Teacher Humor as a Predictor of Student Emotions and Motivation: The Mediating Role of Socio-Emotional and Motivational Factors

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Abstract

Although prior cross-sectional research highlights the benefits of course-related humor, longitudinal evidence examining the mediating roles of socio-emotional and motivational factors on student emotions and motivation remain unexplored. Hence, this study examines how different types of perceived teacher humor influence student emotions and intrinsic motivation through teacher-student relationship and the interestingness of instruction, in a longitudinal mediation framework. A sample of 1,298 9th-grade students (52.1% female; M_{age}: 14.30 years; SD = .52) from 64 secondary school classes participated in this study. Data were collected across three measurement points during one school year. Two-level structural Equation Modeling evaluated the effects from teacher humor types at Time 1, mediated through teacher-student relationship and interestingness of instruction at Time 2, on emotional and motivational outcomes at Time 3. Multilevel results indicated that course-related and self-disparaging humor positively predicted teacher-student relationship and interestingness of instruction in the classroom, while, aggressive and unrelated humor were negative predictors. Both positive teacher-student relationship and interestingness of instruction mediate teacher humor's effects on negative emotions and intrinsic motivation. Course-related and self-disparaging humor strengthen this bond, while course-unrelated and aggressive humor weaken it, increasing negativity. These findings underscore the importance of course-related and self-disparaging humor as tools to foster positive socio-emotional and motivational learning environments, while highlighting the risks of aggressive and unrelated humor. Practical implications regarding the functionality and application of different forms of teacher humor are also discussed.

Introduction

The dynamics of teacher-student relationship have long been recognized as pivotal to students' academic success and emotional well-being (e.g., Saxer et al., 2025). However, not a single study has ever examined the effects of different teacher humor types on such dynamics, and their mediated outcome on student emotions and motivation. Hence, this study aims to bridge this gap by examining whether the inclusion of teacher humor can feasibly influence students' emotions and intrinsic motivation at both student and classroom level, and whether this effect is mediated by students' perceptions of the teacher-student relationship and the interestingness of instruction. Within the model of teacher humor effects on instructional dimensions and student learning (Bieg & Dresel, 2018a) students' emotion and motivation are said to be supported by social-emotional and motivational dimension of instruction which in turn are influenced by the perception of teacher humor. Recent research in educational psychology has examined the impact of teacher humor on various instructional variables, exploring how these relationships are mediated by factors such as instructional dimensions (Bieg & Dresel, 2018a), student emotional well-being (St-Amand et al., 2023), student emotions, attention, and affective learning (Bolkan & Goodboy, 2015), positive emotions (Luo et al., 2023), and emotion, motivation, and information-processing ability (Tsukawaki & Imura, 2019). However, this body of research lacks longitudinal evidence on socio-emotional and motivational features in the classroom and nothing is known about their mediating effect on student emotions and intrinsic motivation.

Prior research in this area (e.g., Bieg et al., 2017; Bieg & Dresel, 2018a; Bolkan & Goodboy, 2015; Luo et al., 2023; St-Amand et al., 2018; Tsukawaki & Imura, 2019) has primarily relied on cross-sectional and correlational designs, leaving an empirical gap regarding both the causal effects of specific types of humor and the mediating role of socio-emotional and motivational characteristics of instruction on educational outcomes. Longitudinal investigations are essential to understand the role of humor in shaping students' perceptions of social, emotional, and motivational phenomena in their classes. In particular, the question of whether and which types of teacher

humor are beneficial in improving student emotions and motivation remains unresolved, especially in secondary school contexts where causal effects have rarely been studied (e.g., Bolkan et al., 2018). Understanding these dynamics is essential, as students' willingness to engage in classroom activities is heavily shaped by their perceptions of instructional quality and emotional experiences (Praetorius et al., 2020). We draw on two theoretical frameworks to guide our study: the Instructional Humor Processing Theory (IHPT, Wanzer et al., 2010) and the Control-Value Theory of Achievement Emotions (CVT, Pekrun, 2006). These frameworks help us understand how teacher humor might influence students' emotions and motivation in the classroom.

Research on Teacher humor

Teacher humor is defined as "the intentional use of verbal and nonverbal messages which elicit laughter, chuckling, and other spontaneous behavior taken to mean pleasure, delight or surprise in the targeted receiver" (Booth-Butterfield & Booth-Butterfield, 1991, p. 206). Teacher humor is not only considered a multi-dimensional construct (Bieg & Dresel, 2016; Martin et al., 2003; Wanzer et al., 2006) where it conveys a 2x2 matrix of functions (for original model, see Martin et al., 2003). Previous studies (Frymier et al., 2008; Wanzer et al., 2006) argue two categories of affiliative (course-related, course-unrelated, self-disparaging) and aggressive teacher humor as instructional humor. The underlying assumptions spring from IHPT (Wanzer et al., 2010) that highlights the role of incongruity-resolution in humor-related situations. Teacher humor can be resolved after the incongruous information in teacher's message is recognized and resolved by the students, the humorous message can later be perceived as either positive or negative; appropriate or inappropriate (Wanzer et al., 2010). IHPT postulates that only particular types of teacher humor lead to a facilitated learning process (cognitively and affectively). For instance, humor implemented through a visual source related to the learning material supports directing attention to the central information. Therefore, humor serving as a signaling design element may direct learners' attention on the central information (Schneider et al., 2018).

In a broader and dichotomous division (Wanzer et al., 2006), humor in the educational context is whether appropriate or inappropriate, where course-related humor fits in the appropriate half. Such humor is an effective tool in learning and recalling information (Wanzer et al., 2010) and is positively associated with enjoyment and the interestingness of instruction (Bieg & Dresel, 2016, 2018a). Course-unrelated teacher humor may divert attention from the course content, resulting in poorer information processing. Thus, course-unrelated teacher humor does not contribute to understanding the content (Wanzer et al., 2010) and acts more as a seductive detail (Garner et al., 1989), diverting attention from relevant content and processing these details instead of the pertinent information. There are challenges related to teachers' self-disparaging humor that question the credibility, aptness, and classroom management of the teachers (Bieg et al., 2019). Self-disparaging humor was identified as both appropriate and inappropriate, and it is not clear whether this humor type creates positive or negative effects (Wanzer et al., 2010). According to the IHPT, a teacher's use of aggressive humor is inappropriate (Wanzer et al., 2006, 2010). In this sense, appropriate humor types should be valued positively while aggressive humor should be valued negatively. Moreover, aggressive humor is positively associated with anger, anxiety, and boredom (Bieg et al., 2017; Martin et al., 2003) and can create a social distance between teachers and students (Nienaber et al., 2019), rendering it an inappropriate type of teacher humor (Wanzer et al., 2006).

Humor, being a multidimensional construct, requires nuanced exploration to determine its varied impacts based on different forms (Bieg & Dresel, 2016; Frymier et al., 2008; Wanzer et al., 2010). Supportive student-teacher relationship is valued as a critical resource to save students at risk of educational failure (Crosnoe et al., 2004; Davis, 2003; Hamre & Pianta, 2006). Qualitative research in humor (Van Praag et al., 2017) argues that humor in the

classroom can potentially tighten the teacher-student bond and motivate students to be more attentive. However, these studies (e.g., Van Praag et al., 2017) lack investigation of different types of teacher humor in this relationship, even though some research investigated the way application of humor contributes to the formation of relationship between students and teachers (Crosnoe et al., 2004; Davis, 2003; Hamre & Pianta, 2006). The use of humor by teachers in the classroom is widely associated with stronger teacher-student relationship and positive emotional experiences for students (Banas et al., 2011). Nevertheless, these findings are based on cross-sectional studies, and thus do not allow for conclusions about the causal effects or long-term impact of humor in the classroom. Moreover, despite these observed associations, it remains unclear how teacher humor affects student emotions and motivation through mediating factors. In particular, we aim to investigate whether this effect is mediated by factors such as positive teacher-student relationship and interestingness of instruction.

Teacher Humor and Student Emotions

We rely on Pekrun's (2006) CVT as a framework to investigate negative emotions in this study. In CVT, academic emotions are considered as 'emotions tied directly to achievement activities or achievement outcomes' (Pekrun, 2006, p. 317). These emotions encompass a broad spectrum of feelings such as enjoyment, anxiety, and boredom (Grazia et al., 2021; Pekrun et al., 2010), which are experienced frequently in learning contexts and play a crucial role in educational outcomes (Grazia et al., 2021; Pekrun et al., 2010). Teacher humor can significantly affect these academic emotions by shaping the learning environment (Bieg et al., 2019). Cross-sectional findings (e.g., Bieg et al., 2017) argue that different teacher humor types are differently associated with student emotions and that different teacher humor types transport different control and value information.

Moreover, course-related humor in long-term can increase enjoyment and decrease boredom and anger (Bieg et al., 2019), while inappropriate types of humor do not. Anger, anxiety, and boredom are the most frequently reported negative academic emotions that can significantly hinder students' engagement, cognitive processing, and overall classroom experience (Pekrun et al., 2002). These emotions are not only prevalent but also emotionally and cognitively taxing, making them critical targets for classroom interventions such as teacher humor (Pekrun, 2006). CVT classifies emotions by object focus (e.g., success vs. failure), valence (positive vs. negative, such as enjoyment vs. boredom), and activation level (activating vs. deactivating, such as anger vs. boredom). Control and value appraisals are central, with high control and positive value fostering positive emotions like enjoyment, whereas low incentive value or mismatched control (too high or too low) can lead to boredom. Anger arises when high control meets negative value (e.g., completing a task seen as overly effortful), while anxiety can be the result of low control and high negative values. CVT emphasizes the role of the social learning environment, including teaching behavior, in shaping students' emotions by influencing their control and value appraisals. For instance, anger can reduce students' intrinsic motivation, stimulate their task-irrelevant thinking (Pekrun, 2006) and harm their learning, performance, and competence (Peixoto et al., 2017). Anxiety appears as a highly prevalent emotional challenge in schools and can affect students in various aspects of learning and emotional well-being, which may lead to academic underachievement (Nail et al., 2015). Boredom can foster detrimental behavioral outcomes (e.g., Truancy: Sommer, 1985; Deviant behavior: Wasson, 1981). It leads to task-irrelevant thinking in learning situations (Pekrun et al., 2011), shows a negative impact on achievement (Peixoto et al., 2017), and denigrates students' interest and intrinsic motivation (Pekrun et al., 2010). It seems advisable to determine classroom activities which could efficiently reduce boredom (Nett et al., 2011). Notably, teacher humor has been linked to different emotional responses by transporting distinct control and value signals (Bieg et al., 2017). Investigating the effects of teacher humor on emotions longitudinally is particularly significant as it sheds light on the dynamics of teaching behavior,

emotional experiences, and CVT principles in this matter. Very little evidence has been collected on the extent to which diverse types of teacher humor affect students' emotional experiences.

In contrast, course-unrelated humor and self-disparaging would not be expected to support control appraisals and thus remain irrelevant for student emotions, and intrinsic motivation (Bieg et al., 2017; based on Pekrun, 2006). While such humor may slightly alleviate boredom, it generally does not affect anger and anxiety. Aggressive humor, however, is appraised negatively in terms of both value and control, and is likely to exert harmful emotional effects (Bieg et al., 2017; Wanzer et al., 2010). According to CVT, unrelated and self-disparaging humor should not impact students' emotions. As proposed by CVT, control appraisal by others or low control and negative value appraisal lead to anger or boredom. When aggressive humor is perceived, success or failure is understood to be externally generated, since teachers use this humor type to disparage others and students will perceive these situations as being controlled by others (see Bieg et al., 2017). IHPT predicts that aggressive humor is inappropriate and valued negatively which creates negative affect. As a result, students will be less able to process instructional messages or understand the course content (Wanzer et al., 2010). Consequently, aggressive humor is considered an ineffective teaching practice that does not contribute to students' subjective control.

Some cross-sectional studies, using student questionnaires, have indicated that the learning environment is perceived as more enjoyable when teachers use humor (Stuart & Rosenfeld, 1994; Torok et al., 2004; Wanzer & Frymier, 1999; Wanzer et al., 2010). Conversely, aggressive teacher humor is associated with an uncomfortable learning environment, resulting in evaluations depicting the subject as unpopular (Banas et al., 2011; Gorham & Christophel, 1990; Stuart & Rosenfeld, 1994; Torok et al., 2004). None of these studies examined the relationships, or effects, different teacher humor types have with, or on, different emotions or the mediating power of socio-emotional and motivational dimensions of instruction on emotions. A study by Bieg et al. (2017, using two-level regression analyses) showed that the use of humor related to course content by teachers is positively associated with student enjoyment and negatively associated with anger, anxiety, and boredom. Unrelated humor predicted students' boredom positively and students' anxiety negatively. They found that aggressive teacher humor has positive associations with boredom, anger, and anxiety and negative associations with enjoyment. Although this study utilized a nested data structure, the results were based on cross-sectional data and therefore do not allow for causal interpretations. Furthermore, in a longitudinal study, Bieg et al. (2019) found the positive effect of course-related teacher humor on positive emotions and its negative effects on the negative emotions.

Teacher Humor and Student Intrinsic Motivation

People have different levels, types, and orientation of motivation (according to Self-Determination Theory, Ryan & Deci, 2000), and intrinsic motivation refers to engaging in an activity for its inherent interestingness and enjoyability. Intrinsically motivated students are more likely to promote psychological well-being (Burton et al., 2006) and their intrinsic motivation is positively associated with their subjective well-being (Grassinger et al., 2024). A motivating and interesting instruction is the one which attracts students' attentions, provokes their thoughts, and engages them. Such instruction fosters situational interest in students, leading to enhanced intrinsic motivation (Krapp, 2002). Due to its attention getting function, affiliative teacher humor types may impact the interestingness of instruction and student's motivation (Bieg & Dresel, 2018a). Bieg and Dresel (2018a) found that course-related teacher humor is associated with students' intrinsic motivation, with an indirect effect via instructional quality factors such as clarity, interestingness, and the quality of the teacher-student relationship. In contrast, unrelated and aggressive humor were associated with reduced intrinsic motivation, mediated by poor clarity and weaker teacher-student relationship. Although Bieg and Dresel (2018a) remains one of the few studies to examine how different

types of teacher humor are related with intrinsic motivation, and the mediating role of instructional factors, its cross-sectional design limits causal interpretation. Therefore, the present study, extends this foundational work by incorporating robust longitudinal data, which offers deeper insights into the sustained effects of teacher humor and emotional and motivational dynamics in the classroom.

A growing body of research suggest that when teachers use affiliative humor, they can foster a stronger emotional connection with their students (e.g., Askildson, 2005; Dresel et al., 2014; Matarazzo et al., 2010; Stuart & Rosenfeld, 1994). These appropriate forms of humor create a more comfortable and engaging atmosphere in the classroom and lead to an increased level of interest and motivation in the classroom. Course-related teacher humor was found positively associated with students' intrinsic motivation (Bieg & Dresel, 2018a). Motivational aspect of learning and instruction is reported to be positively influenced by teacher humor (Banas et al., 2014). Students show more interest in a humor-included instruction or task (Askildson, 2005; Matarazzo et al., 2010). Aroused interest in the classroom is a positive experience in the classroom which fosters positive emotions as well (Ryan & Deci, 2000; Krapp, 2002). Students' willingness to participate in school and classroom activities is positively correlated with appropriate forms of humor, and negatively associated with aggressive humor (Tsukawaki et al., 2020). High school students perceive the class with humor motivating and more enjoyable (Kavandi & Kavandi Habib, 2016), even though humor was not specifically classified in this study. More studies (Bergin, 1999; Neulip, 1991; Torok et al., 2004) show the positive relation between affiliative and an enjoyable learning context, while aggressive humor is associated to discomfort in learning situation.

A motivationally-driven environment not only fosters a positive emotional climate, but also serves as a cornerstone for productive learning experiences (Hattie, 2009). Hence, an appropriate form of teacher humor is positively associated with intrinsic motivation by creating more enjoyable and interesting learning conditions (Bieg & Dresel, 2018a, 2018b; Robinson et al., 2024; Tsukawaki & Imura, 2019). Associations between humor, and motivation and interest in language learning are also found significant (e.g., Neff & Rucynski, 2016; Salmee & Arif, 2019). Given the lack of research based on such mediating effects and the long-term impact of teacher humor on students' intrinsic motivation, this study holds significant importance.

The present study

The overall purpose of the present study was to examine the mediation of four types of teacher humor, conceptualized as specific teaching behavior transporting different information concerning control and value, on the development of students' emotions, and intrinsic motivation in the classroom, as mediated by instructional dimensions. This approach aligns with Cole and Maxwell's (2003) framework for testing mediational models, which emphasizes the importance of identifying theoretical pathways and temporal ordering in examining mediating effects.

Specifically, we tested the following hypotheses:

H1 The effects of affiliative teacher humor types (course-related, course-unrelated and self-disparaging) on students' emotions, and intrinsic motivation are mediated by perceived positive teacher-student relationship and interestingness of instruction.

H2 The effects of aggressive teacher humor on students' emotions, and intrinsic motivation are mediated by perceived positive teacher-student relationship and interestingness of the instruction.

Method

Participants

Our sample included 1,821 students in 71 grade 9 English classes at various XX secondary schools, known as XX. Seven classes which had received changes in the teaching staff at any stage of the school year were excluded from the analyses, as teacher-related factors are assumed to influence the dependent variables, and such changes would undermine the consistency needed for valid interpretation. Thus, the final sample consisted of 1,298 students from 64 classes, with an average cluster size of 22.5 students. Our sample consisted of 52.1% female, 47.1% male, and 0.8% participants who identified as diverse, with an average age of 14.3 years (SD = 0.52). Notably, 90% of the students were born in XX, providing a predominantly native demographic context for the research.

Measures

This study utilized several established scales to assess the variables of interest. The *Teacher Humor from Students' Perspective* Scale (HUMLAS; Bieg & Dresel, 2016) consisted of 17 items with a five-scale Likert ranged from 1 (*never*) to 5 (*very often*). It categorizes teacher humor into four types namely course-related (humor connected to the actual teaching topic), unrelated (humor without thematic connection to the teaching topic), self-disparaging (humor that is related or affects teacher's self-image), and aggressive teacher humor (humor that is related or affects students' self-image). This scale included subscales for course-related humor (6 items, ω = .94), such as 'Our teacher tells jokes that are related to the course content,' course-unrelated humor (3 items, ω = .88), such as 'Our teacher tells jokes that are unrelated to the course,' for self-disparaging humor (4 items, ω = .85), such as 'Our teacher makes fun of himself/herself during the course.' and aggressive humor (4 items, ω = .85), such as 'Our teacher ridicules students' private lives and personal preferences.'

The *teacher-student relationship* was measured with a scale developed by Kunter et al. (2002), using a five-point Likert-type scale from 1 (*not at all true*) to 5 (*very true*). The scale included 6 items (ω = .86), exemplified by the statement, 'All in all, I fully trust the teacher.'

Interestingness of instruction was measured using a four-point Likert-type scale from 1 (*in almost no lesson*) to 4 (*in every lesson*) developed by Ditton (2001; 4 Items, ω = .75), exemplified by the statement, 'Our English teacher gives us interesting tasks.'

Emotions were assessed using the Achievement Emotions Questionnaire (AEQ; Pekrun et al., 2011), with subscales for *anger* (4 items, ω = .82), e.g., 'The course is so annoying to me,' *anxiety* (4 items, ω = .80), e.g., 'When thinking about this class, I get nervous,' and *boredom* (3 items, ω = .85), e.g., 'The course as taught by this teacher is boring.' All items were presented with Likert type scales, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Additionally, *intrinsic motivation* was measured using a scale developed by Seidel et al. (2005), consisting of 4 items (ω = .88), such as 'I enjoy taking part in English lessons.' The scale ranged from 1 (*not at all true*) to 5 (*very true*).

Procedure

We conducted the study throughout the school years 2022–2023 and 2023–2024 in three states of XX: XX, XX and XX at three measurement points. The first data collection phase was at the beginning of each school year so that the participants had minimum perception and mindset of their teachers' teaching characteristics. The data at the second phase was collected after four months of interval, and the final phase was collected at the end of each

school year. The questionnaires (designed digitally on the Unipark platform) were administered online using computers and tablets provided in the participating schools' computer rooms. All the students received instructions before their participation and were assured about the anonymity of the research. Only students with signed parental consent participated in the study. The study received ethical approval from the authors' home university and was preregistered as part of the funding provided by XX. The participants' answers were automatically exported to excel files which were consequently manually transported into an SPSS dataset for further analyses.

Analyses

Due to the nested data structure we conducted a two-level structural equation modeling (SEM) to analyze the data using Mplus Version 8.11 (Muthén & Muthén, 1998–2019). Due to the fact that some of the students were not able to participate consistently in all three measurement points, and some had provided false information, the mismatched information from the students who did not participate in the first measurement point, and were identified only at one of the second or third measurement points were omitted from our analyzing dataset. Moreover, the non-answered options in each item of the questionnaires were defined as the missing value. These were included in the analyses using Mplus's full-information maximum likelihood approach. Next, we conducted preliminary analyses, calculating descriptive statistics and the Intraclass Correlation Coefficient (ICC1) to assess the distribution of variance across levels.

Hence, we examined the mediation at both the teacher and student level. The SEM models included latent variables, with the primary predictor variable being teacher humor. The positive teacher-student relationship, and interestingness of instruction served as the mediating variables, while negative emotions, and intrinsic motivation were the outcome variables. Since our data was collected at three different measurement points, we used teacher humor data collected at the first phase as the main predictor (independent variable), the positive teacher-student relationship and interestingness of instruction data collected at the second measurement point as the mediating factors, and the emotions, and intrinsic motivation data collected at the third measurement point as the outcome variables (dependent variables) in our mediation models. Hence, we employed a longitudinal mediation analysis with sequential measurement of variables at different time points to better capture the developmental processes and causal mechanisms underlying the relationship among the variables of interest. This approach aligns with the recommendations in the literature, which emphasize the importance of measuring variables sequentially over time to establish temporal precedence and reduce biases inherent in cross-sectional designs (Cole & Maxwell, 2003; Selig & Preacher, 2009). By collecting data at multiple waves, we were able to examine how earlier measures of the independent variable influence subsequent measures of the mediator, which in turn affect later outcomes, thus providing more robust evidence for causal inferences (Maxwell, Cole, & Mitchell, 2011). This method allows us to model intra-individual change effectively and interpret indirect effects within a developmental framework, consistent with best practices for developmental research using longitudinal data (Gollob & Reichardt, 1991; Collins, 2006). According to Selig and Preacher (2009), choosing the right lags is important due to the fact that these intervals and the span of the study ensure the feasibility and time-sufficiency to observe the mediation effect. The timing of our measurements, at the beginning, middle, and end of the school year, was carefully chosen to align with the developmental and contextual relevance of the processes under investigation. We consider the chosen lags appropriate and justified, as they are developmentally meaningful, theory-driven, and methodologically consistent with existing research in the field (Selig & Preacher, 2009).

We specified the structural model, defining relationships between latent variables by using participants' CLASSID as the cluster variable. To assess whether classroom clustering might have influenced the results, we relied on the

ICC1 values. The ICC1 values indicated a substantial variance of all examined scales (see Table 1). We estimated the model using Maximum Likelihood estimator and specified the analysis type as two-level. We evaluated the model fit using indices such as CFI, RMSEA, and SRMR using Hu and Bentler (1999) criteria. We conducted an extra model for each type of humor, mediating variable, and outcome variable (4 x 2 x 4) as suggested in the literature (e.g., Cole & Maxwell, 2003; Di Maria & Didelez, 2024). This means that we performed 32 models and then designed them in two discrete figures to represent mediation models for the teacher-student relationship in one figure, and for the interestingness of instruction in the second one. This single mediator-outcome approach avoids misspecification (Di Maria & Didelez, 2024), is ideal for clear causal mechanisms (MacKinnon et al., 2007), offers transparency and robustness (Koschate-Fischer & Schwille, 2022). The estimates and confidence intervals are presented using standardization, which ensures that the variables are standardized with respect to both their means and standard deviations. This approach ensured the robustness and validity of our multilevel SEM analysis, which is highly replicable.

Results

Table 1

Descriptive statistics, bivariate correlations, and Intraclass Correlation Coefficient

	1	2	3	4	5	6	7	8	9	10
1 Related HumorT1	-	.29**	.52**	.04	.45**	.51**	− .20**	− .04	− .27**	.34**
2 Unrelated HumorT1		-	.45**	.47**	− .12**	.03	.08**	.06	.13**	− .01
3 Self-disparaging HumorT1			-	.24**	.21**	.26**	− .10**	− .04	− .08*	.17**
4 Aggressive HumorT1				-	− .26**	− .11**	.19**	.11**	.18**	− .12**
5 RelationshipT2					-	.72**	− .42**	− .23**	− .49**	.48**
6 InterestingnessT2						-	− .31**	− .12**	− .40**	.50**
7 AngerT3							-	.60**	.63**	− .46**
8 AnxietyT3								-	.37**	− .26**
9 BoredomT3									-	− .60**
10 Intrinsic MotivationT3										-
Mean	2.90	1.86	2.10	1.36	3.62	2.41	1.88	1.72	2.53	2.30
SD	1.02	0.97	0.86	0.66	0.91	0.73	0.84	0.84	1.03	0.76
ICC1	.38	.27	.24	.20	.40	.28	.15	.08	.21	.18

Note: * $p < .05$, ** $p < .01$ (2-sided).

Table 4
Model Fit Indices for Models with Teacher-Student Relationship as Mediator

Model	Chi-Square	df	P-Value	RMSEA	CFI	SRMR Within	SRMR Between
Course-related->Relationship->Anger	416.94	148	.00	.04	.97	.03	.09
Course-related->Relationship->Anxiety	491.41	174	.00	.04	.96	.03	.16
Course-related->Relationship->Boredom	43.96	148	.00	.04	.97	.04	.06
Course-related->Relationship->Intr Motivation	44.01	174	.00	.03	.97	.03	.05
Unrelated->Relationship->Anger	214.28	82	.00	.03	.98	.03	.09
Unrelated->Relationship->Anxiety	25.45	102	.00	.03	.97	.03	.13
Unrelated->Relationship->Boredom	217.55	82	.00	.03	.98	.03	.07
Unrelated->Relationship->Intr Motivation	233.57	102	.00	.03	.98	.03	.06
Self-disparaging->Relationship->Anger	182.69	82	.00	.03	.98	.03	.08
Self-disparaging->Relationship->Anxiety	232.83	102	.00	.03	.98	.03	.13
Self-disparaging->Relationship->Boredom	203.57	82	.00	.03	.98	.04	.08
Self-disparaging->Relationship->Intr Motivation	221.02	102	.00	.03	.98	.03	.07
Aggressive->Relationship->Anger	275.17	102	.00	.03	.97	.03	.08
Aggressive->Relationship->Anxiety	322.37	124	.00	.03	.97	.03	.12
Aggressive->Relationship->Boredom	274.51	102	.00	.03	.97	.04	.07
Aggressive->Relationship->Intr Motivation	28.20	124	.00	.03	.98	.03	.05

Teacher humor mediation models with positive teacher-student relationship as mediator

At the teacher level, the teacher-student relationship fully mediated the effect of course-related humor on students' emotional and motivational outcomes. Course-related humor at T1 positively predicted the teacher-student relationship at T2 at both teacher and student level. The enhanced positive relationship subsequently reduced negative emotions at T3, forming full mediation models. Specifically, course-related humor improved the teacher-student relationship, which in turn reduced anger, anxiety, and boredom, and enhanced intrinsic motivation. At the student level, the teacher-student relationship also mediated the link between course-related humor and outcomes. It reduced anger, anxiety, and boredom, and enhanced intrinsic motivation. In contrast to the teacher level findings, course-related humor additionally showed a direct positive effect on intrinsic motivation ($\beta = .19$, $p < .001$),

supporting a partial mediation model for motivation. Overall, the effect of course-related humor was mediated via positive teacher-student relationship to decrease students' anger, anxiety and boredom, and increase their intrinsic motivation on both levels.

The mediating role of the teacher-student relationship did not explain the effects of course-unrelated humor at the teacher level. However, as observable from Fig. 1, at the student level, the teacher-student relationship mediated the negative impact of course-unrelated humor on all outcomes. Unrelated humor at T1 weakened the teacher-student relationship at T2, which then led to higher anger, anxiety, and boredom, and lower intrinsic motivation at T3. Only boredom showed a minor direct increase (β = .09, p = .013), while the rest of the effects were mediated. Furthermore, the results of multilevel mediation analysis for self-disparaging humor demonstrated that this type of teacher humor influenced student outcomes primarily through its positive impact on the teacher-student relationship at both the teacher and student level. The strengthened teacher-student relationship at T2 mediated the decrease in anger and boredom, and the increase in intrinsic motivation at T3. Similarly, at the student level, self-disparaging humor enhanced the teacher-student relationship, which mediated reductions in anger, anxiety, and boredom, and increases in intrinsic motivation. A small direct effect on intrinsic motivation was also present, indicating partial mediation for this motivation (β = .09, p = .013). Aggressive humor negatively influenced emotional and motivational outcomes entirely through the mediation of teacher-student relationship at both levels. The analyses revealed that aggressive teacher humor significantly and negatively predicted positive teacher-student relationship at T2. The mediating effect increased anger, anxiety, and boredom and decreased intrinsic motivation via reduced teacher-student relationship at both levels at T3. These mediation effects had a higher level of significance at the student level. Aggressive teacher humor only directly increased anger (β = .12, p = .003), and boredom (β = .09, p = .03) at the student level.

Table 5
Model Fit Indices for Models with Interestingness of Instruction as Mediator

Model	Chi-Square	Df	P-Value	RMSEA	CFI	SRMR Within	SRMR Between
Course-related->Interestingness->Anger	359.57	102	.00	.04	.96	.04	.12
Course-related->Interestingness->Anxiety	407.34	124	.00	.04	.96	.04	.16
Course-related->Interestingness->Boredom	409.21	102	.00	.05	.96	.05	.09
Course-related->Interestingness->Intr Motivation	411.03	124	.00	.04	.97	.04	.09
Unrelated->Interestingness->Anger	12.11	48	.00	.03	.98	.03	.13
Unrelated->Interestingness->Anxiety	131.01	64	.00	.03	.98	.03	.11
Unrelated->Interestingness->Boredom	162.40	48	.00	.04	.97	.05	.10
Unrelated->Interestingness->Intr Motivation	163.39	64	.00	.03	.98	.04	.12
Self-disparaging->Interestingness->Anger	11.21	48	.00	.03	.98	.03	.11
Self-disparaging->Interestingness->Anxiety	134.79	64	.00	.03	.98	.03	.10
Self-disparaging->Interestingness->Boredom	169.42	48	.00	.04	.97	.05	.09
Self-disparaging->Interestingness->Intr Motivation	169.55	64	.00	.03	.98	.04	.11
Aggressive->Interestingness->Anger	177.94	64	.00	.04	.97	.03	.11
Aggressive->Interestingness->Anxiety	209.43	82	.00	.03	.97	.03	.10
Aggressive->Interestingness->Boredom	221.32	64	.00	.04	.97	.05	.10
Aggressive->Interestingness->Intr Motivation	21.75	82	.00	.03	.98	.04	.11

Teacher humor mediation models with interestingness of instruction as mediator

Results of Fig. 2 indicated that at the teacher level, interestingness of instruction acted as a mediator between teacher humor and both emotional and motivational outcomes only by self-disparaging teacher humor. Self-disparaging humor showed a full mediation pattern. It increased interestingness of instruction, which in turn led to reduced anger and boredom, and enhanced intrinsic motivation. Other three types of teacher humor, in contrast, did not show a meaningful mediation through this motivational factor. However, course-related humor increased

interestingness of instruction and showed its positive role in the motivational dimension in the classroom. Course-related humor directly only reduced anger (β = − .42, *p* = .05) at the teacher level.

At the student level, the mediating role of interestingness of instruction was only evident for course-related and self-disparaging humor. For course-related humor, the model followed a full mediation pattern for negative emotions. Humor increased interestingness at T2, which in turn reduced anger, anxiety, and boredom at T3. At the same time, intrinsic motivation was both directly and indirectly increased, directly by the humor itself (β = .13, *p* = .002) and indirectly via interestingness, indicating a partial mediation for motivation. Nevertheless, at the student level, the direct effect of course-related humor on negative emotions was not statistically significant. Self-disparaging humor also fully mediated emotional and motivational outcomes through increased interestingness at T2. This led to reductions in anger, anxiety, and boredom, and a boost in intrinsic motivation at T3. No direct effects were observed, reinforcing the role of interestingness as a complete mediator for this humor style. Furthermore, as shown in Fig. 2, course-unrelated and aggressive teacher humor were not a predictor of interestingness of instruction either on the teacher or on the student level, which resulted in a lack of mediation. However, unrelated humor directly increased anger (only at the student level, β = .13, *p* = .001), and boredom at both the teacher and student level (β = .24, *p* = .05, β = .16, *p* = .00, respectively). Aggressive teacher humor also directly increased students' perceived anger (β = .38, *p* = .002, β = .18, *p* = .00, respectively), anxiety (only at the student level, β = .13, *p* = .003), and boredom across both the teacher and student level (β = .30, *p* = .01, β = .15, *p* = .00, respectively). In addition, it reduced intrinsic motivation at the teacher level (β = − .25, *p* = .04).

Discussion

The main purpose of the study was to explore the role of teacher humor in influencing students' emotional and motivational experiences through mediating mechanisms by teacher-student relationship and interestingness of instruction. Our findings add insights into assumptions proposed by IHPT (Wanzer et al., 2010) and the associated research (e.g., Bieg & Dresel, 2018a).

Our findings partially confirm H1, revealing that the impact of affiliative teacher humor on student emotions and intrinsic motivation is mediated by socio-emotional and motivational factors, namely the positive teacher-student relationship and interestingness of instruction. Notably, this study is among the first in humor research to show such robust longitudinal effects of teacher humor and particularly the underlying mechanisms which lead to emotional and motivational outcomes. Course-related and self-disparaging humor are found to positively influence student outcomes, leading to reduced boredom, anger, and anxiety, and enhanced intrinsic motivation when mediated by a positive teacher-student relationship or interestingness of instruction. Consistent with previous longitudinal cross-lagged effects on the university students (Goetz et al., 2021), we found the effective role of positive teacher-student relationship (in our research as the mediator) to reduce negative emotions. The mediation effects show that interestingness is also an effective mediator through which self-disparaging teacher humor reduces negative emotions and increases intrinsic motivation. Nonetheless, both course-related and self-disparaging humor support interestingness of instruction and promote its mediating effect. Interestingly, positive teacher-student relationship demonstrates a more powerful pathway since it mediates the effects of more types of humor (specifically all forms of humor at the student level).

In previous research (Bieg & Dresel, 2018a), interestingness of instruction was negatively associated with course-unrelated humor (at the teacher level), which is not supported by our findings. Conversely, course-unrelated did not have a significant effect on socio-emotional factors at the teacher level, and contrary to primary assumptions of IHPT (Wanzer et al., 2010), it reduced teacher-student relationship at the student level, which questions the affiliative

nature of this humor type. Hence, it is rational to argue the redefinition and classification of unrelated humor as a non-affiliative form of teacher humor, which is perceived inappropriate in the classroom. Course-related and self-disparaging teacher humor positively influence the perception of a positive teacher-student relationship. This indicates that when teachers use humor that is related to the course content or humor that lightly targets themselves, it enhances students' perception of a supportive and positive relationship. Moreover, a positive teacher-student relationship was found to significantly reduce students' negative emotional states, such as anger, anxiety, and boredom, while enhancing their intrinsic motivation. These findings align with existing literature (e.g., Crossnoe et al., 2004; Hamre & Pinta, 2006; Saxer et al., 2025) that emphasizes the critical role of positive interpersonal dynamics in educational settings.

Further, our longitudinal findings extend prior research by demonstrating that both course-related and self-disparaging teacher humor can reduce negative emotions and enhance intrinsic motivation at both the teacher and student levels. These effects are mediated by positive teacher-student relationship and the interestingness of instruction. This contrasts with earlier studies, such as Bieg et al. (2019), which found effects only for course-related humor at the teacher level, and with cross-sectional findings (e.g., Bieg & Dresel, 2018a), which reported non-significant long-term effects of self-disparaging humor on negative emotions like boredom and anger. However, in Bieg et al. (2019), it is argued that this humor cannot be decided as an inappropriate form of teacher humor. Our findings affirm that self-disparaging teacher humor is an affiliative type of humor with a constructive power which can effectively promote emotional and motivational dimensions of instruction fostering student emotions and intrinsic motivation.

Our findings also support studies (e.g., Banas et al., 2011; Van Praag et al., 2017) which argued the effectiveness of teacher humor in the improvement of a positive teacher-student relationship. The IHPT assumption (Wanzer et al., 2010) that only particular types of teacher humor lead to facilitation in learning is supported by our findings. Teacher humor types are differently associated with student emotions and that different teacher humor types transport different control and value information, which was found in cross-sectional and longitudinal studies as well (e.g., Bieg et al., 2017, 2019; Bieg & Dresel, 2018a). Our results show the effectiveness of course-related and self-disparaging teacher humor on the reduction of boredom in long term. Since previous research (Grazia et al., 2021) argues that majority of schoolers end the school year with high boredom, these types of teacher humor can be constructive socio-emotional and motivational tools in the classroom.

Finally, H2 was also partially confirmed, showing that aggressive teacher humor has detrimental effects on students' perceptions of emotions and intrinsic motivation mediated through its negative impact on teacher-student relationship. Notably, no significant mediating effect of motivational dimension was observed. Aggressive teacher humor negatively impacted socio-emotional factors, suggesting that humor perceived as hostile can damage social relationships. It also directly increased students' perceived anger, anxiety (only at the student level), and boredom across both the teacher and student level, and reduced intrinsic motivation at the teacher level. Its mediated effect contributed to the increased negative emotions and reduced intrinsic motivation by undermining the quality of teacher-student relationship. These findings align with earlier research (e.g., Bieg et al., 2017, 2019; Nienaber et al., 2019; Martin et al., 2003; Wanzer et al., 2006, 2010) showing that aggressive humor is an inappropriate form of humor, as it directly increases negative emotions and undermines teacher-student relationship. However, our results highlight the central role of relational mechanisms in explaining its detrimental effects in long-term.

Findings of the studies which argue the creation of more enjoyable learning environments promoted by teacher humor (Stuart & Rosenfeld, 1994; Torok et al., 2004; Wanzer & Frymier, 1999) should be discussed with this perspective that such joy in learning is not supported by course-unrelated and aggressive teacher humor in long-

term according to our findings. Furthermore, the mediation effects show that in contrast with course-related and self-disparaging teacher humor, aggressive teacher humor enhanced students' anger, anxiety, boredom, and reduced their intrinsic motivation, which is in line with previous results (Bieg et al., 2017, 2019; Bieg & Dresel, 2018a). At the student level, course-unrelated teacher humor also resembled aggressive teacher humor and negatively affected teacher-student relationship. Moreover, this type of teacher humor, which is categorized as an affiliative type of teacher humor, exerted positive effects on negative emotions but negative effects on intrinsic motivation, which is contrary to previous arguments of IHPT (Wanzer et al., 2010). These findings support the notion that unrelated humor has an indirect, long-term detrimental influence on individuals in high school classrooms. Importantly, unrelated and aggressive humor show positive relationships with negative emotions, but negative relation with intrinsic motivation indicating the dysfunctionality and harmfulness of these two forms of teacher humor.

Our longitudinal findings challenge the previous discussions (e.g., Bieg & Dresel et al., 2018a; Bieg et al., 2017, also see Pekrun 2006 for CVT discussions) which consider course-unrelated and self-disparaging teacher humor fall into the same classification that do not support control appraisals and are irrelevant for student emotions, and intrinsic motivation. Self-disparaging humor appears to have moderate to high control appraisals and a positive value. This is why, it can potentially foster intrinsic motivation. This contrasts with earlier findings by Bieg and Dresel (2018a) which did not find any significant relation between self-disparaging humor and students' intrinsic motivation. Our correlation analyses also reveal that course-related and self-disparaging humor were positively associated with teacher-student relationship and intrinsic motivation, while the correlation with anger and boredom is negative. In this respect, self-disparaging humor demonstrates comparable benefits, with no direct effect on individual students' negative emotions, which partially contradict with previous arguments and findings (see Bieg & Dresel, 2016; Frymier et al., 2008; Wanzer et al., 2010). Taken together, while self-disparaging humor may not directly alleviate negative emotions, it offers emotional and motivational when accompanied and mediated by emotional and motivational factors in the classroom.

In aggregate, our findings support studies which argue the efficacy of an appropriate form of teacher humor on students' intrinsic motivation (Bieg & Dresel, 2018a, 2018b; Robinson et al., 2024). In addition, the studies which found teacher humor positively associated with enhanced interestingness and motivation are supported by our findings (e.g., Neff & Rucynski, 2016; Salmee & Arif, 2019), even though these studies did not specifically argue different types of teacher humor and their mediating effects. Our results indicate that not only different forms of teacher humor have different direct effects (e.g., Bieg & Dresel, 2018a), but they are also differently mediated by socio-emotional and motivational features of instructional quality. This pinpoints the nature of teacher humor as a construct with various facets and dimensions. Hence, our findings extend the literature and highlights the powerful mechanisms which promote the dynamics of teaching and learning. Crucially, our results underscore that teacher humor is not a monolithic construct but a multifaceted concept with diverse emotional and motivational consequences, depending on its form and the socio-emotional and motivational dynamics it evokes. This reinforces and extends prior theoretical frameworks emphasizing the multidimensionality of teacher humor (e.g., Bieg & Dresel, 2016; Martin et al., 2003; Wanzer et al., 2006, 2010).

Limitations and Perspectives for Future Research

Despite addressing several limitations previously observed in teacher humor research, the present study also has notable constraints that future work should aim to resolve. Most importantly, we focused on teacher-student relationship and interestingness of instruction, which, while central to instructional quality, are themselves emotionally and motivationally loaded constructs. This raises concerns regarding construct redundancy or

conceptual overlap with the outcome variables, namely, students' negative emotions and intrinsic motivation (Pekrun, 2006). Future research may benefit from testing alternative or additional mediators such as cognitive activation, clarity, or time on task, in order to reduce ambiguity and disentangle motivational and emotional influences more clearly. Although we benefited from three measurement points, additional measurement points across longer time spans may better capture developmental trends and changes in emotions and motivation (Selig & Preacher, 2009).

Moreover, our sample was limited to 9th-grade students attending English classes in XX secondary schools, which constrains the generalizability of our findings. Instructional and emotional processes may vary by age, subject domain, and cultural-educational context (e.g., Pekrun, 2006). Future research should replicate and extend this model across diverse educational systems, grade levels, and academic subjects to assess its broader applicability. Importantly, researchers should explore how these emotional and motivational responses may, in turn, reciprocally affect the efficacy and use of teacher humor, a currently underexplored area with considerable potential to advance the field (see Bieg et al., 2017; Martin et al., 2003). Finally, we relied exclusively on self-reported student data collected through online questionnaires. This approach is vulnerable to several biases such as social desirability, subjective interpretation, common scale formats and anchors, and individual differences, especially in the absence of teacher-reported or observational data (Podsakoff et al., 2003). Naturalistic and observational research can provide valuable insight into how teachers spontaneously use humor and how students respond in the moment, which bridges the gap between the assumptions of IHPT and the actual classroom practice.

Conclusion

This study show that the effects of teacher humor are predominantly mediated through socio-emotional and motivational mediators. While positive teacher-student relationship mediates the emotional and motivational outcomes of all humor types (in particular at the student level), interestingness of instruction serves as an additional, distinct mediator, particularly for course-related and self-disparaging humor. Our study highlights the importance of teacher humor and the mechanisms which mediate its effects in educational practice. Educators should be mindful of the types of humor they employ, striving to incorporate more course-related and self-disparaging humor while avoiding aggressive and unrelated humor. This can foster a more positive and motivating learning environment. Furthermore, the study reinforces the significance of positive teacher-student relationship and interestingness of instruction in mitigating negative emotions and promoting positive emotional and motivational outcomes. Educational policies and teacher training programs should emphasize the development of interpersonal skills and the strategic use of humor to enhance these relationships. In conclusion, this study underscores the pivotal role of well-chosen teacher humor in fostering positive socio-emotional and motivational experiences and that the effects of teacher humor on student emotions and intrinsic motivation are mediated by socio-emotional and motivational factors.

Declarations

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Authors report that there are no competing interests to declare.

References

1. Askildson L (2005) Effect of humor in the language classroom: Humor as a pedagogical tool in theory and practice. Second Lang Acquisition Teach (SLAT) 12:45–61
2. Banas JA, Dunbar N, Rodriguez D, Liu S-J (2011) A Review of Humor in Educational Settings. *Communication Education, 60*(1), 115–144. https://doi.org/1.1080/03634523.201.496867
3. Bergin DA (1999) Influences on classroom interest. Educational Psychol 34:87–98
4. Bieg S, Dresel M (2016) Fragebogen zur Erfassung des Humors von Lehrkräften aus Schülersicht (HUMLAS): Konstruktion und Validierung [Construction and Validation of the German Questionnaire to Assess Students' Perceptions of Teacher Humor]. *Diagnostica*, *62*(1), 3–15. https://doi.org/1.1026/0012-1924/a000132
5. Bieg S, Grassinger R, Dresel M (2017) Humor as a magic bullet? Associations of different teacher humor types with student emotions. *Learning and Individual Differences, 56*, 24–33. https://doi.org/1.1016/j.lindif.2017.04.008
6. Bieg S, Dresel M (2018a) Relevance of Perceived Teacher Humor Types for Instruction and Student Learning. *Social Psychology of Education, 21*(4), 805–825. https://doi.org/1.1007/s11218-018-9428-z
7. Bieg S, Dresel M (2018b) Förderung von Motivation und emotionalem Erleben von Schüler/innen: Wie Humor dabei helfen kann [Promoting students' motivation and emotional experiences: How humor can help]. In G. Hagenauer & T. Hascher (Eds.), *Emotionen und Emotionsregulation in der Schule und Hochschule* [*Emotions and emotion regulation in schools and universities*] (pp. 197–210). Münster: Waxmann
8. Bieg S, Grassinger R, Dresel M (2019) Teacher humor: Longitudinal effects on students' emotions. *European Journal of Psychology of Education, 34*(3), 517–534. https://doi.org/1.1007/s10212-018-0402-0

9. Bolkan S, Goodboy AK (2015) Exploratory theoretical tests of the instructor humor student learning link. Communication Educ 64(1):45–64
10. Bolkan S, Griffin DJ, Goodboy AK (2018) Humor in the Classroom: The Effects of Integrated Humor on Student Learning. *Communication Education, 67*(2), 144–164. https://doi.org/1.1080/03634523.2017.1413199
11. Booth-Butterfield S, Booth-Butterfield M (1991) Individual differences in the communication of humorous messages. *Southern Communication Journal, 56*(3), 205–218. https://doi.org/1.1080/10417949109372831
12. Burton KD, Lydon JE, D'Alessandro DU, Koestner R (2006) The differential effects of intrinsic and identified motivation on well-being and performance: Prospective, experimental, and implicit approaches to self-determination theory. *Journal of Personality and Social Psychology, 91*(4), 750–762. https://doi.org/1.1037/0022-3514.91.4.750
13. Cann A, Calhoun LG, Nance JT (2000) Exposure to humor before and after an unpleasant stimulus: Humor as a preventative or a cure. Humor 13:177–191
14. Cole DA, Maxwell SE (2003) Testing mediational models with longitudinal data: questions and tips in the use of structural equation modeling. J Abnorm Psychol 112(4):558–577. https://doi.org/10.1037/0021-843X.112.4.558
15. Collins LM (2006) Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. Ann Rev Psychol 57:505–528
16. Crosnoe R, Johnson MK, Elder GH (2004) Intergenerational bonding in school: The behavioral and contextual correlates of student-teacher relationship. Sociol Educ 77:60e81
17. Davis HA (2003) Conceptualizing the role and influence of student-teacher relationship on children's social and cognitive development. Educational Psychol 38(4):207e234
18. Di Maria C, Didelez V (2024) Longitudinal mediation analysis with multilevel and latent growth models: a separable effects causal approach. BMC Med Res Methodol 24(248). https://doi.org/10.1186/s12874-024-02358-4
19. Ditton H (2001) Qualität von Schule und Unterricht [Quality of School and Teaching] - *QuaSSU Skalenbildung*. Available at https://daqs.fachportal-paedagogik.de/search/show/instrument/4700_68
20. Ford T, Ford B, Boxer C, Armstrong J (2012) Effect of humor on state anxiety and math performance. Humor 25(1):59–74. https://doi.org/10.1515/humor-2012-0004
21. Frymier AB, Wanzer MB, Wojtaszczyk AM (2008) Assessing Students' Perceptions of Inappropriate and Appropriate Teacher Humor. *Communication Education, 57*(2), 266–288. https://doi.org/1.1080/03634520701687183
22. Garner RL (2006) Humor in pedagogy: How ha-ha can lead to aha! College Teaching, 54, 177e18. http://dx.doi.org/1.3200/CTCH.54.1.177-18
23. Giles H, Oxford GS (1970) Towards a multidimensional theory of laughter causation and its social implications. Bull Br Psychol Soc 23(79):97e105
24. Goetz T, Bieleke M, Gogol K, van Tartwijk J, Mainhard T, Lipnevich AA, Pekrun R (2021) Getting along and feeling good: Reciprocal associations between student-teacher relationship quality and students' emotions. *Learning and Instruction, 71*, 101349. https://doi.org/1.1016/j.learninstruc.202.101349
25. Gollob HF, Reichardt CS (1991) Analyzing change: Techniques for detecting and describing longitudinal change. Psychol Bull 109(3):376–392
26. Gorham J, Christophel DM (1990) The relationship of teachers' use of humor in the classroom to immediacy and student learning. Communication Educ 39:46–62

27. Grassinger R, Landberg M, Määttä S, Vasalampi K, Bieg S (2024) Interplay of intrinsic motivation and well-being at school. Motivation Emot 48(2):147–154. https://doi.org/10.1007/s11031-024-10057-2
28. Grazia V, Mameli C, Molinari L (2021) Being bored at school: Trajectories and academic outcomes. *Learning and Individual Differences, 9.* 102049. https://doi.org/1. 1016/j. lindif. 2021.102049
29. Hamre BK, Pianta RC (2006) Student-teacher relationship. In: Bear GG, Minke KM (eds) Children's needs III: Development, prevention, and intervention. National Association of School Psychologists, Washington, DC, US, p 59e71
30. Hu L, Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Model 6:1–55
31. Koschate-Fischer N, Schwille E (2022) Mediation Analysis in Experimental Research. In: Homburg C, Klarmann M, Vomberg A (eds) Handbook of Market Research. Springer, Cham. https://doi.org/10.1007/978-3-319-57413-4_34
32. Krapp A (2002) Structural and dynamic aspects of interest development: theoretical considerations from an ontogenetic perspective. Learn Instruction 12(4):383e409
33. Luo R, Zhan Q, Lyu C (2023) Influence of Instructor Humor on Learning Engagement in the Online Learning Environment. Social Behav Personality: Int J 51(2). https://doi.org/10.2224/sbp.12145
34. Kunter M, Schümer G, Artelt C, Baumert J, Klieme E, Stanat P (2002) PISA 2000: Dokumentation der Erhebungsinstrumente. Max-Planck-Institut für Bildungsforschung, Berlin
35. MacKinnon DP, Fairchild AJ, Fritz MS (2007) *Mediation analysis*. *Annual Review of Psychology, 58*, 593–614. https://doi.org/10.1146/annurev.psych.58.110405.085542
36. Maxwell SE, Cole DA, Mitchell MA (2011) Bias in Cross-Sectional Analyses of Longitudinal Mediation: Partial and Complete Mediation Under an Autoregressive Model. Multivar Behav Res 46(5):816–841. https://doi.org/10.1080/00273171.2011.606716
37. Martin RA, Puhlik-Doris P, Larsen G, Gray J, Weir K (2003) Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. J Res Pers 37(1):48–75
38. Matarazzo KL, Durik AM, Delaney ML (2010) The effect of humorous instructional materials on interest in a math task. Motivation Emot 34:293–305
39. Muthén LK, Muthén BO (1998–2019) *Mplus User's Guide. 8th Edition*. Los Angeles, CA: Muthén & Muthén
40. Nail JE, Christoferson J, Ginsburg GS, Drake K, Kendall PC, McCracken JT et al (2015) Academic impairment and impact of treatments among youth with anxiety disorders. *Child & Youth Care Forum, 44*, 327–342. https://doi.org/1.1007/ s10566-014-9290-x
41. Neff P, Rucynski J (2017) Japanese perceptions of humor in the English language classroom. *HUMOR*, *30*(3), 279–301. https://doi.org/1.1515/humor-2016-0066
42. Nett UE, Goetz T, Hall NC (2011) Coping with boredom in school: An experience sampling perspective. Contemp Educ Psychol 36:49–59
43. Neuliep JW (1991) An examination of the content of high school teachers' humor in the classroom and the development of an inductively derived taxonomy of classroom humor. Communication Educ 40:343–355
44. Nienaber K, Abrams G, Segrist D (2019) The funny thing is, instructor humor style affects likelihood of student engagement. J Scholarsh Teach Learn 19(5):53–56
45. Peixoto F, Sanchez C, Mata L, Monteiro V (2017) How do you feel about math? relationship between competence and value appraisal, achievement emotions and academic achievement. Eur J Psychol Educ

32(3):385–405

46. Pekrun R (2006) The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. Educational Psychol Rev 18:315–341
47. Pekrun R, Goetz T, Titz W, Perry RP (2002) Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. Educational Psychol 37(2):91–105. https://doi.org/10.1207/S15326985EP3702_4
48. Pekrun R, Goetz T, Daniels LM, Stupnisky RH, Perry RP (2010) Boredom in achievement settings: Exploring control-value antecedents and performance outcomes of a neglected emotion. *Journal of Educational Psychology, 102*(3), 531–549. https://doi.org/1. 1037/ a0019 243
49. Pekrun R, Goetz T, Frenzel AC, Barchfeld P, Perry RP (2011) Measuring emotions in students' learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary Educational Psychology, 36*, 36–48. https://doi.org/1.1016/j.cedpsych.201.1.002
50. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP (2003) Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol 88(5):879–903. https://doi.org/10.1037/0021-9010.88.5.879
51. Praetorius A-K, Rogh W, Kleickmann T (2020) Blinde Flecken des Modells der drei Basisdimensionen von Unterrichtsqualität? Das Modell im Spiegel einer internationalen Synthese von Merkmalen der Unterrichtsqualität [Blind Spots in the Model of the Three Basic Dimensions of Teaching Quality? The Model in the Mirror of an International Synthesis of Characteristics of Teaching Quality]. Unterrichtswissenschaft 48:303–318
52. Robinson HL, Rose SE, Elliott JM, Vivaldi RA (2024) Teachers' humour use in the classroom: A scoping review. *Educational Psychology Review, 36*(3), Article 73. https://doi.org/1.1007/s10648-024-09913-x
53. Ryan RM, Deci EL (2000) Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54–67. http://dx.doi.org/1.1006/ceps.1999.1020
54. Salmee SA, Arif MM (2019) A study on the use of humour in motivating students to learn English. Asian J Univ Educ 15(3):257–265
55. Saxer K, Schnell J, Mori J, Hascher T (2025) The Relationship Between Student Well-Being and Teacher-Student and Student-Student Relationship: A Longitudinal Approach Among Secondary School Students in Switzerland. *Education Sciences*, *15*(3), 384. https://doi.org/1.3390/educsci15030384
56. Seidel T, Prenzel M, Kobarg M (2005) *How to run a video study: technical report of the IPN video study*. (p. 281), Münster: Waxmann
57. Selig JP, Preacher KJ (2009) Mediation models for longitudinal data: A simulation study and a reanalysis of the data. Struct Equation Modeling: Multidisciplinary J 16(5):689–715
58. Sommer B (1985) What's different about truants? A comparison study of eighth-graders. J Youth Adolesc 14(5):411–422
59. St-Amand J, Smith J, Goulet M (2023) Is Teacher Humor an Asset in Classroom Management? Examining its Association with Students' Well-Being, Sense of School Belonging, and Engagement. Curr Psychol. https://doi.org/10.1007/s12144-023-04619-9
60. Stuart WD, Rosenfeld LB (1994) Student perceptions of teacher humor and classroom climate. Communication Res Rep 11:87–97
61. Torok SE, McMorris RF, Lin WC (2004) Is humor an appreciated teaching tool? Perceptions of professors' teaching styles and use of humor. *College Teaching, 52*, 14 – 2. https://doi.org/1.3200/CTCH.52.1.14-20

62. Tsukawaki R, Imura T (2019) Preliminary Verification of Instructional Humor Processing Theory: Mediators Between Instructor Humor and Student Learning. *Psychological reports*, *123*(6), 2538 – 255. https://doi.org/1.1177/0033294119868799
63. Tsukawaki R, Imura T, Kojima N, Furukawa Y, Ito K (2020) The Correlation Between Teachers' Humor and Class Climate: A Study Targeting Primary and Secondary School Students. *Humor, 1– 16*. https://doi.org/10.1515/humor-2019-0021
64. Van Praag L, Stevens P, Van Houtte M (2017) How humor makes or breaks student-teacher relationship. Teach Teacher Educ 66:393–401
65. Wanzer MB, Frymier AB (1999) The Relationship Between Student Perceptions of Instructor Humor and Students' Reports of Learning. *Communication Education, 48*(1), 48–62. https://doi.org/1.1080/03634529909379152
66. Wanzer MB, Frymier AB, Wojtaszczyk AM, Smith T (2006) Appropriate and Inappropriate Uses of Humor by Teachers. *Communication Education, 55*(2), 178–196. https://doi.org/1.1080/03634520600566132
67. Wanzer MB, Frymier AB, Irwin J (2010) An Explanation of the Relationship Between Instruction Humor and Student Learning: Instructional Humor Processing Theory. *Communication Education, 59*(1), 1–18. https://doi.org/1.1080/03634520903367238
68. Wasson AS (1981) Susceptibility to boredom and deviant behavior at school. Psychol Rep 48(3):901–902
69. Woods P (1983) Coping at school through humor. *British Journal of Sociology of Education, 4*(2), 111e124. http://dx.doi.org/1.1080/0142569830040201

Figures

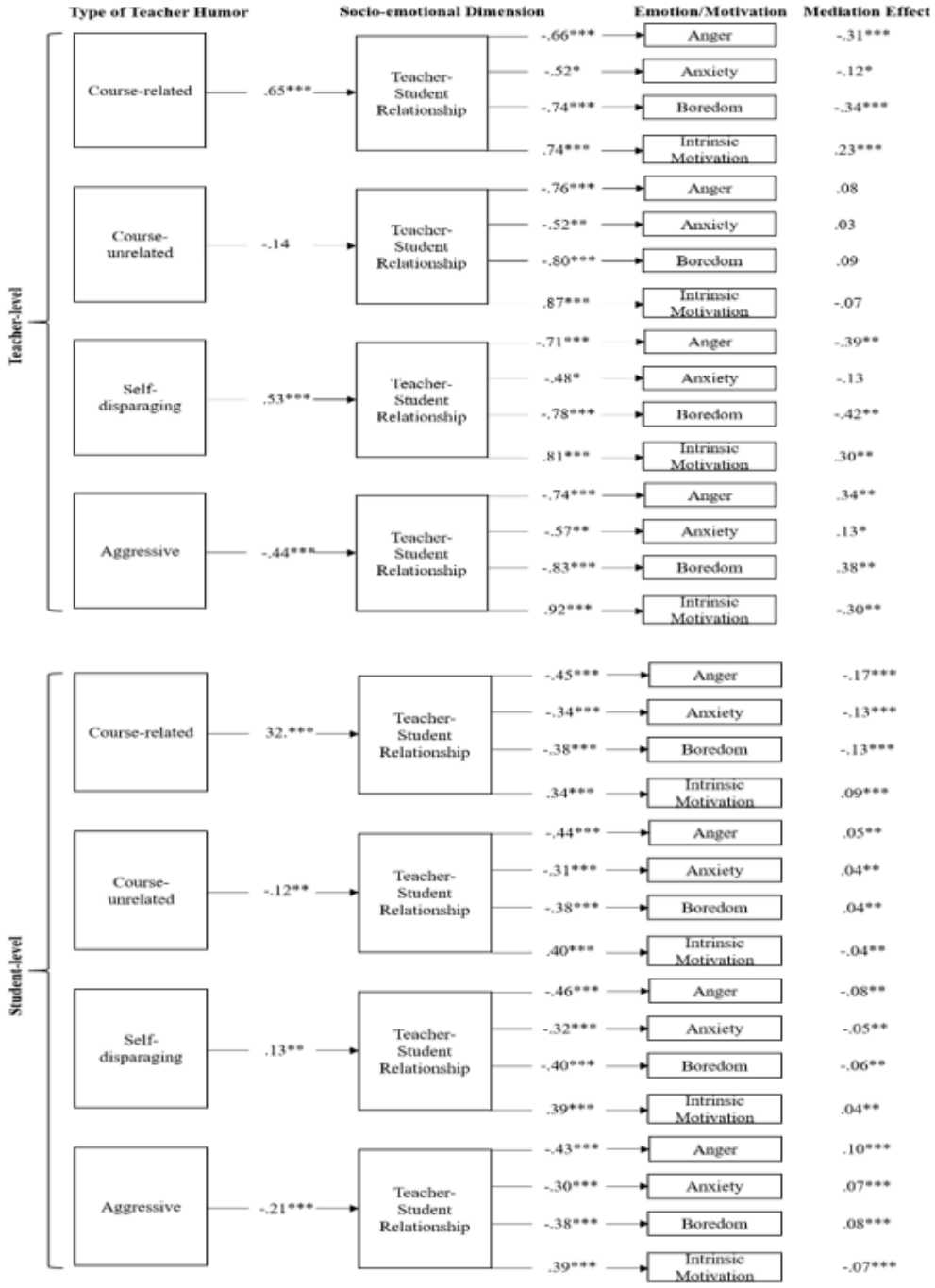

Figure 1

Teacher humor mediation models with positive teacher-student relationship as mediator

Note: * $p < .05$, ** $p < .01$, *** $p < 0.001$. All *p*-values are two-sided.

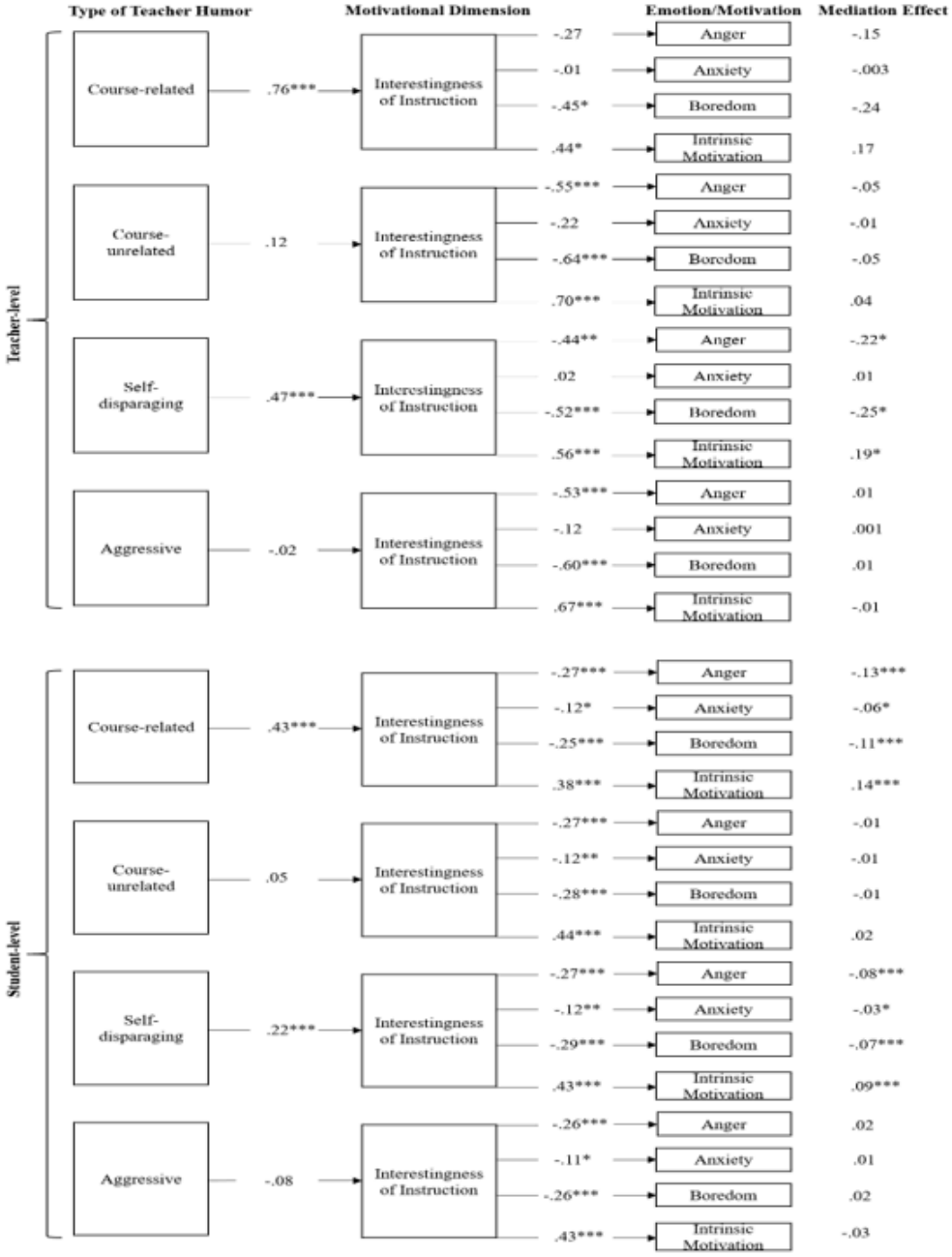

Figure 2

Teacher humor mediation models with interestingness of instruction as mediator

Note: * $p < .05$, ** $p < .01$, *** $p < 0.001$. All p-values are two-sided.