Humor as a magic bullet? Associations of different teacher humor types with student emotions

Sonja Bieg, Robert Grassinger, Markus Dresel

Angaben zur Veröffentlichung / Publication details:

Bieg, Sonja, Robert Grassinger, and Markus Dresel. 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/10.1016/j.lindif.2017.04.008.

Humor as a magic bullet? Associations of different teacher humor types with student emotions

Sonja Bieg*, Robert Grassinger, & Markus Dresel

University of Augsburg, Universitaetsstraße 10, 86135 Augsburg, Germany

1. Introduction

In recent years, research on student emotions with regard to teacher behavior has expanded (e.g. Keller, Hoy, Goetz, & Frenzel, 2015; Kunter, Frenzel, Nagy, Baumert, & Pekrun, 2011). There is no doubt that emotions are relevant for education and central to academic achievement as well as students' personality development. Thus, it is surprising that the impact learning environments have on students' emotions is largely unexplored (Boekaerts & Pekrun, 2016). Nevertheless, in the relevant literature it is generally assumed that humor plays a central role in everyday teaching and has positive effects on the learning environment (Banas, Dunbar, Rodriguez, & Liu, 2011; Perrez, Huber, & Geissler, 2001) – assertions made in humor literature could even lead to the idea that humor functions as a magic bullet in instructional settings. However, current research lacks systematic examination of the relations between teacher humor and student achievement emotions, especially given that there are different types of teacher humor (e.g., Bieg & Dresel, 2016; Wanzer, Frymier, & Irwin, 2010). By conducting two studies at upper track secondary schools in Germany, this paper addresses the connection between different teacher humor types and achievement emotions (enjoyment, boredom, anxiety and anger) reported by students, both on the individual level as well on the aggregate classroom level, and thus has the potential to extend the current state of research concerning the role that humor can play in teaching.

1.1. Achievement emotions

In class, teachers provoke a range of achievement emotions related to teaching, interacting with students, and judging student activities. Thus, in the school context different achievement emotions such as enjoyment, pride, anger, anxiety or boredom can arise. Pekrun (2006) defined achievement emotions as emotions tied directly to achievement activities (like studying) or achievement outcomes (success and failure), therefore these emotions can be segregated into activity and outcome emotions. Emotions can be grouped according to their valence (positive vs. negative), and to the degree of activation (activating vs. deactivating). Pekrun's (2006) Control-Value Theory (CVT) of emotions provides a broad framework to explain students' emotions. CVT comprises assumptions of the transactional stress model (Lazarus & Folkman, 1984), expectancy-value approaches (Turner & Schallert, 2001) and attributional theories (Weiner, 1985), and can therefore explain a large variety of emotions. According to CVT, emotions[1] arise when an individual is in or out of control of actions and outcomes (subjective control appraisals), and

* Corresponding author.
E-mail addresses: sonja.bieg@phil.uni-augsburg.de (S. Bieg), robert.grassinger@phil.uni-augsburg.de (R. Grassinger), markus.dresel@phil.uni-augsburg.de (M. Dresel).

[1] In the present paper we focus in general on achievement emotions and simply refer to them as emotions hereafter.

actions and outcomes are subjectively valued as more or less important and personally relevant (subjective value appraisals). CVT assumes that anxiety will arise when an individual feels uncertain about having control over subjectively important tasks and the focus is on anticipated failure. Regarding enjoyment, it is assumed that this activity emotion results from a combination of positive competence appraisals (the activity can be controlled by the self) and positive appraisals of the intrinsic value of an action (pleasant activities). Anger arises when an activity seems to be controlled by others and is negatively valued (e.g. necessary effort is experienced as aversive) or when success or failure is dependent on other persons. With respect to boredom, the assumption is that this negative activity emotion will be experienced when the activity itself lacks importance or subjective value.

CVT further assumes that characteristics of the social learning environment—including the communicative behaviors of teachers—provide information related to controllability and values, which in turn are important for student emotions (Pekrun, 2006). In previous research it was found that teachers' own enjoyment and enthusiasm, interpreted as indicators of a positive value, were related positively to students' enjoyment (Frenzel, Goetz, Lüdtke, Pekrun, & Sutton, 2009). Given that teacher humor shows a conceptual proximity to teacher enthusiasm (Dresel et al., 2014) it could be expected that teacher humor embedded in social learning environments delivers information related to controllability and academic values, and therefore is important for students' emotions.

1.2. Teacher humor

Humor is defined as the intentional use of verbal and non-verbal communication that tends to result in laughter and joy and involves the communication of incongruous meanings that are somewhat amusing (Booth-Butterfield & Booth-Butterfield, 1991; Martin, 2007). Humor as a multidimensional concept has also proven to be useful when considering teacher humor (Bieg & Dresel, 2016; Frymier, Wanzer, & Wojtaszczyk, 2008; Martin, Puhlik-Doris, Larsen, Gray, & Weir, 2003; Wanzer, Frymier, Wojtaszczyk, & Smith, 2006). Studies with college students published by Wanzer et al. (2006) and Frymier et al. (2008), who explored the perceptions of appropriate and inappropriate teacher humor types, found five different dimensions (related and unrelated humor, other disparaging and self-disparaging humor and offensive humor), the work by Bieg and Dresel (2016) extended this research to secondary schools. Their empirical research with adolescents indicated four teacher humor types: first, teacher humor unrelated to course content with no thematic connection to the current class topic; second, self-disparaging teacher humor in which the teacher does or says amusing things about him/herself; third, teacher humor related to course content, meaning the teacher uses humor to explain or display specific current topics; and fourth, aggressive teacher humor which, comparable to the other-disparaging humor and offensive humor types found by Wanzer et al. (2006) and Frymier et al. (2008), denigrates or ridicules students. Humor related to course content is viewed as appropriate because this humor can help students to relate to the material and to recall and elaborate on the learning content – and thus to control the learning tasks (Wanzer et al., 2006). Teacher humor unrelated to course content or self-disparaging teacher humor can help to promote a positive teacher-student relationship or generate a positive classroom climate, and thus is also viewed as appropriate humor (Frymier et al., 2008; Wanzer et al., 2006). Aggressive teacher humor is viewed as inappropriate because it violates social and classroom norms and expectations and therefore provokes anger or sadness (Bieg & Dresel, 2016; Martin et al., 2003; Wanzer et al., 2006).

A helpful theoretical model to explain how teacher humor works in class is the Instructional Humor Processing Theory (IHPT; Wanzer et al., 2010). The IHPT is an integrative theory that draws from incongruity-resolution, disposition theory (Berlyne, 1960; LaFave, Haddad, & Maesen, 1996), and the elaboration likelihood model of persuasion (ELM, Petty & Cacioppo, 1986). According to IHPT students first have to recognize incongruity in a teacher's verbal or nonverbal behavior and then have to resolve or interpret it. Incongruity theory postulates that a surprising or contrasting element is crucial for humor (Berlyne, 1960). When something happens that is inconsistent with one's own expectations an incongruity arises which may be perceived as humorous. If a student does not resolve the incongruity, he/she will not get the humor and may be confused by the teacher's message. After resolving the incongruity, students may perceive the message as humorous and further evaluate this as either positive or negative. The central assumption of the disposition theory, on which the IHPT is also based, specifies that this evaluation depends on the target of the joke. If the humor targets individuals liked by the recipient it will not be perceived as funny and valued as negative in contrast to humor that targets individuals who are disliked (Frymier et al., 2008; Zillmann & Cantor, 1996). In this sense appropriate humor types should be valued positively while aggressive humor should be valued negatively. Thus, the presence of humor can directly affect the appraisals that underlie the humorous message. This positive affect generated by appropriate humor can motivate students to engage in elaboration. IHPT further postulates that students have to be motivated and must have the ability to process the instructional messages in order to benefit from the increased attention generated by teacher humor (Gorham & Christophel, 1990; Neuliep, 1991; Wanzer et al., 2010). Here ELM emphasizes two possible routes when receiving a message—central and peripheral—individuals who are following the central route pay attention to the message arguments, elaborate on them and cognitive changes occur (Petty & Cacioppo, 1986). If teacher humor is related to the course content it may enhance a student's ability to process and, consequently, to elaborate on and understand the learning material. When a teacher uses humor in instruction, students may pay more attention because the incongruity must be resolved (Wanzer et al., 2010). In summary, IHPT and CVT of emotions provide explanations as to why certain teacher humor types affect student learning positively or negatively, and the variability in student perceptions of the appropriateness of teacher humor (Wanzer et al., 2010).

1.3. Teacher humor and student emotions

Some evidence for the relationship between humorous tasks and material and student emotions has already surfaced in research. Humorous tasks and material can impact emotions in that they promote positive affect and reduce negative affect (e.g., Cann, Calhoun, & Nance, 2000). Furthermore, humorous stimuli fulfill a protective function against the negative effects of anxiety (Cann et al., 2000). Specifically, humor is said to create a positive affect that is incompatible with anxiety (Ford, Ford, Boxer, & Armstrong, 2012). Ford et al. (2012) set out to determine if humorous material prior to a difficult math test does indeed inhibit anxiety. The experiment revealed that participants in the humorous condition performed better on the math test and reported less anxiety than participants in a neutral condition. Matarazzo, Durik, and Delaney (2010) also conducted experiments with humorous tasks to test the effects of humor on task interest, and investigated whether humor can reduce negative emotions and increase positive emotions. No main effects were found regarding humorous tasks predicting happiness or anxiety, but an interaction effect revealed that the humorous tasks led to lower anger for individuals with low interest.

Apart from these experimental studies on humorous task material, researchers have found that by using teacher humor the learning environment is perceived as more enjoyable (Stuart & Rosenfeld, 1994; Torok, McMorris, & Lin, 2004; Wanzer & Frymier, 1999; Wanzer et al., 2010; Ziv, 1979). Further it was determined that self-disparaging teacher humor is related to less anxiety in students (Bryant & Zillmann, 1989; Cornett, 1986; Neuliep, 1991; Torok et al., 2004; Wanzer et al., 2010). When teachers can laugh about their own mistakes they demonstrate that mistakes are natural and thus students may feel less anxious (Bryant & Zillmann, 1989). In contrast, aggressive teacher humor can create an uncomfortable learning environment and is negatively related

Table 1
Teacher humor types, assumptions regarding their value and control appraisals, and their postulated effects on achievement emotions.
(Refer to Pekrun, 2006, for linking specific appraisals with specific emotions).

Teacher humor type	Assumed appraisals		Postulated effects on emotions			
	Value	Control	Enjoyment	Boredom	Anxiety	Anger
Unrelated to course content	Positive	Irrelevant	No	Less	No	No
Self-disparaging	Positive	Irrelevant	No	Less	No	No
Related to course content	Positive	High	More	Less	Less	Less
Aggressive	Negative	Other	Less	More	More	More

to the popularity of the subject (Banas et al., 2011; Gorham & Christophel, 1990; Stuart & Rosenfeld, 1994; Torok et al., 2004).

Previous studies have illustrated that there are relationships between teacher humor and students' emotions but both a theoretical explanation and more differentiated analysis of these associations is still pending. Relying on CVT's assumptions regarding the emotional consequences of different appraisals (Pekrun, 2006), we specified controllability and value appraisals of the four different teacher humor types and made specific theoretical predictions for potential links between teacher humor and students' emotions (Table 1). We assumed that all appropriate teacher humor types have positive value appraisals and aggressive humor as an inappropriate teacher humor type has a negative value appraisal. We further assumed that control appraisals of unrelated and self-disparaging humor are irrelevant for emotions as these humor types are not related to achievement activities or achievement outcomes per se. In contrast, humor related to course content and aggressive humor (as a perceived consequence of achievement behavior) are more related to achievement activities or achievement outcomes. Humor related to course content supports control appraisals because this humor type raises attention on the learning material and the elaboration on and understanding of the learning task (Wanzer et al., 2006). For aggressive humor we assumed control appraisals whereby the teacher is the source of control (control by others) and the outcome is caused by the teacher and external circumstances. When aggressive humor is perceived, success or failure is caused by other persons as the teacher uses this humor type to disparage others. Following these assumed appraisals, we predicted that teacher humor that is related to course content enhances the experience of enjoyment and reduces the experience of boredom, anxiety and anger. On the other hand, we predicted that aggressive teacher humor elicits the opposite pattern, i.e. reduces enjoyment and raises boredom, anxiety and anger. Finally, we predicted that students' experiences of boredom are reduced by self-disparaging and content-unrelated humor, but that these teacher humor types are not capable of fostering the experience of enjoyment or of reducing anxiety and anger.

1.4. Hypotheses

Concerning the relations between humorous tasks and negative emotions, especially anxiety, and the relations of some teacher humor types with a negative or positive learning environment, some empirical indications already exist. But to the best of our knowledge research systematically investigating the relationships between different distinguishable teacher humor types and concrete negative and positive emotions among students has yet to be conducted. However, considering prior results, it becomes obvious that a differentiation between teacher humor types and their relations to emotions is necessary to overcome a limited understanding of the use of teacher humor in the classroom. Students perceive different emotions in class and, in particular, negative emotions are related to poor performance (Frenzel, Pekrun, & Goetz, 2009; Goetz, 2004; Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). Knowing how different teacher humor types are related to student emotions would take us a step forward in creating an optimal learning environment and promoting a competent use of humor. Thus, our primary aim is to examine the associations between the four documented teacher humor types (related to course content, unrelated to course content, self-disparaging, and aggressive) and positive and negative student emotions in classrooms. Accordingly, in the current studies, we test the following hypotheses:

Hypothesis 1. Based on our theoretical considerations (see Table 1) we hypothesize that appropriate teacher humor types show different associations with student emotions. Specifically, humor unrelated to course content and self-disparaging humor are assumed to be negatively associated with the negative emotion boredom. Humor related to course content is assumed to show positive associations with enjoyment and negative associations with the negative emotions boredom, anxiety and anger.

Hypothesis 2. Inappropriate aggressive humor is assumed to be positively associated with the negative emotions anxiety, boredom, and anger and negatively associated with the positive emotion enjoyment (Table 1).

2. The present research

The present research combines two complementary studies. Study 1 sought to fill the research gaps addressed above by using a cross-sectional questionnaire study with students enrolled in German (as a native language) classes at upper track secondary schools to examine the described associations. We used students' perceptions, as they can report best on their own perceived emotions (Pekrun & Bühner, 2014). We also used students' perceptions of teacher humor types to overcome a self-serving bias typical for teacher self-reports (Wubbels, Brekelmans, & Hooymayers, 1992). Student evaluations are expected to be valid when the rating of the teacher behavior does not afford a special didactical knowledge, which is the case for teacher humor. To do so, we examined the emotions enjoyment, boredom, and anxiety because they are experienced quite often in school and are closely related to learning processes and their outcomes (Goetz, Frenzel, & Pekrun, 2007; Goetz & Nett, 2012; Nett, Goetz, & Hall, 2011). Since emotions are perceived differently depending on the school subject (Goetz, Frenzel, Pekrun, & Hall, 2006), Study 2 complements Study 1 by additionally examining the school subjects English (as a foreign language), mathematics and history, and the additional emotion of anger. In Study 1 we chose to examine humor in German (native language) classes, as humor here encompasses aspects of language play in terms of words and meanings, creating fictional words, and playing with pragmatics (e.g. ironic comments; Cook, 2000; Petraki & Nguyen, 2016). In our opinion, the subject of German is well suited for a preliminary study to examine associations of different humor types. Study 2 considers the subject of English as a foreign language as there are also opportunities here for language play which target vocabulary, grammar and pronunciation (Sterling & Loewen, 2015). Since mathematics and history are not as inherently language-based as German (as a native language) or English (as a foreign language), examining humor in those subjects will build contrasts and extend our research and its validity.

Table 2
Study 1 descriptive statistics, reliability estimates and bivariate correlations.

Variable	*M*	*SD*	α	ICC	Correlations					
					1	2	3	4	5	6
Teacher humor										
1. Unrelated to course content	1.64	0.73	0.82	0.29**	–					
2. Self-disparaging	1.92	0.83	0.81	0.25**	0.37**	–				
3. Related to course content	2.36	0.93	0.93	0.47**	0.37**	0.50**	–			
4. Aggressive	1.63	0.83	0.84	0.30**	0.35**	0.14**	0.11**	–		
Student emotions										
5. Enjoyment	3.04	1.21	0.87	0.16**	0.03	0.22**	0.43**	− 0.11**	–	
6. Boredom	3.27	1.31	0.86	0.14**	0.00	− 0.16**	− 0.38**	0.13**	− 0.72**	–
7. Anxiety	1.95	0.86	0.74	0.08**	− 0.02	− 0.05	− 0.05	0.11**	− 0.29**	0.26**

Note. n = 985 from 45 classrooms. ICC = intra-class-correlation.
** $p < 0.01$.

When analyzing students' perceptions of teacher humor in the current studies, it is necessary to consider the nested data structure. In general, student perceptions stem from two sources, the actual conditions in the learning environment on one hand (bottom-up information processing), and personal factors such as prior experiences and prior knowledge leading to potentially biased perceptions on the other hand (top-down information processing). Therefore, we need to differentiate between shared perceptions as classroom-level indicators for the actual environmental conditions (operationalized by the aggregate of all students in a classroom), and more or less divergent perceptions by the individual students as student-level indicators for subjective perceptual deviations from the shared perception (operationalized by the difference between the classroom average and the individual perception; Marsh et al., 2012). Both perceptual components are relevant for our assumptions. The student-level is important because emotion as a self-system construct is predominantly a student-level construct, and we are interested in individual student differences. Furthermore, as teacher humor is a classroom variable it should be analyzed on the classroom-level in order to prevent a series of incorrect conclusions (Marsh et al., 2012; Martin, Bobis, Anderson, Way, & Vellar, 2011). Therefore we analyzed our hypotheses by using multi-level regression models with shared (aggregated) perceptions of the four different teacher humor types as classroom-level predictors and individual perceptions of them as student-level predictors of positive and negative student emotions. To aggregate the data, the individual student data from a single class are used to develop mean scores for the variables as they relate to each class (Heck, 2001).

3. Study 1

3.1. Participants and procedure

A total of 985 students participated in the questionnaire study: 509 ninth graders and 476 tenth graders from 45 German classes at 12 upper track secondary schools in Germany with an average number of 20 students in each class. Participants' ages ranged from 13 to 19 years with a mean of 16.0 years (SD = 0.85) and 47% were female. Eight percent of the students had an immigrant background; for 4% of the students, the primary language spoken at home was not German. Schools were randomly selected in three German states (Bavaria, Baden-Wuerttemberg, and Thuringia). The students were recruited in intact classes, during their German class, and filled out their questionnaires individually. The German teacher was not in the room at the time. All schools took on the responsibility of informing the students' parents regarding the use of data and voluntary participation. We had a written parental agreement for the adolescents and all students took part voluntarily. Adolescents whose parents did not give permission were excluded from the data collection. Written approval was obtained from the responsible ministries of education.

3.2. Measures

3.2.1. Teacher humor

Students' perceptions of teacher humor were assessed with a measure developed by Bieg and Dresel (2016), which is based on a questionnaire assessing the appropriateness of humor among university teachers developed by Frymier et al. (2008). Teacher humor unrelated to course content was assessed with three items (sample item: “Our German teacher tells jokes unrelated to course content”), self-disparaging teacher humor with four items (“Our German teacher makes fun of himself in class”), teacher humor related to course content with six items (“Our German teacher uses humor related to course material”), and aggressive teacher humor with four items (“Our German teacher teases students in class about their intelligence”), see the complete scale in the Appendix A. All items were rated on Likert type scales, ranging from 1 (*never*) to 5 (*very often*). Means, standard deviations, ICCs and reliabilities are shown in Table 2. The four-factor structure and the criterion validity of the scale were already confirmed in earlier work using confirmatory approaches (Bieg & Dresel, 2016). Here, with respect to the convergent validity, course-related and self-disparaging teacher humor showed moderate positive relations with teacher enthusiasm and the interestingness of instruction whereas aggressive teacher humor indicated negative associations. With respect to discriminant validity, the scales revealed only small or no correlations with the humor orientation of the students and their self-efficacy in prior work. All four scales used to assess the different teacher humor types showed also good reliabilities in previous research studies (α = 0.81 to 0.93 in Bieg & Dresel, 2016; α = 0.79 to 0.86 in Wanzer et al., 2010).

3.2.2. Student emotions

All measures of emotions were adapted from the original version of the Achievement Emotions Questionnaire – Mathematics (AEQ-M; Pekrun, Goetz, & Frenzel, 2006). The AEQ-M underlies a multicomponent definition of emotion (Shuman & Scherer, 2014) and its items pertain to the affective, cognitive, expressive, and motivational components of emotion. It is a self-report instrument designed to assess students' achievement emotions experienced in different domains and is appropriate for students in grades 5 to 10 (Frenzel, Thrash, Pekrun, & Goetz, 2007; Goetz, Frenzel, et al., 2006). The items on the scales used refer to emotional experiences in situations while attending class. Previous reliabilities for the emotion scales applied in scholastic domains (mathematics, physics, German and English) ranged from α = 0.73 (anger/German) to α = 0.90 (enjoyment/mathematics; Goetz, Cronjaeger, Frenzel, Lüdtke, & Hall, 2010), reliabilities for the assessment of mathematics emotions ranged from α = 0.87 (boredom) to α = 0.90 (enjoyment; Frenzel, Pekrun, & Goetz, 2007). The emotions assessed are related to students' learning processes (e.g. Goetz, Pekrun, Hall, & Haag, 2006) and have also proven to correlate to social feedback, teachers' instructional behavior and classroom social climate

(Frenzel, Pekrun, & Goetz, 2007; Frenzel, Goetz, et al., 2009). Each emotion was assessed using the class-related scales on which students report how they feel in class with three items. *Enjoyment* refers to the enjoyment students may experience before and during class ("I look forward to my German class", "I enjoy my German class", "I enjoy my German class so much that I am strongly motivated to participate"). *Boredom* refers to boredom experienced during the class ("I think the German class is boring", "I can't concentrate because I am so bored", "I am so bored that I can't stay awake"). *Anxiety* items refer to feelings student may experience before class and during class ("When thinking about my German class, I get nervous", "I am tense and nervous in my German class", "I worry if the material in German class is much too difficult for me"). All items were presented with Likert type scales, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Means, standard deviations, ICCs, and reliabilities are shown in Table 2.

3.3. Analyses

To test our hypotheses that different teacher humor types are related to students' emotions, we ran a set of two-level regression models in which the four teacher humor types on the classroom- and student-level predicted student emotions. We conducted multilevel regression models with HLM 7.0 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) with regard to the hierarchical structure of the data. ICCs were calculated to report the proportion of total variance that can be attributed to between-class differences (Luedtke, Trautwein, Kunter, & Baumert, 2007). Our analyses addressed individual student perceptions at the student-level, and students' shared perceptions of the shared learning environment at the classroom-level. Shared perceptions at the classroom-level were aggregated by averaging all pertaining student perceptions (the average of all student perceptions is the most valid and reliable operationalization). Individual perceptions of teacher humor types at the student-level were group-mean centered, which is the most appropriate approach when both classroom- and student-level effects are simultaneously tested. A group-mean centered variable shows how the score of an individual student deviates from the average score of the class (MacKinnon, 2008). Perceptions of teacher humor types on the classroom-level were grand-mean centered. Grand-mean centering determines the deviation of the class-mean from the overall sample mean, which makes the interpretation of the regression weights easier. We specified random intercept models because, theoretically, the intercept coefficients can vary across classes (Hox, 2010). We *z*-standardized all criterion and predictor variables prior to analyses (predictors separately on both, the student- and the classroom level) – consequently, the regression coefficients of the multilevel analyses can be interpreted in a manner similar to the standardized regression coefficients of ordinary least square regression.

Level 1 (students):

$$\begin{aligned}&\text{Emotion (of individual } i \text{ in class } j) = \beta_{0j}\\&+ \beta_{1j} * (\text{individually perceived course-unrelated humor }_{ij})\\&+ \beta_{2j} * (\text{individually perceived self-disparaging humor }_{ij})\\&+ \beta_{3j} * (\text{individually perceived course-related humor }_{ij})\\&+ \beta_{4j} * (\text{individually perceived aggressive humor }_{ij}) + r_{ij}\end{aligned}$$

Level 2 (classrooms):

$$\begin{aligned}&\beta_{0j} = \gamma_{00}\\&+ \gamma_{01}\\&* (\text{aggregated perceptions of course-unrelated humor }_{j})\\&+ \gamma_{02} * (\text{aggregated perceptions of self-disparaging humor }_{j})\\&+ \gamma_{03} * (\text{aggregated perceptions of course-related humor }_{j})\\&+ \gamma_{04} * (\text{aggregated perceptions of aggressive humor }_{j}) + u_{0j}\\&\beta_{1j} = \gamma_{10}\\&\beta_{2j} = \gamma_{20}\\&\beta_{3j} = \gamma_{30}\\&\beta_{4j} = \gamma_{40}\end{aligned}$$

Missing data (no single item > 5%) were imputed using the expectation maximization algorithm in SPSS (Peugh & Enders, 2004). This approach enables a direct estimation of the model with consideration to all students with missing data, reducing the risk of distorted parameter estimation (Robitzsch & Rupp, 2009).

3.4. Results and summary

Table 2 presents the descriptive statistics for the study variables. As seen, teacher humor types and student emotions were significantly intercorrelated. Bivariate correlations showed weak to moderate positive correlations between enjoyment, course-related teacher humor and self-disparaging, and a weak negative correlation with aggressive humor. Boredom was negatively correlated with course-related teacher humor and self-disparaging teacher humor, and revealed a weak positive correlation with aggressive teacher humor. Anxiety indicated only a weak positive correlation with aggressive teacher humor. ICC values of all teacher humor types were between 0.25 and 0.47, indicating substantial variance in the ratings of teacher humor across classes relative to differences between students within a class. Specifically, the between-classroom variance of course-related humor (ICC = 0.47) is rather high, indicating that there are substantial differences among teachers. ICCs for enjoyment, boredom, and anxiety were between 8% and 16%, indicating a smaller, albeit substantial, proportion of total variance in student emotions between classes. On the descriptive level course-related humor was perceived most frequently by the students, and aggressive humor was perceived the least. Among the emotions assessed, boredom was accounted for most frequently and anxiety the least.

As shown in Table 3, the two-level regression models indicated that different teacher humor types affected student emotions differently. Teacher humor related to course content was significantly associated with individually reported enjoyment and boredom on the student-level. The more the students perceived teacher humor related to course content, the more they reported enjoyment, and the less they reported boredom. Humor unrelated to course content and self-disparaging humor was not at all a predictor on the student-level. Furthermore, aggressive teacher humor was significantly related to individually reported enjoyment, boredom, and anxiety. The students reported less enjoyment, more boredom and more anxiety when the perceived teacher humor was aggressive. Equivalent to the results on the student-level, shared perceptions of humor related to course content was a positive predictor of enjoyment and a negative predictor of boredom among students across classes. Moreover, shared perception of course-unrelated humor was a predictor of enjoyment and boredom in class. Explicitly, the higher the average perception of course-unrelated humor, the lower the average enjoyment and the higher the average boredom across classes. Within classes, between 1% and 20% of the variance between students could be explained for anxiety, boredom, and enjoyment, respectively. Between classes, even more substantial proportions of between-class variances could be explained: 10% for anxiety, 41% for boredom, and 42% for enjoyment. So it can be concluded that humor related to course content and aggressive humor are important predictors of enjoyment and boredom.

In summary, the results of Study 1 reflected the study expectations in which different teacher humor types have distinct associations with the emotions reported by students. The results concerning humor related to course content and aggressive humor supported our hypotheses and, as assumed, we did not find a general positive association for all of the appropriate humor types (course-unrelated humor and self-disparaging humor) regarding student emotions. Surprisingly, course-unrelated teacher humor showed entirely contradictory associations. This humor type comprises aspects such as telling jokes or funny stories which are not connected to course content. Apparently students in class perceive this type of humor as an unproductive use of learning time which does not

Table 3
Study 1 two-level prediction of student emotions from students' perceptions of teacher humor.

	Enjoyment	Boredom	Anxiety
Classroom-level			
Humor unrelated to course content	− 0.15** (0.06)	0.19** (0.06)	0.00 (0.04)
Self-disparaging humor	0.04 (0.06)	− 0.01 (0.06)	− 0.07 (0.08)
Humor related to course content	0.36** (0.07)	− 0.37** (0.06)	− 0.06 (0.09)
Aggressive humor	− 0.04 (0.04)	− 0.01 (0.05)	0.09 (0.05)
Student-level			
Humor unrelated to course content	− 0.07 (0.04)	0.05 (0.04)	− 0.02 (0.04)
Self-disparaging humor	0.05 (0.04)	− 0.02 (0.04)	0.00 (0.04)
Humor related to course content	0.44* (0.05)	− 0.39** (0.04)	0.02 (0.05)
Aggressive humor	− 0.16* (0.04)	0.22** (0.04)	0.09* (0.04)
R^2_{Between}	0.42	0.41	0.10
R^2_{Within}	0.20	0.19	0.01

Note. $n = 985$ from 45 classrooms. All variables were *z*-standardized prior to analyses. Predictors on classroom-level were grand-mean centered and predictors on student-level were group-mean centered. Presented are regression coefficients β. Standard errors are in parentheses.
** $p < 0.01$.
* $p < 0.05$.

support methodological diversity. The opinion of teachers supports this view as they also report that humor (jokes and funny stories) should be related to the lesson, otherwise humor is seen as a waste of valuable learning time (Petraki & Nguyen, 2016) and does not seem important. This could also explain the positive connection to reported boredom (Lohrmann, 2008) and the negative connection to reported enjoyment. As anticipated we found that aggressive teacher humor seems to be counter-productive, particularly in the eyes of the individual student.

4. Study 2

A limitation of our first study was that the investigation of teacher humor types and student emotions was related to a single subject – German as a native language. A further limitation was the consideration of older students, namely ninth and tenth graders. The second study therefore expanded on the first study by investigating further school subjects (English as a foreign language, mathematics, and history) with the understanding that emotions are considered to be domain specific and should be examined domain-specifically (Goetz, Frenzel, et al., 2006). We also investigated anger, in addition to the emotions assessed in Study 1, as anger is a familiar negative emotion that often surfaces in scholastic-settings. With the second study we aimed to replicate the associations found in Study 1.

4.1. Participants and procedure

A total of 774 students (48% female) participated in the online questionnaire study: 183 fifth graders (eight classes), 239 sixth graders (ten classes), 109 seventh graders (four classes), 156 eighth graders (seven classes) and 87 ninth graders (four classes) from a total of 33 classes with an average number of 19 students per class from three randomly selected upper track secondary schools in the German state of Bavaria. The participation rate was 98%. Participant ages ranged from eight to 16 with a mean of 11.8 years (SD = 1.52). Forty-four percent (340 students) were assessed in the context of English classes (fifth and eighth grades), 42% (325 students) were assessed in the context of mathematics classes (sixth and seventh grades), and 14% (109 students) were assessed in the context of history classes (seventh grade). The students were recruited in intact classes during their regular class time and completed the online questionnaires individually, each with their own computer. All schools informed the students' parents regarding the use of data and voluntary participation. A written parental agreement was obtained for each student and all students took part voluntarily. Adolescents whose parents did not give permission were excluded from the data collection. Written approval was obtained from the responsible ministry of education.

4.2. Measures

The same instruments applied in Study 1 were used to assess teacher humor types (Bieg & Dresel, 2016) and emotions (adapted version of AEQ-M, Pekrun et al., 2006). All measurements were operationalized with respect to the subjects of English, mathematics or history. We additionally assessed *anger* with four AEQ-M items referring to anger experienced during the class (e.g. “I am annoyed during my [DOMAIN] class”, “I am so angry during my [DOMAIN] class that I would like to leave”, “I get angry because the material in [DOMAIN] is so difficult”, “I get irritated by my [DOMAIN] class”). All items were presented with Likert type scales, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Means, standard deviations, ICCs, and reliabilities are shown in Table 4.

4.3. Analyses

We conducted analyses similar to those described in Study 1. In order to control for subject differences in emotions (Goetz, Frenzel, et al., 2006), we included the subjects as dummy variables on the classroom-level in our regression equation (English as the reference subject). Again, all variables were z-standardized, thus regression weights can be interpreted in terms similar to standardized weights. The specific emotion was the dependent variable, individual perceptions of all teacher humor types were predictors on the student-level and shared perceptions of all teacher humor types and the different subjects were introduced at the classroom-level. Consequently, the corresponding level 1 and level 2 equations were as follows:

Level 1:

$$\begin{aligned}\text{Emotion (of individual } i \text{ in class } j) &= \beta_{0j} \\ &+ \beta_{1j} * (\text{individually perceived course-unrelated humor}_{ij}) \\ &+ \beta_{2j} * (\text{individually perceived self-disparaging humor}_{ij}) \\ &+ \beta_{3j} * (\text{individually perceived course-related humor}_{ij}) \\ &+ \beta_{4j} * (\text{individually perceived aggressive humor}_{ij}) + r_{ij}\end{aligned}$$

Level 2:

$$\begin{aligned}\beta_{0j} &= \gamma_{00} \\ &+ \gamma_{01} * (\text{aggregated perceptions of course-unrelated humor}_{j}) \\ &+ \gamma_{02} * (\text{aggregated perceptions of self-disparaging humor}_{j}) \\ &+ \gamma_{03} * (\text{aggregated perceptions of course-related humor}_{j}) \\ &+ \gamma_{04} * (\text{aggregated perceptions of aggressive humor}_{j}) \\ &+ \gamma_{05} * (\text{dummy mathematics}) + \gamma_{06} * (\text{dummy history}) + u_{0j} \\ \beta_{1j} &= \gamma_{10} \\ \beta_{2j} &= \gamma_{20}\end{aligned}$$

Table 4
Study 2 descriptive statistics, reliability estimates and bivariate correlations.

Variable	*M*	*SD*	α	ICC	Correlations						
					1	2	3	4	5	6	7
Teacher humor											
1. Unrelated to course content	1.48	0.70	0.82	0.07*	–						
2. Self-disparaging	1.68	0.77	0.81	0.06*	0.35**	–					
3. Related to course content	2.66	1.11	0.94	0.27*	0.15**	0.31**	–				
4. Aggressive	1.39	0.84	0.91	0.18*	0.37**	0.25**	− 0.18**	–			
Student emotions											
5. Enjoyment	3.26	1.12	0.91	0.15*	0.00	0.12**	0.48**	− 0.25**	–		
6. Boredom	2.03	1.03	0.88	0.16*	0.09*	− 0.02	− 0.34**	0.34**	− 0.62**	–	
7. Anxiety	1.94	0.93	0.75	0.06*	0.12**	0.06	− 0.15**	0.29**	− 0.43**	0.45**	–
8. Anger	1.90	0.94	0.86	0.16*	0.08*	− 0.01	− 0.32**	0.35**	− 0.59**	0.71**	0.55**

Note. $n = 731$ from 33 classrooms. ICC = intra-class-correlation.
** $p < 0.01$.
* $p < 0.05$.

$\beta_{3j} = \gamma_{30}$
$\beta_{4j} = \gamma_{40}$

4.4. Results and summary

Akin to the first study, ICCs point towards a substantial proportion of variance in teacher humor between classes (ICC = 0.06–0.27) even though the proportions of variance are somewhat lower than in Study 1 (Table 4). ICC coefficients of the emotions enjoyment, boredom, anxiety, and anger indicate that between 6% and 16% of the variances in student ratings was between classes, which is similar to the variance proportions observed in Study 1. Consistent with Study 1, students reported humor related to course content most frequently, and aggressive teacher humor was reported the least. Regarding emotions, enjoyment was most frequently reported by the students and anger the least. The correlational patterns found for enjoyment and boredom with teacher humor types were similar to those found in Study 1. Anxiety showed a slight discrepancy with Study 1 as a small positive correlation with course-unrelated humor and a small negative correlation with course-related humor was indicated. Finally, anger revealed a small positive correlation with course-unrelated humor, a moderate positive correlation with aggressive humor, and a moderate negative correlation with course-related humor.

As shown in Table 5, the two-level regression models again indicated that different teacher humor types were associated differently to the various emotions of students. Consistent with the hypotheses and the results of the first study, we found on the student-level that humor related to course content predicted enjoyment positively and boredom negatively. Furthermore, the more the students perceived course-related teacher humor, the less they reported anxiety and anger. The results for aggressive humor were also consistent with the assumptions and the results of Study 1. The more the students perceived aggressive humor, the more anger they reported. In contrast to Study 1, course-unrelated humor was a positive predictor of reported anxiety on the student-level.

Almost consistent with findings in Study 1, we found significant negative associations between humor related to course content on the classroom-level with boredom ($p = 0.03$) and anger ($p = 0.06$), the latter at the 10%-level of significance. Whereas the individual student perception of teacher humor unrelated to course content predicted anxiety positively, this prediction was negative at the classroom-level. Self-disparaging humor at the classroom-level was a significant positive predictor of enjoyment. Explicitly, across classes, the higher the average perceived self-disparaging teacher humor, the higher the average enjoyment. The results for aggressive humor were consistent with those from Study 1 and indicated that aggressive humor was a significant predictor of all assessed emotions, implying the higher the average perceived aggressive teacher humor, the higher the average reported boredom, anxiety and anger across classes, but the lower the average reported enjoyment.

School subjects were also associated with the average levels of emotions across classes. Mathematics was associated with lower average enjoyment and higher average boredom whereas history was associated with less average anxiety.[2]

Summing up, the associations found in the second study were similar to the findings from Study 1 in several ways. In line with Study 1, we found that the results of course-related humor supported our assumptions, positively predicting enjoyment and negatively predicting negative emotions. The results for humor unrelated to course content were again quite heterogeneous. In trying to explain the heterogeneous results on the classroom-level, one can hypothesize that the atmosphere in a given class may profit when a teacher cracks jokes or tells funny stories. Furthermore, within this positive class climate, students are more relaxed. In this sense, humor unrelated to course content may have the potential to create a positive affective class mood that is incompatible with anxiety (Ford et al., 2012). But the contradictory result on the student-level may be interpreted as showing there is a tipping point regarding the positive effect of humor on student emotions, unrelated to course content. Beyond this tipping point, telling jokes or eliciting laughter may be experienced as wasting time and contrary to learning and achievement goals. Overall, the use of aggressive humor was a predictor of negative emotions and less enjoyment on both levels.

5. Discussion

The main goal of the present research was to examine the associations between different teacher humor types and students' class-related emotions. We analyzed these associations using a multilevel approach which entailed student perceptions of different types of teacher humor, analyzed on both the student-level and the classroom-level.

Although the associations identified in the two studies did not correspond perfectly, the findings indicate that, in general, the use of teacher humor that is not perceived positively by the students. The finding that humor unrelated to course content and aggressive humor were associated negatively, or not at all, with functional emotions expands on results which show that being funny is not sufficient to

[2] Additionally, we tested whether the various types of teacher humor had different effects on achievement emotions in the three different school subjects using multilevel models that also encompasses (cross-level) interactions between the dummy variables representing school subjects and the four types of teacher humor. Here, we did not find any statistically significant differences between school subjects regarding the effects of teacher humor. However, it should be noted that it was not the aim of this study to identify such interaction effects, so the sample size was not sufficient to meet the necessary power requirements.

Table 5
Study 2 two-level prediction of student emotions from students' perceptions of teacher humor.

	Enjoyment	Boredom	Anxiety	Anger
Classroom-level				
Humor unrelated to course content	0.18 (0.12)	0.02 (0.15)	− 0.37* (0.15)	− 0.18 (0.12)
Self-disparaging humor	0.23* (0.10)	− 0.03 (0.12)	− 0.11 (0.12)	0.03 (0.13)
Humor related to course content	0.11 (0.12)	− 0.30* (0.15)	0.01 (0.12)	− 0.30+ (0.18)
Aggressive humor	− 0.65** (0.14)	0.57** (0.15)	0.54** (0.11)	0.54** (0.16)
Dummy Mathematics	− 0.24* (0.10)	0.29** (0.09)	− 0.12 (0.09)	0.06 (0.09)
Dummy History	0.19 (0.12)	0.19 (0.10)	− 0.25* (0.10)	− 0.19 (0.11)
Student-level				
Humor unrelated to course content	− 0.02 (0.04)	0.01 (0.04)	0.09* (0.04)	0.02 (0.05)
Self-disparaging humor	0.02 (0.04)	0.02 (0.05)	0.06 (0.04)	0.01 (0.04)
Humor related to course content	0.42*** (0.04)	− 0.24*** (0.04)	− 0.15** (0.05)	− 0.21*** (0.04)
Aggressive humor	− 0.14** (0.04)	0.22*** (0.05)	0.21*** (0.06)	0.25*** (0.07)
R^2_{Between}	0.67	0.68	0.51	0.63
R^2_{Within}	0.27	0.21	0.12	0.20

Note. $n = 731$ from 33 classrooms. All variables were z-standardized prior to analyses. Predictors on classroom-level were grand-mean centered and predictors on student-level were group-mean centered. Presented are regression coefficients β. Standard errors are in parentheses.
Reference subject is English language.
*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.
+ $p = 0.06$.

enhance affective learning among college students (Wanzer et al., 2010). Thus teachers should avoid humor unrelated to their courses, and particularly aggressive humor, as this can create climates characterized by anxiety and monotony. Students may perceive the use of course-unrelated humor as a waste of time or not personally relevant and they may not feel mentally challenged. Thus this humor type may have no value for them—this may explain the higher levels of average boredom in class (Pekrun, 2006). Additionally, unrelated humor may not conform to students' expectations and may trigger distractions in the classroom. So it may also be perceived as inappropriate which translates into negative emotions, which would be in line with the predictions of IHPT (Wanzer et al., 2010). Clearly, further research is necessary to better understand how students interpret and handle humor unrelated to course content.

Furthermore, emotional arousal after experiencing aggressive humor may cause individuals to become impatient. In this negative basic mood everything is experienced as more monotonous and unattractive (Steinheider, 2014). In an achievement situation at school, aggressive humor could be perceived as stressful, causing a student to lose self-control and be controlled by the teacher (negative control appraisal in terms of CVT), focusing on anticipated failure and valuing the activity or situation negatively (negative value appraisal, CVT) can result in an increase in anxiety and anger and a reduction of enjoyment. Aggressive humor seems to have the potential to contaminate the classroom climate and thus may be detrimental for learning processes as emotions do mediate between humor and performance (Ford et al., 2012; Strati & Schmidt, 2013). So teachers would be better off laughing with their students and not at their students (Banas et al., 2011). The two present studies revealed indications that the use of course-unrelated humor and aggressive teacher humor is related to negative emotions. Since the reduction of such negative emotions should be a goal of teachers when providing successful instruction, they should use other types of humor.

It seems possible that a social environment using course-related humor plays an essential part in contributing to beneficial emotional appraisals. Above all, humor related to course content could function as an instruction-optimizing tool in that this type of humor provides information related to controllability and values (Pekrun, 2006). Associations with more enjoyment and less boredom support this assumption. Bored students are physically present but mentally absent, disturb other students, are often off task, and lose interest in the class (Lohrmann, 2008). Humor related to course content seems to have the potential to make lessons more interesting, give them value (Baumgartner & Morris, 2008; Bieg & Dresel, 2016) and minimize boredom. Thus student engagement and limiting tedium should be objectives of high quality instruction (Hattie, 2009; Nett et al., 2011). Even if it is not possible to prevent all students from experiencing boredom during lessons, it is possible to plan and introduce humor related to course content in order to promote a stimulating classroom environment.

In this way humor related to course content could aid in reducing boredom and enhancing learning (Kanevsky & Keighley, 2003). A concrete connection between humor and the current learning subject seems to be an indispensable prerequisite of effects on student's emotional experiences. Using humor related to course content can help teachers to establish an effective instruction which, in turn, positively affects student enjoyment. But it is important to emphasize that the utilization of this teacher humor type should not be interpreted as a necessary or sufficient condition for effective instruction. Teachers should use humor when they feel comfortable with it and when it is consistent with their own humor orientation (Wanzer & Frymier, 1999), and they should not feel forced to use humor. Our suggestion is to start with humor in instruction, it may be wise to begin with humorous cartoons or video clips because they are easier to engage than preparing a joke or a humorous example related to course content (Banas et al., 2011; Petraki & Nguyen, 2016). When teachers create a humorous learning atmosphere they create an opportunity to dissipate negative emotions that can impede learning (Strean, 2011).

5.1. Limitations

Despite the advantage of exploring different teacher humor types and their associations with various class-related student emotions on the student- and classroom-levels, the current studies do have some limitations. First, both studies are based on cross-sectional data and thus do not allow for any causal interpretations, effect relationships included. Therefore, it is necessary for future research to examine the relations of teacher humor types with student emotions longitudinally, so as to take us a step further. Second the findings are only based on one data source, i.e. student self-reports and their perceptions of teacher humor. However, assessing student emotions via self-reports has several advantages: self-reports make it possible to assess all the components of emotion because all of these processes can be represented in the mind; a self-report of affective and cognitive components is more differentiated than any other available method and is also more economical

(Pekrun & Bühner, 2014). Furthermore, the practice of compiling shared students' perceptions to measure teacher characteristics is a common method used to rule out biases associated with teacher self-reports (Marsh et al., 2012) and a strength of the present work. It would nevertheless be fruitful to complement the student perspective with additional perspectives, specifically video-based observations of classroom interactions. Finally, in considering student evaluations of teacher humor, there may well be a sympathy effect at hand in that students evaluate their teacher better when they like her/him. Thus there could be a halo effect in that the more positive a student judges her/his teacher to be, the more positive the perception of their humor, thus our findings have to be treated with caution. Nevertheless, students are said to be a reliable and valid source for rating teacher instruction when the dimension examined does not afford high didactic pedagogical knowledge. This is because students have a great amount of experience across a large number of classes (Baumert et al., 2004).

6. Conclusions

In sum, the current studies suggest that the examination of teacher humor should be multidimensional. Further it is not the humor itself which is experienced positively, and thus humor per se is not a magic-bullet; eliciting laughter does not necessarily mean that positive emotions are experienced. Our findings emphasize that teacher humor in the classroom should be related to course content, and that aggressive teacher humor should be seriously avoided. In the special case of teacher humor, appropriate humor has to be considered differentially, and the theoretical framework of CVT helps to clarify the links between teacher humor and student emotions. Although none of these humor types are offensive or disparaging to students, this does not automatically mean that they are all perceived in a positive manner. Thus teachers may help their students by planning jokes and stories while preparing lessons, and think of humorous examples to promote enjoyment and avoid anger, boredom, and anxiety (Frenzel & Stephens, 2011). In particular, teacher humor related to course content seems to be readily accessible to teachers as it can be planned. As research on teacher humor types is in a nascent stage, future studies should therefore address the development and evaluation of teacher training approaches to foster an effective use of teacher humor related to course content in classroom instruction.

Appendix A

Our [subject] teacher …
Course-related humor
… uses humor related to course material.
… uses funny props to illustrate a concept or as an example.
… tells jokes related to course content.
… tells humorous stories related to course content
*… teaches the course material in a humorous way.
*… uses funny examples in class.
Course-unrelated humor
…tells humorous stories unrelated to course content.
…tells jokes unrelated to course content.
*…wanders away from the subject and tells us funny stories instead.
Self-disparaging humor
… makes fun of himself in class.
… tells embarrassing stories about himself.
… makes fun of himself when he makes mistakes in class.
*… laughs about himself.
Aggressive humor
… teases students in class.
… teases students in class about their intelligence.
… makes humorous comments about students' personal lives or personal interests.
… teases students about how they are dressed.

Note: Items are adaptations from the instrument by Frymier et al. (2008). Items with * are new in the instrument by Bieg and Dresel (2016). All items were rated on Likert type scales, ranging from 1 (*never*) to 5 (*very often*).

References

Banas, J. A., Dunbar, N., Rodriguez, D., & Liu, S.-J. (2011). A review of humor in educational settings. *Communication Education*, *60*, 115–144.

Baumert, J., Kunter, M., Brunner, M., Krauss, S., Blum, W., & Neubrand, M. (2004). Mathematikunterricht aus Sicht der PISA-Schülerinnen und -Schüler und ihrer Lehrkräfte. [Mathematics education from the perspective of PISA students and their teachers]. In M. Prenzel,, J. Baumert,, W. Blum,, R. Lehmann,, D. Leutner,, & M. Neubrand, (Eds.), *PISA 2003: Der Bildungsstand der Jugendlichen in Deutschland [The educational attainment of adolescents in Germany]* (pp. 314–354). Münster: Waxmann.

Baumgartner, J. C., & Morris, J. S. (2008). Jon Stewart comes to class: The learning effects of America (the book) in introduction to American government courses. *Journal of Political Science Education*, *4*, 169–186.

Berlyne, D. E. (1960). *Conflict, arousal and curiosity*. New York, NY: Mc Graw-Hill.

Bieg, S., & Dresel, M. (2016). Construction and validation of the German questionnaire to assess students' perceptions of teacher humor. *Diagnostica*, *62*, 3–15.

Boekaerts, M., & Pekrun, R. (2016). Emotions and emotion regulation in academic settings. In L. Corno, & E. M. Anderman (Eds.), *Handbook of educational psychology* (pp. 76–90). New York: Routledge.

Booth-Butterfield, S., & Booth-Butterfield, M. (1991). Individual differences in the communication of humorous messages. *Southern Communication Journal*, *56*, 205–217.

Bryant, J., & Zillmann, D. (1989). Chapter 2: Using humor to promote learning in the classroom. *Journal of Children in a Contemporary Society*, *20*(1–2), 49–78.

Cann, A., Calhoun, L. G., & Nance, J. T. (2000). Exposure to humor before and after an unpleasant stimulus: Humor as a preventative or a cure. *Humor*, *13*, 177–191.

Cook, G. (2000). *Language play, language learning*. Oxford: Oxford University Press.

Cornett, C. E. (1986). *Learning through laughter: Humor in the classroom. Fastback 241*. Box 789, Bloomington, IN 47402: Phi Delta Kappa, Eighth and Union.

Dresel, M., Bieg, S., Fasching, M. S., Steuer, G., Nitsche, S., & Dickhäuser, O. (2014). Teacher humor in the perception of students: Discrimination from teacher enthusiasm and associations with perceived instructional quality. *Psychologie in Erziehung und Unterricht*, *1*, 56–74.

Ford, T. E., Ford, B. L., Boxer, C. F., & Armstrong, J. (2012). Effect of humor on state anxiety and math performance. *Humor*, *25*, 59–74.

Frenzel, A. C., Goetz, T., Lüdtke, O., Pekrun, R., & Sutton, R. E. (2009). Emotional transmission in the classroom: Exploring the relationship between teacher and

student enjoyment. *Journal of Educational Psychology*, *101*, 705–716.
Frenzel, A. C., Pekrun, R., & Goetz, T. (2007). Perceived learning environment and students' emotional experiences: A multi-level analysis of mathematics classrooms. *Learning and Instruction*, *17*, 478–493.
Frenzel, A. C., Pekrun, R., & Goetz, T. (2009). Emotionale Voraussetzungen des Lernens. [Emotional antecedents of learning]. In K.-H. Arnold, U. Sandfuchs, & J. Wiechmann (Eds.), *Handbuch Unterricht* (pp. 432–435). (2nd ed.). Bad Heilbrunn: Klinkhardt.
Frenzel, A. C., & Stephens, E. J. (2011). Emotion. In T. Goetz (Ed.), *Emotion, motivation and self-regulated learning* (pp. 15–77). Paderborn: Schöningh.
Frenzel, A. C., Thrash, T. M., Pekrun, R., & Goetz, T. (2007). Achievement emotions in Germany and China: A cross-cultural validation of the Academic Emotions Questionnaire-Mathematics (AEQ–M). *Journal of Cross-Cultural Psychology*, *38*, 302–309.
Frymier, A. B., Wanzer, M. B., & Wojtaszczyk, A. M. (2008). Assessing students' perceptions of inappropriate and appropriate teacher humor. *Communication Education*, *57*, 266–288.
Goetz, T. (2004). *Emotionales Erleben und selbstreguliertes Lernen bei Schülern im Fach Mathematik*[Emotional experiencing and self-regulated learning in mathematics education]. München: Utz.
Goetz, T., Cronjaeger, H., Frenzel, A. C., Lüdtke, O., & Hall, N. C. (2010). Academic self-concept and emotion relations: Domain specificity and age effects. *Contemporary Educational Psychology*, *35*, 44–58.
Goetz, T., Frenzel, A. C., & Pekrun, R. (2007). Regulation von Langeweile im Unterricht. Was Schülerinnen und Schüler bei der "Windstille der Seele" (nicht) tun[Regulation of boredom in class: What students (don't) do when experiencing the "windless calm of the soul"]. *Unterrichtswissenschaft*, *35*, 312–333.
Goetz, T., Frenzel, A. C., Pekrun, R., & Hall, N. C. (2006a). The domain specificity of academic emotional experiences. *Journal of Experimental Education*, *75*, 5–29.
Goetz, T., & Nett, U. E. (2012). *Boredom in university students. Unpublished codebook*. Konstanz, Germany: University of Konstanz.
Goetz, T., Pekrun, R., Hall, N. C., & Haag, L. (2006b). Academic emotions from a social cognitive perspective: Antecedents and domain specificity of students' affect in the context of Latin instruction. *British Journal of Educational Psychology*, *76*(2), 289–308.
Gorham, J., & Christophel, D. M. (1990). The relationship of teachers' use of humor in the classroom to immediacy and student learning. *Communication Education*, *39*(1), 46–62.
Hattie, J. A. C. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Oxon, UK: Routledge.
Heck, R. H. (2001). Multilevelmodeling with SEM. In G. A. Marcoulides, & R. E. Schumacker (Eds.), *New developments and techniques in structural equation modeling*. Mahwah, NJ: Erlbaum.
Hox, J. J. (2010). *Multilevel analysis*(2nd ed.). New York: Routledge.
Kanevsky, L., & Keighley, T. (2003). To produce or not to produce? Understanding boredom and the honor in underachievement. *Roeper Review*, *26*, 20–28.
Keller, M. M., Hoy, A. W., Goetz, T., & Frenzel, A. C. (2015). Teacher enthusiasm: Reviewing and redefining a complex construct. *Educational Psychology Review*, 1–27.
Kunter, M., Frenzel, A., Nagy, G., Baumert, J., & Pekrun, R. (2011). Teaching enthusiasm: Dimensionality and context specificity. *Contemporary Educational Psychology*, *36*, 289–301.
LaFave, L., Haddad, J., & Maesen, W. A. (1996). Superiority, enhanced self-esteem, and perceived incongruity humor theory. In A. J. Chapman, & H. C. Foot (Eds.), *Humor and laughter: Theory research and applications* (pp. 63–91). New Brunswick, NT: Transaction.
Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
Lohrmann, K. (2008). *Langeweile im Unterricht*[Boredom at school]. Münster: Waxmann.
Luedtke, O., Trautwein, U., Kunter, M., & Baumert, J. (2007). Reliability and agreement of student ratings of the classroom environment: A reanalysis of TIMSS data. *Learning Environments Research*, *9*, 215–230.
MacKinnon, D. (2008). *Introduction to statistical mediation analysis*. New York: Taylor and Francis Group.
Marsh, H. W., Lüdtke, O., Nagengast, B., Trautwein, U., Morin, A. J. S., Abduljabbar, A. S., & Köller, O. (2012). Classroom climate and contextual effects: Conceptual and methodological issues in the evaluation of group-level effects. *Educational Psychologist*, *47*, 106–124.
Martin, A. J., Bobis, J., Anderson, J., Way, J., & Vellar, R. (2011). Patterns of multilevel variance in psycho-educational phenomena: Comparing motivation, engagement, climate, teaching, and achievement factors. *German Journal of Educational Psychology*, *25*, 49–61.
Martin, R. A. (2007). *The psychology of humor: An integrative approach*. Oxford: Elsevier.
Martin, R. A., 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. *Journal of Research in Personality*, *37*, 48–75.
Matarazzo, K. L., Durik, A. M., & Delaney, M. L. (2010). The effect of humorous instructional materials on interest in a math task. *Motivation and Emotion*, *34*, 293–305.
Nett, U. E., Goetz, T., & Hall, N. C. (2011). Coping with boredom in school: An experience sampling perspective. *Contemporary Educational Psychology*, *36*, 49–59.
Neuliep, J. W. (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 Education*, *40*, 343–355.
Pekrun, R. (2006). The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educational Psychology Review*, *18*, 315–341.
Pekrun, R., & Bühner, M. (2014). Self-report measures of academic emotions. In R. Pekrun, & R. Linnenbrink-Garcia (Eds.), *International handbook of emotions in education* (pp. 561–579). New York: Routledge.
Pekrun, R., Goetz, T., Daniels, L. M., Stupnisky, R. H., & Perry, R. P. (2010). Boredom in achievement settings: Exploring control-value antecedents and performance outcomes of a neglected emotion. *Journal of Educational Psychology*, *102*, 531–549.
Pekrun, R., Goetz, T., & Frenzel, A. C. (2006). *Academic emotions questionnaire – Mathematics (AEQ-M)*. Manual Version. Unpublished manuscript. Munich, Germany: Department of Psychology, University of Munich.
Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The achievement emotions questionnaire (AEQ). *Contemporary Educational Psychology*, *36*, 36–48.
Perrez, M., Huber, G. L., & Geissler, K. A. (2001). Psychologie der pädagogischen interaktion. [Psychology of pedagogical interaction]. In A. Krapp, & B. Weidenmann (Eds.), *Educational Psychology* (pp. 357–413). Weinheim: Beltz.
Petraki, E., & Nguyen, H. H. P. (2016). Do Asian EFL teachers use humor in the classroom? A case study of Vietnamese EFL university teachers. *System*, *61*, 98–109.
Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer-Verlag.
Peugh, J. L., & Enders, C. K. (2004). Missing data in educational research: A review of reporting practices and suggestions for improvement. *Review of Educational Research*, *74*, 525–556.
Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., Congdon, R. T., & du Toit, M. (2011). *HLM 7: Hierarchical linear and nonlinear modeling*. Chicago, IL: Scientific Software International.
Robitzsch, A., & Rupp, A. A. (2009). Impact of missing data on the detection of differential item functioning: The case of Mantel-Haenszel and logistic regression analysis. *Educational and Psychological Measurement*, *69*, 18–34.
Shuman, V., & Scherer, K. R. (2014). Concepts and structures of emotions. In R. Pekrun, & L. Linnenbrink-Garcia (Eds.), *International handbook of emotions in education* (pp. 13–35). New York: Taylor & Francis.
Steinheider, P. (2014). *Was Schulen für ihre guten Schülerinnen und Schüler tun können. [What schools can do for gifted students]*. Wiesbaden: Springer VS.
Sterling, S., & Loewen, S. (2015). The occurrence of teacher-initiated playful LREs in a Spanish L2 classroom. *System*, *53*, 73–83.
Strati, A. D., & Schmidt, J. A. (2013, April). Exploring the role of teacher challenge and support in high school general science classrooms. *Paper presented at the annual meetings of the American Educational Research Association* (San Francisco, CA).
Strean, W. B. (2011). Creating student engagement? HMM: Teaching and learning with humor, music, and movement. *Creative Education*, *2*, 189–192.
Stuart, W. D., & Rosenfeld, L. B. (1994). Student perceptions of teacher humor and classroom climate. *Communication Research Reports*, *11*, 87–97.
Torok, S. E., McMorris, R. F., & Lin, W. C. (2004). Is humor an appreciated teaching tool? Perceptions of professors' teaching styles and use of humor. *College Teaching*, *52*, 14–20.
Turner, J. E., & Schallert, D. L. (2001). Expectancy-value relationships of shame reactions and shame resiliency. *Journal of Educational Psychology*, *93*, 320–329.
Wanzer, M. B., & Frymier, A. B. (1999). The relationship between student perceptions of instructor humor and students' reports of learning. *Communication Education*, *48*, 48–61.
Wanzer, M. B., Frymier, A. B., & Irwin, J. (2010). An explanation of the relationship between instruction humor and student learning: Instructional humor processing theory. *Communication Education*, *59*, 1–18.
Wanzer, M. B., Frymier, A. B., Wojtaszczyk, A. M., & Smith, T. (2006). Appropriate and inappropriate uses of humor by teachers. *Communication Education*, *55*, 178–196.
Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review*, *92*, 548–573.
Wubbels, T., Brekelmans, M., & Hooymayers, H. P. (1992). Do teacher ideals distort the self-reports of their interpersonal behavior? *Teaching and Teacher Education*, *8*, 47–58.
Zillmann, D., & Cantor, J. R. (1996). A disposition theory of humor and mirth. In A. J. Chapman, & H. C. Foot (Eds.), *Humor and laughter: Theory, research and applications* (pp. 93–115). New Brunswick, NJ: Transaction Publishers.
Ziv, A. (1979). The teacher's sense of humor and the atmosphere in the classroom. *School Psychology International*, *1*, 21–23.