



Teachers' daily positive and negative affect and their relationship with teachers' emotion regulation strategies and daily work engagement – results of a diary study among team teachers

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Abstract

Team teaching as a close form of teacher collaboration entails frequent interactions between the team-teaching partners in the classroom. During these interactions, the team teachers experience a variety of positive and negative emotions, triggered by their team partner. The teachers may express or suppress these emotions, depending on their habitual use of these emotion regulation strategies. In turn, the teachers' daily emotions may be related to an important facet of teacher well-being, namely their daily work engagement. This study aims to investigate the related factors (habitual emotion regulation, daily work engagement) of team teachers' daily positive and negative emotions triggered by the team partner in the classroom. Forty-seven Austrian team teachers working in secondary education completed a daily diary study, consisting of 15 diary entries, measuring their habitual emotion expression and suppression strategies, their daily positive and negative affect and daily work engagement. Multilevel regression analyses were conducted. Results show that positive and negative affect and work engagement vary substantially within and between team teachers. Random-intercept fixed-slope multilevel models indicate that the habitual use of authentic display of positive emotions is associated with daily positive affect, and teachers' daily positive and negative affect significantly relate to their daily work engagement both on the within- and between-person level. This study underscores the important role that team teachers' emotional experiences play regarding their work engagement. We draw theoretical and practical implications for the role of emotions during team-teaching practices.

Keywords Teacher affect · Teacher emotions · Work engagement · Emotion regulation · Team teaching · Diary study

1 Introduction

Teacher collaboration can support the establishment of a positive school climate (Hammar Chiriac et al., 2023) and the implementation of innovative school development processes (Muckenthaler et al., 2020). Therefore, it is not surprising that institutions such as the United Nations Educational, Scientific and Cultural Organization call for increasing collaboration among the teaching staff (2021, 2023). One form of teacher collaboration that requires close joint work is team teaching. Team teaching is an educational practice where (at least) two teachers plan, instruct and evaluate the same group of students in the same subject (Baeten & Simons, 2014). It has gained importance in secondary (Krammer et al., 2017) and tertiary education (Minett-Smith & Davis, 2020) and in different phases of teacher training, for example in student teachers' team practica (Waber et al., 2021).

The term *team teaching* has been used synonymously with other terms such as co-teaching, cooperative teaching or collaborative teaching (Krammer et al., 2018). Frequently, co-teaching refers to the collaboration between a trained subject teacher and a special needs educator in the context of special education or inclusive schooling (see, e.g., Cook & Friend, 1995; Pratt, 2014). Due to the context of the present study, we use the term team teaching: In the Austrian school system, team teaching is structurally implemented in low-track, lower secondary schools in the subjects of mathematics, English (first foreign language) and German (language of instruction), and the team consists of two trained subject teachers who are equally responsible for the teaching and learning processes of the same learners of the same class (Austrian Federal Ministry of Education, Science and Research, 2020).

Team teaching can entail advantages for the teachers, such as an exchange of materials, division of tasks, or enhanced professionalisation due to support and reflective processes in the team; however, also challenges may occur, such as conflicting attitudes or teaching styles, ineffective communication, rivalry or competition (Baeten & Simons, 2014; Waber et al., 2021). A distinctive feature of team teaching is the complex interpersonal interaction situation in the classroom, which results in rich and diverse emotional lives of team teachers. To describe this process, we adopt an understanding of emotions grounded in social psychology (Parkinson, 1996; Parkinson et al., 2005), which highlights the social aspects of emotional experiences, claiming that emotions are an inherent phenomenon of interpersonal interactions, impact the interaction partners and have a communicative function. During team teaching, characterised by frequent social interactions between the two teachers, emotions are frequently triggered in response to the team partner's behaviours; emotions which are also subsequently regulated (Muehlbacher & Hagenauer, 2023; Muehlbacher et al., 2022). Therefore, and in contrast to other classrooms, the team-teaching classroom adds another layer of interpersonal interaction, namely with the team teacher, with corresponding emotions that require regulation and appropriate communication by the team teachers.

Research on team teachers' emotional experiences triggered by their team partner is important because teacher emotions in general have been linked to teachers' instructional practices and student outcomes (Burić & Frenzel, 2023) as well as teacher well-being (Hagenauer & Hascher, 2018). While research on teacher

emotions in the solo-taught classroom has increased in recent years, little is known about the associated factors of team teachers' emotions in the team-taught classroom from a quantitative perspective. From a qualitative perspective, Muehlbacher and Hagenauer (2023) conducted an interview study and found that teachers experience many distinct positive and negative emotions due to their team partner, such as joy, anger, gratitude and disappointment, showing that the team-teaching setting is highly emotional for teachers.

Research in the field of collaborative teaching is continuing to be crucial because collaboration in the teaching profession is becoming increasingly important (Krammer et al., 2017; UNESCO, 2021, 2023), and emotions and their regulation are thus likely to gain a specific significance in this teaching setting. Against this backdrop, the following study has been conducted using team teaching as context for the study of teacher emotions. We investigate the daily¹ emotional experiences of team teachers in the team-teaching classroom, which we relate to team teachers' trait emotion regulation and daily work engagement as a core component of teacher well-being (Hascher & Waber, 2021).

1.1 Teacher emotions

In this study, we draw on appraisal theories of emotion (Ellsworth & Scherer, 2003) to understand the emergence of teacher emotions. Appraisal theory postulates that it is not the objective situation that triggers emotions within people but rather a person's cognitive evaluation (i.e., appraisal) of the situation. This explains why two teachers may experience different emotions in the same classroom setting as they might form different cognitive appraisals, for example in terms of relevance of the situation or the attainment of teaching goals, and therefore feel differently.

Moreover, we assume that teachers' cognitive appraisals are important during social situations in the classroom, especially when they are interacting with their team partner. Our approach is therefore furthermore grounded in a socio-psychological understanding of emotions (Parkinson, 1996; Parkinson et al., 2005), which highlights that emotions are a frequent feature of social situations, meaning that they occur when interacting and engaging with others and cognitively appraising these interactions.

The classroom as such is a social space (Pekrun et al., 2018). Therefore, we assume that team teachers experience classroom emotions based on the appraisal of their partner teachers' behaviour regarding their underlying team-teaching goals (Muehlbacher & Hagenauer, 2023). Moreover, we believe these emotions are connected to the team teachers' classroom behaviour as outlined in appraisal theory frameworks for teacher emotions in the individually taught classroom (Frenzel, 2014; Frenzel et al., 2021). Within these frameworks, teachers cognitively evaluate classroom situations, and based on their classroom goals, they will experience certain emotions,

¹ The term *daily* indicates that the relevant constructs of the diary study were assessed on team-teaching days, and the items were furthermore formulated in a situation-specific manner, meaning that team teachers' answers were related to the particular team-teaching lessons on the particular team-teaching day.

which in turn influence the teachers' instructional behaviour, which reciprocally influences teachers' subsequent classroom goals and their respective emotions.

Previous research has repeatedly shown that teachers in the solo-taught classroom experience various emotions during teaching based on their cognitive appraisals (Becker et al., 2015; Frenzel et al., 2016; Stark et al., 2023). Emotions of the same valence (i.e., experienced as either positive or negative) can be sorted into positive and negative affect. Affect "is often used to refer to omnibus variables of positive versus negative emotions or moods, with *positive affect* referring to a compilation of various positive states (e.g., enjoyment, pride, satisfaction) and *negative affect* consisting of various negative states (e.g., anger, anxiety, frustration)" (Pekrun & Linnenbrink-Garcia, 2014, p. 2). Due to the multitude of team teachers' emotional experiences, it can be useful to group distinct emotions in terms of their valence into positive and negative affect (similar to e.g., Taxer & Frenzel, 2015).

When studying teacher emotions, an important distinction needs to be made between trait and state emotions/affect (Frenzel et al., 2021). Studies have shown that teachers' reports of their trait emotions; that is, teachers' evaluation of emotions they report to usually feel during a lesson, and their state emotions; that is, teachers' evaluation of emotions they experience during the lesson in a specific classroom moment, are correlated, but still differ to some extent (Keller, Frenzel, et al., 2014). Research has considered both teachers' general emotional and affective experiences on the trait level in addition to the fluctuations of emotions and affect across days or situations on the state level (e.g., Becker et al., 2015; Stark et al., 2023).

In recent years, studies measuring emotions and affect on the state level have increased significantly, focusing particularly on understanding the situation-specificity of emotional experience (Moeller et al., 2022). Specifically, when investigating teachers' emotions or affect on the state level, the amount of variance due to individual (contextual) or situational differences can be studied. Limited studies exist that explicitly report the amount of variance of teachers' state affect that lies within and between persons (Stark et al., 2023). In a study among employees, Reis et al. (2016) found that a large percentage of variance is attributable to within-person changes; that is, to situational rather than individual differences. Stark et al. (2023) conducted an experience-sampling study and closely examined teachers' daily affect and its variation during schooldays. They found that daily affect varied almost equally within and between teachers (intraclass correlation=ICC; $ICC_{\text{positive affect}} = 0.51$; $ICC_{\text{negative affect}} = 0.58$), arguing that "both person and context may play an important role in teachers' affective experiences" (Stark et al., 2023, p. 23).

1.2 Teacher emotion regulation

Teacher emotions are closely linked to teachers' emotion regulation strategies. Emotion regulation, i.e. teachers' competence to regulate their emotions in the classroom appropriately, can be considered one important facet of teachers' professional competence (Kunter et al., 2013). Teachers have different options on how to handle their classroom emotions (Gross, 2015; Taxer & Gross, 2018). Teachers follow so-called emotion display rules, which prescribe when and how certain emotions should be shown or suppressed in the classroom (Stark & Bettini, 2021; Sutton, 2004; Wang

et al., 2019). These display rules can guide teachers in how they habitually display their emotions; for example, teachers oftentimes report that positive emotions may be shown to a moderate extent, while negative emotions should usually be hidden from students (Stark & Bettini, 2021; Sutton, 2004). Importantly, teachers' display rules can also differ depending on the cultural context (Hagenauer et al., 2016; Ekman et al., 1969). Overall, the two opposing emotion regulation strategies of authentic display (i.e., expressing emotions authentically) and suppression (i.e., hiding emotions) play a major role in teachers' trait emotion regulation repertoire (Burić et al., 2021; Keller & Becker, 2021).

In the literature, these two emotion regulation strategies are regularly evaluated in terms of their (in)effectiveness and (mal)adaptiveness. For example, the authentic display of positive emotions is frequently considered an effective and adaptive emotion regulation strategy. Teachers who authentically displayed their positive emotions showed higher well-being (i.e., physical and mental health, emotional exhaustion and job satisfaction). In contrast, the authentic display of negative emotions in the classroom is considered maladaptive: teachers' authentic display of negative emotions was negatively related to well-being (i.e., physical and mental health and job satisfaction) (Taxer & Frenzel, 2015). Suppression is frequently considered maladaptive and ineffective, particularly concerning a person's well-being (Gross & John, 2003; Jiang et al., 2016). While the frequently applied Emotion Regulation Questionnaire (Gross & John, 2003), which measures expressive suppression, does not distinguish between the suppression of positive and negative emotions, it has been established that a distinction is both theoretically and conceptually meaningful (Yu et al., 2023). For example, the expressive suppression of positive emotions was significantly, negatively related to well-being in a non-teacher sample from Taiwan and the US; in contrast, the expressive suppression of negative emotions showed no relationship with well-being (Yu et al., 2023). In a sample among US teachers, however, Taxer and Frenzel (2015) showed that suppressing negative emotions was positively related to emotional exhaustion.

Teachers' emotion regulation strategies have extensively been studied in the individually taught classroom (e.g., Taxer & Frenzel, 2015; Taxer & Gross, 2018). However, we must assume that teachers' emotion regulation strategies regarding student-triggered emotions are partly different from those used concerning emotions triggered by the team partner: While it might be acceptable to display (down-regulated) anger towards students' misbehaviour, showing anger towards the team partner in front of the students is frequently considered an inappropriate strategy by team teachers (Muehlbacher et al., 2022). In an interview study with 30 team teachers, Muehlbacher et al. (2022) showed that team teachers apply a variety of emotion regulation strategies due to the emotions triggered by their team partner, including authentic display and suppression. While all the interviewed team teachers stated that they authentically display their positive emotions in the classroom, almost half explained they had at least once also openly shown their negative emotions caused by the team partner. Regarding the suppression of emotions, none of the interviewed teachers stated that they suppress their positive emotions in the classroom. In contrast, all team teachers described at least once suppressing their negative emotions triggered by their partner teacher in the team-teaching situation.

Hence, it can be assumed that the way team teachers habitually regulate their emotions, following their display rules for emotion expression and suppression, may be related to their classroom emotions and subsequently also to teacher well-being.

1.3 Teachers' work engagement

Based on theoretical frameworks (Frenzel et al., 2021), teacher emotions play an important role in the classroom setting because they are related to teachers' well-being (Hagenauer & Hascher, 2018). Teacher well-being is defined differently across studies (for an overview, see Hascher & Waber, 2021). One core component of teacher well-being is teachers' work engagement (Burić & Macuka, 2018), a highly functional state characterised by vigour, dedication and absorption (see Schaufeli et al., 2006, p. 702). Originally, Kahn (1990, p. 694) defined personal engagement in the job domain "as the harnessing of organization members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performance". Teachers' work engagement has been linked to certain favourable classroom characteristics in the solo-taught classroom, such as teachers' job satisfaction and job performance (Bakker & Bal, 2010; Høigaard et al., 2012). While earlier research has assumed that work engagement is a stable factor (Schaufeli et al., 2006), current research assumes that work engagement fluctuates over time, suggesting high variations between situations (Bakker, 2011; Reis et al., 2016).

The positive aspects of teachers' work engagement are well-known. Høigaard et al. (2012) demonstrated that work engagement (i.e., dedication, absorption, vigour) was positively correlated with job satisfaction and negatively correlated with burnout and quitting intentions. Bakker and Bal (2010) showed that teachers' weekly work engagement was positively related to teachers' weekly job performance; that is, being able to fulfil the requirements of their job well. Hakanen et al. (2006) established that teachers' work engagement (i.e., vigour, dedication) was positively related to their commitment towards their school's mission and goals. The fluctuating state of work engagement was presented by Simbula (2010) who, conducting a diary study, showed that teachers' work engagement varied within and between teachers: Almost two thirds of variance lay between teachers, and more than one third of variance was attributable to situational differences.

Overall, we can summarise that having engaged teachers would be desirable, not only from the individual teacher's perspective (regarding job satisfaction and health) and students' perspective (regarding job performance), but also from the institutional perspective (regarding commitment and quitting intentions). Having vigorous, absorbed and dedicated teachers, also in the team-teaching setting, is especially important because team teaching comes with challenges in addition to benefits, for example conflicts between team teachers (Baeten & Simons, 2014; Do & Hascher, 2023).

1.4 The relationship between positive and negative affect and work engagement

Work engagement is frequently conceptualised as a multi-dimensional construct, consisting of not only a cognitive and motivational but also an affective component (Kahn, 1990; Reis et al., 2016; Schaufeli et al., 2006). Because of the conceptual blurriness, Reis et al. (2016) empirically analysed the similarities and differences between the concepts of state work engagement (vigour, absorption) and state affect (pleasant affect, energetic arousal and tense arousal). In their experience-sampling study among workers, they showed that work engagement shows a different within-day variation than affect; that is, within-day fluctuation of affect was higher than that of work engagement. Moreover, work engagement and affect showed different relations to certain predictor and outcome variables, thereby reasoning that “state work engagement can be differentiated from state affect” (Reis et al., 2016, p. 7). Further empirical studies linking work engagement to emotions have found the following: In a cross-sectional study among postdoctoral fellows, Gloria and Steinhardt (2017) found that positive emotions were positively related to work engagement, conceptualising positive emotions as a predictor of work engagement. Burić et al. (2021) identified significant, positive correlations between positive affect, vigour, dedication and absorption among a cross-sectional sample of Croatian teachers. Moreover, in a longitudinal study among Croatian teachers, Burić and Macuka (2018) showed a positive, reciprocal relationship between teachers' positive emotions and work engagement and a negative, reciprocal relationship between negative emotions and work engagement.

In line with these results, we view work engagement as distinct from but closely linked to teachers' positive and negative affect. We view both work engagement and teacher affect as situation-specific.

1.5 The relationship between positive and negative affect, emotion regulation and work engagement

Drawing on the theoretical framework of work engagement (Bakker & Demerouti, 2008), emotion regulation can be considered a personal resource that likely influences work engagement. For example, teachers who maladaptively regulate their emotions presumably also show lower positive affect and work engagement and higher negative affect. In a cross-sectional study by Ma (2023), emotion regulation (encompassing both suppression and reappraisal) positively predicted teachers' work engagement; however, no distinction was made between suppression and reappraisal or whether the strategies refer to positive or negative emotions in the analyses. Burić et al. (2021), in contrast, distinguished between several emotion regulation strategies and identified six affective regulation profiles of Croatian teachers. They found that “Suppressors”; that is, teachers using the strategy of suppression rather frequently and more often than reappraisal or faking (i.e., displaying a maladaptive pattern regarding emotion regulation), showed the lowest mean scores for positive affect, vigour, dedication and absorption of all six profiles. Therefore, we can conclude that the suppression of both positive and negative emotions might be negatively related to positive and negative affect and all dimensions of work engagement. Apart from this

study, there are few studies linking teachers' emotion regulation to their affect and work engagement. In the collaborative teaching setting, these studies are still lacking.

2 The present study

The present study aims to examine the links between team teachers' positive and negative affect, their emotion regulation (i.e., suppression and authentic display) and their work engagement (i.e., vigour, dedication and absorption) as a core association pertaining to teachers' well-being. To account for the situation specificity of team teachers' affect and work engagement, we consider them state variables, while focusing on team teachers' habitual emotion regulation strategies as trait variables, drawing on the concept of internalised emotion display rules.

While research on teacher emotions and work engagement has frequently focused on cross-sectional designs, we chose a diary study based on a longitudinal design to disentangle the relationships between affect, emotion regulation and work engagement, thereby adopting a more situative perspective. Moreover, we focus on a positive aspect of teachers' working lives; that is, their work engagement. As Stark et al. (2023, p. 28) argue, "previous [...] research on teachers' emotions has linked the emotional aspects of their work to negative outcomes", such as emotional exhaustion. They further encourage researchers to "examine how teachers' daily experiences of positive affect may also predict positive outcomes" (Stark et al., 2023, p. 28). We therefore extend previous findings on teachers' state affect by focusing on a positive aspect: state work engagement. In addition, we add to the literature by examining teacher affect in a context that can be highly challenging and emotional for teachers: Team teaching.

Based on previous research, we assume that team teachers' state affect and state work engagement vary between lessons and the individual team teachers who have participated (Keller, Chang, et al., 2014; Simbula, 2010). Hence, we expect to find substantial within- and between-person variation. Moreover, we assume that team teachers' trait emotion regulation strategies of suppression and authentic display are related to their state affect (Muehlbacher et al., 2022; Burić et al., 2021; Greenier et al., 2021). For example, if team teachers tend to authentically show their positive emotions, this will likely increase positive affect in the team-teaching classroom. Furthermore, we assume that team teachers' state affect is related to their state work engagement (Burić & Macuka, 2018; Gloria & Steinhardt, 2017): If team teachers feel high positive affect because of their team partner, this is likely reflected in high(er) work engagement. Conversely, if team teachers feel high negative affect due to their team partner, this should be reflected in low(er) work engagement.

Based on these considerations, we propose the following hypotheses (see Fig. 1):

H1 Team teachers' trait emotion regulation is related to their daily positive and negative affect.

(a) Team teachers' trait authentic display of positive emotions is positively related to their daily positive affect and negatively related to daily negative affect.

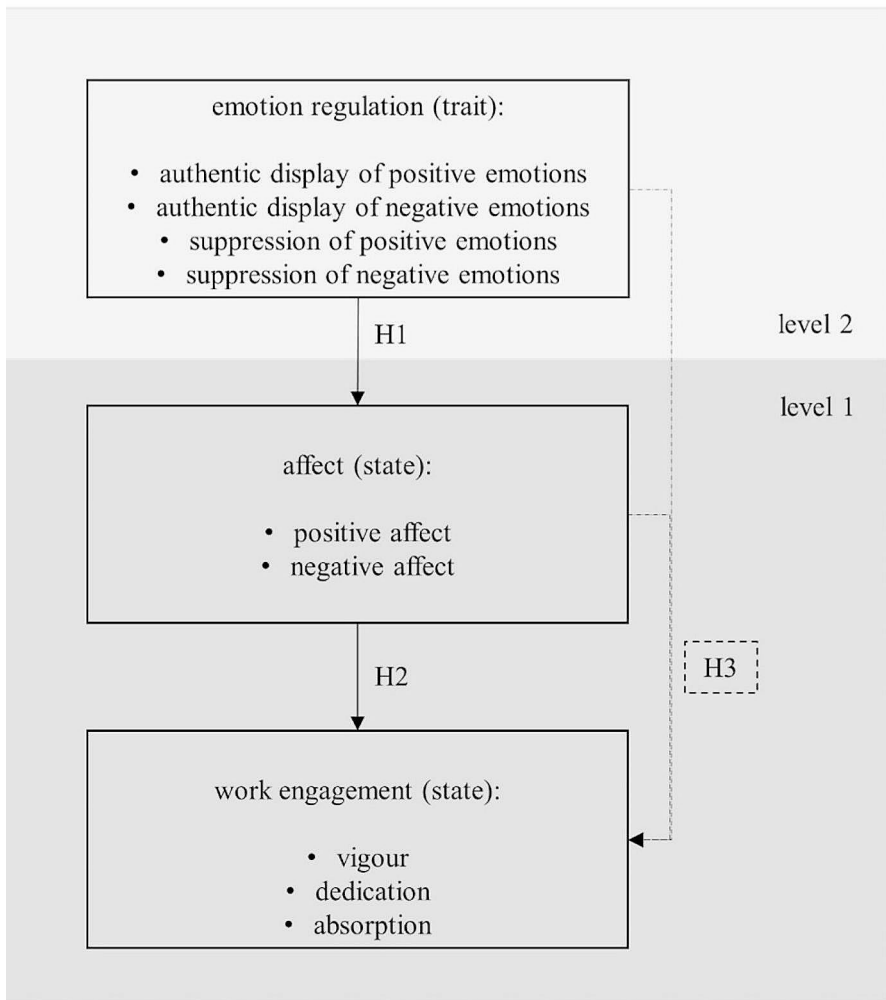


Fig. 1 Representation of the study hypotheses

(b) Team teachers' trait suppression of positive and negative emotions and authentic display of negative emotions are negatively related to their daily positive affect and positively related to daily negative affect.

H2 Team teachers' daily positive affect is positively associated with their daily work engagement (i.e., vigour, dedication, and absorption) (a), while their daily negative affect is negatively associated with their daily work engagement (b).

H3 The relationships proposed in Hypothesis 2 are expected to be stable when controlled for trait emotion regulation.

3 Materials & methods

3.1 Context and participants

The present study was conducted among in-service team teachers from Austrian low-track, lower secondary schools. Forty-seven team teachers participated in the study. Fourteen team-teaching dyads (i.e. teams) participated, and 19 team teachers participated without their team partner. The participants' characteristics can be found in Table 1.

3.2 Procedure and study design

The instruments used in the present study were included in a pre-survey (demographics, trait measures, covariates) and in daily diary questionnaires (daily affect, daily work engagement). We pilot-tested these questionnaires among eight team teachers and adjusted as necessary. The main study was conducted between September 2022 and March 2023.

We sent out a study invitation to several schools in Austria. Team teachers interested in the study were asked to contact the study coordinator (first author). Ideally, teams (i.e., dyads) were sought for participation; however, participation was also open to team teachers who wanted to participate without their team partner. Participation requirements prescribed team-teaching experience of at least half a year and hardly any use of the parallel teaching model (i.e., teachers teach separate groups in

Table 1 Participants' characteristics

Characteristics	<i>n</i>	<i>M</i>	<i>SD</i>
Gender			
Male	13		
Female	34		
Team-teaching subject			
Mathematics	13		
German	16		
English	18		
Age		40.45	13.62
22 – 30	18		
31 – 40	8		
41 – 50	6		
51 – 60	13		
61 – 62	2		
Teaching experience (in years)		14.09	13.41
1 – 5	22		
6 – 10	5		
11 – 15	1		
16 – 20	2		
21 – 25	6		
26 – 30	2		
31 – 35	4		
36 – 39	5		

separate locations; see Baeten & Simons, 2014); thereby, it should be ensured that teachers were acquainted with team teaching and able to rate their emotions in relation to their team partner who was present in the classroom.

Interested and eligible teachers were provided with further information on study proceedings and the processing of their data. When teachers decided to participate, they were asked to focus on one specific team-teaching partner and one specific class; all their context-specific assessments referred to this team teacher in that classroom; that is, the team-teaching partner and class were kept constant for each participating teacher. Teachers had to inform the study coordinator about their team-teaching days during the week (e.g., Mondays, Wednesdays).

After completing the pre-survey, they were emailed with a link to the daily diary entries in the morning of the team-teaching days they had specified earlier. Participants were asked to fill out the diary entry on the same day – they were advised to fill out the entry as soon as possible after the team-teaching lesson and until midnight at the latest for two reasons: First, to avoid recall bias; second, to ensure team teachers filled out their entries before they had their next team-teaching lesson with the same team partner in the same class. Participation in the daily assessments ended after 15 successfully completed diary entries. Most teachers ($n=38$) completed all 15 diary entries. Nine teachers did not complete all 15 diary entries. In total, 652 diary entries out of 705 possible entries (47 teachers x 15 entries) over the course of four months were filled out, resulting in a 92% compliance rate. Small incentives were given to the teachers for participation.

3.3 Instruments

The study was conducted online using the software LimeSurvey. Participants regularly received emails containing links to the relevant questionnaires.

3.3.1 Demographics and covariates

In the pre-survey, participants answered items concerning their demographics, such as gender, age, team-teaching experience, and their team-teaching subject. Moreover, they answered items relating to the following trait assessments (i.e., trait emotion regulation).

3.3.2 Trait assessments

Teachers' trait emotion regulation was assessed using the strategies of authentic display and suppression of positive and negative emotions. The introductory sentence was as follows: "When you are experiencing positive [or: negative] emotions due to your team partner, how do you usually handle them?". The participants were asked to focus on the team partner specifically chosen for this study and their collaboration in one specific class when answering these items. The items were formulated to refer to the regulation of positive and negative emotions separately. All items were rated on a seven-point scale, from 1 (*not true at all*) to 7 (*completely true*).

Authentic display of positive and negative emotions was measured using three items each, based on the emotional labour scale (subscales: expression of naturally felt emotions) developed and validated by Yang et al. (2019). The items were adapted to fit the team-teaching context, translated by the first author and discussed during the pilot-testing phase. A sample item was: “The emotions I show match what I spontaneously feel”. Reliability was good ($\omega=0.85$ for authentic display of positive emotions; $\omega=0.77$ for authentic display of negative emotions; $\alpha=0.83$ for authentic display of positive emotions; $\alpha=0.78$ for authentic display of negative emotions).

Suppression of positive and negative emotions was assessed using the translated, German version (Abler & Kessler, 2009) of the Emotion Regulation Questionnaire by Gross and John (2003). Participants answered six items (three items relating to suppression of positive and negative emotions each). A sample item was “I keep the feelings to myself”. The scales showed moderate to good reliability ($\omega=0.73$ for suppression of positive emotions; $\omega=0.85$ for suppression of negative emotions; $\alpha=0.68$ for suppression of positive emotions; $\alpha=0.84$ for suppression of negative emotions).

3.3.3 State assessments

Teachers had to fill out 15 diary entries on days they conducted a team-teaching lesson with a specific team partner in a specific class. To maintain participants’ commitment over several weeks, we used single item measures. This is a common study design among daily diary or experience sampling studies (for example, see Goetz et al., 2016), with 1-item measures particularly useful for capturing emotions (Allen et al., 2022).

For each entry (i.e., for each team-teaching lesson), team teachers indicated how intensely they had felt 22 emotions during the respective team-teaching lesson, triggered by their team partner, ranging from 1 (*not at all*) to 5 (*extremely*) (see Table 2). The item stem was “Today during the lesson in the selected class my team partner made me feel...”. The 22 emotions were based on the PANAS (Positive and Negative Affect Schedule; Watson et al., 1988), whose translated, German version (Breyer & Bluemke, 2016) was used and extended by some emotions specifically relevant for the team-teaching setting, as found by a previous qualitative study on team teachers’ emotions (Muehlbacher & Hagenauer, 2023). Based on these findings, we added the emotions *grateful*, *bored* and *amused*, and deleted the emotion *strong*. This resulted in 11 positive and 11 negative state emotions. We summarised the positive and negative emotions into positive and negative affect scales.

In addition, team teachers rated their daily work engagement for each team-teaching lesson, with one item for the facets of vigour, dedication and absorption on a four-point scale (1 = *does not apply*, 4 = *fully applies*). Items were based on the UWES-9 scale by Schaufeli and Bakker (2004). The final, translated items were based on the

Table 2 Positive and negative affect words

positive affect	excited, inspired, proud, active, interested, attentive, enthusiastic, alert, determined, grateful, amused
negative affect	scared, afraid, upset, nervous, ashamed, guilty, irritable, hostile, jittery, distressed, bored

German items shown in Klusmann and Waschke (2018). Following the item stem "To what extent do the following statements apply to today's team-teaching lesson?", the item for vigour was "During the team-teaching lesson with my team partner, I felt bursting with energy". The item for dedication was "I was enthusiastic about the work I did with my team partner". The item for absorption was "I was immersed in my work with my team partner".

3.4 Ethical principles

Prior to the official start of the study, we obtained permission from the ethics committee of the University of Salzburg. Participants received an individualised code to participate in the study, necessary to allocate the diary entries to the respective participants. Moreover, participants needed to provide the study coordinator with their email address so the questionnaires could be sent out. Only the study coordinator had access to the email addresses, and they were deleted from the data sets prior to data analysis. Participation was voluntary, and the participants could withdraw from the study any time. Before each diary entry and the pre-survey, they ticked a box showing their informed consent.

3.5 Data analysis

Data preparation and descriptive analyses such as reliability tests were conducted using IBM SPSS Statistics 27 and Jamovi (version 2.3.28). All further analyses were conducted using R (R Core Team, 2023). Our data had a nested structure: the daily diary entries (Level 1; $n=652$) were nested within the participants (Level 2; $n=47$), who were nested within teams (Level 3; $n=15$). Hence, we used multilevel modelling (MLM) to analyse the data, which enabled differentiation between within-subject and between-subject relationships. In addition, this approach accommodated multiple observations per person, different numbers of observations between participants and non-equidistant times of measurements, while providing model estimates for missing data. To test the necessity of including the team as an additional level, we computed null models. As the team-related variance was below 0.10 (positive affect: 0.07; negative affect: 0.00; vigour: 0.05; dedication: 0.08; absorption: 0.06), which does not account for significant variation on the team level and therefore does not justify the use of the team as an additional level, we subsequently included two levels in all models.

We used maximum likelihood estimation to handle the missing data (0.76%). Item answers were voluntary, so it was possible that participants had (in)voluntarily skipped single answers regarding certain affect words or work engagement facets. All models were run in R using the nlme package (v3.1.162; Pinheiro et al., 2023). Teachers' gender (0=female; 1=male) and team-teaching experience were entered as covariates into all the analyses.

To test the relationship between daily positive and negative affect and team teachers' trait emotion regulation (see Hypothesis 1), we ran a random-intercept and fixed-slope multilevel regression model in which the four trait emotion regulation strategies were entered as grand mean centred predictors. To test how far teachers'

state work engagement could be explained by state positive and negative affect singularly (Hypothesis 2), as well as with trait emotion regulation strategies as additional predictors (Hypothesis 3), we ran successive random-intercept and fixed-slope multilevel models for each dimension of work engagement. Positive and negative affect were entered as level 1 group mean centred predictors (within-person variation) and as a level 2 group mean predictor (between-person variation; i.e., the average person-level positive and negative affect); the four trait emotion regulation strategies were entered as grand mean centred level 2 predictors. Model comparisons can be found in the Online Supplement.

Table 3 Means, standard deviations and within-subject intercorrelations for the study variables

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
State variables											
1. Positive affect	644	3.55	0.88								
2. Negative affect	644	1.10	0.23	-.20**							
3. Vigour	640	2.61	0.87	.69**	-.15**						
4. Dedication	641	3.20	0.77	.67**	-.31**	.53**					
5. Absorption	637	3.05	0.89	.65**	-.31**	.62**	.68**				
Trait variables											
6. Display of negative emotions	47	3.64	1.59	.10*	-.08*	.04	.13**	.18**			
7. Suppression of negative emotions	47	4.22	1.78	-.06	.12**	-.03	-.14**	-.18**	-.75**		
8. Display of positive emotions	47	5.87	1.00	.35**	.03	.23**	.27**	.35**	.43**	-.32**	
9. Suppression of positive emotions	47	2.15	1.10	-.11**	.04	-.02	-.08*	-.08*	-.12**	.24**	-.43**

Note. *M* and *SD* represent mean and standard deviation, respectively. Potential range for affect (state) was 1–5. Potential range for work engagement (state) was 1–4. Potential range for emotion regulation (trait) was 1–7

* $p < .05$. ** $p < .01$

4 Results

4.1 Descriptive statistics

Table 3 shows the means and standard deviations for state positive and negative affect, the dimensions of work engagement, trait emotion regulation and the within-subject intercorrelations between all study variables. On average, team teachers experienced more positive than negative affect ($M=3.55$ and $SD=0.88$ for positive affect; $M=1.10$ and $SD=0.23$ for negative affect). Team teachers showed moderate amounts of vigour, dedication and absorption. Team teachers reported that they usually authentically displayed their positive emotions ($M=5.87$; $SD=1.00$) and hardly suppressed their positive emotions ($M=2.15$; $SD=1.10$). In contrast, they frequently suppressed their negative emotions ($M=4.22$; $SD=1.78$) and sometimes authentically displayed them ($M=3.64$; $SD=1.59$). Table 4 lists the means and standard deviations of the discrete emotions and the relative frequencies of lessons in which teachers experienced the emotions to at least some extent (answers between 2 [a little] and 5 [extremely]).

Table 4 Discrete positive and negative (state) emotions: descriptive statistics

	<i>n</i>	<i>M</i>	<i>SD</i>	%
Discrete positive emotions				
active	640	4.01	0.99	97%
attentive	640	3.96	0.96	97%
interested	642	3.91	0.98	96%
excited	643	3.78	1.05	97%
alert	635	3.75	1.06	94%
grateful	632	3.63	1.30	90%
determined	634	3.59	1.16	91%
enthusiastic	639	3.56	1.09	94%
inspired	630	3.16	1.25	84%
amused	633	2.93	1.35	80%
proud	627	2.73	1.36	73%
Discrete negative emotions				
distressed	636	1.17	0.56	11%
jittery	637	1.15	0.45	12%
upset	639	1.13	0.47	9%
irritable	637	1.13	0.50	8%
bored	643	1.12	0.40	10%
nervous	641	1.08	0.32	6%
guilty	640	1.08	0.31	6%
scared	638	1.06	0.32	4%
hostile	636	1.06	0.35	3%
ashamed	638	1.05	0.26	4%
afraid	637	1.03	0.20	2%

Note. All emotions were rated on a scale from 1 to 5. % describes the percentage of lessons in which team teachers rated the experience of the respective emotion 2 or higher

Table 5 Intraclass correlations (ICC) of positive and negative affect and the dimensions of work engagement

Predictors	positive affect			negative affect			vigour			dedication			absorption		
	Estimates	β	<i>p</i>	Estimates	β	<i>p</i>	Estimates	β	<i>p</i>	Estimates	β	<i>p</i>	Estimates	β	<i>p</i>
Intercept	3.53	-0.02	<.001	1.10	0.01	<.001	2.56	-0.06	<.001	3.18	-0.03	<.001	3.00	-0.06	<.001
Random Effects															
σ^2	0.22			0.03			0.34			0.30			0.39		
τ_{00}	0.53			0.02			0.43			0.28			0.42		
ICC	0.71			0.45			0.56			0.49			0.52		
<i>n</i>	47			47			47			47			47		
Observations	644			644			640			641			637		
AIC	1014.246			-302.496			1275.240			1178.364			1346.640		

Note. σ^2 indicates the residual variance, i.e., represents within-person variance. τ_{00} indicates the variance of the intercepts, i.e., represents between variance. ICC = Intraclass correlation coefficient. *n* = Number of persons; Observations = Number of state measurements; AIC = Akaike information criterion

4.2 Inter- and intra-individual variation of positive and negative affect and work engagement

In a first step, we examined how teachers' positive and negative affect in addition to work engagement varied between and within teachers. In so doing, we calculated the intraclass correlation (ICC) based on an intercept-only multilevel model.

Regarding team teachers' affect, the ICCs reported in Table 5 show that positive affect varied more between the teachers (level 2) than between the situations (level 1) and was therefore more person-specific ($ICC_{\text{positive affect}} = 0.71$). In contrast, approximately equal proportions of variance of negative affect lay between teachers and team-teaching lessons ($ICC_{\text{negative affect}} = 0.45$). Concerning the ICCs of work engagement, the ICCs of vigour, absorption and dedication showed that the amount of variance due to the subjects (level 2) and the situations (level 1) was almost equal ($ICC_{\text{vigour}} = 0.56$; $ICC_{\text{dedication}} = 0.49$; $ICC_{\text{absorption}} = 0.52$).

4.3 The relationship between team teachers' state positive and negative affect and trait emotion regulation

We found no significant relationships between team teachers' trait emotion regulation strategies and state affect, except for the positive relationship between the authentic display of positive emotions and positive affect (H1a), suggesting that teachers who authentically display positive emotions to their team partner also experience higher positive affect in team-teaching lessons ($\beta = 0.38$, $p < .05$) (see Table 6).

4.4 The relationship between team teachers' state positive and negative affect and state work engagement

Regarding the relationships between positive and negative state affect and state work engagement (Hypothesis 2, Model 1 in Tables 7, 8 and 9), in line with our expectations, positive affect on the within-level in addition to on the between-level were positively related to vigour ($\beta_{\text{within}} = 0.28$, $p < .001$; $\beta_{\text{between}} = 0.67$, $p < .001$), dedication ($\beta_{\text{within}} = 0.26$, $p < .001$; $\beta_{\text{between}} = 0.57$, $p < .001$) and absorption ($\beta_{\text{within}} = 0.22$, $p < .001$; $\beta_{\text{between}} = 0.57$, $p < .001$). Moreover, negative affect on the within-level was negatively related to absorption ($\beta = -0.19$, $p < .001$) and dedication ($\beta = -0.12$, $p < .001$), and negative affect on the between-level was negatively related to dedication ($\beta = -0.14$, $p < .05$). However, negative affect on the within and between level showed no significant relationships with vigour.

When entering affect and emotion regulation simultaneously into the multilevel regression analysis to examine daily work engagement (Hypothesis 3, see Model 2 in Tables 7, 8 and 9), the relationships of positive and negative affect on the within and between level, found also in Model 1, remained stable.

Table 6 Model for daily positive and negative affect

Predictors	positive affect			negative affect		
	<i>Estimates</i>	β	<i>p</i>	<i>Estimates</i>	β	<i>p</i>
Intercept	3.29	-0.02	<.001	1.19	0.01	<.001
display of positive emotions (gra)	0.34	0.38	.013	0.03	0.13	.341
suppression of positive emotions (gra)	0.02	0.03	.846	0.03	0.12	.344
display of negative emotions (gra)	-0.04	-0.07	.717	0.01	0.04	.798
suppression of negative emotions (gra)	0.00	0.00	.999	0.02	0.17	.322
gender	0.33	0.16	.207	-0.07	-0.14	.247
team-teaching experience	-0.03	-0.17	.165	0.00	0.03	.796
Random Effects						
σ^2	0.22			0.03		
τ_{00}	0.42			0.02		
ICC	0.66			0.43		
<i>n</i>	46			46		
Observations	629			629		
Marginal R ² / Conditional R ²	0.168 / 0.717			0.040 / 0.450		
AIC	991.984			-281.062		

Note. (gra) indicates that trait emotion regulation was entered as a grand mean centred predictor variable. σ^2 indicates the residual variance. τ_{00} indicates the variance of the intercepts. ICC = Intraclass correlation coefficient. *n* = Number of persons. Observations = Number of state measurements. Marginal R² = proportion of variance explained by fixed effects. Conditional R² = proportion of variance explained by fixed and random effects. AIC = Akaike information criterion

5 Discussion

We aimed to investigate team teachers' affective experiences, triggered by their partner teacher in the classroom, their emotion regulation strategies and the connections with work engagement. To account for the situation specificity of teachers' emotional lives and their engagement at work, we conducted a longitudinal diary study among 47 team teachers from lower secondary schools in Austria. They responded to 15 daily entries in a diary. Affect and work engagement were considered as state and emotion regulation as trait variables. Knowledge of team teachers' affective experiences, regulatory behaviour and work engagement is imperative because team teaching is associated with many socio-emotional challenges (Do & Hascher, 2023; Waber et al., 2021). Thus, a study on team teachers' emotional lives from a multilevel and daily perspective is long overdue; our insights into team teachers' emotional lives add to existing studies on solo teachers' emotions.

In this sample, overall, team teachers showed a positive affective pattern: They frequently felt alert, excited, attentive and interested because of their team partner and their collaboration in the classroom. In contrast, over the course of 15 days the team teachers reported few experiences of negative emotions due to their team-teaching partner. It is not unusual for teachers to experience higher positive than negative affect while teaching (see, e.g., Hagenauer et al., 2021; Stark et al., 2023). Nevertheless, the low frequency and intensity of team teachers' daily negative affect is surprising in the team-teaching context as other studies have found multiple negative affective experiences in team teachers (Muehlbacher & Hagenauer, 2023; Muehlbacher et al., 2022). However, as these previous studies referred to generalized, retrospective trait

Table 7 Models for daily vigour

Predictors	vigour					
	model 1			model 2		
	<i>Estimates</i>	β	<i>p</i>	<i>Estimates</i>	β	<i>p</i>
Intercept	0.17	-0.02	.758	0.31	-0.02	.607
positive affect (gru)	0.56	0.28	<.001	0.56	0.28	<.001
groupmean positive affect	0.75	0.67	<.001	0.75	0.67	<.001
negative affect (gru)	-0.14	-0.03	.270	-0.14	-0.03	.272
groupmean negative affect	0.02	0.00	.944	-0.04	-0.01	.905
display of positive emotions (gra)				0.02	0.02	.841
display of negative emotions (gra)				0.02	0.04	.696
suppression of positive emotions (gra)				0.08	0.08	.279
suppression of negative emotions (gra)				0.02	0.04	.700
gender	-0.25	-0.13	.081	-0.30	-0.16	.045
team-teaching experience	0.01	0.07	.307	0.01	0.07	.322
Random Effects						
σ^2	0.28			0.28		
τ_{00}	0.11			0.10		
ICC	0.28			0.27		
<i>n</i>	43			43		
Observations	595			595		
Marginal R ² / Conditional R ²	0.500 / 0.641			0.508 / 0.642		
AIC	1026.412			1032.748		

Note. (gru) indicates that positive and negative affect were entered as groupmean centred predictor variables. groupmean positive/negative affect describe mean positive/negative affect on the group level (level 2). (gra) indicates that trait emotion regulation was entered as a grandmean centred predictor variable. σ^2 indicates the residual variance. τ_{00} indicates the variance of the intercepts. ICC = Intraclass correlation coefficient. *n* = Number of persons. Observations = Number of state measurements. Marginal R² = proportion of variance explained by fixed effects. Conditional R² = proportion of variance explained by fixed and random effects. AIC = Akaike information criterion

and state reports and the present study covered daily affect, it is possible that the presently chosen slice of 15 lessons / days per person did not cover potentially rare negative emotional episodes that were still salient in trait reports (reflecting one kind of memory bias in trait reports, the so-called peak-end-rule).

The results further show that both positive and negative affect varied both between team-teaching days and across teachers. While positive affect seemed to vary more between team teachers (ICC=0.71), negative affect, in contrast, seemed to vary almost equally within and between teachers; that is, situation-specific variables in addition to contextual variables play a role in daily negative affect. The finding of daily negative affect is comparable to the results of Stark et al. (2023), who found that 58% of the variance of negative affect lies on the between-level; however, in their study, 51% of the variance of daily positive affect was on the between-level. Keller, Chang, et al. (2014) found that German teachers' enjoyment, anger and anxiety vary mostly between lessons; that is, they are rather situation-specific (ICCs were lower than 25%). A possible explanation of these differences is the specific context of team teaching: The participating team teachers rated their emotions that were triggered by one specific team partner in one specific class. In studies in which teachers rated their

Table 8 Models for daily absorption

Predictors	absorption					
	model 1			model 2		
	<i>Estimates</i>	β	<i>p</i>	<i>Estimates</i>	β	<i>p</i>
Intercept	1.44	-0.02	.010	1.84	-0.01	.001
positive affect (gru)	0.46	0.22	<.001	0.46	0.22	<.001
groupmean positive affect	0.65	0.57	<.001	0.58	0.51	<.001
negative affect (gru)	-1.00	-0.19	<.001	-1.00	-0.19	<.001
groupmean negative affect	-0.45	-0.09	.201	-0.56	-0.11	.100
display of positive emotions (gra)				0.13	0.15	.088
display of negative emotions (gra)				0.03	0.05	.624
suppression of positive emotions (gra)				0.10	0.11	.130
suppression of negative emotions (gra)				-0.03	-0.05	.584
gender	-0.10	-0.05	.490	-0.13	-0.07	.352
team-teaching experience	-0.01	-0.10	.189	-0.01	-0.09	.202
Random Effects						
σ^2	0.30			0.30		
τ_{00}	0.11			0.09		
ICC	0.27			0.23		
<i>n</i>	43			43		
Observations	595			595		
Marginal R ² / Conditional R ²	0.487 / 0.626			0.516 / 0.625		
AIC	1070.694			1070.689		

Note. (gru) indicates that positive and negative affect were entered as groupmean centred predictor variables. groupmean positive/negative affect describe mean positive/negative affect on the group level (level 2). (gra) indicates that trait emotion regulation was entered as a grandmean centred predictor variable. σ^2 indicates the residual variance. τ_{00} indicates the variance of the intercepts. ICC = Intraclass correlation coefficient. *n* = Number of persons. Observations = Number of state measurements. Marginal R² = proportion of variance explained by fixed effects. Conditional R² = proportion of variance explained by fixed and random effects. AIC = Akaike information criterion

emotions triggered by students, there are more possible emotion-triggering sources. Depending on the classroom size, a large number of individual students could act as a trigger of positive and negative affect within a single lesson. Therefore, we assume that the emotional experiences triggered by students must be even more situation-specific compared to the emotional experiences triggered by one partner teacher; therefore, the context may play a more significant role.

Moreover, daily work engagement, that is, teachers' vigour, dedication and absorption, varied between team-teaching days and team teachers (ICCs between 0.49 and 0.56). Our findings thus roughly align with those of Simbula (2010), who, in a sample among 61 Italian schoolteachers, reported an ICC for work engagement of .62. Drawing on the findings, team teachers' daily work engagement is almost equally influenced by situational and contextual as well as personal factors.

Regarding our first hypotheses, we assumed that team teachers' trait emotion regulation strategies of authentic display and suppression should be related to their daily affect (H1). However, this assumption was not entirely confirmed in the present dataset. The only strategy with a significant relationship with daily positive affect was authentic display of positive emotions. It appears beneficial to their daily positive

Table 9 Models for daily dedication

Predictors	dedication					
	model 1			model 2		
	Estimates	β	<i>p</i>	Estimates	β	<i>p</i>
Intercept	1.97	-0.01	<.001	2.09	-0.01	<.001
positive affect (gru)	0.46	0.26	<.001	0.46	0.26	<.001
groupmean positive affect	0.57	0.57	<.001	0.56	0.56	<.001
negative affect (gru)	-0.56	-0.12	<.001	-0.56	-0.12	<.001
groupmean negative affect	-0.62	-0.14	.024	-0.64	-0.14	.024
display of positive emotions (gra)				0.03	0.03	.678
display of negative emotions (gra)				0.03	0.06	.524
suppression of positive emotions (gra)				0.05	0.06	.377
suppression of negative emotions (gra)				-0.01	-0.02	.854
gender	-0.03	-0.02	.783	-0.06	-0.04	.596
team-teaching experience	-0.01	-0.11	.095	-0.01	-0.11	.098
Random Effects						
σ^2	0.25			0.25		
τ_{00}	0.06			0.06		
ICC	0.20			0.19		
<i>n</i>	43			43		
Observations	595			595		
Marginal R ² / Conditional R ²	0.505 / 0.604			0.512 / 0.605		
AIC	934.676			940.058		

Note. (gru) indicates that positive and negative affect were entered as groupmean centred predictor variables. groupmean positive/negative affect describe mean positive/negative affect on the group level (level 2). (gra) indicates that trait emotion regulation was entered as a grandmean centred predictor variable. σ^2 indicates the residual variance. τ_{00} indicates the variance of the intercepts. ICC = Intraclass correlation coefficient. *n* = Number of persons. Observations = Number of state measurements. Marginal R² = proportion of variance explained by fixed effects. Conditional R² = proportion of variance explained by fixed and random effects. AIC = Akaike information criterion

emotions when team teachers openly express their positive emotions. The experience of positive teacher emotions and their authentic display is not only related to positive teacher outcomes (such as teacher work engagement or teacher job satisfaction), but can also be related – through direct transmission effects (Frenzel et al., 2021) – to student outcomes, such as students' emotions or motivation. Per definition, not only the experience of the positive emotion itself but also its authentic expression is relevant for teacher emotions to be instilled in their students, which is likely to also occur during team-teaching lessons.

However, contrary to expectations regarding hypothesis 1, we found no relationship between team teachers' suppression of positive and negative emotions or authentic display of negative emotions and their daily affect. One possible explanation is that it might be necessary to move beyond viewing emotion regulation strategies per se as (in)effective or (mal)adaptive in regulating emotions (Brockman et al., 2023). As Brockman et al. (2023) showed, no single emotion regulation strategy itself is effective in influencing affect; rather, mediators such as psychological need satisfaction may influence the effectiveness of single emotion regulation strategies within a given situation. Moreover, methodologically and regarding negative affect and emo-

tion regulation, it may be that the null findings in this study also resulted from the low variance in negative affect; that is, team teachers reported hardly any experiences of negative emotions during team-teaching lessons and, therefore, variances were small. Furthermore, perhaps it is not one emotional regulation strategy alone that impacts affect, but a combination of different forms of emotion regulation, for example as shown by Burić et al. (2021). Hence, future studies could investigate teacher emotion regulation profiles and their relationships with work engagement on a state level, because usually, teachers use several emotion regulation strategies during a single lesson. Moreover, it might be necessary to view emotion regulation strategies in combination with mediator variables or in the specific situational context, focusing more on their effectiveness when measured in the respective situation rather than as a trait-like construct in general.

Hypothesis 2 – team teachers' daily positive affect is positively associated, and daily negative affect is negatively associated, with their daily work engagement – was clearly supported by our results. This result remained stable even when we controlled for teachers' emotion regulation strategies (Hypothesis 3). Our results align with findings by Burić et al. (2021), who found positive correlations between positive affect and all three facets of work engagement among Croatian teachers (in the solo-taught classroom) (Burić et al., 2021). Extending on this initial association, in this study, not only is team teachers' daily positive affect, triggered by the team partner during the lesson, predictive of high vigour, absorption, and dedication, but also their mean positive affect experienced due to the team partner has a positive influence on their work engagement. In fact, this association is even stronger than the daily affective experience of the team teachers; that is, the positive affect team teachers experience on average throughout all lessons has an even stronger relationship with their work engagement. Conversely, if team teachers experience daily negative affect because of their team partner, this is reflected in lower dedication and absorption, and the experience of negative affect on the between-level also relates to their dedication negatively.

These findings highlight the important role that team teachers' affective experiences, triggered by the team partner, have on their energy and resilience levels, persistence, involvement and concentration in their team-teaching practices. In particular, the concepts of team teachers' work engagement and positive affect show strong associations: Drawing on the broaden-and-build theory (Fredrickson, 2001), our findings indicate that positive affective experiences of team teachers can lead to higher levels of work engagement, thereby broadening teachers' thought-action repertoires by being more vigorous, dedicated and absorbed in their work. This, in turn, may lead to long-lasting resources, also in the sense of enhanced team teachers' well-being.

5.1 Limitations and directions for future research

Although the study's diary-based nature can be regarded as a strength, this design also has some limitations. First, because participation in this study was voluntary, we cannot rule out possible self-selection bias among participants. Contrasting the affective pattern found in this sample (team teachers' experiences of high positive affect

and almost no negative affect) with the results of other studies in which team teachers reported a variety of instances in which they had experienced negative emotions (e.g., Muehlbacher & Hagenauer, 2023; Muehlbacher et al., 2022), we assume that many team teachers who enjoyed teaching with their team partner and were generally highly committed to team teaching participated. While this study's participants predominately reported having experienced positive affect, we must not neglect the converse: There are certainly team teachers who find team teaching frustrating and experience a variety of negative emotions (see Muehlbacher & Hagenauer, 2023). Future studies that incorporate a sample that experiences a larger variety and intensity of negative emotions, along with larger variances, are necessary to untangle the role of emotion suppression and the possible links to burnout, frequently regarded as the opposite of work engagement. Moreover, future studies should include a broader variety of teachers who experience team teaching as more challenging; for example, team teachers at the beginning of their team collaboration might experience more challenges, possibly leading to more diverse emotional experiences.

Second, we relied on self-report data; therefore, we cannot rule out that team teachers gave socially desirable answers based on professional norms or emotion display rules (Ekman & Friesen, 2003). Moreover, the team teachers were asked to rate their emotions in regard to their team-teaching partner, which might as well have contributed to a stronger social desirability bias as opposed to rating student-triggered or general trait emotions. Although self-reports are well-suited to studying emotions and work engagement because both experiences are highly subjective, complementary measures could be used to study emotional states, such as facial expressions, also using mixed methods approaches (Creswell & Plano Clark, 2017; Frenzel et al., 2021).

Third, the study's results must be interpreted in its contextual setting: team teaching of in-service teachers in lower secondary schools in Austria, Europe. There exist cultural differences in (teachers') emotion experiences, emotion display rules and emotion regulation (Butler et al., 2007; De Leersnyder et al., 2013; Ekman et al., 1969; Yin & Lee, 2012). Therefore, the study's context must be considered when aiming to transfer the results to or replicate the findings in other educational or cultural contexts.

Fourth, the use of single items can be criticised (Allen et al., 2022) for potentially reducing the measurements' content validity; however, when conducting a study over a longer period of time – such as this one with participation spanning several months – we found it necessary to reduce the (temporal) costs for participants to retain their compliance and commitment throughout the study duration.

Fifth, we must highlight the cross-sectional nature of the multilevel analyses, whereby we cannot establish causal effects. It may also be the case that certain relationships are reciprocal in nature. Future research could apply methods such as multi-level, dynamic structuring equation modelling, generalized additive mixed modelling or cross-lagged analyses to model and investigate temporal trends.

5.2 Practical and theoretical implications

This study highlights the important role that teachers' emotions play in a highly collaborative teaching setting that is gaining increasing importance in today's modern teaching workplace: team teaching. Team teaching has been associated with socio-emotional challenges, such as competition, need frustration or divergent ideas regarding teaching (de Zordo et al., 2017; Do & Hascher, 2023). These emotional challenges and experiences require explicit attention, not only in empirical research but also in team teachers' daily teaching practice.

The results of this study suggest that those who experience pleasant emotions when collaboratively working with their team partner are on average more vigorous, dedicated and absorbed; an association which is also present on the daily level. In contrast, those who emotionally struggle when teaching with their team partner may be less engaged during their team-teaching lessons. Ultimately, this may negatively impact team teachers' teaching quality, and, as a result, also the students (Frenzel, 2014); considering the aim of team teaching, which is providing a heterogeneous learner group with differentiated instruction, this could entail problematic consequences. Therefore, as a first step, it would be imperative that the teachers can determine which behaviours of their team-teaching partner act as antecedents of their positive and negative emotions (Muehlbacher & Hagenauer, 2023) to foster the experiences of a positive affective climate in the team while keeping negative emotions low. To achieve this, teachers' social-emotional competencies should be explicitly promoted during initial teacher training and further training to provide a good foundation for emotionally pleasant cooperation in the team, ultimately contributing to teachers' work engagement and high-quality teaching.

Additionally, this study has contributed to the field of teacher emotion research by considering teachers' emotions and work engagement from a more situative perspective, which is frequently highlighted as a research desideratum (Hagenauer et al., 2024). Moreover, what is often neglected in research on teacher emotion regulation is a consideration of emotional valence. In this regard, we followed a differentiated approach by distinguishing between teachers' emotion regulation strategies in terms of their focus on either positive or negative emotions, meaning that we measured team teachers' suppression/authentic display of positive emotions and suppression/authentic display of negative emotions separately, as suggested for example by Yu et al. (2023). Again, teacher trainer curricula and further training for in-service teachers should consider the variety of emotion regulation strategies, their (in)effectiveness and consequences regarding teachers' emotions and equip student teachers and in-service teachers with the necessary tools to foster this competence in the collaborative teaching setting.

6 Conclusion

In this study, we have demonstrated that team teaching entails many emotional experiences, predominantly positive emotions, that need to be regulated, depending on situational and contextual as well as (inter-)personal factors. Our results suggest that

these emotional experiences (assessed as positive and negative affect) are strongly related to team teachers' work engagement, often considered an important facet of teachers' well-being (Hascher & Waber, 2021). The results pertaining to the strong link between teachers' emotions and work engagement are relevant in the light of high attrition rates of teachers in general (UNESCO, 2022) and the challenges associated with team teaching in particular (Do & Hascher, 2023). Teachers who are dedicated, show high levels of commitment and energy, withstand difficulties, and find their work (in the team) meaningful are of paramount significance, not only considering teachers' own well-being, but also students' successful learning.

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Declarations

Ethical approval The work presented in this paper was conducted per The Code of Ethics of the World Medical Association (Declaration of Helsinki) for research involving human participants and in accordance with the APA ethical standards. All participants provided their written informed consent per the Declaration of Helsinki, approved the processing of their data in advance and regularly throughout the study, and could terminate their participation at any time without justification. The study was permitted by the ethics committee of the University of Salzburg (approval number: 17/2022).

Conflict of interest The authors report there are no competing interests to declare.

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