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Teacher humor: longitudinal effects on students' emotions

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Abstract
Characteristics of teaching are associated with the emotions students experience in the classroom; however, empirical evidence regarding longitudinal effects is scarce. The present study investigated changes in positive and negative achievement emotions (enjoyment, boredom, and anger) vis-à-vis different teacher humor types (course-related, course-unrelated, self-disparaging, and aggressive), using the instructional humor processing theory and control-value theory of achievement emotions as a theoretical foundation. A total of 668 German upper track secondary school students from 41 classrooms with a mean age of 12.7 years (SD = 1.76) reported their perceptions of teacher humor and their experienced achievement emotions by completing online questionnaires (retest interval 6 months). Using the corresponding levels of emotions at the first measurement point as control values, results from multilevel analyses indicate that course-related humor weakens both decreases in enjoyment and increases in boredom and anger. Consistent with the hypotheses, aggressive humor leads to less enjoyment and more boredom and anger. Directions for future research are discussed and suggestions on how to best relate humor to course content are made.

Keywords Humor · Emotional experience · Longitudinal studies · Questionnaires

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Introduction

While attending school, students interact in various social situations and experience different emotions. For example, students may laugh, get annoyed, or feel bored in the classroom. There is no doubt that achievement emotions are relevant for education as they affect students' cognitive and self-regulatory processes (Goetz et al. 2006; Pekrun et al. 2002; Pekrun and Perry 2014), direct attention, and impact memory processes (Pekrun et al. 2018). Achievement emotions, defined as emotions directly related to achievement activities (e.g., preparing for a test) or achievement outcomes (e.g., success on a test; Pekrun 2006), are related with beneficial motivational variables and affect students' interests and academic achievement (Ainley et al. 2005; Pekrun et al. 2002; Pekrun and Perry 2014), as well as personality development (Boekaerts and Pekrun 2016). Furthermore, achievement emotions affect the social climate in classrooms and are central to well-being (Pekrun 2006). From a theoretical point of view, the learning environment (e.g., instruction, feedback, teacher behavior) holds information about controllability and value and is important for the emotional experiences of students (Pekrun 2006). Hence, it is surprising that the impact of learning environments, specifically teaching behavior, on students' achievement emotions is rather unexplored (Bieg et al. 2017; Boekaerts and Pekrun 2016; Keller et al. 2016; Muntaner-Mas et al. 2017). Teacher humor, as a part of teaching behavior, plays a central role in teaching as it is related to a positive classroom environment, increased student motivation and student learning, and the interestingness of instruction (Banas et al. 2011; Bieg and Dresel 2016, 2018; Goodboy et al. 2015; Houser et al. 2007; Kaplan and Pascoe 1977; Wanzer and Frymier 1999; Wanzer et al. 2010). Humorous communication has been validated as a beneficial skill (Booth-Butterfield and Wanzer 2016). However, only few empirical studies have investigated how different teacher humor types are associated with affective learning (Wanzer and Frymier 1999; Wanzer et al. 2010), or positive and negative achievement emotions (Bieg et al. 2017), and all of these studies demonstrate significant limitations. Studies conducted by Wanzer et al. (2010) did not examine concrete emotions, only affective learning. They showed that related humor and self-disparaging humor experienced by college students were positively associated with affective learning, implying that teacher humor type affects affective learning among their students. Unrelated humor and aggressive humor showed no correlations. In particular, the cross-sectional design of these studies does not allow for conclusions concerning the causal direction of the relationships between teacher humor types and the emotions experienced by students. It is quite possible that teachers use more humor in the classroom when they perceive that their students are enjoying themselves. It may also be the case that self-esteem (Stieger et al. 2011) or the sense of humor (McGhee 1994) regulates how teachers use humor and thus their students' emotions.

The study investigates the effects teacher humor type has on different discrete emotions like enjoyment, boredom, and anger, as reported by students in retrospective questionnaires. All three achievement emotions play important roles in student learning and achievement. Enjoyment can support psychological growth and improved well-being (Fredrickson 2001), positively affects learning and performance (Peixoto et al. 2017; Pekrun et al. 2018), and leads students to use more flexible and innovative learning strategies and attention is focused on the task (Pekrun et al. 2011, 2018). Negative emotions are also important to investigate because they distract attention away from learning (Pekrun et al. 2018). Boredom is reported very frequently by secondary school students (Nett et al. 2011), even more frequently than anxiety (Goetz et al. 2006), and it seems advisable to determine classroom activities which could

efficiently reduce boredom (Nett et al. 2011). Boredom corresponds with detrimental behavior outcomes (Larson and Richards 1991) such as truancy (Sommer 1985) or deviant behavior (Wasson 1981), diminishes interest and intrinsic motivation (Pekrun et al. 2010, 2018), leads to task-irrelevant thinking in learning situations (Pekrun et al. 2011), and shows a negative impact on achievement (Pekrun et al. 2018; Peixoto et al. 2017). Anger is also detrimental to student-perceived competence, learning and performance (Peixoto et al. 2017) as it reduces intrinsic motivation and fosters task-irrelevant thinking (Pekrun 2006). Accordingly, this paper addresses, for the first time, the effects of different teacher humor types on different specific achievement emotions (enjoyment, boredom, and anger) reported by students, on both the student level and the classroom level, in terms of the instructional humor processing theory (Wanzer et al. 2010) and the control-value theory of achievement emotions (Pekrun 2006). Therefore, this work aims to expand on the current state of research—for the most part correlational studies—by conducting a study, with two measurement points, at upper track secondary schools in Germany. Thus, it elaborates on current challenges in research on students' achievement emotions and teacher humor research and provides answers to essential questions in this field such as which types of teacher humor are effective in the classroom and which theories can best explain the relationships between teacher humor and student emotions (Booth-Butterfield and Wanzer 2016).

Teacher humor

In the present study, teacher humor is conceived behaviorally and is not considered to be a stable personality trait as has been the case previously (Booth-Butterfield and Booth-Butterfield 1991; McCroskey and Daly 1987). This perspective also implies that teacher humor may be learnable—although even less has been established on this point (Ruch et al. 2018). It 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 and Booth-Butterfield 1991, p. 206).

When investigating teacher humor, it is important to know that humor itself is a multidimensional concept (Martin et al. 2003). Martin et al. (2003) introduced a 2×2 model of humor functions (use of humor to enhance the self or to enhance social relationships; use of humor is or is not detrimental to self or others) which results in four different humor types with different effects. It has been demonstrated that a distinction into four different humor types is also useful when considering teacher humor (Bieg and Dresel 2016; Frymier et al. 2008; Wanzer et al. 2006).

Previous studies at US colleges investigated students' perceptions of teacher humor types and found five dimensions of instructional humor (related and unrelated humor, other-disparaging humor, self-disparaging humor, and offensive humor; Frymier et al. 2008; Wanzer et al. 2006). Based on those studies, Bieg and Dresel (2016) examined teacher humor types at secondary schools and validated four teacher humor types, similar to those in the college studies: humor unrelated to course content, with no thematic connection to the current topic; self-disparaging humor, in which the teacher does or says amusing things about him/herself; humor related to course content, in which humor is connected to current topics; and aggressive humor which, analogous to the other-disparaging humor described by Wanzer et al. (2006) and Frymier et al. (2008), teases or ridicules students (see Bieg et al. 2017, p. 25).

When teacher humor is related to course content students evaluate it as appropriate (Wanzer et al. 2006). This humor type supports connections to the learning material and the recall and control of the learning tasks (Wanzer et al. 2010). Furthermore, course-related humor is

positively associated with enjoyment and the interestingness of instruction (Bieg and Dresel 2016, 2018). Teacher humor unrelated to course content was positively associated with a positive teacher-student relationship and a positive classroom climate (Frymier et al. 2008; Wanzer et al. 2006). Course-related humor and unrelated humor were evaluated as appropriate types of teacher humor (Wanzer et al. 2006). Self-disparaging humor was identified as both appropriate and inappropriate, and it is not clear whether this humor type creates positive or negative affect (Wanzer et al. 2010). Aggressive teacher humor is rated as inappropriate as it violates social and classroom rules and expectations, and it can create negative affect, lessen motivation, and reduce the ability to process instructional messages because it may distract students' attention from the class content. It is positively associated with anger, anxiety, and boredom (Bieg et al. 2017; Martin et al. 2003; Wanzer et al. 2006).

To clarify the effects teacher humor has on student emotions, instructional humor processing theory (IHPT; Wanzer et al. 2010) is a suitable theoretical framework. IHPT was developed to explain the relationship between humor and learning aspects (Booth-Butterfield and Wanzer 2016). IHPT is an integrative theory (see Wanzer et al. 2010) based on assumptions drawn from the elaboration likelihood model of persuasion (Petty and Cacioppo 1986), incongruity resolution theory (Berlyne 1960; LaFave et al. 1996), and disposition theory (Zillmann and Cantor 1996). IHPT postulates that students must first recognize and resolve incongruity in the teacher's humorous message for it to be perceived as humorous. If the incongruity is not understood, students will be confused by the message (Wanzer et al. 2010). When the incongruity is resolved and students perceive the message as humorous, they further evaluate it as either positive or negative in affect (Wanzer et al. 2010). IHPT assumes that students form affective responses to humorous messages that are processed and resolved, based on whether students consider the message to be appropriate or inappropriate (Goodboy et al. 2015). If a student interprets a humorous message as appropriate, it will create positive affect. Conversely, if the humorous message is perceived as inappropriate, it will create negative affect (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.

Achievement emotions

The present study also refers to Pekrun's (2006) control-value theory of achievement emotions (CVT), which provides a suitable framework to explain achievement emotions.[1] According to CVT, emotions can be classified in three dimensions: their object focus in outcome emotions (success and failure), their valence (positive vs. negative states, such as enjoyment vs. anger and boredom), and the degree of activation (activating vs. deactivating such as enjoyment and anger vs. boredom). Due to the focus on different objects, control and value appraisals serve different functions (Pekrun 2006). In accord with CVT assumptions, emotions rise from the *subjective control* an individual perceives for their activities and their outcomes (subjective control appraisals). Having subjective control over outcome stems from one's belief about their own competence which has an impact on their expectations of success or failure. The second appraisal group concerns *subjective value*. Activities and outcomes are subjectively valued as positive or negative with regard to their personal importance and personal relevance (value appraisals). These value appraisals determine whether a positive or negative emotion will be

[1] To improve readability, we use the term emotions when referring to achievement emotions.

experienced (Pekrun 2006). Control appraisals determine the quality of emotions (i.e., which concrete emotion will be experienced; Pekrun 2006). For example, high levels of subjective control and a positive subjective value appraisal are assumed to elicit positive emotions such as enjoyment. When the focus is on the learning activity, it is assumed that enjoyment results from the combination of high control appraisal (e.g., "I understand the topic and I am able to do that task"), and positive value appraisal of the activity and material (e.g., "Solving this task is really important for me"). Conversely, when the focus is on the learning activity, it is assumed that boredom will be experienced when an achievement activity lacks incentive value and the control appraisal is very high (e.g., a task is very easy and does not represent a challenge) or very low, for example, the demands exceed one's capabilities (Goetz and Frenzel 2010; Goetz and Hall 2014; Pekrun 2006). Anger is a combination of high control appraisals (the activity seems to be controllable) with a negative value appraisal. For example, if a student is able to complete a task but the activity itself is valued negatively (e.g., it requires too much effort) the task may lead to anger (Pekrun 2006).

CVT further "postulates that the affective impact of social learning environments—e.g., teaching behavior—is mediated by control and value appraisals" (Pekrun 2006, p. 325). Thus, it is assumed that environmental features transport information related to controllability and values which are significant for student emotions (Pekrun 2006). In this sense, teaching characteristics can have an important influence on students' emotions (Muntaner-Mas et al. 2017). It has been shown that teachers' instructional behavior is associated with students' anger and enjoyment (Becker et al. 2014). Other studies have reported that enjoyment and enthusiasm experienced by teachers is positively related to student enjoyment (Frenzel et al. 2009). Goetz et al. (2013) state that the way a teacher presents learning material is essential for students' enjoyment, as are clear and structured teachers (Frenzel et al. 2007a) and affective support (Sakiz 2012). Muntaner-Mas et al. (2017) found that teaching characteristics had a strong positive effect on enjoyment and accentuate the role of teaching skills for perceived academic control. Furthermore, the quality of examples provided by the teacher can contribute to students' perceived control (Pekrun and Stephens 2012). Prior research has found that different teacher humor types are differently associated with student emotions (enjoyment, anxiety, boredom, and anger) and that different teacher humor types transport different control and value information (Bieg et al. 2017).

Very little evidence has been collected on the extent to which the above-outlined teacher humor types are associated with students' emotional experiences. Some cross-sectional studies, using student questionnaires, have indicated that the learning environment is perceived as more enjoyable when teachers use humor (Stuart and Rosenfeld 1994; Torok et al. 2004; Wanzer and Frymier 1999; Wanzer et al. 2010; Ziv 1979), and conversely, aggressive teacher humor is associated with an uncomfortable learning environment, resulting in evaluations depicting the subject as unpopular (Banas et al. 2011; Gorham and Christophel 1990; Stuart and Rosenfeld 1994; Torok et al. 2004). Verbal aggressiveness is, for both students and teachers, positively related to aggressive humor (Frymier et al. 2008). None of these studies examined the relationships, or effects, different teacher humor types have with, or on, different emotions or investigated emotion unidimensionally as affective learning. Thus, their findings are general and preliminary in nature. A recent study by Bieg et al. (2017) overcame these limitations and showed, by using two-level regression analyses, 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.

Beyond these cross-sectional studies, some experimental studies have focused on humorous learning material. Matarazzo et al. (2010) found no main effects regarding humorous tasks predicting happiness, anger, or anxiety. Regarding the effects of using teacher humor in the classroom, these results are of limited transfer capacity as the study did not investigate humorous behavior among teachers in social interactions; it only examined the effects of a humorous task. A study by Ford et al. (2012) revealed that performance was better in a humorous condition and that participants reported less anxiety. An experiment by Cann et al. (2000) using humorous videotapes, before or after exposure to an unpleasant videotape, showed that humorous videos can promote positive affect and reduce negative affect. Another video-based experiment, conducted by Ziv et al. (1986), used four films, each 10 min long, in the context of a Biology class. One film included self-disparaging humor, one film other disparaging humor, one film was a mixture of both humor types (self- and other disparaging), and the fourth condition was a control film with no humor at all. They found that humor in the classroom could improve student evaluations of teachers, the mixed condition was perceived as the most appealing (sociable; pleasant), and the other-disparaging condition was rated highest in power (confident; strong), but the experiment did not examine effects on student' emotions and did not consider course-related vs. course-unrelated humor.

To summarize, some studies have illustrated that teacher humor is related to students' positive and negative affect, but did not examine relationships with concrete positive and negative emotions (e.g., Wanzer et al. 2010). Limitations inherent in these experimental studies are that they did not consider the use of all four teacher humor types and cannot make any statements about effects on concrete positive or negative emotions.

Hypotheses

The overall purpose of the present study was to examine the effects of four types of teacher humor, as a specific teaching behavior transporting different information concerning control and value, on the development of students' positive and negative emotions in the classroom. Knowing how different teacher humor types determine students' emotional experiences would broaden our knowledge of the competent use of humor in the classroom and could advance assumptions made in IHPT (Bieg et al. 2017). Based on theoretical assumptions made in CVT on the emotional consequences of different appraisals (Pekrun 2006), we identified controllability and value appraisals of the four different teacher humor types and made specific theoretical predictions for the potential effects of teacher humor on students' emotions (Bieg et al. 2017).

As we know from IHPT, students' affective responses are related to perceived humorous messages and thus, we expected that students' perceptions of all appropriate humor types would create positive value appraisals, and students' perceptions of inappropriate humor (aggressive humor) would create negative value appraisals (Wanzer et al. 2010). Conceptually, unrelated and self-disparaging humor would not be expected to transport control appraisals and thus remain irrelevant for emotions. These humor types, for example, do not support clarity, structure, or teaching practices based in elaboration, which all contribute to students' control (Bieg and Dresel 2018; Buff 2014). Regarding CVT, unrelated and self-disparaging humor should not impact students' emotions. Humor related to course content could induce high control appraisals because it is connected to the learning material, promotes elaboration on—

and understanding of—a learning task, and is positively related to clarity of instruction (Bieg and Dresel 2018; Bieg et al. 2017), as CVT assumes effects on positive emotion are par for the course. According to IHPT, course-related humor enhances students' abilities to process humorous messages (Wanzer et al. 2010). Regarding aggressive humor, we assumed control appraisals by others or low control respectively, whereby the teacher is the source of control and the outcome is caused by the teacher and external circumstances (Bieg et al. 2017). 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 and will create negative affect. Students will be less able to process instructional messages and understand course content (Wanzer et al. 2010). So aggressive humor does not seem to be an effective teaching characteristic and does not contribute to students' subjective control.

Specifically, we tested the following hypotheses: (1) depending on CVT, course-related humor is understood as a teaching behavior with positive value appraisals and high control appraisals for students. Thus, teachers' use of humor related to course content supports experiences of enjoyment and decreases experiences of boredom and anger. (2) As outlined above, we assume rather positive value appraisals of humor unrelated to course content and self-disparaging humor and irrelevant control appraisals resulting in less boredom. Hence, the use of humor unrelated to course content and self-disparaging humor by teachers decreases experiences of boredom. (3) IHPT postulates that the use of aggressive humor is negatively valued by students, is associated with diminished self-control, and distracts them from the learning content. Consequently, the use of aggressive humor by teachers decreases experiences of enjoyment and increases experiences of boredom and anger.

Method

Participants and procedure

The sample consisted of 668 German secondary school students (mean age 12.7 years, SD = 1.76; 50% female). Participants were recruited from a total of 41 classrooms. Six grade levels were assessed including 77 students in grade five, 138 students in grade six, 160 students in grade seven, 73 students in grade eight, 126 students in grade 9, and 94 students in the tenth grade. The students were assessed in the context of English (30%), mathematics (38%), and history classes (32%). Students attended English and math classes between 3 to 5 h per week and history classes for 2 h per week. Thus, students' perceptions of their teachers' humor are based on a composite of at least 12 class meetings, in most cases more. We do not have any information about how familiar the students were with their teachers. It is possible that some of the older students knew their teachers from previous school years. The survey was part of a school evaluation project; student participation was voluntarily and required parental consent. Written approval was also obtained from local school boards. The students were surveyed in intact classes during their regular class time and completed online questionnaires individually, with school computers. Each student evaluated only one teacher for the subject in question. The survey began in late October (T1) when students had been back in school at least for 6 weeks and was repeated following the first term in April (T2). We assessed students'

perceptions of teacher humor at T1 and students' emotional experiences at T1 and T2. To test our hypotheses, we used a longitudinal design with two measurement points separated by 6 months. Twenty-seven students were missing at one of the two measurement points due to illness or relocation, so the final sample consisted of 641 students.

Measures

Teacher humor was measured with a well-established German instrument developed by Bieg and Dresel (2016) based on student perceptions. The instrument is based on the Teacher Humor Scale developed by Frymier et al. (2008) to measure different humor types. It comprises four subscales, one to assess each of the four humor types. *Course-unrelated humor* was assessed with three items (e.g., "Our [DOMAIN] teacher gets off the subject and tells us funny stories instead"). *Self-disparaging humor* was assessed with four items (e.g., "Our [DOMAIN] teacher makes fun of himself when he makes mistakes in class"). *Course-related humor* included six items (e.g., "Our [DOMAIN] teacher uses funny examples in class") and *aggressive humor* was assessed with four items (e.g., "Our [DOMAIN] teacher teases students in class"). All items were presented with the Likert-type scales ranged from 1 (*never*) to 5 (*very often*). Reliabilities are shown in Table 1.

Student emotions were assessed with the Achievement Emotions Questionnaire (AEQ, Pekrun et al. 2011), a self-report instrument used to assess emotions experienced by students in different domains. The scales used refer to class-related emotions. The instrument has proven to be appropriate for students in grades 5 to 10 (Frenzel et al. 2007b). We assessed enjoyment and boredom with three items each (e.g., "I enjoy my [DOMAIN] class"; "I can't concentrate because I am so bored"). Anger was assessed with four items (e.g., "I am annoyed during my

Table 1 Descriptive statistics, reliability estimates, and bivariate correlations between emotions and teacher humor types

	1	2	3	4	5	6	7	8	9	10
Enjoyment T1	–	0.66*	−0.71*	−0.54*	−0.66*	−0.50*	0.22	0.34*	0.74*	−0.20
Enjoyment T2		–	−0.54*	−0.75*	−0.51*	−0.67*	0.23	0.30	0.66*	−0.20
Boredom T1			–	0.55*	0.73*	0.48*	−0.17	−0.39*	−0.74*	0.17
Boredom T2				–	0.46*	0.74*	−0.11	−0.25	−0.62*	0.13
Anger T1					–	0.52*	−0.22	−0.41*	−0.69*	0.27
Anger T2						–	−0.28	−0.40*	−0.71*	0.14
Humor unrelated to course content T1							–	0.41*	0.30*	0.33*
Self-disparaging humor T1								–	0.43*	0.20*
Humor related to course content T1									–	−0.06
Aggressive humor T1										–
M	3.24	3.08	2.21	2.33	2.02	2.10	1.60	1.71	2.51	1.41
SD	11.14	1.19	1.09	1.13	0.97	1.04	0.84	0.79	1.15	0.79
ICC	0.28*	0.31*	0.22*	0.27*	0.18*	0.23*	0.26*	0.20*	0.39*	0.18*
α	0.91	0.93	0.87	0.91	0.84	0.87	0.87	0.83	0.95	0.90

$n = 641$ students from 41 classrooms. Emotion and Teacher Humor Scales ranged from 1 to 5; *ICC* intra-class correlation

*$p < .05$

[DOMAIN] class". All items were presented with the Likert-type scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Reliabilities are shown in Table 1.

Analyses

Due to the hierarchical structure of the data—students are nested in classes (Raudenbush et al. 2011)—we calculated multilevel models using HLM 7.0. Our analyses addressed student-reported enjoyment, boredom, and anger in class as outcome variables. As predictors at the student level, we used students' individual perceptions of teacher humor types at T1 (group mean centered). We used students' shared perceptions of teacher humor types at T1 as predictors at the classroom level (grand mean centered). Grand mean centering is appropriate here because it generates information on the deviation of the class mean from the total sample mean and makes it easier to interpret the regression weights. Shared perceptions at the classroom level were aggregated by averaging the student perceptions of teacher humor types for class members. Emotions at T1 were controlled—consequently, the humor effects on T2 emotions can be interpreted as effects on the development of the students' emotional experiences. We *z*-standardized all variables prior to analyses on both the student and the classroom levels.

The corresponding equations are as follows:

Level 1 (student level)

$$\begin{aligned}\text{Emotion T2}_{ij} = {} & \beta_{0j} + \beta_{1j}{}^{*}\left(\text{Emotion T1}_{ij}\right) \\ & + \beta_{2j}{}^{*}\left(\text{individually perceived course–unrelated humor T1}_{ij}\right) \\ & + \beta_{3j}{}^{*}\left(\text{individually perceived self–disparaging humor T1}_{ij}\right) \\ & + \beta_{4j}{}^{*}\left(\text{individually perceived course–related humor T1}_{ij}\right) \\ & + \beta_{5j}{}^{*}\left(\text{individually perceived aggressive humor T1}_{ij}\right) + r_{ij}\end{aligned}$$

Level 2 (classroom level)

$$\begin{aligned}\beta_{0j} = {} & \gamma_{00} + \gamma_{01}{}^{*}(\text{aggregated perceived course–unrelated humor T1}) \\ & + \gamma_{02}{}^{*}(\text{aggregated perceived self–disparaging humor T1}) \\ & + \gamma_{03}{}^{*}(\text{aggregated perceived course–related humor T1}) \\ & + \gamma_{04}{}^{*}(\text{aggregated perceived aggressive humor T1}) + u_{0\text{j}}\end{aligned}$$

$$\beta_{1j} = \gamma_{10}, \beta_{2j} = \gamma_{20}, \beta_{3j} = \gamma_{30}, \beta_{4j} = \gamma_{40}, \beta_{5j} = \gamma_{50}$$

Results

Descriptive analyses

Descriptive information and bivariate correlations are outlined in Table 1. Regarding the means, course-related humor was perceived, on average, most intensely by the students, and aggressive humor was perceived the least. Among the emotions, enjoyment was reported on average most frequently, and anger was reported the least. The intra-class correlations ICC (1) showed that all variables differed systematically among the classes. Student ratings ranged between 18 to 39% at T1, and 22 to 31% at T2, indicating that a substantial proportion of the total variance is due to the variance among the teachers. The ICC (2), a measure of reliability on the class level, indicated a very good reliability for all cluster-level variables (i.e., the four types of teacher humor), ranging from 0.82 to 0.93. With a view to the bivariate correlations at T1, we found no relationship between unrelated humor and the assessed emotions. Self-disparaging humor showed a small positive relationship with enjoyment and negative relationships with boredom and anger at T1. Course-related humor was strongly, positively associated with enjoyment and negatively associated with boredom and anger at T1. We found no significant relationships between aggressive humor and the assessed emotions.

t tests for one sample indicated that mean changes in the assessed emotions were significant and showed that enjoyment decreased over time $t\ (664) = 4.31$, $p = .000$, while boredom $t\ (664) = -2.87$, $p = .004$, and anger increased over time $t\ (664) = -2.11$, $p = 0.35$. Further, we tested whether the changes in emotional experiences were the same for all classes or if the classes show different changes. Such differences between classrooms for changes in emotional experiences are a basic assumption when analyzing the effects of teacher humor on the development of student emotions reported at T1 and T2. We used a multilevel model including all three emotions at T2 as outcome variables and all three emotions at T1 as predictor variables on the student level. Our results indicate that all three emotions developed significantly differently in different classes (variance between classes ranged between 0.116** and 0.139**), showing that there are significant differences between the classes in the changes observed, which is a necessary precondition for classroom-level effects of humor (Table 2).

Longitudinal multilevel analyses

We examined the development of three emotions with regard to teacher humor types using the longitudinal multilevel analyses described above. We used students' reports of their perceived

Table 2 Variances of T2 emotions between classes and within students, T1 emotions controlled

Variable	Random effects				
	Classroom level (u_{0j})				Student level (r_{ij})
	Variance between classes (τ_{00})	df	χ^2	p	Variance within student (δ^2)
Enjoyment T2	0.129	40	213.76	< .001	0.460
Boredom T2	0.139	40	190.98	< .001	0.572
Anger T2	0.116	40	155.54	< .001	0.625

Since emotions at T1 were controlled, the results indicate differences between classrooms regarding the changes in emotional experiences

teacher humor at T1 to predict student-reported emotions at T2. As shown in Table 3, humor related to course content had no effect on students' emotions on the student-level results, but classroom-level results show that the more students perceived course-related humor at T1, the less enjoyment decreased at T2 (0.50), and the less boredom (−0.48) and anger (−0.38) increased at T2, controlling for the corresponding levels of those emotions at T1. Hypothesis 1 was partially supported in these analyses, since the expected effects only emerged on the classroom level.

Humor unrelated to course content and self-disparaging humor showed no significant effects on boredom at T2 on either level. These humor types were not predictive for experienced enjoyment and anger among students at T2, on either the student or classroom level. Hypothesis 2 was not supported by our data.

The analyses provide some support for hypothesis 3. On the student level, aggressive teacher humor was a significant predictor for the emotions assessed. The more students perceived aggressive teacher humor at T1, the less they experienced enjoyment (−0.08) and the more they experienced boredom (0.09) and anger (0.21) at T2, controlling for the corresponding levels of those emotions at T1. Aggressive teacher humor showed, beyond the effects on student level, no effects on the classroom level.

The explained variances for enjoyment (56%; 60%), boredom (44%; 55%), and anger (33%; 44%), on student and classroom levels respectively, are decent but also imply that other aspects in the classroom influence the development of the emotions assessed.

Discussion

The present study aimed to analyze the effects different types of teacher humor have on the change of student emotions. Four types of teacher humor have shown to be differently associated with students' emotions. IHPT and CVT (Pekrun 2006; Wanzer et al. 2010) provide a theoretical framework for research on teacher humor. However, research on teacher humor

Table 3 Longitudinal multilevel analyses predicting students' emotions

	Enjoyment		Boredom		Anger	
Student level						
Humor unrelated to course content	0.04	(0.04)	0.03	(0.05)	0.01	(0.05)
Self-disparaging humor	0.02	(0.03)	−0.05	(0.04)	−0.05	(0.04)
Humor related to course content	0.03	(0.04)	−0.06	(0.04)	−0.05	(0.05)
Aggressive humor	−0.08*	(0.03)	0.09*	(0.04)	0.21**	(0.04)
Enjoyment/boredom/anger	0.56**	(0.04)	0.41**	(0.04)	0.39**	(0.04)
Classroom level						
Humor unrelated to course content	−0.01	(0.14)	0.18	(0.13)	0.02	(0.12)
Self-disparaging humor	−0.13	(0.10)	0.03	(0.10)	0.02	(0.09)
Humor related to course content	0.50**	(0.07)	−0.48**	(0.07)	−0.38**	(0.07)
Aggressive humor	−0.11	(0.07)	0.01	(0.07)	0.10	(0.06)
Explained within class variance (%)	56		44		33	
Explained between class variance (%)	60		55		44	

Variables were all *z*-standardized, group mean centered on student level and grand mean centered on class level. Standard errors are in parentheses

*$p < .05$; **$p < .001$

and its connection to experienced emotions is at an early stage, and greater detail on how teacher humor types affect the classroom is needed.

Previous studies examined associations of teacher humor types with positive and negative affect (Wanzer et al. 2010) or investigated the effects of humorous tasks on different emotions (Matarazzo et al. 2010), but to the best of our knowledge, no study has yet examined the effects of different teacher humor types on concrete emotions. Thus, with the present study, we were able to surmount some prior restraints in that we examined the changes of different emotions experienced by students regarding their perceptions of teacher humor. The study provides new insight on the effects of teacher humor. Our results also expand the theoretical assumptions made in IHPT (Wanzer et al. 2010) and specify, for the first time, how different teacher humor types affect students' emotions, thereby providing answers to previously unresolved questions.

Overall, the present outcomes replicated, and thus substantiated, the finding that it is necessary to differentiate among teacher humor types, because teacher humor itself does not guarantee positive emotions (Bieg and Dresel 2016). Our longitudinal multilevel analyses demonstrated most of the effects teacher humor is expected to have on student emotions. The study findings supported our first hypothesis by showing that teachers who use more course-related humor weaken the decrease in enjoyment and weaken the increases in boredom and anger students experience over time. This developmental effect expands on previous correlational findings by Bieg et al. (2017) and is remarkable in that it occurs on the classroom level, where students' shared perceptions of the actual learning environment are the source, and as such is considered to be more relevant (Marsh et al. 2012). Regarding the distinction between appropriate and inappropriate teacher humor made by Frymier et al. (2008), course-related teacher humor could be labeled as appropriate, in that students experience more enjoyment and fewer negative emotions. This constellation can boost attention in class and consequently achievement (Muntaner-Mas et al. 2017; Pekrun et al. 2010; Pekrun and Perry 2014).

In our second hypothesis, we assumed that course-unrelated and self-disparaging teacher humor would lead to less boredom in class. Despite correlation analyses depicting a negative relationship between self-disparaging teacher humor and boredom, we found no longitudinal effects either for self-disparaging or course-unrelated teacher humor. Hence, being funny is not a sufficient criterion for reducing negative emotions (Bieg et al. 2017; Wanzer et al. 2010). One explanation could be that boredom is a deactivating negative emotion, and students cope with this emotion by searching for more cognitive activities and tasks that better fit their individual needs (Nett et al. 2011). Apparently, those two teacher humor types do not have the potential to make a lesson more interesting, and their value is not as positive as previously assumed. Personal anecdotes, mistakes related by the teacher, and stories unrelated to course content are not experienced as personally relevant, and students will not feel mentally challenged while listening to them. Consequently, they do not experience less boredom (Bieg et al. 2017).

Our results indicate a negative effect of aggressive teacher humor (less enjoyment, more boredom, and anger) on the individual perceptions of the student (hypothesis 3). Aggressive humor generally targets individual persons and, consequently, the recipient of this aggression develops a negative disposition. This bad mood determines the perception of the learning environment, and everything associated with the lesson is experienced as more monotonous and unpleasant (Steinheider 2014). The majority of school experiences are made in achievement situations. When a teacher uses aggressive humor in such a situation, a student may perceive this as stressful because he cannot respond in a similarly aggressive manner since the

teacher outranks him in the classroom hierarchy, e.g., teacher: "Look at Max, he does not know the answer—what a surprise!"; hence, the student feels that he cannot control the situation (negative control appraisal). The aggrieved student may well focus on anticipated failure and value the task or situation negatively (negative value appraisal), which results in more anger and less enjoyment. Thus, the frequent use of aggressive humor in the classroom could serve to deteriorate the classroom climate (Bieg and Dresel 2018). Furthermore, aggressive teacher humor is evaluated as inappropriate (Wanzer et al. 2006) as it produces task-irrelevant thinking (e.g., anger about the teacher) and may reduce cognitive resources (Pekrun and Perry 2014). To sum up, aggressive humor is perceived as negative, offensive, and not at all amusing by the recipient and leads to anger and boredom. A teacher's goal should be to prevent and reduce negative emotions while providing good instructional quality, so teachers are better off using course-related humor.

Returning to the questions raised in the introduction as to whether all types of teacher humor are effective in the classroom, and the search for theories which give a rationale for the relationships among the different variables (Booth-Butterfield and Wanzer 2016), our findings clearly indicate that only course-related humor is effective, and aggressive humor should definitely be avoided. Although course-unrelated humor and self-disparaging humor have no effects on the assessed emotions, we cannot deem these types as inappropriate per se. However, the use of these humor types is not advantageous for emotional experiences and therefore deserves no further attention when planning lessons. These humor types may impact the teacher-student relationship and may even have the potential to reduce perceived distance between the teacher and students (Bieg and Dresel 2018; Booth-Butterfield and Wanzer 2016). More empirical studies are needed to uncover further details on these humor types.

Limitations and future research directions

The present study is not without limitations. First, the findings rely solely on student self-reports and perceptions. It would be beneficial to add other perspectives, e.g., video-based observations and teacher self-reports. However, in the case of emotions, a self-report is more highly differentiated than other methods, as well as more economical (Pekrun and Bühner 2014). Moreover, when using shared students' perceptions to measure teacher characteristics, the biases associated with teacher self-reports can be avoided (Marsh et al. 2012). The current study measured trait emotions and future studies should employ state measures of the emotions, for example, through experienced sample methods, to reduce recall biases and stereotypical responses on questionnaires (Goetz and Hall 2014). Here, by focusing on trait emotions, we analyzed emotions experienced over a longer period of time. Although the study focused on central emotions in class, it is also limited by the selection of emotions. Even if we account for both positive and negative emotions, students experience a wide variety of emotions in class, e.g., pride, hope or anxiety, and future research should focus on additional emotions and other teaching skills.

A third limitation derives from the design which uses two measurement points which makes it impossible to make concrete statements about the types of changes observed. Nevertheless, the present study is the first one to consider changes in emotional experiences with respect to different teacher humor types. Despite these limitations, the present study can indicate causality and overcomes the restrictions associated with the overwhelming number of one-time correlational studies conducted previously. One further option for future research could be to confirm the results with carefully controlled experimental designs to secure more valid data.

Previous studies showed that emotions are domain-specific (e.g., Goetz et al. 2006), but there is no clear theoretical basis to explain why humor should have different effects in different disciplines (even when humor is be conveyed differently in different disciplines). Other studies have pointed out gender differences in the experience of emotions (Frenzel et al. 2007a). In future studies, it could be interesting to determine whether different teacher humor types have different effects on girls and boys, based on differences in perceived value and perceived control (e.g., Peixoto et al. 2017).

Practical implications and conclusions

The current study provides empirical evidence that the more teachers use course-related humor, the more advantageous the development of students' enjoyment, anger, and boredom should be over time. So, humor related to course content can function as an instruction-optimizing tool to reduce boredom and enhance the interestingness of instruction (Bieg and Dresel 2018). For teachers who want to start using humor in the classroom efficiently, one possibility could be to search for humorous materials like cartoons, video clips (e.g., YouTube), funny pictures, or comics which are related to the course content. Furthermore, when preparing lessons, teachers can create humorous examples or tasks, or plan to use a riddle in their lessons. Even if teachers do not feel comfortable with humor, they could determine in advance how to incorporate different types of humorous materials, exercises, or tasks in their lessons. A more differentiated application of humor is to make up and tell funny stories or personal anecdotes that are related to course content. Teachers can alter with their voices and highlight specific sections with intonations, gestures, or facial expressions or other sorts of nonverbal communication. They can play with language and use witty banter and puns (Booth-Butterfield and Wanzer 2016). Even though humor in the classroom could be enriching, it is also important to note that humor is not an indispensable tool for good instruction. Teachers should not feel forced to use humor but are rather encouraged to try it. This leads us to the question of whether humor is a skill which can be trained and learned. We are aware of professional development courses for college teachers on how to use humor in seminars. However, training should start even earlier in the academic career, for example, at the university level. Student teachers could learn about the theoretical and empirical foundations of humor in seminars and courses. Furthermore, they should be encouraged to practice how to tell a funny story, for example, or how to use various humor-based elements in their lessons. An early start could pave the way to the regular use of course-related humor in the classroom.

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Current themes of research:

Teacher humor and its relation to students' emotion, motivation and instructional characteristics, cross-sectional and longitudinal research.
Student motivation in secondary school and at university—diagnostic, promotion and investigation of the context conditions
Relation of teacher motivation with student emotion

Most relevant publications of all authors in the field of psychology of education:

Bieg, S. & Dresel, M. (2018). Relevance of perceived teacher humor types for instruction and student learning. *Social Psychology of Education*.
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Current themes of research:

Students' Achievement Motivation and its changes
Self-Regulated Learning with a special focus on learning from errors
Gifted Education

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Current themes of research:

Self-regulated learning
Teachers' goal orientations
Procrastination as a risk factor for abortion of study

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