



Mapping teachers' emotional and pedagogical dimensions: a network analysis of teachers' socio-emotional competencies, conceptions of teaching and implicit theories of emotions

Nathalie Mella^{1,2} · Catherine Audrin³ · Sandrine Biémar⁴ · Line Fischer⁴ · Marc Romainville⁴ · David Sander^{1,2} · Elise Dan-Glauser⁵

Received: 30 July 2025 / Accepted: 8 July 2026
© The Author(s) 2026

Abstract

Teachers' socio-emotional competencies (SEC) are known to contribute to their well-being and classroom climate. Yet, little is known about how these competencies interact with their conception of teaching and their implicit theories about emotions. We addressed this gap using a network analysis from 263 preservice teachers to explore the interrelations between preservice teachers' intra and interpersonal SEC, their conceptions of teaching, and their beliefs about utility, source and malleability of emotions in the classroom. Results show that a constructivist approach to teaching is positively associated with perceiving oneself as a key source of students' emotional experiences, with this association occurring alongside higher valuation of positive emotions in learning contexts. Intrapersonal SEC is associated with beliefs in the malleability of students' emotions and co-occurs with teachers' perceived capacity to support students' emotional regulation. The central position of malleability beliefs and intrapersonal competencies suggests that these dimensions are highly connected within this system and may represent priorities for future longitudinal or intervention research. Overall, the findings provide a basis for examining how emotional competencies and pedagogical conceptions become translated into classroom practices during teacher development.

Keywords Teachers' socio-emotional competencies · Conception of teaching · Academic emotions · Implicit theories of emotions

1 Introduction

Over the past decades, emotions have gained significant attention in the educational context, as they affect both students and teachers. Regarding student emotions, Pekrun and colleagues have emphasized the importance of academic emotions (Camacho-Morles et al., 2021; Pekrun et al., 2002; Pekrun & Stephens, 2012). Academic emotions refer to emotions arising in learning contexts, such as pride or frustration. These emotions have notably been related to the subject being studied, to the social aspects of classroom situations, to the cognitive dimension of learning (i.e., epistemic emotions), and to achievement-related outcomes (i.e., achievement emotions) (Pekrun, 2024).

Regarding teachers, their emotions have also been studied quite thoroughly. Research reports that teachers navigate a broad spectrum of emotions that differ in intensity, quality, and valence (Burić & Macuka, 2018). They report experiencing both positive and negative emotions, with enjoyment, anger and anxiety being among the most frequently reported (Frenzel et al., 2021; Lohbeck et al., 2018). As Farouk (2012) highlights, teacher emotions are deeply intertwined with their interactions and relationships with students, colleagues, and parents, shaping their overall teaching experience (Farouk, 2012). Research further emphasizes that teacher emotions are closely linked to their well-being, self-efficacy, and students' learning outcomes (Frenzel et al., 2021).

Emotions are thus at the heart of the educational process, influencing not only students' learning outcomes but also teachers' well-being and professional practices, such as instructional strategies and relationship building. They can act as powerful motivators for learning and engagement, but they can also become obstacles when mismanaged or misunderstood. Teachers, as central figures in shaping the classroom climate, must navigate their own emotional experiences while simultaneously addressing the needs of their students. These abilities require good socio-emotional competencies (SEC).

1.1 Teacher socio-emotional competencies and perception of emotions

SEC encompass the ability to recognize, understand, and regulate one's own emotions, as well as to respond effectively to the emotional experiences of others, including students (Mikolajczak, 2020). They thus refer to both intrapersonal, dealing with teachers' own emotions, and interpersonal, dealing with students' emotions. To better understand how teacher emotions translate into student outcomes, Jennings and Greenberg (2009) proposed the Prosocial Classroom Model. This model posits that teachers' SEC play a central role in shaping classroom processes. Teachers who can perceive, understand, and regulate their own emotions are more likely to implement effective classroom management, adopt supportive instructional practices, and develop positive relationships with students. These processes contribute to the establishment of a positive classroom climate, which in turn fosters students' engagement, emotional adjustment, and academic learning. Therefore, the influence of teacher emotions on students is theoretically assumed to be mediated by teachers' SEC and their impact on classroom interactions. As an example of intrapersonal

SEC, a teacher might feel angry with a student who does not understand a lesson in which the teacher has invested significant effort. However, a teacher with high SEC may be able to regulate this anger and remain composed. On another hand, a teacher witnessing a student being angry and managing de-escalate this emotional state, for instance by initiation a discussion, is an example of interpersonal SEC. Several studies has emphasized the importance of teachers' SEC not only for teachers themselves (Oliveira et al., 2021) but also for students' outcomes (Gebre et al., 2025).

However, teachers' SEC are not developed in isolation. Understanding teachers' emotional competences requires considering how they intertwine with their conceptions of teaching and their implicit theories about students' emotional experiences. To address this gap, we explored whether teachers' SEC are related to (1) their personal conceptions of teaching and (2) how they perceive the role of their students' emotions in the classroom.

1.2 Teachers' personal conceptions of teaching and learning

Teachers' conceptions of teaching and learning refer to "the beliefs [they] hold about their preferred ways of teaching and learning" (Chan & Elliott, 2004 p. 819). Beyond these preferences, conceptions also encompass beliefs about less valued or avoided approaches, which contribute to shaping teachers' instructional choices. These conceptions include not only the meaning of teaching and learning but also the roles of teachers and students. Teachers' conceptions of teaching and learning are typically associated with two models: the traditional and the constructivist models. In the traditional conception, sometimes also referred to as "teacher-centred" (Chan & Elliott, 2004), teaching is viewed as the direct transmission of knowledge from the teacher, seen as the expert, to the students, who are perceived as a passive recipients. Learning, in this perspective, is often equated with memorization and repetition, with an emphasis on structured instruction, discipline, and teacher authority. The underlying beliefs thus are that knowledge is certain and fixed, with students expected to absorb and reproduce information as presented by the teacher. Conversely, the constructivist conception, sometimes also referred to as "student-centred" (Chan & Elliott, 2004), views learning as an active and dynamic process in which students engage with and make sense of knowledge through exploration, discussion, and personal engagement. Teaching, in this view, is not merely about transmitting information but about facilitating inquiry, encouraging critical thinking, and supporting students in developing their own understanding. This model assumes that knowledge is not absolute but rather shaped by individual experiences and interactions. In terms of teaching practices, teachers with a more constructivist approach tend to prioritize student-centred activities, problem-solving, and collaborative learning, fostering an environment where students actively engage with content rather than passively receive it.

These conceptions of teaching are not dichotomous but instead can be seen as a continuum ranging from a teacher-centred perspective to a student-centred perspective. In addition, teachers may hold to different conceptions depending on the context in which they teach (Cheng et al., 2016), and different conceptions of teaching maybe more or less appropriate depending on the situation (Ross, 2017). Interestingly, there is contrasting evidence regarding the link between teacher conceptions of learning

and teaching and teaching practices. While some suggest that they may not be related (e.g., Eley, 2006), others indicate that teaching conceptions are associated with how teachers “approach their teaching, which in turn can affect learner learning” (Ross, 2017, p.8). However, to our knowledge, no previous studies have investigated the link between teachers’ conceptions of teaching and learning and conceptions about emotions. In addition, teachers’ implicit beliefs about emotions may also play a critical role in how emotions are handled in educational contexts.

1.3 Teachers’ implicit theories about emotions

Implicit theories of emotions refer to individuals’ underlying beliefs about the nature and controllability of emotions. One study has previously investigated implicit theories in pre-service teachers and has notably emphasized that pre-service teachers recognize the importance of emotions in learning and globally consider that pleasant emotions have positive effects whereas unpleasant emotions get deleterious effects. This study further emphasized that pre-service teachers recognize the role of emotions in student-teacher relationship, as well as in the school climate (Fischer et al., 2026). Literature distinguishes between two primary mindsets: the entity theory and the incremental theory. People who hold an entity theory view emotions as fixed and uncontrollable, believing that emotions are direct and inevitable responses to external events. In contrast, individuals with an incremental theory - or growth mindset - believe that emotions can be regulated and changed through effort and strategies (Schroder et al., 2017). These beliefs significantly shape how individuals engage with their emotions.

More specifically, individuals who endorse an incremental view of emotions tend to use adaptive regulation strategies, such as cognitive reappraisal, which involves reinterpreting situations to change their emotional impact (Kappes & Schikowski, 2013; Schell et al., 2023; Smith et al., 2023; Tamir et al., 2007; Zhang et al., 2023). In contrast, those who view emotions as fixed are more likely to rely on maladaptive strategies like avoidance or suppression, which can lead to higher stress, anxiety, and lower overall well-being (Tamir et al., 2007; Schell et al., 2023). Studies have further demonstrated that interventions promoting an incremental view can enhance emotional flexibility and well-being, suggesting that these beliefs are not only influential but also modifiable through psychological training and education (Jiang et al., 2024). As implicit theories refer to broad beliefs about humans in general, individuals with an incremental view of emotion for themselves may endorse similar views for others’ emotions (Mangels et al., 2006). Teachers’ implicit theories of emotions are then likely to influence both the way they regulate their own emotions and the way they perceive they can help regulate student’s emotions. Teachers with a fixed mindset of emotions may be less likely to consider emotional dimensions of learning and may be less inclined to foster an affectively secured learning climate, while teachers with a growth mindset may be more attentive to students’ emotional needs and more likely to contribute to supportive and emotionally enriching learning environments (Orlova et al., 2015).

1.4 Objective of the study

Despite growing research on the role of SEC in teaching, there is limited integration of studies examining how these competencies intersect with teachers' pedagogical conceptions and implicit theories of emotions. This gap is particularly significant given that these three dimensions likely interact in shaping teachers' perceptions and potentially their practices. For instance, a teacher with strong SEC but a traditional view of teaching may prioritize emotional downregulation to maintain classroom order, whereas a constructivist teacher may leverage emotions as opportunities for collaborative problem-solving.

This article seeks to address this gap by examining the relationships between preservice teachers' SEC, their conception of teaching, and their representations of students' emotions in the classroom. Specifically, it aims to explore how these three dimensions are interrelated in educational settings.

The study of the relationships between preservice teachers' SEC, their conceptions of teaching, and their implicit theories of emotions involves a set of interconnected variables, whose links are not necessarily unidirectional. As we have no a priori assumptions regarding causal relationships, our data analysis strategy was to perform a network analysis because it offers a flexible way to examine both the organization and the strength and nature of relationships (Borsboom et al., 2021).

2 Methods

2.1 Participants and procedure

A total of 292 participants aged between 18 and 60 years (72% women) were recruited from four institutions (i.e., University of Namur, Belgium, University of Teacher Education (Vaud, Switzerland), University of Lausanne, Switzerland, and University of Geneva, Switzerland). Most of the respondents were from the University of Geneva (60%), followed by University of Namur (21.5%), University of Teacher Education (15.5%) and finally University of Lausanne (1.5%). Most of the participants had no previous teaching experience (57%) and were in their first year of teacher training (66.5%), preparing to teach in secondary school (66%).

The study was approved by the ethics committees of the University of Namur (n°2023/2) and the University of Geneva (n° CUREG-2023-05-63). Participants were recruited during their training by researchers. Their participation was voluntary. They were given an online questionnaire link that they could complete either during a course break or at home. Before the beginning of the questionnaire per se, participants first gave their informed consent to participate in the study. Then we collected sociodemographic data (i.e., participants' gender, age, the country where they followed their training, the level of teaching they chose and their prior experience as a teacher). The final part of the questionnaires was devoted to the collection of the study measures (see below).

2.2 Measures

Teachers' SEC were measured using the short French version of the PEC (Mikolajczak et al., 2014). This scale consists of 20 items measuring five competencies (i.e., identification, understanding, expression, regulation and use) in a self-reported way. Items are oriented toward intrapersonal skills (10 items, 2 for each competence, such as "When I am touched by something, I immediately know what I feel") and interpersonal skills (10 items, 2 for each competence, such as "I am good at sensing what others are feeling"), rated on a 5-point Likert scale. Cronbach Alpha = 0.69 and $\omega=0.65$ for the interpersonal competencies and Alpha = 0.69 and $\omega=0.71$ for the intrapersonal competencies.

Teachers' conceptions of teaching were assessed using the French version of the Teaching and learning conceptions questionnaire (; translated and adapted in French by Chan & Elliott, 2004; Therriault & Harvey, 2011). This scale consists of 30 items and allows assessment of whether participants endorse more traditional ("The teacher's essential role is to impart knowledge to students") or constructivist conception of learning and teaching ("Effective teaching values discussion and activities designed for students"). Cronbach Alpha =.83, $\omega=.85$ for the constructivist dimension and $\omega=.74$ for the traditional dimension.

Teachers' perception of students' emotions in the classroom was assessed with three dimensions regarding emotions: 1) utility of emotions for learning, 2) source of emotions and 3) controllability of emotions. Concerning the perceptions of utility and source of emotions, we focused on nine emotions typically experienced in the classroom (Bowen et al., 1988; Pekrun et al., 2002) and that cover both epistemic and achievement emotions (Sznycer et al., 2021; Vogl et al., 2021; Wilutzky, 2015) : three positive emotions (i.e., joy, interest and pride) and six negative emotions (i.e., anger, shame, frustration, anxiety, discouragement and boredom). To assess perceived utility for learning, participants were asked to assess how useful each emotion was for learning, engagement, or performance. The scale consisted in a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). Mean scores were computed for negative emotions and positive emotions separately (Cronbach Alpha =.90 for negative emotions, $\omega=.76$ and.74 for positive emotions, $\omega=.70$). To assess teachers' beliefs regarding the source of students' emotions in the classroom, they were asked to answer, for each emotion, if they believed that the given emotion "always came from external factors to the teacher" (1) to "always came from the teacher" (5). A mean score was computed across all emotions to assess the extent to which teachers perceive themselves as the source of students' emotions in the classroom. Cronbach Alpha =.61, $\omega=.62$. Finally, to assess their beliefs regarding the controllability of (students') emotions, four questions were adapted from the implicit emotion theory scale (Congard et al., 2022; Tamir et al., 2007). The selected items were the following: "No matter how hard they try, students can't truly change the emotions that they have"; "Every student can learn to control his/her emotions"; "The truth is, students have very little control over their emotions"; "If they want to, students can change the emotions that they have". Participants were asked to answer on a 5-point Likert scale. A mean score was computed (Cronbach Alpha = 0.71, $\omega=0.71$).

2.3 Data analysis

Analyses were conducted on participants with complete data on the variables included in the network analysis ($N=263$). We first performed descriptive (mean, SD, minimum and maximum value) statistics for each variable at stake (see Table 1). Then, because the aim of the study was exploratory and focused on mapping conditional associations among constructs without imposing a priori directional assumptions, a network approach was used (Briganti et al., 2024). Network analyses were conducted in R (version 4.4.1) using the qgraph and bootnet packages (Epskamp et al., 2012, 2018). We estimated a regularized partial correlation network using the EBIC glasso procedure (EBICglasso, $\gamma=0.5$), which applies graphical least absolute shrinkage and selection operator regularization to reduce spurious associations. Correlations were computed using the `cor_auto` function, which estimates polychoric correlations for ordinal variables and Pearson correlations for continuous variables. We examined node connectivity using strength centrality, defined as the sum of absolute edge weights connected to a node. Centrality indices were interpreted descriptively as indicators of relative connectedness within the estimated network. Betweenness centrality was also computed but interpreted cautiously given its known instability in psychological networks.

To evaluate the accuracy and robustness of the estimated network, we conducted bootstrap analyses following current methodological recommendations (Epskamp et al., 2018). First, nonparametric bootstrap procedures were used to compute confidence intervals around edge weights, allowing assessment of the precision of individual associations. Second, case-dropping bootstrap analyses were performed to evaluate the stability of centrality indices. We calculated the correlation stability (CS) coefficient, which quantifies how much of the sample can be removed while retaining a correlation of at least 0.70 with the original centrality estimates. In line with established guidelines, CS-coefficients above 0.50 were interpreted as indicating stable centrality estimates.

The network included the following variables: intrapersonal emotional competencies (PEC intrapersonal subscale), interpersonal emotional competencies (PEC interpersonal subscale), constructivist teaching conception, traditional teaching conception, perceived usefulness of positive emotions (mean of joy, interest, and

Table 1 Descriptive statistics for study variables

Variables	<i>n</i>	mean	SD	min	max
Utility of positive emotions	263	3.47	0.31	2.67	4.00
Utility of negative emotions	263	1.62	0.45	1.00	4.00
Ability to regulate students' emotions	263	3.15	0.81	1.00	5.00
Student's controllability of emotions	263	3.13	1.11	1.00	5.00
Teachers as a source of students' emotions	263	3.10	0.35	2.11	4.00
Constructivist view	263	4.15	0.48	1.92	5.00
Traditional view	263	2.70	0.45	1.53	4.13
Intrapersonal Competence	263	3.38	0.58	1.60	4.90
Interpersonal Competence	263	3.60	0.46	2.40	4.80

pride), perceived usefulness of negative emotions (mean of anger, shame, frustration, anxiety, discouragement, and boredom), perceived student emotional controllability, perceived teacher ability to regulate students' emotions, and perceived teacher as a source of students' emotions. Each node therefore represents a composite observed variable derived from questionnaire subscales or averaged indices.

3 Results

Table 1 provides descriptive statistics for the variables of interest. Table 2 provides pairwise correlations between the dimensions explored in the network. As displayed in Table 2, pairwise correlations showed that traditional and constructivist views of teaching are negatively related. In addition, the perceived utility of positive emotions in the classroom was positively related to a constructivist conception of teaching, while being negatively related to a traditional conception of teaching, and negatively related to the perceived utility of negative emotions. Furthermore, teachers who think that positive emotions are useful in the classroom also tend to report that they are at the source of students' emotions and reported higher interpersonal competencies. A strong positive correlation was also observed between teachers' perception of students' ability to control their emotions and their perceived ability to regulate students' emotions, suggesting a shared underlying belief regarding the controllability of emotions.

3.1 Robustness of the Network

To evaluate the robustness of the network, we conducted nonparametric and case-dropping bootstrap analyses (Epskamp et al., 2018). Bootstrap confidence intervals indicated that the precision of many individual edge-weight estimates was limited, with several intervals overlapping zero (see Fig. 1). Therefore, individual edges, especially small ones, should be interpreted cautiously. However, case-dropping bootstrap analyses showed excellent stability of strength and expected influence

Table 2 Correlation matrix used for the network estimation

	1	2	3	4	5	6	7	8
1. Constructivist view	--							
2. Traditional view	-0.16*	--						
3. Utility of positive emotions	0.31**	-0.18**	--					
4. Utility of negative emotions	-0.07	-0.05	-0.19**	--				
5. Ability to regulate students' emotions	0.06	-0.02	-0.03	-0.02	--			
6. Teachers as a source of students' emotions	0.01	-0.11	0.23**	-0.05	0.04	--		
7. Student's controllability of emotions	0.00	0.03	-0.05	-0.07	0.72**	0.00	--	
8. Intrapersonal Competence	0.05	0.05	0.12	-0.02	0.06	0.10	0.18**	--
9. Interpersonal Competence	0.16*	-0.12	0.13*	-0.07	0.01	0.11	0.02	0.31**

** $p < .01$, * $p < .05$, bilateral, correlations in bold are significant

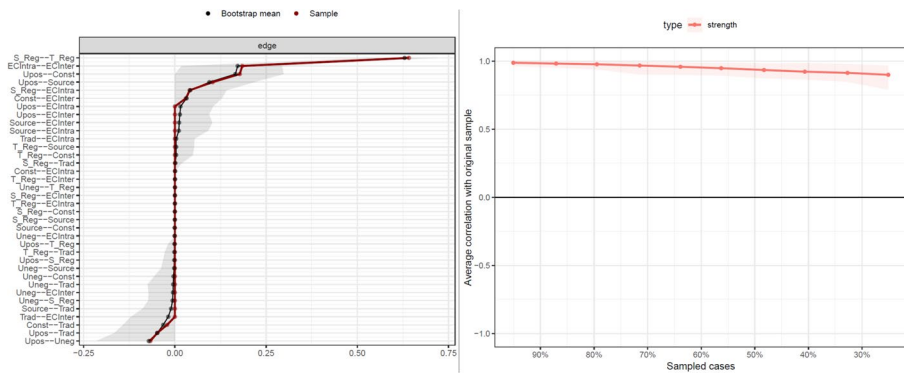


Fig. 1 Edge-weight accuracy plot (1a) and Case-dropping bootstrap results for strength centrality (1b). (a) represents bootstrapped confidence intervals of edge weights. The red line indicates the sample estimate, and the grey area represents the variability across bootstrap samples. Overlap with zero indicates limited precision; thus, individual edges should be interpreted with caution. (b) presents the case-dropping bootstrap results for strength centrality. The y-axis shows the correlation between centrality indices computed on subsets of the data and those from the original sample, while the x-axis represents the proportion of cases retained. The high and stable correlations across decreasing sample sizes indicate strong stability of centrality estimates (CS coefficient = 0.75)

(CS = 0.75), supporting the interpretation of relative centrality indices and overall network structure. When examining the weighted network (Fig. 2), which allows the observation of the structure of conditional associations between variables after controlling for all other variables, we observe two groups of interrelated variables: (1) one group linking preservice teachers' emotional competencies and perceived malleability of student's emotion, both by teachers and by students themselves, and (2) one group linking the constructivist view of teaching, the perception of utility of positive emotions, and the perception that teachers are the main source of students' emotions (Table 2).

More specifically, in the network, intrapersonal emotional competencies were connected to beliefs about students' emotional controllability, and these beliefs were also connected to preservice teachers' perceived ability to regulate students' emotions. These associations indicate that SEC and emotion-related beliefs tend to co-occur within a common configuration of variables. Preservice teachers reporting higher intrapersonal competencies also tended to endorse more malleable views of students' emotions and a higher perceived capacity to regulate them. Importantly, these associations do not imply that one variable influence another; they reflect conditional relationships estimated after controlling for all other variables in the network.

To examine potential redundancy between these two last nodes, we conducted a goldbricker analysis comparing correlation patterns across variables. The analysis suggested substantial overlap between students' emotional controllability and preservice teachers' perceived ability to regulate students' emotions (only 14% of correlations significantly differed). This indicates that the two variables occupy highly similar positions in the network. The strong association observed between these nodes should therefore be interpreted cautiously, as it may partly reflect shared vari-

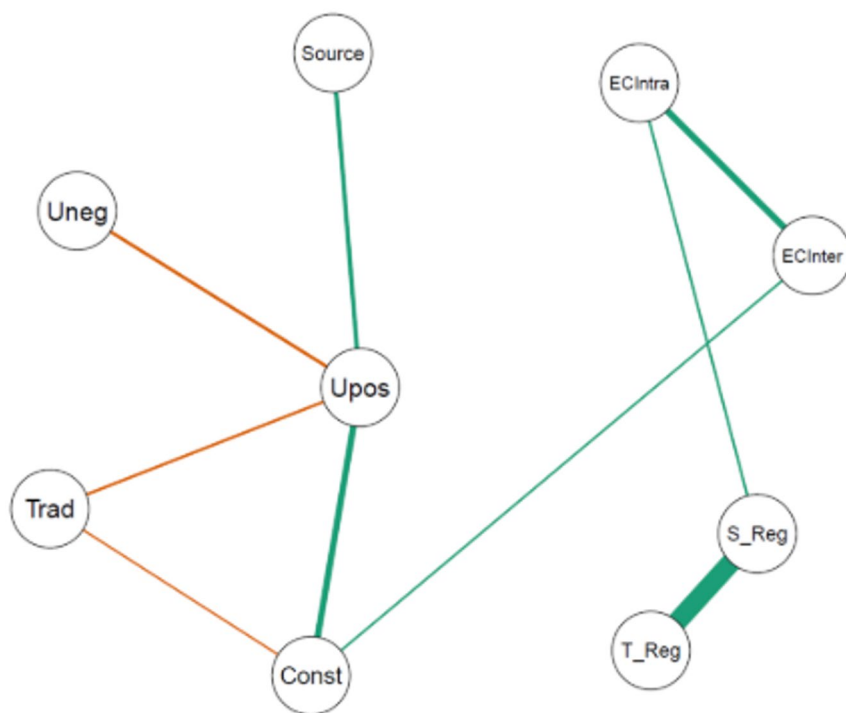


Fig. 2 Weighted network of socio-emotional competencies, teachers' conceptions of teaching and implicit theories of student's emotions at school (*glasso* corrected). Green lines represent positive correlations, red lines represent negative correlations. Thin lines represent weak connections, and thick lines represent strong connections. ECintra= intrapersonal emotional competencies; ECinter= interpersonal emotional competencies; Const= constructivist conception of teaching; Trad= traditional conception of teaching; Uneg= perceived utility of negative emotions; Upos= perceived utility of positive emotions; Source= perception that teachers are at the sources of students' emotions in the classroom, S_Reg= perceived controllability of students' emotions by the students themselves; T_Reg= perceived ability to regulate students' emotions

ance between closely related constructs rather than a distinct relationship between separate psychological processes.

Furthermore, a more constructivist approach to teaching and learning was associated with the perception that positive emotions are useful for learning processes. This perception is also linked to the belief that teachers are the main source of students' emotions in the classroom (i.e., that they are the main influence on students' emotions). These associations describe a coherent pattern of beliefs, in which teaching conceptions, the perceived emotional value of learning situations, and the perceived emotional involvement of the teacher are organized together within the network.

In addition to positive associations, several negative edges were observed, particularly between traditional and constructivist conceptions of teaching, and between the perceived utility of positive and negative emotions. However, given the limited precision of edge estimates, these negative associations should be interpreted cautiously and not considered robust.

Table 3 Degree centrality and Betweenness Centrality indices of the different variables of the weighted network

Student's controllability of emotions	Degree centrality	Betweenness centrality
	0.86	4
Ability to regulate students' emotions	0.70	0
Utility of positive emotions	0.46	2
Intrapersonal Competence	0.44	4
Interpersonal Competence	0.29	0
Constructivist view	0.26	0
Teachers as a source of students' emotions	0.20	0
Traditional view	0.00	0
Utility of negative emotions	0.00	0

Intrapersonal EC = Intrapersonal Emotional Competencies; Interpersonal EC = Interpersonal Emotional Competencies. The CS-coefficient (0.75) was estimated for strength centrality only, betweenness centrality values were not assessed via case-dropping bootstrap and should be interpreted with caution

As displayed in Table 3, centrality indices indicated that some variables were more strongly connected to the rest of the network. Beliefs about students' emotional controllability and preservice teachers' perceived ability to regulate students' emotions showed the highest strength and expected influence, suggesting that they may occupy a relatively central position within the network of associations linking competencies, conceptions of teaching, and emotion-related beliefs. In addition, intrapersonal emotional competencies were located within the core of the network and were connected to multiple emotion-related beliefs. This position indicates that these competencies are closely embedded in the broader configuration of preservice teachers' emotional representations and perceived regulatory capacities.

Some nodes showed a degree of zero in the regularized network (Traditional view and Utility of negative emotions). This does not indicate that these variables were unrelated to the others in the data. Rather, in a regularized partial correlation network, edges are retained only when a unique conditional association remains after controlling for all other variables. Associations that are weak, indirect, or redundant with other nodes are shrunk to zero by the regularization procedure. Thus, a zero edge reflects a statistical cutoff of conditional associations.

4 Complementary analyses

To examine whether the observed network structure depended on training stage, we conducted a sensitivity analysis comparing participants with and without teaching experience using the Network Comparison Test (NCT). This permutation-based procedure evaluates differences in global network structure and overall connectivity between groups. The network comparison test did not reveal significant differences in overall network structure ($M=0.19$, $p=.37$) or global connectivity ($S=0.58$, $p=.24$) between participants with and without teaching experience. This suggests that the configuration of associations was comparable across training stages. Although a small number of individual edges differed between groups, the general organization of the network remained stable.

Thus, although most participants were early in their training and a large proportion came from a single institution, the sensitivity analysis indicated that the network structure was not primarily driven by training stage.

To examine whether the aggregation of emotions influenced the observed network structure, we conducted supplementary analyses including all discrete emotion variables (see Supplementary Material). These analyses resulted in less stable and less interpretable network structures, with no clear or replicable pattern of associations emerging across specifications.

5 Discussion

The purpose of this study was to examine the relationships between preservice teachers' SEC, their conceptions of teaching, and their implicit theories of students' emotions in the classroom, namely their controllability, utility and source. This question was addressed using a weighted network to explore both the nature and structure of interrelations, as well as the most central variables of the network. We observed two main results: (1) the utility of positive emotions was related to a constructivist view of teaching and to the belief that teachers are the main source of students' emotions; and (2) the perceived malleability of students' emotions was related to both preservice teachers' intrapersonal emotional competencies and to the belief that they can help students regulate their emotions. In addition, the perceived malleability of students' emotions and preservice teachers' intrapersonal emotional competencies appeared to occupy a relatively central position in the network, as reflected by higher strength and expected influence indices.

5.1 Relationships between conception of teaching, perceived utility of emotion and perceived source of students' emotions

Interindividual differences in a constructivist approach to teaching were positively related to interindividual differences in preservice teachers' propensity to consider themselves as the main source of students' emotions in the classroom. This association may reflect that preservice teachers adopting a more constructivist approach also tend to perceive their role as extending beyond the mere transmission of knowledge, also acknowledging their potential involvement in students' epistemic emotions during learning activities – for instance, through the use of cognitive conflict to evoke curiosity, uncertainty, or productive confusion. Interestingly, the relationship between preservice teachers' tendency to adopt a constructivist approach and their perception of themselves as a major source of students' emotions co-occurred with a stronger valuation of positive emotions in learning contexts. Constructivist approaches are more student-centred and draw on students' interests, potentially fostering emotional engagement as a resource for learning (Barr & Tagg, 1995). Our findings are consistent with the presence of a coherent belief system linking constructivist teaching conceptions with a more agentic and emotionally engaged view of the teacher's role. Within this system, preservice teachers appear not only to acknowledge the presence of emotions in the classroom, but also to attribute them a functional value in

the learning process. Positive epistemic emotions such as curiosity, interest, joy or even productive confusion may thus be perceived as desirable in learning situations. Moreover, perceiving oneself as a key source of students' emotions may reflect a stronger sense of emotional involvement in the classroom. This may be associated with greater attention to the emotional climate of learning situations, although the present data do not allow to determine how these beliefs translate into actual teaching practices.

Although network analyses do not allow for conclusion about directional effect, we may propose hypotheses regarding how these interrelations could be reflected in classroom contexts. Preservice teachers with a more constructivist view of learning and teaching may also tend to place greater emphasis on students' emotional experiences when designing learning activities. Although this study does not examine teaching practices directly, such an interpretation is consistent with the idea that pedagogical approaches may be associated with underlying beliefs about learning and emotions. In this perspective, placing greater value on students' emotional engagement could be associated with more individualized and responsive teaching, possibly counteracting stereotype-based expectations by focusing less on preconceived assumptions about students' abilities and more on their situated engagement in learning. At the same time, this configuration of beliefs may also have ambivalent implications. Viewing oneself as central to students' emotional experiences may be associated with increased perceived emotional demands in teaching. Future research is therefore needed to examine how these beliefs relate not only to student outcomes but also to teachers' well-being.

These findings also point to the relevance of addressing emotions in teacher education. Initial and in-service training may benefit from helping teachers understand how emotions emerge in classroom contexts, how they relate to learning processes, and how teachers might support or regulate these emotions. However, further research is needed to examine how these belief systems translate into actual teaching practices and student outcomes.

5.2 Relationships between preservice teachers' emotional competencies and perceived controllability of students' emotions

Our findings further shed light on the relationships between preservice teachers' emotional competencies and their perception of controllability regarding students' emotions. This strong association may reflect that these variables capture a shared representation concerning emotional regulation in the classroom rather than distinct functional processes. The prominent edge connecting these nodes likely captures this shared conceptual space. At the same time, these constructs may remain theoretically distinguishable, as they refer to different aspects of teachers' emotional functioning and beliefs.

This interpretation is consistent with the prosocial classroom model proposed by Jennings and Greenberg (2009), which emphasizes the central role of teachers' social and emotional competencies in shaping classroom processes. In this model, teachers' intrapersonal competencies, such as emotional awareness and regulation, are thought to influence both their own emotional functioning and the emotional climate of the

classroom, thereby affecting students' emotional experiences. Although the present study does not assess classroom processes directly, the observed associations suggest that preservice teachers' perceived ability to influence students' emotions may be closely related to their own emotional competencies, in line with this theoretical framework.

Because network clusters can also arise from measurement features (e.g., shared response formats, aggregation procedures, or conceptual overlap), the observed grouping should be interpreted cautiously. As such, the present findings primarily reflect the organization of reported beliefs and competencies at the level of observed measures.

The network structure of relationships between preservice teachers' SEC and their perception of the malleability of students' emotions, both by the students themselves and by preservice teachers, highlights the central position of intrapersonal competencies within the network. Indeed, intrapersonal competencies, both reported by preservice teachers and perceived in the students, occupied a central position in the network, linking preservice teachers' interpersonal competencies to their perceived ability to help students regulate emotions. This observation resonates with the literature on growth mindset applied to emotions, which is consistent with literature suggesting that perceiving emotions as malleable and controllable fosters adaptive strategies for emotional regulation and greater persistence in challenging situations, while perceiving emotions as uncontrollable has been associated with emotional dysfunction (Kneeland & Simpson, 2022; Schell et al., 2023; Tamir et al., 2007). Preservice teachers who embrace a growth mindset regarding emotional experiences, both their own and those of their students, might be more confident in their capacity to support students in managing emotions, therefore highlighting the role of intrapersonal competencies within this network associations. Understanding these associations emphasizes the necessity of promoting teachers' emotional competencies, particularly intrapersonal competencies, not only for enhancing their own emotional well-being but also for strengthening their perceived agency in fostering emotionally supportive learning environments. Furthermore, beliefs in the malleability of emotions have been associated with more adaptive social behaviour and better interpersonal relationships (Tamir et al., 2007). As such, teachers who hold these beliefs may be more likely to build trusting and supportive relationships with their students.

5.3 Centrality of preservice teachers' emotional intrapersonal competencies and of perception of malleability of students' emotions

Beliefs concerning students' emotions malleability showed the highest centrality in the network, both in terms of strength and expected influence, and were closely related to preservice teachers' intrapersonal emotional competencies. This result suggests that these dimensions occupy a highly interconnected position in the configuration of reported beliefs and competencies assessed in this study. The bootstrap analyses indicated stable centrality estimates, which increases confidence that this pattern reflects a robust organization of associations in the present sample.

One possible interpretation is that these nodes reflect a broader representation related to emotional regulation in educational contexts. Preservice teachers who

report greater awareness and regulation of their own emotions may also be more inclined to view emotions as controllable in general and to perceive themselves as capable of supporting students emotionally. This interpretation remains hypothetical and should be examined in longitudinal or experimental designs, as the present cross-sectional network cannot establish directional relationships.

The central positioning of these variables therefore does not identify intervention targets but may help generate research hypotheses. Future studies could test whether changes in preservice teachers' emotion-related beliefs or intrapersonal competencies precede, follow, or co-develop with changes in other pedagogical beliefs and classroom practices. Teacher education research could examine how these representational dimensions are associated with observable behaviours, such as emotion-related instructional practices or teacher-student interactions. An interesting avenue for future research concerns the generalizability of these findings beyond preservice teachers. It remains unclear whether similar network structures would be observed among in-service teachers, or how these configurations might evolve across different stages of the teaching career. Exploring potential developmental changes in teachers' conceptions of emotions and their integration with SEC would provide valuable insights into the stability and transformation of these representations over time.

6 Limitations

The network represents conditional associations between variables estimated from cross-sectional data. The results therefore describe patterns of co-occurrence and organization among constructs and do not specify directional or causal relationships. While our results provide interesting insights into preservice teachers' perceptions of emotions, SEC and conceptions of teaching and learning, future research is needed to further investigate the causal links between these dimensions, for example through longitudinal studies. More specifically, intervention studies may investigate whether and how developing emotional competences is associated with changes in preservice teachers' representations toward emotions or, conversely, whether changes in beliefs precede changes in competencies. Furthermore, our results are based exclusively on self-reports, and it might be important to investigate how implicit theories of emotion are associated with the teaching environment at school, as well as the impact of teachers' emotional competencies on their teaching practices or on their actual use of emotion-related strategies in the classroom. Further research is therefore needed to examine these links. A further limitation concerns the internal consistency of some measures, particularly the scale assessing the perceived source of emotions ($\alpha=0.61$). Because network models are based on observed variables, measurement error may attenuate or obscure associations and reduce the precision of individual edges. Accordingly, individual edges, especially weaker ones, should be interpreted cautiously. In addition, the precision of individual edge estimates was limited, as indicated by wide bootstrap confidence intervals, suggesting that specific connections between variables should be interpreted with caution. Furthermore, some nodes showed substantial conceptual and statistical overlap (e.g., perceived controllability of students' emotions and perceived ability to regulate them), which may have influ-

enced their centrality within the network. The composition of the sample also limits generalizability, as most participants were at an early stage of teacher training and were recruited predominantly from a single institution. Finally, the use of composite scores for each construct may have obscured more fine-grained relationships between specific dimensions of emotional competencies and beliefs. While aggregating across emotions may mask some heterogeneity, the supplementary analyses suggest that modelling discrete emotions resulted in less stable and less interpretable network structures in the present sample. This supports the use of aggregated indices as a more robust representation of general beliefs about emotions in this study. However, future research with larger samples or alternative methodological approaches may allow for a more fine-grained examination of emotion-specific patterns and their distinct pedagogical implications.

Future Research Directions Although the network approach used in this study does not allow for causal inferences, the observed patterns of associations may inform hypotheses about potential mechanisms underlying teachers' beliefs and competencies. These hypotheses could guide future applied research, particularly longitudinal or intervention studies aimed at examining how changes in these dimensions unfold over time. From an applied perspective, these findings may point to the importance of two complementary strategies. First, training programs could consider focusing on fostering teachers' adoption of a growth mindset regarding emotions, encouraging the belief that emotions, both their own and their students', can be effectively regulated and managed. Studies have shown that implicit theories are highly malleable and can be targeted through specific interventions (Jiang et al., 2024). Thus, research on growth mindset interventions targeting socio-emotional outcomes suggests that such approaches may contribute to fostering a more incremental view of emotions. Such interventions may also represent a lever to mitigate the influence of stereotypes on teachers' emotional expectations and interactions with their students. Second, interventions or training may also aim to strengthen teachers' intrapersonal emotional competencies, such as emotion regulation and emotional self-awareness. By specifically targeting these dimensions, training programs or interventions may be associated with broader changes in teachers' representations, including their conceptions of teaching, their beliefs about the utility of emotions in the classroom, and their perception of themselves as key contributors to students' emotional experiences. Ultimately, this approach may be associated with more adaptive teaching practices and a more emotionally supportive learning environment. While previous literature highlighted the importance of teachers' intrapersonal emotional competencies for their own well-being (Aldrup et al., 2024; Oliveira et al., 2021), our results are consistent with the idea that enhancing these competencies may also be related to students' experiences, through teachers' beliefs and attention to emotional processes in the classroom.

7 Conclusion

The present study aimed to examine how pre-service teachers' SEC, conceptions of teaching, and beliefs about students' emotions are organized within a network of associations. The findings may be understood as capturing an early representational

level of teacher functioning. In line with theoretical frameworks such as the prosocial classroom model (Jennings & Greenberg, 2009), teachers' SEC are expected to be associated with student outcomes through behavioural and relational classroom processes (e.g., teacher-student relationships, classroom management, and emotional climate). Although the present study does not assess such classroom behaviours, it provides insight into how competencies and beliefs are organized at an early stage of professional development. Taken together, the results highlight a structured configuration linking preservice teachers' beliefs about teaching and emotions with their SEC. Constructivist conceptions of teaching were associated with a stronger valuation of positive emotions and a more agentic view of the teacher's emotional role, while intrapersonal emotional competencies were closely connected to beliefs about the controllability of students' emotions. These findings should be interpreted as reflecting patterns of associations rather than directional or causal relationships.

From an applied perspective, these findings may inform teacher education by identifying domains that are closely connected within teachers' representations. Considering emotional competencies and emotion-related beliefs together in training contexts may be relevant, given their proximity within the network structure. Future research should further investigate how these configurations evolve over time and how they are associated with observable teaching practices and classroom processes.

Acknowledgements We are grateful to all the pre-service teachers who generously participated in this study.

Funding Open access funding provided by University of Geneva. This research has not received any funding.

Declarations

Competing interests The authors declare no conflict of interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Barr, R. B., & Tagg, J. (1995). From teaching to learning—A new paradigm for undergraduate education. *Change: The Magazine of Higher Learning*, 27(6), 12–26.
- Borsboom, D., Deserno, M. K., Rhemtulla, M., Epskamp, S., Fried, E. I., McNally, R. J., Robinaugh, D. J., Perugini, M., Dalege, J., & Costantini, G. (2021). Network analysis of multivariate data in psychological science. *Nature Reviews Methods Primers*, 1(1), Article 58.

- Bowen, D. D., Seltzer, J., & Wilson, J. A. (1988). Dealing with emotions in the classroom. *Organizational Behavior Teaching Review*, 12(2), 1–14.
- Briganti, G., Scutari, M., Epskamp, S., Borsboom, D., Hoekstra, R. H., Golino, H. F., Christensen, A. P., Morvan, Y., Ebrahimi, O. V., & Costantini, G. (2024). Network analysis: An overview for mental health research. *International Journal of Methods in Psychiatric Research*, 33(4), Article e2034.
- Burić, I., & Macuka, I. (2018). Self-efficacy, emotions and work engagement among teachers: A two wave cross-lagged analysis. *Journal of Happiness Studies*, 19(7), 1917–1933.
- Camacho-Morles, J., Slep, G. R., Pekrun, R., Loderer, K., Hou, H., & Oades, L. G. (2021). Activity achievement emotions and academic performance: A meta-analysis. *Educational psychology review*, 33(3), 1051–1095.
- Chan, K. W., & Elliott, R. G. (2004). Relational analysis of personal epistemology and conceptions about teaching and learning. *Teaching and Teacher Education*, 20(8), 817–831.
- Cheng, A. Y., Tang, S. Y., & Cheng, M. M. (2016). Changing conceptions of teaching: A four-year learning journey for student teachers. *Teachers and Teaching*, 22(2), 177–197.
- Congard, A., Le Vigouroux, S., Antoine, P., Andreotti, E., & Perret, P. (2022). Psychometric properties of a French version of the implicit theories of emotion scale. *European Review of Applied Psychology*, 72(1), Article 100728.
- Eley, M. G. (2006). Teachers' conceptions of teaching, and the making of specific decisions in planning to teach. *Higher education*, 51, 191–214.
- Epskamp, S., Borsboom, D., & Fried, E. I. (2018). Estimating psychological networks and their accuracy: A tutorial paper. *Behavior Research Methods*, 50(1), 195–212.
- Epskamp, S., Cramer, A. O., Waldorp, L. J., Schmittmann, V. D., & Borsboom, D. (2012). qgraph: Network visualizations of relationships in psychometric data. *Journal of statistical software*, 48, 1–18.
- Farouk, S. (2012). What can the self-conscious emotion of guilt tell us about primary school teachers' moral purpose and the relationships they have with their pupils? *Teachers and teaching*, 18(4), 491–507.
- Fischer, L., Audrin, C., Biémar, S., Mella, N., Sander, D., Romainville, M., & Dan-Glauser, E. (2026). What do teachers think about students' emotions? A mixed-method exploration of their implicit theories. *European Journal of Psychology of Education*, 41(1), 31.
- Frenzel, A. C., Daniels, L., & Burić, I. (2021). Teacher emotions in the classroom and their implications for students. *Educational Psychologist*, 56(4), 250–264.
- Gebre, Z. A., Demissie, M. M., & Yimer, B. M. (2025). The impact of teacher socio-emotional competence on student engagement: A meta-analysis. *Frontiers in Psychology*, 16, Article 1526371.
- Jiang, X., Mueller, C. E., & Paley, N. (2024). A systematic review of growth mindset interventions targeting youth social-emotional outcomes. *School Psychology Review*, 53(3), 251–272.
- Kappes, A., & Schikowski, A. (2013). Implicit theories of emotion shape regulation of negative affect. *Cognition & emotion*, 27(5), 952–960.
- Kneeland, E. T., & Simpson, L. E. (2022). Emotion malleability beliefs influence emotion regulation and emotion recovery among individuals with depressive symptoms. *Cognition and Emotion*, 36(8), 1613–1621.
- Lohbeck, A., Hagenauer, G., & Frenzel, A. C. (2018). Teachers' self-concepts and emotions: Conceptualization and relations. *Teaching and Teacher Education*, 70, 111–120.
- Mangels, J. A., Butterfield, B., Lamb, J., Good, C., & Dweck, C. S. (2006). Why do beliefs about intelligence influence learning success? A social cognitive neuroscience model. *Social cognitive and affective neuroscience*, 1(2), 75–86.
- Mikolajczak, M. (2020). Emotional competence. *The Wiley Encyclopedia of Personality and Individual Differences: Personality Processes and Individual Differences*, 137, 141.
- Mikolajczak, M., Brasseur, S., & Fantini-Hauwel, C. (2014). Measuring intrapersonal and interpersonal EQ: The short profile of emotional competence (S-PEC). *Personality and Individual Differences*, 65, 42–46.
- Oliveira, S., Roberto, M. S., Veiga-Simão, A. M., & Marques-Pinto, A. (2021). A meta-analysis of the impact of social and emotional learning interventions on teachers' burnout symptoms. *Educational Psychology Review*, 33(4), 1779–1808.
- Orlova, K., Ebner, J., & Genoud, P. A. (2015). Émotions et apprentissages scolaires. *Recherche & Formation*. <https://doi.org/10.4000/rechercheformation.2435>
- Pekrun, R. (2024). Control-value theory: From achievement emotion to a general theory of human emotions. *Educational psychology review*, 36(3), 83.

- Pekrun, R., & Stephens, E. J. (2012). Academic Emotions. In K. R. Harris, S. Graham, T. Urdan, S. Graham, J. M. Royer, & M. Zeidner (Eds.), *APA educational psychology handbook* (Vol. 2, pp. 3–31). American Psychological Association.
- Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational psychologist*, 37(2), 91–105.
- Ross, M. (2017). Conceptions of Teaching: An Illustrated Review. *The clinical teacher*, 14(1), 8–14.
- Schell, V., De France, K., Lin, L., & Hollenstein, T. (2023). The role of avoidance in understanding emotional dysfunction associated with a fixed emotion mindset. *Personality and Individual Differences*, 201, Article 111945.
- Schroder, H. S., Yalch, M. M., Dawood, S., Callahan, C. P., Donnellan, M. B., & Moser, J. S. (2017). Growth mindset of anxiety buffers the link between stressful life events and psychological distress and coping strategies. *Personality and Individual Differences*, 110, 23–26.
- Smith, A. M., Young, G., & Ford, B. Q. (2023). The interpersonal correlates of believing emotions are controllable. *Motivation and Emotion*, 47(3), 323–332.
- Sznycer, D., Sell, A., & Lieberman, D. (2021). Forms and functions of the social emotions. *Current Directions in Psychological Science*, 30(4), 292–299.
- Tamir, M., John, O. P., Srivastava, S., & Gross, J. J. (2007). Implicit theories of emotion: Affective and social outcomes across a major life transition. *Journal of personality and social psychology*, 92(4), 731.
- Therriault, G., & Harvey, L. (2011). Postures épistémologiques que développent de futurs enseignants de sciences et de sciences humaines lors des cours de formation disciplinaire et pratique: L'apport d'une recherche mixte. *Recherches qualitatives*, 30(2), 71–95.
- Vogl, E., Pekrun, R., & Loderer, K. (2021). Epistemic emotions and metacognitive feelings. *Trends and prospects in metacognition research across the life span: A tribute to Anastasia Efklides*, 41–58.
- Wilutzky, W. (2015). Emotions as pragmatic and epistemic actions. *Frontiers in psychology*, 6, 1593.
- Zhang, M., Li, W. J., Zhang, L., Jia, N., You, X., Zhen, Z., & Kong, F. (2023). Relation of emotion malleability beliefs to subjective well-being: A short-term longitudinal study. *Applied Psychology: Health and Well-Being*, 15(4), 1391–1405.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Authors and Affiliations

Nathalie Mella^{1,2}  · Catherine Audrin³ · Sandrine Biémar⁴ · Line Fischer⁴ · Marc Romainville⁴ · David Sander^{1,2} · Elise Dan-Glauser⁵

✉ Nathalie Mella
Nathalie.mella-barraco@unige.ch

✉ Catherine Audrin
Catherine.audrin@hepl.ch

¹ Faculty of Psychology and Educational Sciences, University of Geneva, Geneva, Switzerland

² Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland

³ University of Teacher Education, Lausanne, Switzerland

⁴ University of Namur, Faculty of Education and Training Sciences, Namur, Belgium

⁵ Institute of Psychology, University of Lausanne, Lausanne, Switzerland