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# Associations between need-supportive teaching and student and teacher emotions: a mixed-methods investigation

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## ABSTRACT

This study investigated associations between need-supportive teaching and student and teacher emotions using mixed methods. Quantitative data were gathered from the self-reports of 326 lower-secondary school students from 22 classes in Finland. Qualitative data were obtained from semi-structured interviews with four teachers. The student ratings revealed considerable between-class variances in perceived teacher emotions. The teacher interviews confirmed that teachers experienced different emotions in different classes. No significant associations between negative emotions and need support were found based on student ratings, while negative emotions were found to be connected with need support based on teacher interviews. The overall results, which combined structural equation modeling of student ratings and thematic analysis of teacher interviews, suggested the existence of reciprocal relationships between need-supportive teaching and the emotions of students and teachers. Implications for intervention research on teaching practices and teacher education are also provided.

## ARTICLE HISTORY



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## KEYWORDS

Need-supportive teaching; student emotions; teacher emotions; mixed methods

## 1. Introduction

This study explored associations between teaching practices and the emotions of students and teachers. Understanding student and teacher emotions in the classroom is vital for enhancing teaching quality and well-being at school (Frenzel, 2014). Students' emotions affect their interest in learning, engagement, and academic achievement (Pekrun, 2006; Pekrun et al., 2011; Tze et al., 2014), while teacher emotions play a crucial role in teaching behaviors and teacher-student relationships (Chen, 2019; Hascher & Hagenauer, 2016). Moreover, *need-supportive teaching*, which refers to fostering the fulfillment of students' fundamental needs for autonomy, competence, and relatedness (Mouratidis et al., 2011), has received increasing attention, as evidence shows that need-supportive teaching can facilitate students' positive emotions (Kaplan, 2018; Mouratidis et al., 2011) and their engagement (Skinner et al., 2008; Tze et al., 2014). This might explain why intervention research tends to help teachers learn how to become more autonomy-supportive toward students (Reeve, 2009). However, there is still limited knowledge of how student emotions influence teacher

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emotions and teaching behaviors. Moreover, teacher emotions can affect student emotions via teaching behaviors (Frenzel et al., 2009a, 2018). Therefore, in addition to the more traditional model that looks at pathways from teaching behaviors to student emotions, this study aims to examine bidirectional interactions between teaching and the emotions of students and teachers in the classroom, which can provide new insights into educational research and teacher education.

This study used student ratings to investigate students' emotions during learning, perceived teacher emotions, and perceived need-supportive teaching. To complement students' views and avoid relying only on quantitative analysis, we used a mixed-methods approach that included interviews with teachers to capture their emotional experiences in their own words.

### **1.1. Need-supportive teaching**

Self-determination theory (SDT; Ryan & Deci, 2000) postulates that support for one's basic psychological needs for autonomy, competence, and relatedness facilitates one's autonomous motivation, optimal functioning, and well-being. The need for autonomy refers to one's inherent desire to initiate and choose actions by oneself (Reeve, 2009). The need for competence concerns one's inclination to feel capable of interacting with the environment (Skinner et al., 2008). The need for relatedness involves one's tendency to establish close and meaningful relationships with others (Stroet et al., 2013).

Teaching practices that foster the fulfillment of these fundamental needs in students are termed *need support* or *need-supportive teaching*, including autonomy, competence, and relatedness support (Mouratidis et al., 2011). *Autonomy support* encompasses providing choice, encouraging self-initiation, acknowledging students' perspectives and feelings, and respecting their interests and preferences (Reeve, 2009). *Competence support* involves communicating positive expectations, structuring lessons in a clear way, introducing learning activities that are optimally challenging, and providing informational feedback (Skinner et al., 2008). *Relatedness support* is provided by, for example, showing caring and affection toward students, enjoying interactions with them, being attuned to them, and devoting time and resources to them (Stroet et al., 2013). Considerable empirical evidence grounded in SDT has suggested that need-supportive teaching is positively related to students' and teachers' positive emotions, including students' enjoyment (Mouratidis et al., 2011) and teachers' enthusiasm (Frenzel et al., 2009b), and negatively associated with their negative emotions, such as students' boredom (Tze et al., 2014) and teachers' burnout (Van den Berghe et al., 2014).

### **1.2. Student emotions**

Emotions are generated through person-environment transactions that involve evaluations of the relationships between external situations and internal motives and resources, and thus emotions are triggered by evaluations or appraisals of events rather than by the events themselves (Lazarus, 2001). Student emotions can be defined based on Pekrun's (2006) control-value theory of achievement emotions, which refer to emotions pertaining to achievement-related activities (e.g., group learning), and achievement outcomes (e.g., success or failure in an exam). In a dynamic that is consistent with appraisal theory (Lazarus, 2001), students' achievement emotions are elicited by evaluating their subjective control over and subjective values of achievement activities and outcomes. For example, students may experience enjoyment when they feel able to master a learning material that they view as important. In contrast, students may experience anxiety when they perceive uncertainty about achievement outcomes that are important to them. Conversely, boredom is experienced when students perceive that a learning activity lacks incentive values.

Student emotions can be categorized using the dimensions of valence and activation. Valence is used to differentiate between positive emotions and negative emotions, such as pleasant enjoyment versus unpleasant anxiety. In contrast, activation is used to distinguish physiologically activating emotions from deactivating emotions, such as activating hope versus deactivating hopelessness

(Pekrun et al., 2011). Students can experience an array of achievement emotions, including positive activating emotions (e.g., enjoyment), positive deactivating emotions (e.g., relief), negative activating emotions (e.g., anger), and negative deactivating emotions (e.g., hopelessness).

### **1.3. Teacher emotions**

By combining Pekrun's (2006) social-cognitive approach and Lazarus's (2001) appraisal theory, emotion researchers have interpreted teacher emotions as responses to judgments regarding the congruence or incongruence between teaching goals and student behaviors (Chang, 2009; Frenzel, 2014). Frenzel (2014) proposed five appraisal dimensions pertaining to teacher emotions: goal consistency, goal conduciveness, coping potential, responsibility, and goal importance. Goal consistency refers to whether teachers perceive student behaviors as matching their teaching goals. Goal conduciveness pertains to whether teachers perceive student behaviors as contributing to achieving teaching goals. Coping potential explains whether teachers feel capable of attaining their goals. Responsibility involves the question of who is responsible for achieving a teaching goal. Finally, goal importance reflects how important it is for teachers to achieve a teaching goal.

Frenzel (2014) argued that goal consistency and goal conduciveness can determine the valence of teacher emotions, that goal importance can dictate the intensity of teacher emotions, and that coping potential and responsibility can determine both the valence and the intensity of teacher emotions. This argument is consistent with Chang's (2009) proposition on appraisals of teacher emotions. For example, a teacher may feel angry if his or her students misbehave while the goal in the classroom is to teach academic content. Also, the teacher may be angry if he or she feels incapable of achieving the goal because the misbehaving students are violating it. The intensity of the anger could increase if the teacher perceives teaching academic content as highly important.

Teacher emotions can also be classified based on the dimensions of valence and activation or arousal (Schutz et al., 2009). When these two dimensions are combined, the following four clusters of teacher emotions emerge: positive-high activation (e.g., enjoyment), positive-low activation (e.g., relaxation), negative-high activation (e.g., anger), and negative-low activation (e.g., tiredness).

Teachers' emotional experiences have been documented in previous qualitative studies using interviews that enable teachers to describe their emotional lives at school (e.g., Cross & Hong, 2012; Hosotani & Imai-Matsumura, 2011). When assessing the degrees of teacher emotions, student perceptions have been increasingly used not only because of students' astuteness in observing how teachers feel (Sutton & Wheatley, 2003) but also because of their reliability and validity, which have been confirmed by quantitative evidence (Jiang et al., 2016; Kunter et al., 2008).

### **1.4. Relations between need-supportive teaching and student and teacher emotions**

According to Frenzel's (2014) social-cognitive approach to teachers' emotions, teachers' appraisals of students' social-emotional behaviors influence teachers' emotional experiences. Moreover, Fredrickson's (2001) broaden-and-build theory posits that one's emotions influence one's thinking and actions. Furthermore, Pekrun's (2006) social-cognitive approach to students' emotions suggests that students' perceptions of teachers' instructional behaviors influence students' emotional experiences. Combining these theories, we assume that need-supportive teaching and student and teacher emotions interact and affect each other.

Many SDT-based quantitative studies have found that need-supportive teaching predicts an increase in students' positive emotions and a decrease in their negative emotions. These findings have been confirmed based on cross-sectional (Kaplan, 2018; Karimi & Fallah, 2021), longitudinal (Skinner et al., 2008; Tze et al., 2014), and experimental studies (Mouratidis et al., 2011); among school children (Mouratidis et al., 2011; Skinner et al., 2008), adolescents (Kaplan, 2018), and university students (Karimi & Fallah, 2021; Tze et al., 2014); using students' perceptions (Kaplan, 2018; Karimi & Fallah, 2021; Tze et al., 2014) or a combination of students' perceptions and teachers' self-

reports (Mouratidis et al., 2011; Skinner et al., 2008); and involving different domains, such as mathematics (Kaplan, 2018), language (Kaplan, 2018; Karimi & Fallah, 2021), and physical education (Mouratidis et al., 2011). In addition to the strong evidence regarding the effects of need-supportive teaching on student emotions, the influences of student emotions on need-supportive teaching have also been reported. For example, the emotional engagement of primary school students was found to predict their teachers' behaviors, as the teachers responded to children who were more enthusiastic with more autonomy and relatedness support (Skinner & Belmont, 1993). Moreover, previous studies involving lesson observations (Van den Berghe et al., 2016) and ratings of both teachers and students (Van den Berghe et al., 2015) revealed that student engagement was related to more need support, while student disengagement was linked to less need support.

Student emotions can also affect teacher emotions. For instance, a large-scale survey involving secondary school teachers found that student enthusiasm contributed to teaching enthusiasm (Stenlund, 1995). Moreover, semi-structured interviews with schoolteachers revealed that students' extreme positive or negative emotions were perceived by teachers as leading to a loss of control, and anger and anxiety (Aultman et al., 2009). Reciprocally, teacher emotions can directly impact student emotions by means of emotional contagion (Frenzel et al., 2009a). Alternatively, this impact can occur through mediation. For example, it was found that teacher-perceived enjoyment was transmitted to student-perceived enjoyment in learning, which was mediated by student-perceived teacher enthusiasm (Frenzel et al., 2018).

Teacher emotions can also influence need-supportive teaching. For instance, Hascher and Hagenauer (2016) argued that positive teacher emotions are likely to induce autonomy-supportive teaching behaviors. Chen (2019) found that positive teacher emotions predicted student-centered approaches, which are similar to autonomy support, while negative teacher emotions predicted teacher-centered approaches, which entail the suppression of student autonomy. Despite the acknowledged impact of teacher emotions on need-supportive teaching, there are relatively few studies on the effects of need-supportive teaching on teacher emotions. Some scholars have used correlational and cluster analyses of teachers' and students' reports and found that autonomy support was positively associated with teacher enjoyment and negatively associated with teacher anger, anxiety, and burnout (Frenzel et al., 2009b; Van den Berghe et al., 2014).

In sum, need-supportive teaching and student and teacher emotions are inter-correlated, and they are supposed to have reciprocal effects. However, previous studies have rarely investigated these variables in the same model or revealed their mediating mechanisms. The quantitative studies by Frenzel et al. (2009a, 2018) are an exception. Frenzel (2014) proposed that students' social-emotional behaviors impact teachers' instructional behaviors and that this impact is mediated by teachers' emotions. Based on this proposition, our first assumption is that the effects of student emotions on need-supportive teaching are mediated by teacher emotions. Frenzel et al. (2009a, 2018) found that the effects of teacher enjoyment on student enjoyment were mediated by teacher enthusiasm. Drawing on their findings, our second assumption is that the effects of teacher emotions on student emotions are mediated by need-supportive teaching.

## 2. The present study

This study was conducted in the context of English as a foreign language (EFL) because emotions related to EFL education have received much less attention than other subjects, such as mathematics (Frenzel et al., 2009a). A mixed-methods sequential explanatory design (Ivankova et al., 2006) was employed. In the quantitative phase, the associations between need-supportive teaching and student and teacher emotions were examined using student ratings. In the qualitative phase, teacher interviews were used to interpret and complement student perceptions.

As explained in the introduction, both theoretical (Fredrickson, 2001; Frenzel, 2014; Pekrun, 2006) and empirical studies (Frenzel et al., 2009a, 2018) suggest that need-supportive behaviors are not, by definition, an antecedent of student or teacher emotions. Moreover, student perceptions

are widely used to investigate need-supportive teaching and student emotions (Kaplan, 2018; Karimi & Fallah, 2021; Tze et al., 2014); they are also increasingly used to examine teacher emotions (Frenzel et al., 2009a, 2018; Jiang et al., 2016; Kunter et al., 2008). Therefore, we used student perceptions to test the following two hypotheses (see Figure 1):

- (1) There are significant associations leading from student emotions to perceived need-supportive teaching via perceived teacher emotions.
- (2) There are significant associations leading from perceived teacher emotions to student emotions via perceived need-supportive teaching.

### 3. Quantitative data

#### 3.1. Participants and procedure

The participants were 326 students from 22 classes in two lower-secondary schools in Finland. Of the 326 students, 175 (53.7%) were girls. The students' age ranged from 12 to 17 years ( $M = 13.86$ ,  $SD = .96$ ). The students were in seventh (53.4%), eighth (23.9%), and ninth (22.7%) grade, and they were taught by 15 EFL teachers. The mean number of participating students per class was 14.8 (minimum = 8, maximum = 21,  $SD = 3.6$ ). One of the schools was a local Finnish school with 87 (26.7%) participants, and the other was a multicultural school with 239 (73.3%) participants. In total, 178 (54.6%) participating students were native Finnish speakers, and 148 (45.4%) spoke other languages such as Spanish as their native languages. Prior to data collection, the study was approved by the schools, and consent was obtained from both students and parents. The students filled out the questionnaires in about 15 min during a regular lesson.

#### 3.2. Measures

##### 3.2.1. Perceived need-supportive teaching

Perceived need-supportive teaching was measured with the Teacher as Social Context Questionnaire – Student Report (Belmont et al., 1992). The 10 items assessed perceived autonomy, competence, and relatedness support separately (Cronbach's  $\alpha$  range = .64–.86). Autonomy support

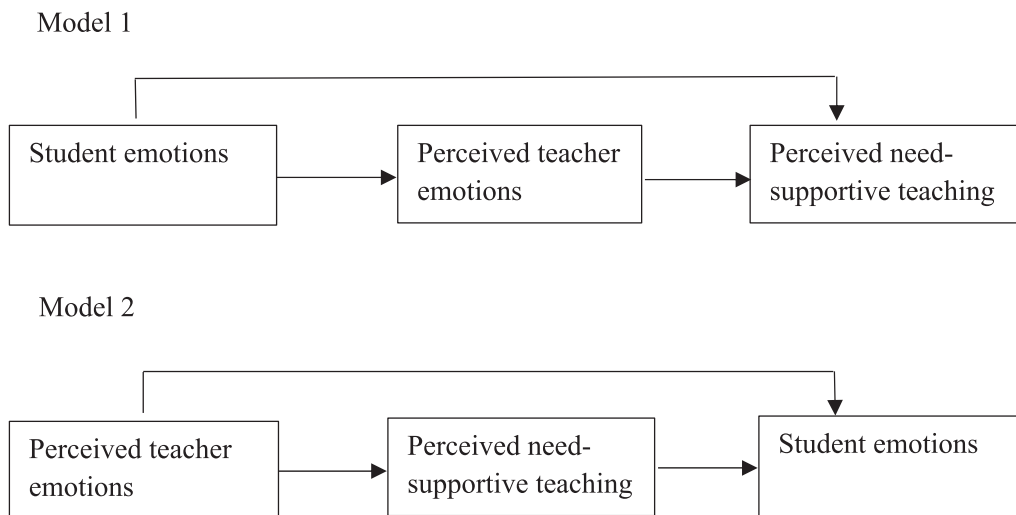


Figure 1. The hypothesized models.

included three items, which referred to choices provided for students, the relevance of learning activities, and the acknowledgment of students' perspectives (e.g., "My teacher lets me choose learning activities"). Competence support comprised four items, which involved the structure of lessons, guidance, and constructive feedback (e.g., "My teacher organizes lessons in clear steps"). Relatedness support consisted of three items, which concerned teachers' affection and attunement (e.g., "My teacher cares about how I feel"). The students rated autonomy, competence, and relatedness support provided by their teachers using a 5-point Likert scale ranging from 1 (almost never true) to 5 (almost always true).

### **3.2.2. Self-reported student emotions**

Student emotions were assessed with the short version of the Achievement Emotion Questionnaire (Pekrun et al., 2011). The 10 items assessing students' class-related emotions consisted of positive activating emotions (five items; e.g., "I enjoy learning in class"), negative activating emotions (three items; e.g., "I get annoyed while learning in class"), and negative deactivating emotions (two items; e.g., "I get bored while learning in class"). Cronbach's  $\alpha$  ranged from .76 to .85. The students reported their experiences of emotions on a 5-point Likert scale ranging from 1 (almost never true) to 5 (almost always true).

### **3.2.3. Perceived teacher emotions**

The students rated how often they perceived their teachers to be in a particular emotional state. The measure of perceived teacher emotions was based on the Positive Affect Negative Affect Scale (PANAS; Watson et al., 1988). Of the 14 items that were adjectives expressing emotions, seven (e.g., "happy" and "angry") were selected from the PANAS; the other seven items (e.g., "affectionate" and "distracted") were chosen from the literature on teacher emotions (Chang, 2009; Sutton & Wheatley, 2003). These emotions are frequently experienced by teachers or are deemed to be salient for understanding their emotional lives (Cross & Hong, 2012; Frenzel, 2014). The 14 items consisted of positive activating emotions (six items; e.g., "happy"), positive deactivating emotions (one item; i.e., "relaxed"), negative activating emotions (four items; e.g., "angry"), and negative deactivating emotions (three items; e.g., "tired"). Cronbach's  $\alpha$  ranged from .82 to .87. A 5-point Likert scale was used ranging from 1 (never) to 5 (very often).

## **3.3. Data analyses**

### **3.3.1. Preliminary analyses and criteria**

The hypothesized models were tested using structural equation modeling (SEM) in Mplus version 8.7 (Muthén & Muthén, 1998-2017). There was a small degree of randomly missing data (no more than 1.5% per variable), which was handled by the full-information maximum likelihood procedure in Mplus. The evaluation of the model fit was based on the comparative fit index (CFI), Tucker-Lewis index (TLI), root-mean-square error of approximation (RMSEA), and standardized root-mean-square residual (SRMR) (Hu & Bentler, 1999). According to Hu and Bentler (1999), a good fit is demonstrated when the indices are as follows: CFI and TLI > .95, RMSEA < .06, and SRMR < .08.

Since the student ratings were nested within classes, intraclass correlations (ICC) were calculated to examine whether multilevel analyses were needed for the hypothesized models. The ICC<sub>1</sub> is interpreted as the proportion of total variance that can be attributed to between-class differences, whereas the ICC<sub>2</sub> incorporates the number of students per class and estimates the reliability of class-mean ratings (Lüdtke et al., 2009). An ICC<sub>1</sub> value above .05 reveals an adequate proportion of class-level variances; an ICC<sub>2</sub> value above .70 indicates acceptable levels of reliability of class means. The ICC<sub>1</sub> and ICC<sub>2</sub> for perceived need support reached .19 and .78; the ICC<sub>1</sub> and ICC<sub>2</sub> for perceived teacher emotions reached .15 and .71. In contrast, the ICC<sub>1</sub> and ICC<sub>2</sub> for student emotions only reached .05 and .44. Thus, student emotions did not have sufficient class-level

variances and acceptable reliability of class means. The number of classes (only 22) may also be too small to hold specific hypotheses for within- and between-class effects. Therefore, multilevel models may not be necessary. Instead, the command TYPE = COMPLEX was employed in SEM to adjust for the dependency of the data.

Confirmatory factor analysis was conducted to test the construct validity of latent variables. Perceived need support was supposed to consist of three constructs – support for autonomy, competence, and relatedness (Belmont et al., 1992). However, recent research has shown that the best fit for the items measuring need support was a single factor (Ahn et al., 2019). Therefore, three-factor and alternatively one-factor solutions for perceived need support were assessed. In addition, since the measure of student emotions did not include any items concerning positive deactivating emotions, the factor structure of student emotions was investigated by examining whether two factors (positive vs negative) were superior to three factors (positive vs negative activating vs negative deactivating). Furthermore, there was only one item measuring teachers' positive deactivating emotions, which could not construct a factor. Hence, the factor structure of perceived teacher emotions was explored by testing whether two factors (positive vs negative) fitted the data better than three factors (positive vs negative activating vs negative deactivating).

### 3.3.2. SEM

SEM under robust maximum likelihood estimation was used to test the two models. Model 1 specified paths leading from student emotions to perceived need-supportive teaching via perceived teacher emotions. Model 2 specified paths leading from perceived teacher emotions to student emotions via perceived need-supportive teaching. The mediation effect was tested using the delta method in Mplus. In both models, we controlled for age, gender, and native language because they could be associated with student emotions and perceived need support (Karimi & Fallah, 2021).

## 3.4. Results

### 3.4.1. Dimensionality of the data

Different models were compared using confirmatory factor analysis and the fit indices are shown in Table 1. One factor for perceived need-supportive teaching yielded a good model fit. Two factors (positive vs negative) for student emotions fitted the data well. Three factors (positive vs negative activating vs negative deactivating) for perceived teacher emotions showed a goodness of fit to the data.

The factor loadings on perceived need-supportive teaching ranged from .46 to .83; those on students' positive emotions ranged between .57 and .78, and those on students' negative emotions ranged from .40 to .75. The factor loadings on perceived positive teacher emotions ranged between .46 and .82; those on perceived negative activating teacher emotions ranged from .53 to .78, and those on perceived negative deactivating teacher emotions ranged between .60 and .66.

**Table 1.** Confirmatory factor analysis: Fit indices for different models.

Model	$\chi^2$	df	p	CFI	TLI	RMSEA	SRMR
Perceived need support							
1. One factor	28.40	31	.60	1.00	1.00	.00	.02
2. Three factors	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>	<sup>a</sup>
Student emotions							
1. Two factors	18.23	18	.44	1.00	1.00	.01	.03
2. Three factors	88.15	30	.00	.95	.92	.08	.04
Perceived teacher emotions							
1. Two factors	178.39	72	.00	.94	.93	.07	.05
2. Three factors	71.96	57	.09	.99	.99	.03	.04

<sup>a</sup>Not applicable because the model failed to converge.

### 3.4.2. Descriptive statistics and correlations

The latent variables' means, standard deviations, and correlations are presented in Table 2. Perceived need-supportive teaching was positively correlated with self-reported positive student emotions and perceived positive teacher emotions; it was negatively correlated with self-reported negative student emotions and perceived negative activating and negative deactivating teacher emotions.

### 3.4.3. Model 1

Model 1 yielded a good fit:  $\chi^2(582) = 787.28$ ,  $p < .001$ , CFI = .96, TLI = .95, RMSEA = .03, SRMR = .06. As shown in Model 1 (see Figure 2), students' positive emotions were positively related to perceived positive teacher emotions. Students' negative emotions were positively associated with perceived negative activating and negative deactivating teacher emotions. Students' positive emotions were positively related to perceived need support. No relationships were found for students' negative emotions. Perceived positive teacher emotions were positively related to perceived need support, but this was not the case for perceived negative teacher emotions. Perceived positive teacher emotions significantly mediated the positive associations between students' positive emotions and perceived need support (indirect effect = .27,  $p < .001$ ).

### 3.4.4. Model 2

Model 2 showed a good fit:  $\chi^2(580) = 772.55$ ,  $p < .001$ , CFI = .96, TLI = .95, RMSEA = .03, SRMR = .06. As presented in Model 2 (see Figure 2), perceived positive teacher emotions were positively related to perceived need support. Perceived need support was positively associated with students' positive emotions. Perceived need support significantly mediated the positive relationships between perceived positive teacher emotions and students' positive emotions (indirect effect = .47,  $p < .001$ ). No relationships were found with students' or teachers' negative emotions.

## 4. Qualitative data

### 4.1. Participants and procedure

Four teachers (two males and two females) from the multicultural school where the quantitative data were collected were interviewed. They taught EFL in seventh, eighth, and ninth grade, and their teaching experience ranged from 10 to 30 years. Each interview lasted about 30–40 min. The interviews were semi-structured and conducted in English. The core interview questions involved descriptions of teachers' emotional experiences while teaching a specific class. The teachers' responses were prompted by a list of emotion words.

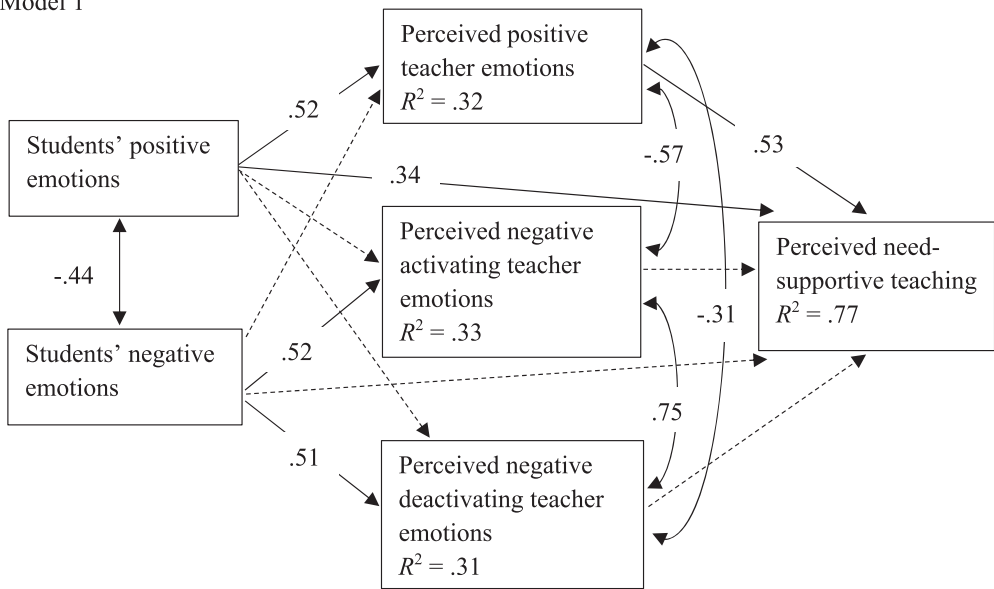
- (1) Which of the listed emotions do you often experience when teaching Class X? (The list included words such as "happiness", "inspiration", "calmness", "anger", "annoyance", and "nervousness".)
- (2) Could you describe a situation in which you experienced a particular emotion during class? What happened at that time? How did your students feel?
- (3) Can you talk about how your feelings, your students' feelings and your teaching affect each other?

**Table 2.** Latent variables' means, standard deviations, and correlations.

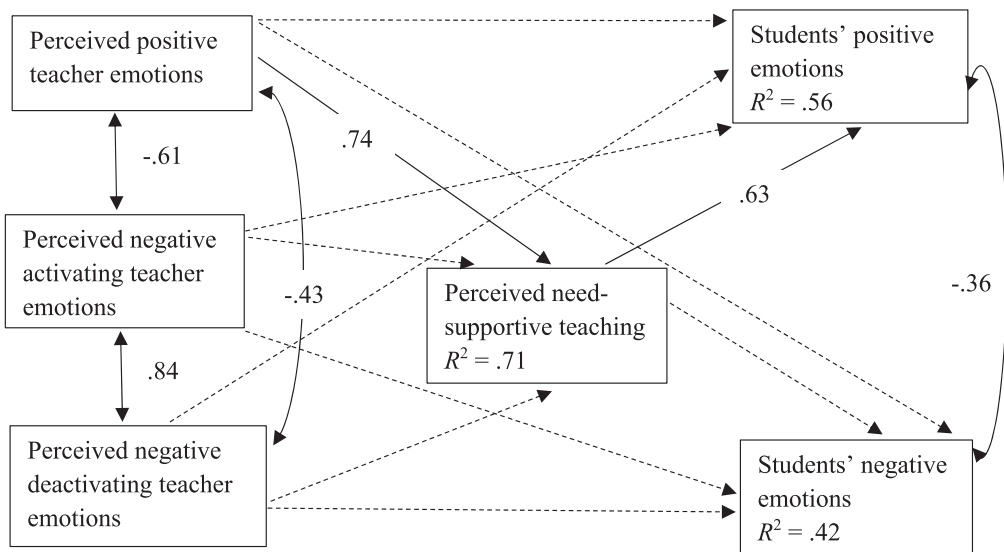
	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Need-supportive teaching	3.50	.79	–					
2. Students' positive emotions	3.72	.79	.68	–				
3. Students' negative emotions	2.27	.81	–.38	–.44	–			
4. Teachers' positive emotions	3.52	.80	.81	.56	–.32	–		
5. Teachers' negative activating emotions	2.28	.81	–.59	–.32	.57	–.61	–	
6. Teachers' negative deactivating emotions	2.07	.84	–.49	–.32	.55	–.43	.83	–

Note: All the correlations were significant at  $p < .001$ .

Model 1



Model 2



**Figure 2.** Models with standardized coefficients. Note. Significant paths are shown with solid lines ( $p < .001$ ).  $R^2$  refers to the explained variance.

#### 4.2. Data analyses

All the interviews were transcribed verbatim and analyzed following the guidelines of thematic analysis (Braun & Clarke, 2006). The transcripts were read and re-read to search for meanings and patterns. Drawing on previous theoretical and empirical studies (e.g., Pekrun, 2006; Reeve, 2009; Schutz et al., 2009), the initial codes were derived from constructs of need support and student and teacher emotions. These codes were collated into potential themes that represented the relationships between need support and student and teacher emotions, which were confirmed by

prior research (e.g., Aultman et al., 2009; Frenzel et al., 2009b; Kaplan, 2018; Van den Berghe et al., 2016) and the quantitative findings of this study. The coding process was carried out systematically and iteratively. To enhance reliability, two researchers coded the transcripts independently using the coding scheme. An example of the coding scheme is presented in Table 3. A code was considered to be reliable only if both coders assigned it to the same unit of text. Discrepancies were resolved through discussion, and the final intercoder reliability reached 95%.

As shown in Table 3, the development of a theme was based on domain summaries, which are similar to a “bucket theme” that summarizes what participants have said in relation to a topic (Braun et al., 2019). Domain summaries were chosen because the focus of the qualitative analysis was on presenting the associations between the emotions of students and teachers and need support, including their directions, antecedents, and outcomes. Thus, the “bucket themes” served our research purpose well.

### 4.3. Results

The identified themes highlighted how teachers described their emotional experiences in relation to their need-supportive teaching and their students’ emotions. The examples below are provided as evidence to support and illustrate the themes. The results were also elaborated using quotes from the teachers’ statements. The following pseudonyms were given to the four interviewed teachers: Jenni, Maria, Risto, and Sam.

#### 4.3.1. Theme 1: Effects of student emotions on teachers’ experiences of emotions and need-supportive teaching

The four teachers revealed that their students’ emotions affected their emotional experiences while teaching. Their emotions also impacted their need-supportive teaching.

Jenni reported that there were occasions when she tried to be calm but failed because her feelings were attached to those of her students. In this kind of situation, her lack of calmness could hinder the provision of her need-supportive teaching.

I try to be calm, but I can’t always be calm if they have something in their mind. There was a basketball game, and they lost. They were very nervous. They didn’t want to study, so I wasn’t very calm because our feelings were attached. They affected me too.

Previous research supports this finding. For example, a study based on lesson observations found that student engagement was related to more need support, while student disengagement was associated with less need support (Van den Berghe et al., 2016).

Jenni also explained that when her students became interested in learning, she felt inspired. Then, she would seek more ways to trigger the students’ motivation.

**Table 3.** Coding scheme examples.

Coding category	Description	Example
Student emotions	Adjectives related to interest, enthusiasm, or motivation during learning (e.g., “interested”, “enthusiastic”, and “nervous”)	“Because they are more motivated, more interested.”
Teacher emotions	Adjectives related to relaxation, interest, or enthusiasm during teaching (e.g., “calm”, “inspired”, “pleased”, and “tired”)	“Then I’m inspired by them.”
Need support	Support for students’ autonomy, competence, and relatedness (e.g., working closely with students, and giving feedback)	“If they do something, I praise them and I show it on my face.”
Effects of student emotions on teacher emotions and need support	Student emotions as an antecedent, and teacher emotions and need support as outcomes	“When I give them a task, and they actively do more than I expect, that makes me inspired. If they do something, I praise them and I show it on my face.”

They like the techniques and get better results than usual, so it works (Q: Does this make you inspired?) Yes, I think so. Because they are more motivated, more interested. Then, I try to work more. I try to think of something, of their ways of learning to get them interested in studying.

Maria reported that she felt inspired by her students' engagement in learning. This process renewed her energy and made her work closely with the students.

They say, "Oh, now that we look at it like this, we see that it is an interesting book." The students come up with ideas and suggestions about what might happen. They're into it, and I'm inspired by them ... [This] sort of renews my energy to do it. When we work together very well, it's very rewarding.

Risto mentioned that when his students were enthusiastic during a task, he felt inspired. As a result, he would praise them for the good job they had done.

When I give them a task, and they actively do more than I expect, that makes me inspired. If they do something, I praise them and I show it on my face. "That was an excellent point." "Wow, I've never thought of that." "That's a new thing."

Previous studies based on teacher interviews also found that teachers experience happiness because of students' joy (Hosotani & Imai-Matsumura, 2011) and pleasant interactions with students (Cross & Hong, 2012).

Jenni, Maria, and Sam revealed that their emotional experiences were affected differently by student emotions in different classes. When a class was enthusiastic about learning, they could easily become pleased about teaching. In contrast, when a class was uninterested in learning, they tended to become annoyed. Their negative emotions could interfere with the provision of their need-supportive teaching. As Sam explained,

This year it is a very different group than last year. They're a model class. They're really good, so I can be quite relaxed with them. Last year, I had to be every now and then angry with them. I had to be every now and then annoyed and they made me nervous at times, and I was displeased.

Previous studies that used teacher interviews also found that students' misbehaviors or their displays of negative emotions can lead to teachers experiencing negative feelings, such as anger and anxiety, which can interfere with teaching (Aultman et al., 2009; Cross & Hong, 2012).

#### **4.3.2. Theme 2: effects of need-supportive teaching on student emotions and teachers' experiences of emotions**

All four teachers revealed that their need-supportive teaching influenced their students' emotions. At the same time, students' emotions impacted teachers' experiences of emotions.

Jenni explained that she provided autonomy support (Reeve, 2009), such as integrating students' preferences into teaching, so that her students could become more interested in their learning activities. When they enjoyed learning, she felt pleased.

They are interested in music and films, and computers and iPads, so we try to work with them. Sometimes we have to take tests about grammar, structures, and words, but we can do it. They are very interested in the program. They even want to have extra word tests because they can do it with the computer. When they are pleased, I am also pleased.

Similar teaching strategies have been employed by teachers who tie students' interests to the curriculum (Aultman et al., 2009) and incorporate students' voices in their lessons (Parr et al., 2021), thus building positive connections with them.

Maria mentioned providing autonomy support (Reeve, 2009) and competence support (Skinner et al., 2008), such as using the film versions of novels to help students become interested in the books. When this was successful, she felt happy with her students' progress.

We're looking at a book through a film version, without really reading the whole book, just part of it. I had one boy in 9th grade who said that *The Pearl* was the first book he had read and he loved it. I think that if you have students who are not so interested in reading, it can help. I think that's the teacher's happy moment.

Risto talked about providing competence support (Skinner et al., 2008) and relatedness support (Stroet et al., 2013), such as giving individual feedback to his students. He felt inspired when a student became more engaged because of his feedback.

I give personal feedback on their oral exams. The next time we meet, if I see that the student is more active, I'd feel inspired because I can see that my personal contact with the student has had an effect.

Teachers in previous studies also reported getting to know their students by making individual contact (Aultman et al., 2009) and building supportive relationships with them by expressing approval (Hosotani & Imai-Matsumura, 2011).

Risto also stated that he provided competence support (Skinner et al., 2008) by engaging his students in collaborative learning. When the students were engaged, he forgot about the tiredness he had felt at the beginning of the lesson.

They work in pairs or in groups and give presentations. I don't feel that tiredness affects my teaching. I feel tired when I go there, but once I get things going, I forget about it.

Sam explained that he provided competence support (Skinner et al., 2008) by engaging his students in creative classroom activities. After the students became engaged, he felt less stressed.

Let's say that I have a headache that day, I would play not such a big role in the classroom. I would organize things so that they are doing the work ... "What do you know about China? Come to the board and write something about China." The Great Wall, and then dragons. You get them to be active, and that'll take the pressure off you.

Previous studies based on teacher interviews also revealed that creating diverse and meaningful learning activities for students helps to increase student engagement and teacher intrinsic motivation (Aultman et al., 2009; Parr et al., 2021).

## 5. Discussion

Using both student ratings and teacher interviews, this study examined the relationships between need-supportive teaching and the emotions of students and teachers. The quantitative analyses of the students' perceptions showed that both tested models worked. Intraclass correlations suggested that students from different classes rated teachers' need support and emotions differently. The interviews were used to verify whether the teachers described their emotional experiences in relation to need support and student emotions as indicated by the two quantitative models. Two themes concerning teacher interviews emerged from the qualitative findings. It was also indicated that the teachers experienced different emotions in different classes, and they applied different need-supportive strategies to specific groups of students.

This study's findings make several theoretical contributions. The evidence regarding the differences in teachers' need-supportive teaching and their emotions in different classes can enrich our understanding of SDT (Ryan & Deci, 2000) and SDT-based teaching conceptualization (Stroet et al., 2013). SDT tends to interpret need support as a general practice. We found that the provision of need support was tailored to specific groups of students, and that teachers reacted emotionally to individual students or classes depending on how they reacted to teachers. Thus, this study suggests that need support is an interpersonal endeavor that entails one-on-one discourses between a teacher and a student or a teacher and a group of students. The development of SDT needs to enrich the interpretation regarding the interaction between the provider and the receiver of need support.

The quantitative findings of student ratings showed that negative student emotions or perceived negative teacher emotions were not significantly associated with perceived need support. In contrast, the qualitative results of teacher interviews revealed that students' negative emotions could negatively affect teachers' emotions, thus interfering with the provision of need-supportive teaching. These findings highlight the differences between students' and teachers' perceptions of emotions and need support. From the students' perspective, need support may involve a general

impression of a teacher (Ahn et al., 2019). It is likely that students regard a teacher to be need-supportive even if he or she displays anger in some situations, as students may perceive that the teacher cares about their learning and development. An important prerequisite for this to happen is that the students and the teacher trust each other and have a positive relationship (Jiang et al., 2016). However, from the teachers' perspective, need support can be greatly influenced by a variety of factors, as students' problems or their displays of negative emotions can interfere with teaching (Aultman et al., 2009). Thus, our results suggest that students may perceive need support as a whole picture that is not much affected by negative emotions, while teachers may perceive need support as a situational endeavor that can be hindered by negative emotions. These results can help teachers to develop their need-supportive teaching from different angles.

Our evidence concerning differences in teacher emotions and need support in different classes also has practical implications. The participating teachers experienced happiness in a class that tended to be enthusiastic about learning, and irritation in a class that tended to be uninterested. The teachers in this study had at least 10 years of professional experience, and they still revealed that it was normal to experience positive emotions in one class and negative emotions in another class. This conclusion is insightful for novice teachers who are struggling against boundary dilemmas in teacher-student relationships and who are experiencing negative emotions when teaching classes that show little initial learning motivation (Aultman et al., 2009). Novice teachers should not despair because they are not alone in facing this situation. Although some previous studies have focused on classroom diversity, differences in students' cultural background, language, and gender have been studied more extensively (Escayg, 2010; Pozas et al., 2020). Teaching practices based on the preferences and interests of different classes have not been seriously considered in previous research. As indicated by one of the interviewed teachers, her students were "interested in music and films, and computers and iPads." Therefore, she integrated their preferences into the design of her teaching. This method helped her students become interested in learning, and it made her feel happy about teaching. Another teacher explained that her students enjoyed using their imagination when analyzing literature, which made her inspired and work closely with them. It is probable that a teaching method applicable to one class would not be useful to another class because students' preferences are influenced by the classroom climate (Frenzel, 2014). Teacher education programs should encourage teachers to deeply explore the characteristics of a class and develop differentiated need-supportive teaching practices based on the preferences of that class for the sake of both the students' and the teacher's positive emotions.

The student ratings indicate the associations between the positive emotions of students and teachers and need-supportive teaching. The teacher interviews complement the quantitative findings and suggest the relationships between the negative emotions of students and teachers and need-supportive teaching. These findings point to useful directions for improving traditional intervention research on teaching practices. This study supports previous findings that the emotions of students and teachers can be transmitted to each other and play a crucial role in shaping teaching enthusiasm (Frenzel et al., 2018). Compared to previous quantitative (Frenzel et al., 2009a) and qualitative (Cross & Hong, 2012; Hosotani & Imai-Matsumura, 2011) research, our study is the only one that combines need-supportive teaching with student and teacher emotions in the classroom and that provides quantitative models of student ratings as well as qualitative accounts of teachers' vivid field experiences. Traditional intervention research tends to help teachers learn how to become more autonomy-supportive toward students (Reeve, 2009). However, this approach adopts a single angle and assumes that teaching behavior is independent of student and teacher emotions. This study provides evidence that such emotions and need-supportive teaching should not be ignored when developing effective teaching practices. These aspects interact and influence each other; hence, overlooking one of them may lead to missing the whole picture of teaching.

Despite its novel contributions, this study has some limitations. One shortcoming is that the quantitative part of the research was cross-sectional. Future research should include longitudinal data or observational methods to examine the models used here. Another limitation is that this

study did not include measures of need-thwarting teaching. A question that can be addressed in future research, therefore, is whether the negative emotions of teachers and students cause teachers to enact more need-thwarting behaviors (Van den Berghe et al., 2016). A third shortcoming is that there were more students in the multicultural school than in the local Finnish school. Although there were native Finnish speakers in the multicultural school, the atmosphere of this school might have differed from that of the local Finnish one. Thus, the participants' perceptions about need support and emotions may have been affected by the atmosphere of their school. A fourth limitation is that teacher emotions were investigated based on student ratings. There might be discrepancies between students' perceptions of teacher emotions and self-reported teacher emotional experiences. Future research can investigate teacher emotions using both student and teacher ratings (Frenzel et al., 2009b). A fifth shortcoming is the small number of teachers who took part in the interviews. The reason the four teachers were chosen for this study is that their demographic characteristics, including gender and teaching grade, can reflect those of lower-secondary EFL teachers in Finland. Furthermore, they had at least 10 years of teaching experience, so they had more insights into teaching and emotions in the classroom than novice teachers. However, scholars in future research should interview more teachers to enrich their qualitative findings.

## 6. Conclusion

In sum, this study shows that considerable between-class variances in perceived teacher emotions exist and that teachers experience different emotions in different classes. Moreover, there are no significant associations between negative emotions and need support from students' perspective, while negative emotions are connected with need support from teachers' point of view. The combined results of the SEM of student ratings and of the thematic analysis of teacher interviews show reciprocal relationships between need-supportive teaching and the emotions of students and teachers. These findings contribute to a richer understanding of SDT and SDT-based teaching conceptualization; they also provide insights into intervention research on teaching practices and teacher education. Teacher education programs should encourage teachers to deeply explore the characteristics of a specific class and develop differentiated need-supportive teaching practices based on the preferences of that class for the sake of both the students' and the teacher's positive emotions. Finally, awareness of student and teacher emotions as well as of their interactions in the process of developing need-supportive teaching strategies should be fostered in intervention research on teaching practices.

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