Kappa coefficient underestimates the reliability of the procedure (Gras et al., 1990). Results for Cohen's kappa: 0.76 (motivating category), 0.30 (demotivating category) and 0.60 (category *others*).

Table 1
Average pairwise percentage agreement across categories, frequencies, and example answers.

Category	Examples	Agreement among GPT-4 and coder		Frequency	
		Number of Disagreements	Percentage Agreement %	N	%
Motivating style	"*She is a very good teacher, answers all the questions, and tries to make sure everyone understands the subject matter.*", "*Quite good. She makes it interesting. She explains very well, and the classes are fun.*" "*My teacher helps you and explains what is necessary in various ways so that you can choose the one that seems easiest to you.*", "*The classes are explained in sufficient detail, clarifying all the doubts that may arise.*"	11	89	563	56,58
Demotivating style	"*Well, he doesn't explain well, and he picks on us and he gets quite angry.*", "*There is no clear class dynamic most of the time. The teacher does not explain adequately and generates quite a lot of confusion.*"; "*The classes leave me with many doubts, and sometimes I feel like there are only two people in the class.*", "*In a chaotic manner.*"	8	92	96	9,65
Other	"*Good person.*"; "*She is very good and funny.*", "*That the subject is very complicated.*"	13	87	336	33,77
			Total	995	100

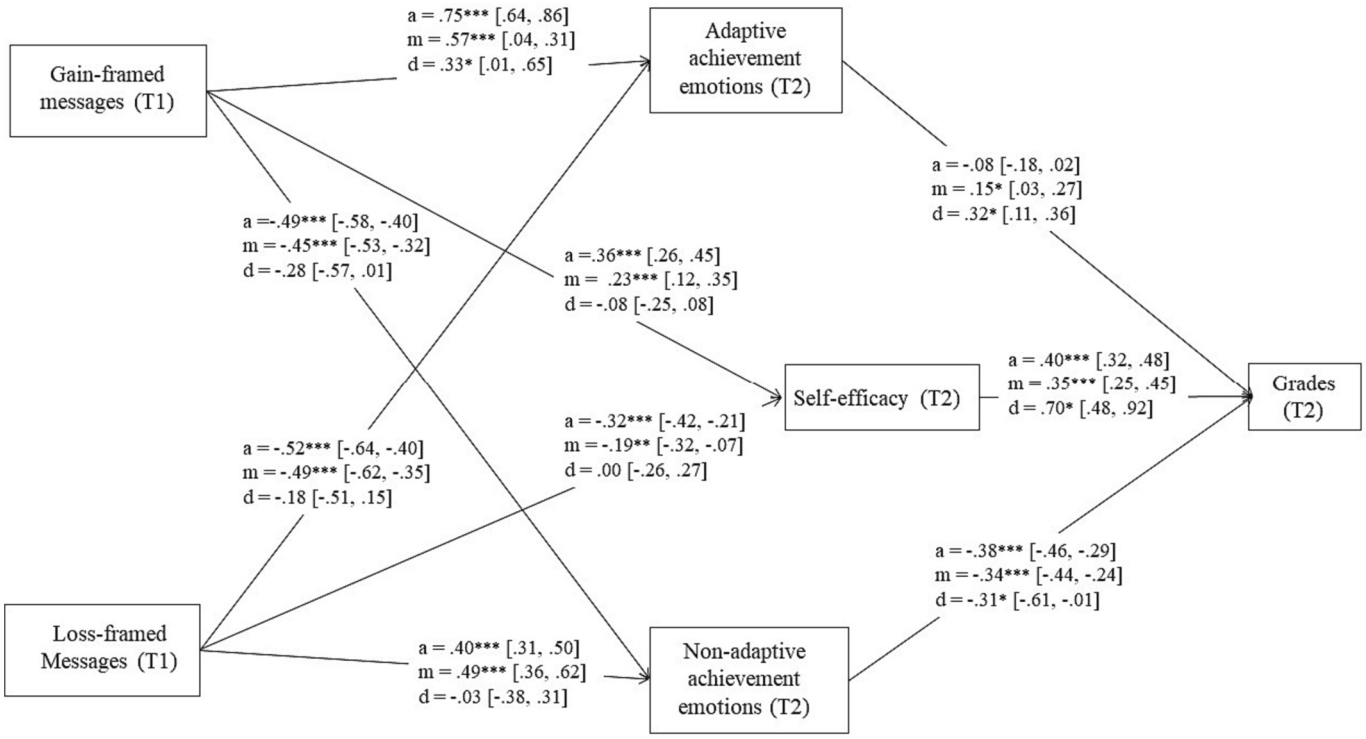


Fig. 2. Standardized direct effects for the models tested.
Note. a = overall model (no grouping); m = motivating style model, d = demotivating style model; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

5.2. Preliminary analysis

Descriptive statistic, McDonald's Omega and Pearsons' correlations among variables are displayed in Table 2.

5.3. Structural equation models

Model fit indices for the estimated models showed a good fit to the data. The overall model showed the following fit: χ^2 (341) = 1480.669, $p < .001$, RMSEA = 0.055, SRMR = 0.090, TLI = 0.901, CFI = 0.911. Whereas the model that accounted for the grouping of data considering the teaching styles showed the following fit, which display slightly better fit to the data: χ^2 (1279) = 2038.836, p < .001, RMSEA = 0.042, SRMR = 0.097, TLI = 0.933, CFI = 0.940.

5.3.1. Direct relations

Results from the direct paths of both models are displayed in Fig. 2.

All paths for direct relations between variables for the overall model (model a) resulted statistically significant except for the path among adaptive achievement emotions and grades. The relations among variables showed a large magnitude. Regarding the nature of the relations, results showed that gain-framed messages related positively with adaptive achievement emotions and self-efficacy beliefs, whereas they negatively related with non-adaptive achievement emotions. The inverse pattern was observed for loss-framed messages. Self-efficacy positively related with grades, whereas this relation was negative for non-adaptive achievement emotions.

For the model accounting the grouping by teaching style, teachers assigned to the motivating teaching style (model m) all paths resulted significant and the magnitude of relations ranged from large to moderate. The nature of relations displayed the same pattern as those in the overall model (model a), whereas for the relation among adaptive achievement emotions and grades, this relation was positive. For students who assigned their teachers to de demotivating teaching style (model d), only gain-framed messages displayed a positive large relation with adaptive achievement emotions. Moreover, the relation among emotions and self-efficacy displayed the same pattern as those for the model for the motivating teaching style (model m). Nonetheless, the magnitudes for the path among self-efficacy and grades ($\beta_{motivating}$ = 0.35 [0.25, 0.45]; $\beta_{demotivating}$ = 0.70 [0.48, 0.92]), and adaptive achievement emotions were larger ($\beta_{motivating}$ = 0.15 [0.03, 0.27]; $\beta_{demotivating}$ = 0.32 [0.11, 0.36]). For the results on the category "*other*" see supplementary material.

5.3.2. Indirect relations

Results from the indirect paths are displayed in Table 3.

Table 2
Means, standard deviations, McDonalds' omega, and correlations.

	M	SD	ω	1	2	3	4	5
1. Grades $_{T2}$	6.42	2.33		–				
2. Gain-framed messages $_{T1}$	4.75	1.31	0.86	−0.01	–			
3. Loss-framed messages $_{T1}$	2.20	1.36	0.92	−0.10*	0.33*	–		
4. Adaptive achievement emotions $_{T2}$	4.83	1.67	0.76	0.44*	0.19*	0.01	–	
5. Non-adaptive achievement emotions $_{T2}$	3.21	1.47	0.77	−0.42*	−0.08	0.04	−0.51*	–
6. Self-efficacy $_{T2}$	5.97	1.00	0.81	0.43*	0.05	−0.02	0.37*	−0.26*

Note. N = 1107, M = mean, SD = Standard Deviation, ω = McDonalds' Omega. T1 =First data wave; T2 = Second data wave.
* $p < .05$.

Table 3
Standardized indirect effects from the SEM.

Paths	Overall model			Motivating style			Demotivating style		
	β	*SE*	95 % CI	*β*	*SE*	95 % CI	*β*	*SE*	95 % CI
GFM $_{T1}$ ➔ Adaptive achievement emotions $_{T2}$ ➔ Grades $_{T2}$	−0.06	0.04	−0.13, 0.00	0.09*	0.03	0.03, 0.14	0.11	0.06	0.02, 0.20
GFM $_{T1}$ ➔ Non-adaptive achievement emotions $_{T2}$ ➔ Grades $_{T2}$	0.18	0.03	0.13, 0.24	0.15*	0.03	0.10, 0.21	0.09	0.06	−0.01, 0.19
GFM $_{T1}$ ➔ Self-efficacy $_{T2}$ ➔ Grades $_{T2}$	0.14	0.02	0.10, 0.18	0.08*	0.02	0.04, 0.12	−0.06	0.06	−0.16, 0.04
LFM $_{T1}$ ➔ Adaptive achievement emotions $_{T2}$ ➔ Grades $_{T2}$	0.04	0.03	−0.00, 0.09	−0.07*	0.03	−0.13, −0.02	−0.06	0.05	−0.14, 0.02
LFM $_{T1}$ ➔ Non-adaptive achievement emotions $_{T2}$ ➔ Grades $_{T2}$	−0.15	0.03	−0.19, −0.11	−0.17*	0.03	−0.23, −0.11	0.01	0.05	−0.08, 0.10
LFM $_{T1}$ ➔ Self-efficacy $_{T2}$ ➔ Grades $_{T2}$	−0.13	0.02	−0.17, −0.09	−0.07*	0.02	−0.10, −0.03	0.00	0.10	−0.16, 0.16
Total indirect									
GFM $_{T1}$ ➔ Grades $_{T2}$	0.26	0.04	0.20, 0.32	0.32*	0.05	0.24, 0.40	0.14	0.10	−0.03, 0.30
LFM $_{T1}$➔ Grades $_{T2}$	−0.23	0.03	−0.23, −0.18	−0.31*	0.05	−0.39, −0.23	−0.05	0.12	−0.24, 0.15

Note. T1 = First data wave; T2 = Second data wave. GFM = Gain-framed messages; LFM = Loss-framed messages.
* $p < .05$.

For the overall model (model a) all paths for indirect relations between variables resulted statistically significant $p < .05$, except for the indirect path between messages (both gain and loss-framed), adaptive achievement emotions and grades. The magnitudes of relations were generally moderate, except for the total indirect relations among gain-framed messages and grades, which exhibited a large magnitude. Regarding the model accounting for teaching styles, the paths for the motivating style model (model d) were all statistically significant and positive for indirect paths involving gain-framed messages and negative for those involving loss-framed messages. Magnitudes ranged from small to moderate. Hence, results showed that teachers whose teaching style was motivating, gain-framed messages had an indirect and positive effect on grades, through both self-efficacy and achievement emotions, whereas loss-framed messages had a negative indirect effect on grades through the same paths. For students who described their teachers as being demotivating, none of the paths resulted significant. For the motivating style the total indirect effect of gain-framed messages on grades was positive whereas these was negative for loss-framed messages. This model also displayed the largest magnitudes on these paths.

6. Discussion

The present study followed both a qualitative and a quantitative prospective design to examine: (1) how students describe their teachers' approach to teaching; (2) how gain versus loss-framed messages relate with students' self-efficacy beliefs, achievement emotions and grades; and (3) how does teaching style (motivating versus demotivating), as described by students through open-ended questions, shape the predictive value of these associations. Overall, three main findings can be drawn from the present results: most teachers were described as having a motivating teaching style, with very few being described as demotivating; gain-framed messages positively related with students' outcomes (both directly and indirectly) whereas loss-framed messages did so negatively; and finally, overall, messages only showed their predictive value on student outcomes when teachers displayed a motivating teaching style with the exception of gain-framed messages on adaptive achievement emotions when teachers displayed a demotivating style. These findings bridge numerous gaps within the field by examining several understudied issues: investigating the proposed links by examining teaching styles from a self-determination theory following a qualitative design (Johnson & Onwuegbuzie, 2004; Ryan & Deci, 2020), addressing concurrently teachers' message framing and how teaching style can shape the predictive value of such messages on student outcomes (Tang et al., 2021), exploring a broad range of emotions (Goetz et al., 2021; Putwain et al., 2018; Tang et al., 2021), and finally, exploring the direct effect of teaching in students emotions (Goetz et al., 2020). By doing so, the present findings contribute to the field by identifying another resource teachers can rely on to enhance students' emotions, self-efficacy beliefs and grades. They also bring theory and practice closer as they highlight a simple, practical, and specific resource teachers can start to use within their lessons. Major findings are discussed below.

6.1. Students' perceptions of teachers' teaching

Regarding the first research question, findings showed that students reported more often their teacher as having a motivating teaching, as highlighted previously by (Aelterman et al., 2019; Moè et al., 2022) who found that motivating behaviours were most frequently reported than demotivating. Contrastingly, the demotivating style was only reported by 9.65 %. Notwithstanding, a big proportion of the students highlighted other teaching behaviour. These results underscore that students ascribe value to such behaviour, but they also describe other behaviours that are not considered within the framework of self-determination theory. Given that teaching is such a complex phenomenon, it is necessary for researchers to also attend students' perspectives as they could inform relevant teaching practices. This would be key to narrow the gap between theory and practice to also suit research to students' needs (Lynch & Salikhova, 2017).

6.2. Framing messages and student outcomes

Attending to the second research question, regarding students' emotions, results showed that gain-framed messages related with students' adaptive emotions whereas for non-adaptive emotions this relation was negative. In contrast, loss-framed messages negatively related students' adaptive achievement emotions whereas it positively related non-adaptive emotions. Independently from the nature of the relations, the effect that gain-framed messages had on the proposed links with the rest of the variables was always higher than those of loss-framed messages. These results resemble those of Santana-Monagas et al. (2023) and Santana-Monagas, Putwain, et al. (2022) showing the greater effect that gain-framed messages have on student outcomes. Contrary to the idea that "bad is stronger than good" (Alves et al., 2017), recent research suggests that focusing on positive events has a higher effect than to that of negative (Martínez-Zelaya et al., 2022). Thus, it could be that, although negative information has a greater psychological impact (Alves et al., 2017), positive information is retained for longer and densely in the memory (Unkelbach et al., 2008), which could contribute to its stronger long-term impact than that of negative information. Thus, loss-framed messages could provoke immediate negative reactions on students (e.g., non-adaptive achievement emotions) and could be more easily recalled as a negative event time after, but gain-framed messages could be recalled daily and thus contribute to their positive outcomes (Unkelbach et al., 2020).

This evidence further emphasizes alignment with the control-value theory (Pekrun, 2006; Pekrun et al., 2007), indicating a significant connection between emotions and teachers' behaviour, particularly through verbal messages. Additionally, it suggests that a teacher's behaviour may directly predict students' emotions (Goetz et al., 2020).

In this sense, students who receive messages such as "*If you work hard, you are going to be able to study what you like*" might feel more adaptive emotions in such classes in contrast to teachers that use messages such as "*If you don't work hard, you are going to make your parents feel angry*". Both messages display the same choice frame, but the consequences of achievement (or underachievement, as in the case of loss-framed messages) are different. This negative highlight could, thus, be responsible of students' negative affective experiences. Another plausible explanation might involve emotional contagion (Parkinson & Manstead, 2015). It is conceivable that teachers convey messages with expressions of negative or positive emotions, thereby triggering a negative or positive emotional response in students through the contagion of these emotions. Considering the present findings, the positive framing of messages could be a useful resource for teachers to help students striving. In this sense, hopeful and encouraging words could foster an optimistic perspective and promoting a proactive attitude towards challenges.

Finally, gain-framed messages positively related with student's self-efficacy believes. Again, as the control-value theory posits, a negative highlight on the consequences of underachievement, could be responsible for such finding. Messages such as "*If you work hard, you can learn interesting facts"* can boost students' sense of self-efficacy as it reflects teachers believes on students' efficacy to achieve desired outcomes, increasing the controllability of achieving success (i.e., control-action expectancies). On the other hand, telling a student "*If you don't pay attention, you won't be able to find a good job"* transmits the opposite, that the teachers consider that students cannot be successful in the future, ultimately negatively predicting students' sense of self-efficacy by reducing control-action expectancies. Students build up their confidence and self-efficacy from the information they receive from the environment (Bandura, 2006). In schools, teachers are the main source through which students receive this information. If they emphasize the idea that they consider their students capable individuals, it is very likely that the students will do the same.

Overall, findings also suggested that messages indirectly related with students' grades through the proposed links, with positive relations for gain-framed messages and negative for loss-framed messages. This finding adds to those of Santana-Monagas, Putwain, et al. (2022) who found that teachers' messages were indirectly related to grades through motivation to learn. Thus, the present findings add to the knowledge that teacher messages do not directly relate to students' grades, but that they do indirectly through various variables. When teachers are supportive, in terms of framing messages positively (i.e., gain-framed messages), they show students their conviction about their capabilities and at the same time, are most likely to enhance their adaptive emotions regarding their performance at school. As previous research has proven (Diseth et al., 2012; Liu et al., 2018; Wright et al., 2013), this could ultimately make them exert greater effort and thus, achieve higher grades.

6.3. Teaching style and message framing

When accounting for the teaching style adopted by educators, results displayed significant relations for motivating teachers. Conversely, when teachers were identified as being demotivating, only gain-framed messages were related with adaptive achievement emotions. Regarding their indirect relations and in line with findings of Santana-Monagas, Putwain, et al. (2022), again, only for motivating teachers did messages have an indirect relation with students' grades, positive for gain-framed messages and negative for loss-framed messages. Given the novelty of such findings, these results cannot be compared with previous evidence. Indeed, previous evidence has highlighted advice-giver characteristics as a factor influencing people's response to advise (Bo Feng & MacGeorge, 2010; Feng & MacGeorge, 2006; Jang & Feng, 2018; MacGeorge et al., 2008), and self-determination theory studies have found how controlling words and tones elicit defiant reaction in listeners (Weinstein et al., 2020), but no research before has investigated within the educational contexts how teaching styles might shape the outcomes of message framing.

Nonetheless, this finding suggests that messages are not predictive of student outcomes "per se" but rather that teacher characteristics alter the predictive value of such messages. In this sense, a supportive and motivating teacher might foster a positive and encouraging environment, becoming a trustworthy figure for students. Students might therefore value such messages and grant them meaningfulness. On the contrary, a demotivating teacher might diminish students' interest and trust, leading to a disconnection and lack of commitment. Ultimately, a demotivating teacher may lose influence because students are less likely to respect and follow someone whose teaching methods, attitude and approach do not meet their educational and emotional needs, hence, disregarding their messages.

Moreover, the fact that gain-framed messages had a positive predictive value for students adaptive achievement emotions even when teachers were demotivating, suggest that the framing of messages plays a crucial role in influencing students' emotional responses to demotivating teachers. Despite a demotivating teaching style, gain-framed messages still managed to be linked to adaptive achievement emotions, indicating that the way information is presented can have a significant predictive value on students' emotional experiences. This finding underscores the potential resilience of positive framing even in challenging educational environments. Again, given the scarce evidence on gain-framed messages within the educational context, the present findings cannot be compared with previous studies.

6.4. Limitations and future directions

Notwithstanding the contributions made by the present study, some limitations should be considered. Firstly, as opposed to cross-sectional designs, the study's prospective design increased the predictive value of results (Vallerand & Bissonnette, 1992), although the relationships found do not imply causality. Future research could conduct longitudinal research to analyse the relationships proposed by the present work to observe whether changes in teachers' messages can produce changes in other variables. Secondly, part of our data was self-reported. Although it seems a suitable approach for addressing self-efficacy beliefs and emotions, since they are perceived experiences, it may not be a suitable approach to address teachers' messages. Measuring such messages through self-reports could lead to some bias. Instead, future research could record teachers' voices while teaching and identify and classify such messages (Falcon et al., 2023). Therefore, we recommend readers to interpret such findings with caution. Moreover, the present findings were circumscribed to a Spanish sample of secondary school students. Therefore, to increase generalizability, cross-cultural studies and samples from other developmental stages are needed. The qualitative part of the present study identified a big proportion of students that did not highlight autonomy-supportive practices. However, they did not inform about what other traits students may have highlight. Thus, future research could identify what other categories were mentioned for those answers classified in the category "other". Finally, the present study relied on the GPT-4 AI tool. However, given that this is an emerging field of rapid evolution, it could be that by the time readers are reading this, more advanced models are available.

7. Conclusions

These results contribute to a growing understanding of the intricate dynamics between teaching style, message framing, and student outcomes. The notion that teachers motivating or demotivating approaches to teaching can modify the predictive power of messages emphasizes the importance of considering the broader context in which educational communication takes place. It reinforces the idea that a teacher's demeanour, motivational approach, and overall teaching style significantly shape the effectiveness of instructional messages. Attending the

hypothesis model, results emphasized the relevance of teachers' forms of communication to persuade students to follow their advice. Not only could gain-framed messages influence students' success regarding their academic performance, but they could also promote adaptive achievement emotions and influence students' self-efficacy beliefs. In conclusion, this study emphasizes the critical role of motivational teaching and suggests that, regardless of a teacher's overall approach, the framing of messages in terms of gains remains a key factor in shaping students' emotional experiences and, potentially, their academic outcomes. Contrastingly, given loss-framed messages negative outcomes, for students to succeed, it could be convenient for teachers to limit the use of these messages. Altogether, the present findings highlighted a resource teachers could incorporate into their teaching to ensure their students' success from the academic to the emotional and affective domain.

Funding

This study was supported by a grant with reference ProID2021010115 to Juan L. Núñez and a grant to Elisa Santana-Monagas of the Regional Ministry of Economy, Industry, Trade and Knowledge and the co-financing of the European Social Fund through the consecution of the predoctoral training programme for research staff in the Canary Islands.

CRediT authorship contribution statement

Elisa Santana-Monagas: Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Paula da Costa Ferreira:** Writing – review & editing, Supervision, Conceptualization. **Ana Margarida Veiga Simão:** Writing – review & editing, Supervision, Conceptualization. **Juan L. Núñez:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Appendix A

A.1. GPT coding prompt

You are analysing students' answers to the following question: "If you had to tell a classmate how your teacher is doing in class, what would you say? Your task is to rank the students' answers about how their teacher teaches. Classify the answers according to '1' (Participative), '2' (Attuning), '3' (Guiding), '4' (Clarifying), '5' (Demanding), '6' (Domineering), '7' (Abandoning), '8' (Awaiting) or '9' (Others). Format your response as 1 Excel column separated by '|'. This column represents the category assigned to the message '1', '2', '3', '4', '5', '6', '7', '8' or '9'. Fill in this column with the assigned category. Some examples are: "I feel that sometimes I cannot keep up with the teacher, but I don't like to slow my classmates down, so I prefer to study more at home." = |4|; "That the teacher explains quite well and cares that we understand everything." = |2|; "Good if you pay attention." = |9|; "They are very different from what I am used to, but what I like the most is that he does the exercises in a way that you have to think and look for a reasoning" = |3|; "The teacher cares, is willing and eager to teach." = |1|.

A.2. GPT instructions

'1' Participative: Identifies students' interests, offers meaningful choices and engages in dialogue with them. For example, invites students to suggest a set of guidelines to help them feel comfortable in class or asks students to discuss the question with their partner and then invites them to share their answers within their groups. The opposite of the participatory style is demanding.

'2' Attuning: Accepts negative expressions of affection, makes the material and the class engaging, interesting, fun, enjoyable and pleasant, allows students to work at their own pace, listens patiently and sympathetically to what students say, assures them that you are open to their input and suggestions, explains the reasons why you want them to behave correctly, identifies what the learning is useful for students' everyday lives. The opposite of the tuning style is domineering.

'3' Guiding: Provides help, guidance and assistance when needed, encourages reflection on mistakes, adopts a progress-oriented approach, clarifies and reformulates doubts, shows useful strategies on how to break down the problem to solve it step by step, helps learners to review their wrong answers so they understand where they went wrong and how to improve it, re-explains the subject until they master it better. The opposite of the guiding style is Abandoning.

'4' Clarifying: Communicates clearly what is expected and the contents of the subject, gives an overview of the lesson, monitors progress. For example, communicates what learning objectives he/she expects students to achieve, provides a clear and detailed programme, explains the solution to a problem step by step and then guides their progress and improvement on subsequent problems, checks that everyone understands what is required to successfully complete the tasks. The opposite of the clarifying style is the Awaiting style.

'5' Demanding: Exercises power, insists that students do what they are told, uses authoritarian language, insists on homework and discipline, threatens, demands certain behaviour, strongly insists that students must learn what they are taught, insists that low scores are unacceptable to him or her, insists that they pay attention, threatens punishment. The opposite of the demanding style is participative.

'6' Domineering: Criticizes pupils, uses aggressive language and attitude, shouts, threatens punishment, induces guilt and shame. For example, strongly insisting that "Now is the time to work hard", telling students that they must work whether they like it or not, that they need to learn things against their will, rushing them to finish early. The opposite of the dominant style is attuning.

'7' Abandoning: Neglects and leaving learners without guidance on what they need and how to achieve their goals. For example, does not care because intervening is a problem, ignores complaints, believes that learners must learn to overcome obstacles on their own, does not intervene, lets learners work things out for themselves, waits until learners ask for help, lets the activity speak for itself rather than explaining what to do. The opposite of the abandonment style is the guiding.

'8' Awaiting: The teacher adopts a passive, unplanned attitude and waits to see how things develop. For example, he/she cares little about rules and regulations, does not plan too much and see how things evolve, minimises the lesson plan; lets whatever happens in the lesson happen, does not plan, or organise the class. The opposite of this style is to be clarifying.

'9' Others: The student's comment does not refer to any of the above categories on teaching style.

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.lindif.2024.102420.

References

Aelterman, N., Vansteenkiste, M., Haerens, L., Soenens, B., Fontaine, J. R. J., & Reeve, J. (2019). Toward an integrative and fine-grained insight in motivating and demotivating teaching styles: The merits of a circumplex approach. *Journal of Educational Psychology, 111*(3), 497–521. https://doi.org/10.1037/edu0000293

Ahmed, W., van der Werf, G., Kuyper, H., & Minnaert, A. (2013). Emotions, self-regulated learning, and achievement in mathematics: A growth curve analysis. *Journal of Educational Psychology, 105*(1), 150–161. https://doi.org/10.1037/a0030160

Alves, H., Koch, A., & Unkelbach, C. (2017). Why good is more alike than bad: Processing implications. *Trends in Cognitive Sciences, 21*(2), 69–79. https://doi.org/10.1016/j.tics.2016.12.006

Artino, A. R., & Jones, K. D. (2012). Exploring the complex relations between achievement emotions and self-regulated learning behaviors in online learning.

Internet and Higher Education, 15(3), 170–175. https://doi.org/10.1016/j.iheduc.2012.01.006
Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science, 1*(2), 164–180. https://doi.org/10.1111/j.1745-6916.2006.00011.x
Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management, 38*(1), 9–44. https://doi.org/10.1177/0149206311410606
Belcher, J., Wuthrich, V. M., & Lowe, C. (2022). Teachers use of fear appeals: Association with student and teacher mental health. *British Journal of Educational Psychology, 92*(2), 1–17. https://doi.org/10.1111/bjep.12467
Bieleke, M., Gogol, K., Goetz, T., Daniels, L., & Pekrun, R. (2021). The AEQ-S: A short version of the achievement emotions questionnaire. *Contemporary Educational Psychology, 65*. https://doi.org/10.1016/j.cedpsych.2020.101940
Brown, T. B., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., … Amodei, D. (2020). Language models are few-shot learners. *Advances in Neural Information Processing Systems, 33*, 1877–1901.
Caldarella, P., Larsen, R. A. A., Williams, L., Downs, K. R., Wills, H. P., & Wehby, J. H. (2020). Effects of teachers' praise-to-reprimand ratios on elementary students' on-task behaviour. *Educational Psychology, 40*(10), 1306–1322. https://doi.org/10.1080/01443410.2020.1711872
Camacho-Morles, J., Slemp, G. R., Pekrun, R., Loderer, K., Hou, H., & Oades, L. G. (2021). Activity achievement emotions and academic performance: A meta-analysis. *Educational Psychology Review, 33*(3), 1051–1095. https://doi.org/10.1007/s10648-020-09585-3
Caraway, K., Tucker, C. M., Reinke, W. M., & Hall, C. (2003). Self-efficacy, goal orientation, and fear of failure as predictors of school engagement in high school students. *Psychology in the Schools, 40*(4), 417–427. https://doi.org/10.1002/pits.10092
Chen, G., Zhang, J., Chan, C. K. K., Michaels, S., Resnick, L. B., & Huang, X. (2020). The link between student-perceived teacher talk and student enjoyment, anxiety and discursive engagement in the classroom. *British Educational Research Journal, 46*(3), 631–652. https://doi.org/10.1002/berj.3600
Chesebro, J. L., & Martin, M. M. (2010). Message framing in the classroom: The relationship between message frames and student perceptions of instructor power. *Communication Research Reports, 27*(2), 159–170. https://doi.org/10.1080/08824091003738107
Çınar, E., Aynur, T., & Çelik, K. (2023). Psychological need satisfaction and academic stress in college students: Mediator role of grit and academic. *European Journal of Psychology of Education, 38*(1), 131–160. https://doi.org/10.1007/s10212-022-00658-1
Diseth, Å., Danielsen, A. G., & Samdal, O. (2012). A path analysis of basic need support, self-efficacy, achievement goals, life satisfaction and academic achievement level among secondary school students. *Educational Psychology, 32*(3), 335–354. https://doi.org/10.1080/01443410.2012.657159
Ekatushabe, M., Kwarikunda, D., Muwonge, C. M., Ssenyonga, J., & Schiefele, U. (2021). Relations between perceived teacher's autonomy support, cognitive appraisals and boredom in physics learning among lower secondary school students. *International Journal of STEM Education, 8*(1). https://doi.org/10.1186/s40594-021-00272-5
Falcon, S., Admiraal, W., & Leon, J. (2023). Teachers' engaging messages and the relationship with students' performance and teachers' enthusiasm. *Learning and Instruction, 86*, Article 101750. https://doi.org/10.1016/j.learninstruc.2023.101750
Feng, B., & MacGeorge, E. L. (2006). Predicting receptiveness to advice: Characteristics of the problem, the advice-giver, and the recipient. *Southern Communication Journal, 71*(1), 67–85. https://doi.org/10.1080/10417940500503548
Feng, B., & MacGeorge, E. L. (2010). The influences of message and source factors on advice outcomes. *Communication Research, 37*(4), 553–575. https://doi.org/10.1177/0093650210368258
Fredrickson, B. L., & Branigan, C. (2005). Positive emotions broaden the scope of attention and thought-action repertoires. *Cognition & Emotion, 19*(3), 313–332. https://doi.org/10.1080/02699930441000238
Freelon, D. G. (2010). ReCal: Intercoder reliability calculation as a web service. *International Journal of Internet Science, 5*(1), 20–33.
Frenzel, A. C., Goetz, T., Lüdtke, O., Pekrun, R., & Sutton, R. E. (2009). Emotional transmission in the classroom: Exploring the relationship between teacher and student enjoyment. *Journal of Educational Psychology, 101*(3), 705–716. https://doi.org/10.1037/a0014695
Gerend, M. A., & Cullen, M. (2008). Effects of message framing and temporal context on college student drinking behavior. *Journal of Experimental Social Psychology, 44*(4), 1167–1173. https://doi.org/10.1016/j.jesp.2008.02.007
Gerend, M. A., & Maner, J. K. (2011). Interactive effects of emotion and message framing on health behavior. *Health Psychology, 30*(4), 420–423. https://doi.org/10.1037/a0021981.Fear
Goetz, T., Bieleke, M., Gogol, K., van Tartwijk, J., Mainhard, T., Lipnevich, A. A., & Pekrun, R. (2021). Getting along and feeling good: Reciprocal associations between student-teacher relationship quality and students' emotions. *Learning and Instruction, 71*, Article 101349. https://doi.org/10.1016/j.learninstruc.2020.101349
Goetz, T., Keller, M. M., Lüdtke, O., Nett, U. E., & Lipnevich, A. A. (2020). The dynamics of real-time classroom emotions: Appraisals mediate the relation between students' perceptions of teaching and their emotions. *Journal of Educational Psychology, 112*(6), 1243–1260. https://doi.org/10.1037/edu0000415
Gras, J. A., Argilaga, M. T. A., & Benito, J. G. (1990). *Metodología de la investigación en ciencias del comportamiento* (Vol. 1). EDITUM.
Grazia, V., Mameli, C., & Molinari, L. (2021). Being bored at school: Trajectories and academic outcomes. *Learning and Individual Differences, 90*, Article 102049. https://doi.org/10.1016/j.lindif.2021.102049
Hirvonen, R., Putwain, D. W., Määttä, S., Ahonen, T., & Kiuru, N. (2020). The role of academic buoyancy and emotions in students' learning-related expectations and behaviours in primary school. *British Journal of Educational Psychology, 90*(4), 948–963. https://doi.org/10.1111/bjep.12336
Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118
Hynninen, T., Knutas, A., Hujala, M., & Arminen, H. (2019). Distinguishing the themes emerging from masses of open student feedback. In *42nd International Convention on Information and Communication Technology, Electronics and Microelectronics, MIPRO 2019 - Proceedings* (pp. 557–561). https://doi.org/10.23919/MIPRO.2019.8756781
Jang, J. Y., & Feng, B. (2018). The effects of gain- and loss-framed advice messages on recipients' responses to advice. *Journal of Language and Social Psychology, 37*(2), 181–202. https://doi.org/10.1177/0261927X17706961
Jenkins, L. N., Floress, M. T., & Reinke, W. (2015). Rates and types of teacher praise: A review and future directions. *Psychology in the Schools, 52*(5), 463–476. https://doi.org/10.1002/pits.21835
Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14–26. https://doi.org/10.3102/0013189X033007014
Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., … Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences, 103*, Article 102274. https://doi.org/10.1016/j.lindif.2023.102274
Keith, T. Z. (2019). *Multiple regression and beyond: An introduction to multiple regression and structural equation modeling*. Routledge Taylor & Francis Group. https://doi.org/10.4135/9781071878903.n18
Linnenbrink-Garcia, L., & Pekrun, R. (2011). Students' emotions and academic engagement: Introduction to the special issue. *Contemporary Educational Psychology, 36*(1), 1–3. https://doi.org/10.1016/j.cedpsych.2010.11.004
Lithopoulos, A., & Young, B. W. (2018). Sport gain-framed messages, possible selves, and their effects on adults' interest, intentions, and decision to register in sport. *International Journal of Sport and Exercise Psychology, 16*(3), 313–326. https://doi.org/10.1080/1612197X.2016.1216003
Little, T. D., Jorgensen, T. D., Lang, K. M., & Moore, E. W. G. (2014). On the joys of missing data. *Journal of Pediatric Psychology, 39*(2), 151–162. https://doi.org/10.1093/jpepsy/jst048
Liu, R., Zhen, R., Ding, Y., Liu, Y., Wang, J., Jiang, R., & Xu, L. (2018). Teacher support and math engagement: Roles of academic self-efficacy and positive emotions. *Educational Psychology, 38*(1), 3–16. https://doi.org/10.1080/01443410.2017.1359238
Liu, X., Gong, S.-Y., Zhang, H., Yu, Q., & Zhou, Z. (2021). Perceived teacher support and creative self-efficacy: The mediating roles of autonomous motivation and achievement emotions in Chinese junior high school students. *Thinking Skills and Creativity, 39*(October 2020), Article 100752. https://doi.org/10.1016/j.tsc.2020.100752
Luo, W., Ng, P. T., Lee, K., & Aye, K. M. (2016). Self-efficacy, value, and achievement emotions as mediators between parenting practice and homework behavior: A control-value theory perspective. *Learning and Individual Differences, 50*, 275–282. https://doi.org/10.1016/j.lindif.2016.07.017
Lynch, M., & Salikhova, N. (2017). Teachers' beliefs about the needs of students: Teachers as local experts (a qualitative analysis). *Education & Self Development, 12*(3), 33–43. https://doi.org/10.26907/esd12.3.03
MacGeorge, E. L., Feng, B., & Thompson, E. (2008). "Good" and "bad" advice: How to advise more effectively. In M. T. Motle (Ed.), *Studies in applied interpersonal communication* (pp. 145–164). SAGE.
Martínez-Zelaya, G., Ramírez, M. B., & Rovira, D. P. (2022). Good is stronger than bad for eudaimonic well-being. *Revista de Psicologia (Peru), 40*(1), 455–490. https://doi.org/10.18800/psico.202201.015
Moè, A., Consiglio, P., & Katz, I. (2022). Exploring the circumplex model of motivating and demotivating teaching styles: The role of teacher need satisfaction and need frustration. *Teaching and Teacher Education, 118*. https://doi.org/10.1016/j.tate.2022.103823
Moreira, P., Cunha, D., & Inman, R. A. (2019). Achievement emotions questionnaire-mathematics (AEQ-M) in adolescents: Factorial structure, measurement invariance and convergent validity with personality. *European Journal of Developmental Psychology, 16*(6), 750–762. https://doi.org/10.1080/17405629.2018.1548349
Nicholson, L. J., Putwain, D. W., Nakhla, G., Porter, B., Liversidge, A., & Reece, M. (2019). A person-centered approach to students' evaluations of perceived fear appeals and their association with engagemen. *Journal of Experimental Education, 87*(1), 139–160. https://doi.org/10.1080/00220973.2018.1448745
O'Connor, C., & Joffe, H. (2020). Intercoder reliability in qualitative research: Debates and practical guidelines. *International Journal of Qualitative Methods, 19*, 1–13. https://doi.org/10.1177/1609406919899220
O'Keefe, D. J., & Jensen, J. D. (2007). The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *Journal of Health Communication, 12*(7), 623–644. https://doi.org/10.1080/10810730701615198
O'Keefe, T., & Forrester, D. A. (2009). A successful online mentoring program for nurses. *Nursing Administration Quarterly, 33*(3), 245–250. https://doi.org/10.1097/NAQ.0b013e3181accb45
Parkinson, B., & Manstead, A. S. R. (2015). Current emotion research in social psychology: Thinking about emotions and other people. *Emotion Review, 7*(4), 371–380. https://doi.org/10.1177/1754073915590624
Paulino, P., Sá, I., & da Silva, A. L. (2016). Students' motivation to learn in middle school: A self-regulated learning approach. *Electronic Journal of Research in*

Educational Psychology, 14(39), 193–225. https://doi.org/10.25115/EJREP.39.15169
Pekrun, R. (2006). The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educational Psychology Review, 18*(4), 315–341. https://doi.org/10.1007/s10648-006-9029-9
Pekrun, R., Frenzel, A. C., Goetz, T., & Perry, R. P. (2007). The control-value theory of achievement emotions. In *Emotion in education* (pp. 13–36). Elsevier. https://doi.org/10.1016/B978-012372545-5/50003-4.
Pekrun, R., Goetz, T., Frenzel, A. C., & Barchfeld, P. (2011). Measuring emotions in students' learning and performance. *Contemporary Educational Psychology, 36*(1), 36–48.
Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist, 37*(2), 91–105. https://doi.org/10.1207/S15326985EP3702_4
Pekrun, R., Lichtenfeld, S., Marsh, H. W., Murayama, K., & Goetz, T. (2017). Achievement emotions and academic performance: Longitudinal models of reciprocal effects. *Child Development, 88*(5), 1653–1670. https://doi.org/10.1111/cdev.12704
Putwain, D. W., Becker, S., Symes, W., & Pekrun, R. (2018). Reciprocal relations between students' academic enjoyment, boredom, and achievement over time. *Learning and Instruction, 54*, 73–81. https://doi.org/10.1016/j.learninstruc.2017.08.004
Putwain, D. W., & Remedios, R. (2014). The scare tactic: Do fear appeals predict motivation and exam scores? *School Psychology Quarterly, 29*(4), 503–516. https://doi.org/10.1037/spq0000048
Putwain, D. W., Sander, P., & Larkin, D. (2013). Academic self-efficacy in study-related skills and behaviours: Relations with learning-related emotions and academic success. *British Journal of Educational Psychology, 83*(4), 633–650. https://doi.org/10.1111/j.2044-8279.2012.02084.x
Putwain, D. W., Schmitz, E. A., Wood, P., & Pekrun, R. (2021). The role of achievement emotions in primary school mathematics: Control–value antecedents and achievement outcomes. *British Journal of Educational Psychology, 91*(1), 347–367. https://doi.org/10.1111/bjep.12367
Putwain, D. W., & Symes, W. (2011). Perceived fear appeals and examination performance: Facilitating or debilitating outcomes? *Learning and Individual Differences, 21*(2), 227–232. https://doi.org/10.1016/j.lindif.2010.11.022
Putwain, D. W., Symes, W., & McCaldin, T. (2019). Teacher use of loss-focused, utility value messages, prior to high-stakes examinations, and their appraisal by students. *Journal of Psychoeducational Assessment, 37*(2), 169–180. https://doi.org/10.1177/0734282917724905
Putwain, D. W., Symes, W., Nicholson, L. J., & Remedios, R. (2021). Teacher motivational messages used prior to examinations: What are they, how are they evaluated, and what are their educational outcomes? In A. Elliot (Ed.), *Advances in motivation science* (1st ed., pp. 63–103). Elsevier. https://doi.org/10.1016/bs.adms.2020.01.001.
Putwain, D. W., Symes, W., & Remedios, R. (2016). The impact of fear appeals on subjective-task value and academic self-efficacy: The role of appraisal. *Learning and Individual Differences, 51*, 307–313. https://doi.org/10.1016/j.lindif.2016.08.042
Putwain, D. W., Symes, W., & Wilkinson, H. M. (2017). Fear appeals, engagement, and examination performance: The role of challenge and threat appraisals. *British Journal of Educational Psychology, 87*(1), 16–31. https://doi.org/10.1111/bjep.12132
Rattan, A., Good, C., & Dweck, C. S. (2012). "It's ok - not everyone can be good at math": Instructors with an entity theory comfort (and demotivate) students. *Journal of Experimental Social Psychology, 48*(3), 731–737. https://doi.org/10.1016/j.jesp.2011.12.012
Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist, 44*(3), 159–175. https://doi.org/10.1080/00461520903028990
Reeve, J., & Cheon, S. H. (2021). Autonomy-supportive teaching: Its malleability, benefits, and potential to improve educational practice. *Educational Psychologist, 56*(1), 54–77. https://doi.org/10.1080/00461520.2020.1862657
Ren, X., Jing, B., Li, H., & Wu, C. (2022). The impact of perceived teacher support on Chinese junior high school students' academic self-efficacy: The mediating roles of achievement goals and academic emotions. *Frontiers in Psychology, 13*, 1–14. https://doi.org/10.3389/fpsyg.2022.1028722
Respondek, L., Seufert, T., Stupnisky, R., & Nett, U. E. (2017). Perceived academic control and academic emotions predict undergraduate university student success: Examining effects on dropout intention and achievement. *Frontiers in Psychology, 8*, 1–18. https://doi.org/10.3389/fpsyg.2017.00243
Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin, 121*(1), 3–19. https://doi.org/10.1037/0033-2909.121.1.3
Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.
Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, Article 101860. https://doi.org/10.1016/j.cedpsych.2020.101860
Ryan, R. M., Duineveld, J. J., Di Domenico, S. I., Ryan, W. S., Steward, B. A., & Bradshaw, E. L. (2022). We know this much is (meta-analytically) true: A meta-review of meta-analytic findings evaluating self-determination theory. *Psychological Bulletin, 148*(11−12), 813–842. https://doi.org/10.1037/bul0000385
Santana-Monagas, E., Núñez, J. L., Loro, J. F., Huéscar, E., & León, J. (2022). Teachers' engaging messages: The role of perceived autonomy, competence and relatedness. *Teaching and Teacher Education, 109*. https://doi.org/10.1016/j.tate.2021.103556
Santana-Monagas, E., Núñez, J. L., Loro, J. F., Moreno-Murcia, J. A., & León, J. (2023). What makes a student feel vital? Links between teacher-student relatedness and teachers' engaging messages. *European Journal of Psychology of Education, 38*(3), 1201–1226. https://doi.org/10.1007/s10212-022-00642-9
Santana-Monagas, E., Putwain, D. W., Núñez, J. L., Loro, J. F., & León, J. (2022). Do teachers' engaging messages predict motivation to learn and performance? *Revista de Psicodidácetica, 27*(1), 86–95. https://doi.org/10.1016/j.psicoe.2021.11.001
Symes, W., & Putwain, D. W. (2016). The role of attainment value, academic self-efficacy, and message frame in the appraisal of value-promoting messages. *British Journal of Educational Psychology, 86*(3), 446–460. https://doi.org/10.1111/bjep.12117
Tang, D., Fan, W., Zou, Y., George, R. A., Arbona, C., & Olvera, N. E. (2021). Self-efficacy and achievement emotions as mediators between learning climate and learning persistence in college calculus: A sequential mediation analysis. *Learning and Individual Differences, 92*, Article 102094. https://doi.org/10.1016/j.lindif.2021.102094
Umemoto, T., & Ito, T. (2016). The relationship between self-efficacy, intrinsic value, and emotional engagement: Using a cross-lagged panel model. *Educational Technology Research, 39*(1), 145–154.
Unkelbach, C., Alves, H., & Koch, A. (2020). Negativity bias, positivity bias, and valence asymmetries: Explaining the differential processing of positive and negative information. In *, Vol. 62. Advances in experimental social psychology* (pp. 115–187). Academic Press Inc.. https://doi.org/10.1016/bs.aesp.2020.04.005
Unkelbach, C., Fiedler, K., Bayer, M., Stegmüller, M., & Danner, D. (2008). Why positive information is processed faster: The density hypothesis. *Journal of Personality and Social Psychology, 95*(1), 36–49. https://doi.org/10.1037/0022-3514.95.1.36
Vallerand, R. J., & Bissonnette, R. (1992). Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A prospective study. *Journal of Personality, 60*(3), 599–620. https://doi.org/10.1111/j.1467-6494.1992.tb00922.x
Vanderlinde, R., & van Braak, J. (2010). The gap between educational research and practice: Views of teachers, school leaders, intermediaries and researchers. *British Educational Research Journal, 36*(2), 299–316. https://doi.org/10.1080/01411920902919257
Vermote, B., Aelterman, N., Beyers, W., Aper, L., Buysschaert, F., & Vansteenkiste, M. (2020). The role of teachers' motivation and mindsets in predicting a (de)motivating teaching style in higher education: A circumplex approach. *Motivation and Emotion, 44*(2), 270–294. https://doi.org/10.1007/s11031-020-09827-5
Wang, J., De Liu, R., Ding, Y., Xu, L., Liu, Y., & Zhen, R. (2017). Teacher's autonomy support and engagement in math: Multiple mediating roles of self-efficacy, intrinsic value, and boredom. *Frontiers in Psychology, 8*(1–10), Article 1006. https://doi.org/10.3389/fpsyg.2017.01006
Wei, D., Zhang, D., He, J., & Bobis, J. (2020). The impact of perceived teachers' autonomy support on students' mathematics achievement: Evidences based on latent growth curve modelling. *European Journal of Psychology of Education, 35*(3), 703–725. https://doi.org/10.1007/s10212-019-00437-5
Weinstein, N., Vansteenkiste, M., & Paulmann, S. (2020). Don't you say it that way! Experimental evidence that controlling voices elicit defiance. *Journal of Experimental Social Psychology, 88*, Article 103949. https://doi.org/10.1016/j.jesp.2019.103949
Wright, S. L., Jenkins-Guarnieri, M. A., & Murdock, J. L. (2013). Career development among first-year college students: College self-efficacy, student persistence, and academic success. *Journal of Career Development, 40*(4), 292–310. https://doi.org/10.1177/0894845312455509
Zimmermann, J., Tilga, H., Bachner, J., & Demetriou, Y. (2021). The effect of teacher autonomy support on leisure-time physical activity via cognitive appraisals and achievement emotions: A mediation analysis based on the control-value theory. *International Journal of Environmental Research and Public Health, 18*(8). https://doi.org/10.3390/ijerph18083987
Zyberaj, J. (2022). Investigating the relationship between emotion regulation strategies and self-efficacy beliefs among adolescents: Implications for academic achievement. *Psychology in the Schools, 59*(8), 1556–1569. https://doi.org/10.1002/pits.22701