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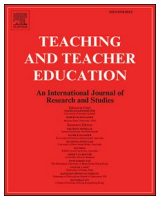

Research paper

Student teachers as in-service teachers in schools: The moderating effect of social support in the relationship between student teachers' instructional activities and their work-related stress☆

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ABSTRACT

Teacher shortages have led schools to fill vacant positions with student teachers who are not yet fully qualified but work part-time in schools. When student teachers begin working in the classroom, they face professional challenges that can lead to work-related stress. Drawing on assumptions from the job demands–resources (JD-R) model, we surveyed 172 student teachers in Germany and found that more complex instructional activities (e.g., teaching independently) are related to higher work-related stress. While social support from colleagues moderates this relationship, student teachers' self-efficacy beliefs do not.

1. Introduction

Schools worldwide are facing growing teacher shortages (on international teacher shortages, see OECD, 2021; Australia: Gallant & Riley, 2017; Germany: Porsch & Reintjes, 2023; Israel: Carmel & Badash, 2018; South Africa: Pitsoe, 2013; Sweden: Lindqvist et al., 2014; USA: Ingersoll & Tran, 2023; Sutcher et al., 2019). These are the result of teachers retiring or resigning as well as too few new teachers entering the profession. Approximately 40 percent of teachers in the European Union are expected to retire within the next few years (European Commission, 2015). Work overload, disruptive student behavior, and a perceived lack of social recognition may contribute to further attrition, as they are associated with symptoms of teacher burnout and intentions to leave the profession (e.g., European Commission, 2015; Fernet et al., 2012; Madigan & Kim, 2021). This will open up numerous vacancies that will urgently need to be filled (Darling-Hammond, 2023; Lucksnat et al., 2022). To meet the need for teachers capable of providing high-quality instruction, schools are turning increasingly to student teachers—teacher candidates who have not yet completed their training and are not yet licensed—as part-time in-service teachers (Scheidig & Holmeier, 2022). In the present study, we distinguish between *student teachers*, who are engaged in part-time work in a school setting while enrolled in a teacher preparation program, and *teacher candidates*, who are still enrolled in teacher preparation but not engaged in part-time employment. While this nuanced definition sets our study apart from existing research on teacher candidates, we contend that the term *student teacher* most accurately captures the semantic essence of teacher candidates working part-time in a school. Moreover, this distinction is crucial for understanding the dynamics of work-related stress and teachers leaving the profession early in their careers.

The demands of the teaching profession, including classroom disruptions, resource constraints, and heterogeneous student populations, pose challenges for teachers and especially for student teachers (Brevik et al., 2018). In this respect, the induction phase is decisive for student teachers, as failures during this phase can lead to decreased job satisfaction and a higher intention to leave the profession (Admiraal & Kittelsen Røberg, 2023; Skaalvik & Skaalvik, 2011; Veenman, 1984). As the job demands–resources (JD-R) model posits, job resources and personal resources, such as social support and self-efficacy, can play a vital role in helping student teachers cope with the demands of their work (Bakker & Demerouti, 2017; Hakanen et al., 2006).

There has been little empirical research on the instructional activities of student teachers because student teaching is a relatively new phenomenon in German school settings (Simonis & Klomfaß, 2023). This

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means that we have no information on what specific activities student teachers in Germany are engaged in, how they perceive the demands of their work, whether they receive social support from colleagues, or how they rate their self-efficacy beliefs. This is especially problematic because student teachers appear to be a vulnerable group: First, they still lack the skills to handle the challenges of the teaching profession. Second, due to general teacher shortages, they may not receive adequate support from colleagues. The present study aims to fill the existing research gap by investigating student teachers' instructional activities and their relationship to work-related stress. Moreover, we examine the moderating effect of social support from colleagues and student teachers' self-efficacy beliefs as assumed by the JD–R model (Bakker & Demerouti, 2017). In the following, we define the group of student teachers and present the theoretical rationales of our study.

1.1. Instructional activities of student teachers in schools

In light of teacher shortages and limited opportunities provided by teacher training programs to gain authentic field experience, teacher candidates increasingly take up part-time positions as student teachers (Lawson et al., 2015; Scheidig & Holmeier, 2022; Winter et al., 2023). In these positions, they are likely to carry out a variety of instructional activities, such as supervising or tutoring individual students, covering for fellow teachers, or teaching classes on their own (Winter et al., 2023). So far, there is no standardized pathway for teacher candidates in Germany to seek a position in a school. They may approach school principals or school administrators on their own or rely on placement programs through their university (e.g., Ronthaler, Reichert, & Winreich, 2020). While student teachers have responsibilities that are set out in their contract, there are no overarching regulations delineating what they can be expected to do. Student teachers receive a monthly salary through federal funding sources that school principals and school administrators are at liberty to use in hiring school staff (e.g., tutors for sports or arts-related activities; Simonis & Klomfaβ, 2023).

Despite the growing presence of student teachers in schools, empirical research on their instructional activities is scarce. Winter et al. (2023) surveyed 943 teacher candidates from six universities in Germany, revealing that approximately one third are employed part-time in schools, spending an average of 11.5 h per week on instructional tasks—including teaching subjects that are outside their field. Although only one third of student teachers receive support from mentors at school, they still express greater confidence in becoming certified teachers than non-employed teacher candidates. They also perceive their part-time teaching as beneficial for their career aspirations. Similar findings were reported by Scheidig and Holmeier (2022) and Bäuerlein et al. (2018) on samples of 929 and 249 teacher candidates, respectively, from Switzerland.

We assume that working in a school has a positive impact on student teachers if their specific needs, such as the need for support, are met. This assumption is grounded in empirical findings on the effects of teaching internships on teacher candidates' professional learning (e.g., Mok & Staub, 2021; Ronfeldt & Reininger, 2012). In the following section, we provide contextual information and empirical insights on teacher candidates' field experience during their teaching internships.

1.2. Teacher candidates' field experience in teaching internships

In the past two decades, universities and teacher training institutions have increasingly incorporated teaching internships into their programs. These internships aim to offer teacher candidates authentic classroom experience, including lesson planning and teaching, to enhance their professional learning (e.g., Arnold et al., 2014; Caires et al., 2012; Klassen & Durksen, 2014; Martins et al., 2015; Ronfeldt & Reininger, 2012). Whereas teacher candidates enrolled in undergraduate degree programs typically carry out less complex activities (e.g., observing fully qualified teachers, guided lesson planning, co-teaching), those enrolled in master's programs usually carry out more complex activities such as teaching classes on their own. Internships typically last from a few weeks to an entire semester and involve mentoring from both in-service teachers at the school and teacher educators at the university (Arnold et al., 2014; Beck & Kosnik, 2002; Hobson et al., 2009).

Empirical research finds positive effects of high-quality teaching internships on teacher candidates, such as increased self-efficacy and decreased work-related stress as a result of mastery experiences gained in the classroom (Brouwer & Korthagen, 2005; Kücholl et al., 2019; Mok et al., 2023; Mok & Staub, 2021; Ronfeldt, 2015; Ronfeldt & Reininger, 2012; Rupp & Becker, 2021). For instance, findings from studies by Burger et al. (2021), Caires et al. (2009), Fives et al. (2007), Mok et al. (2023), and Richter et al. (2022) consistently show that guidance and support from mentor teachers are correlated with elevated levels of job satisfaction and self-efficacy, as well as reduced levels of emotional exhaustion among teacher candidates during their internships. A qualitative study by Beck and Kosnik (2002) highlighted the importance of positive relationships with mentor teachers who provide professional feedback and emotional support, aiding teacher candidates in setting instructional goals, identifying areas for growth, and developing their teacher identity. While this evidence refers to the professional learning of teacher candidates in unpaid teaching internships, we assume that field experience can be equally advantageous for student teachers if they are provided with the appropriate conditions, such as social support from mentor teachers.

1.3. Characteristics of student teachers' instructional activities and teaching internships

While student teachers' instructional activities may resemble those carried out by teacher candidates in unpaid teaching internships, their part-time employment differs in several ways. Teaching internships typically involve a series of consecutive instructional activities, such as observing expert teachers, planning lessons, and teaching classes under supervision (Arnold et al., 2014). In contrast, student teachers are often employed to cover classes or provide additional support to students, limiting their opportunities to observe experienced educators (Scheidig & Holmeier, 2022; Winter et al., 2023). Additionally, while teaching internships have a set duration of several months, part-time employment is usually for an entire school year with the option of further employment (Winter et al., 2023). Moreover, teaching internships provide systematic support from mentors (teacher educators at the university or mentor teachers in schools). Student teachers, in contrast, receive no systematic support from mentors at their university who could help them reflect on their classroom experiences, as their part-time employment is not part of teacher education programs. Student teachers are also unlikely to have mentor teachers in schools, as teacher shortages and high workloads led to the job vacancies that created the need for student teachers in the first place (Klusmann et al., 2008).

When student teachers start working in a school, they face job-related challenges, such as coping with classroom disruptions, navigating relationships with parents, and completing administrative tasks for the first time (Dicke et al., 2014; Tynjälä & Heikkinen, 2011; Veenman, 1984). Drawing on the job demands–resources (JD-R) model, we posit that these challenges can lead to high levels of work-related stress in student teachers, particularly as they may lack the resources to cope, such as self-efficacy and social support from colleagues (Bakker & Demerouti, 2017; Schmidt et al., 2017). In the following, we will discuss these theoretical rationales in more detail.

1.4. Student teachers' job demands and work-related stress

As the JD–R model posits, job-related challenges represent demands that are inherent to the job context (Demerouti & Bakker, 2011; Karasek, 1979). Job demands are positively associated with teacher strain, represented by higher emotional exhaustion, job-related anxiety, and

health complaints (Bakker & Demerouti, 2007, 2017; Bakker et al., 2003; Demerouti et al., 2001). The more demanding teachers perceive their workload to be, the more they need mental and physical resources to cope with these demands. An imbalance between job demands and resources might lead to increased work-related stress, emotional exhaustion, and turnover intentions among teachers (Collie, 2023; Hakanen et al., 2006).

While there is no evidence yet on student teachers, numerous studies have focused on work-related stress in teachers in the induction phase (e.g., Klusmann et al., 2008; Richter et al., 2013). These studies identified the experience of "reality shock" or "practice shock", which describes short-term increases in novice teachers' work-related stress, decreases in their motivation, and changes in their instructional beliefs when entering the profession (Brouwer & Korthagen, 2005; Hartl et al., 2022; Hoy & Woolfolk, 1990; Klassen & Durksen, 2014; Veenman, 1984; Voss & Kunter, 2020). In a diary study of 152 novice teachers from Germany, Aldrup et al. (2017) found that teachers who were exposed to work-related stress reported lower levels of work enthusiasm and higher levels of emotional exhaustion. Increased levels of stress in teachers can lead to reduced job satisfaction (Woods et al., 2023), lower sense of school-belongingness (Collie et al., 2018), and poor instructional quality (Klusmann et al., 2008).

In this study, we examined the job demands resulting from student teachers' instructional activities in school. We assumed that higher job demands are related to higher levels of work-related stress. According to the JD–R model, however, the association between job demands and work-related stress may be moderated by job resources (e.g., social support from colleagues) and personal resources (e.g., individual self-efficacy beliefs; Bakker & Demerouti, 2017; Jolly et al., 2021), which we will describe in the following section.

1.5. Social support and self-efficacy as resources in the JD–R model

As student teachers have only limited capacities to cope with professional stressors, they need a set of resources when facing job-related challenges inherent to the teaching profession for the first time. The JD–R model posits that resources can be differentiated into job-related resources and personal resources (Bakker & Demerouti, 2017). Job-related resources refer to "psychological or material resources that are provided to a focal individual by partners in some form of social relationship" and include social support from peers and colleagues (Jolly et al., 2021, p. 229). As noted above, mentor teachers play a crucial role in providing social support to novice teachers, who usually lack professional experience, knowledge, and educational resources (Richter et al., 2013). Mentor teachers can, in particular, provide informational, instrumental, and emotional support (Jolly et al., 2021).

On the informational level, they can share school-specific knowledge that helps novice teachers to adapt to organizational norms and standards through approaches such as instructional goal-setting (Hobson et al., 2009). Mentor teachers can also observe novice teachers' instruction, provide professional feedback, and recommend instructional techniques. On the instrumental level, mentor teachers can share educational resources with novice teachers to help them address specific student needs. In addition, mentor teachers can provide emotional support by encouraging novice teachers when they are facing challenges such as student misbehavior in the classroom (Hobson et al., 2009).

Empirical research has demonstrated the diverse positive impacts of providing social support to novice teachers (e.g., Jähne et al., 2022). These effects include facilitating their professional growth, reducing feelings of isolation and turnover intentions, and enhancing their self-efficacy beliefs and job satisfaction (Caires et al., 2009; Hobson et al., 2009; Klassen & Durksen, 2014; D. Richter et al., 2013, E. Richter et al., 2022). For instance, Dreer (2021) investigated 125 teacher candidates from Germany during a 15-week teaching internship and found that the perceived quality of the mentor-mentee relationship positively correlated with overall satisfaction with the internship. Similarly, Ronfeldt and Reininger (2012) observed that the quality of social support from mentor teachers contributed to teacher candidates' sense of instructional preparedness. Burger et al. (2021) discovered that mentor teachers can foster novice teachers' perception of autonomy, thus reducing emotional exhaustion. However, findings are not always consistent: Aldrup et al. (2017) found no evidence that social support from colleagues buffered the relationship between stress exposure and novice teachers' enthusiasm or exhaustion. Similarly, Voss and Kunter (2020) found no effect of emotional support from peers on the negative longitudinal change in emotional exhaustion among beginning teachers.

Personal resources of teachers include individual self-efficacy beliefs (Bakker & Demerouti, 2017; Xanthopoulou et al., 2007). Self-efficacy is a motivational construct that consists of people's beliefs about their individual capability to control their environment (Bandura, 1993, 1997). Teachers with higher levels of perceived self-efficacy feel more confident in their ability to deal with challenging situations such as student misbehavior in the classroom. Self-efficacy beliefs have been argued to buffer the effect of job demands on teachers' work-related stress and may protect novice teachers from feeling overwhelmed by the high demands of the teaching profession (Bakker & Demerouti, 2017; Klassen & Durksen, 2014).

Empirical evidence overall suggests that teachers' self-efficacy beliefs are negatively associated with work-related stress (Zee & Koomen, 2016). Hoogendijk et al. (2022) found that teachers' self-efficacy negatively predicted emotional exhaustion at later time points using a cross-lagged panel model. Similar results have been reported by E. Richter et al. (2022), Skaalvik and Skaalvik (2007), and Skaalvik and Skaalvik (2010). Examining a sample of 806 teachers from Canada, Fernet et al. (2012) found that changes in teachers' self-efficacy induced by student misbehavior were associated with higher levels of emotional exhaustion, depersonalization of the job, and the feeling of reduced professional accomplishment. Kücholl et al. (2019) also found that self-efficacy beliefs in a sample of teacher candidates from Germany negatively predicted emotional exhaustion during a six-month teaching internship. Chan (2002), however, found no evidence of a moderating effect of self-efficacy on the relationship between job demands and work-related stress.

In sum, empirical evidence suggests that job resources (e.g., social support from colleagues) and personal resources (e.g., self-efficacy beliefs) can moderate the positive relationship between job demands (e.g., instructional activities) and work-related stress (Bakker & Demerouti, 2017). The present study investigates these relationships on a sample of student teachers, who are employed part-time in a school.

1.6. The present study

Due to teacher shortages and the limited field experiences in teacher training programs, teacher candidates are increasingly being hired to work part-time as student teachers in schools. While existing research focused on teaching internships and novice teachers in the teaching induction phase, only few studies investigated student teachers as defined in our study. To this end, the present study addresses several research gaps: First, there is no evidence to date on what activities student teachers carry out in schools. We expect the instructional activities undertaken by student teachers to vary in complexity, depending on whether they are enrolled in undergraduate or graduate-level teacher training programs (i.e., bachelor's or master's programs). We chose an explorative person-centered approach that seeks to identify latent groups in the population of student teachers based on their distinct types of activities (i.e., job demands; Demerouti et al., 2001). Second, while there is evidence that novice teachers who recently entered the teaching profession are challenged by their job demands, there are no findings to date on the work-related stress perceived by student teachers working part-time in schools. Third, while teaching internships incorporated into formal teacher training programs offer teacher candidates social support from mentors at the university and mentor teachers in schools, there is

no evidence on the extent of social support that student teachers receive. At the same time, we have ample evidence that novice teachers require job-related resources, such as social support, and personal resources, including self-efficacy belief, to cope with the inherent challenges of the teaching profession. In this respect, student teachers appear to be a vulnerable group, lacking the skills to cope with the challenges of the teaching profession on their own and presumably receiving little support from their colleagues in school. For this reason, the present study draws on the job demands–resources (JD-R) model to investigate the following research questions (RQ):

RQ1. *How do groups of student teachers, categorized by their instructional activities, differ in terms of student teachers' professional characteristics?*

We chose an explorative person-centered approach for RQ1, as we were first interested in identifying latent groups with distinct instructional activities in our sample of student teachers. We made no specific assumptions about the number of groups. We chose a person-centered over a variable-centered approach, as it allows more nuanced interpretations of how latent groups differ with regard to specific variables as well as more nuanced conclusions on practical implications (Kusurkar et al., 2021).

RQ2. *How do student teachers assess their work-related stress, social support, and self-efficacy?*

As student teachers do not yet possess all the professional skills they will presumably have at the end of their studies, it is likely that they face challenges in meeting job demands, such as dealing with classroom disruptions, navigating relationships with parents, and completing administrative tasks that pose objective stressors to novice teachers (Bruns et al., 2021; Dicke et al., 2015; Fives et al., 2007; Veenman, 1984). To this end, we assumed that student teachers report moderate to high levels of work-related stress (Dicke et al., 2014; Klassen & Durksen, 2014; Schmidt et al., 2017; Voss & Kunter, 2020). Moreover, as student teachers appear to fill vacancies in schools that exist due to teacher shortages and stress experienced by in-service teachers (Ingersoll & Tran, 2023; Sutcher et al., 2019), we assumed that they receive little social support from other teachers. We further assumed that student teachers report relatively high levels of self-efficacy as they seek job positions in schools voluntarily and are, hence, more likely to believe in their own abilities.

RQ3. *What is the moderating effect of self-efficacy and social support on the relationship between student teachers' instructional activities in schools and their work-related stress?*

Drawing on the JD–R model and previous research, we expected to find a positive relationship between student teachers' instructional activities and their work-related stress (Demerouti et al., 2001; Karasek, 1979; Schaufeli & Taris, 2014). We further expected to find that social support from colleagues and self-efficacy beliefs act as job resources and personal resources, respectively, that moderate this relationship (Bakker & Demerouti, 2017; Xanthopoulou et al., 2007). That is, we expected a negative interaction effect of social support and self-efficacy on the relationship between student teachers' instructional activities and work-related stress. The hypothesized model for RQ3 is depicted in Fig. 1.

2. Methods

2.1. Study design and sample

In this quantitative survey study, we collected cross-sectional data from January to September 2022, from $n = 172$ student teachers in Germany—that is, teacher candidates who were currently employed part-time in a school—through an online-based survey using the platform Unipark by Tivian Xi GmbH (mean duration for completing the survey was 12 min). We contacted the student teachers in the sample using mailing lists from the teacher training program at the University of Potsdam and by addressing student teachers directly in lectures and seminars. We also invited student teachers to take part in our survey through social media platforms such as Twitter, using popular German hashtags for teachers' digital interactions (e.g., #twlz, #twitterlehrerzimmer; in English: "teacher staff room"). A total of 225 student teachers responded to our invitation to participate in the study, of which 76 percent completed the survey ($n = 172$).

This study adhered to ethical guidelines and data protection regulations established by the University of Potsdam and followed standards for ethical research outlined by the American Psychological Association (APA, 2017) and the German Psychological Society (DGPs, 2018). All procedures were conducted in accordance with these guidelines. Following a thorough evaluation of the study's lack of potential harm or risk, it was determined that Institutional Review Board (IRB) approval was not required. Participants in this study were of legal age and provided informed consent voluntarily, without coercion. They were not involved in any professional or academic relationship with the authors, nor were their participation outcomes tied to academic achievements. Prior to participation, all individuals were fully informed about the study's purpose and objectives. Additionally, anonymity and confidentiality were assured throughout the study process. All participants were guaranteed the freedom to withdraw from the study at any point without facing any penalties or risk to their career. The survey was designed to avoid inducing psychological stress, and measures were taken to ensure that participants were not exposed to any risks during the study. Participants had been informed about data protection regulations prior to taking the survey, and the security of all collected data was ensured.

Eighty-eight percent of student teachers in the sample were female. The mean age of the student teachers in our sample was $M = 28.00$ years ($SD = 6.19$). While 54 percent were undergraduate students, 44 percent were enrolled in a master's teacher training program. Fifty-seven percent of student teachers were enrolled in a teacher training program to teach at the primary level, and 43 percent were enrolled in a program to teach at the secondary level. Regarding school type, 68 percent were employed in primary schools, and 32 percent were employed in secondary schools. As this study used a non-random sampling approach, we have no specific information on the number of different schools that student teachers worked at. The student teachers in our sample carried out various instructional activities in their schools, ranging from tutoring individual students (38 percent) to teaching classes on their own (15 percent; see Table 1).

2.2. Measures

To assess the job demands of student teachers, we asked all participants to provide information on their instructional activities in their part-time employment. In this regard, we developed five items covering instructional activities based on insights from preceding interviews with student teachers at the University of Potsdam. Moreover, items in this scale are based on activities that teacher candidates typically engage in throughout teaching internships implemented in formal teacher training (Arnold et al., 2014; Gröschner et al., 2015): *I tutor individual students*, *I co-teach classes together with other teachers*, *I cover for other teachers*, *I teach classes on my own*, and *I am a homeroom or class teacher on my own*.[1] All items were rated dichotomously (0 = No, 1 = Yes). As student teachers may be engaged in various instructional activities in their school, they were allowed to select multiple activities. To answer RQ2, we asked student teachers to report on the work-related stress they experienced as a result of their job demands (i.e., instructional activities). We used three items from a scale developed by Böhm-Kasper et al.

[1] In Germany, the class teacher (Klassenlehrkraft) is responsible for teaching both homeroom and regular classes. A group of students assigned to the class teacher usually remain with that teacher for several years.

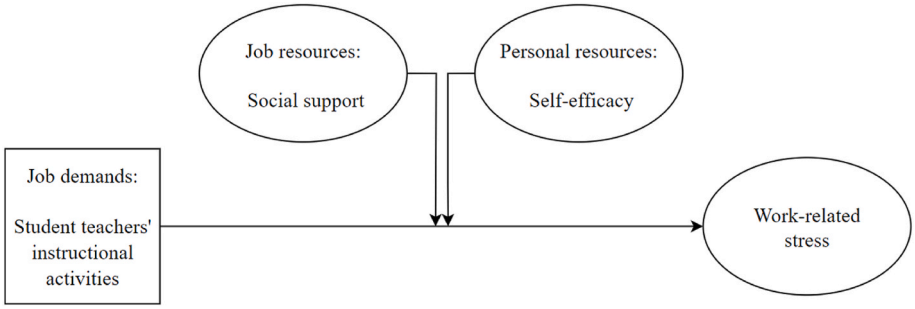


Fig. 1. Hypothesized model according to the job demands-resources model.

Table 1
Percentages of student teachers' instructional activities.

Instructional activity	Percentage
I tutor individual students.	38%
I co-teach classes together with other teachers.	40%
I occasionally cover for other teachers.	53%
I teach classes on my own.	59%
I am a homeroom or class teacher on my own.	15%

Note: Percentages do not add up to 100 as student teachers were allowed to select multiple answer options.

(2000): *I often feel exhausted and stressed because of my professional tasks*. To measure job resources as pointed out in the JD–R model, we further asked the student teachers to report on the social support they receive from their colleagues in school. We used three items adapted from the Berlin Social Support Scale (Schulz & Schwarzer, 2003): *My colleagues provide me with help when I need it*. Moreover, we were interested in student teachers' self-efficacy beliefs as an indicator for their personal resources according to the JD–R model. To assess this, we used three items from a scale developed by Schwarzer and Jerusalem (1999): *I am sure that I can help students with severe difficulties when I try*. We chose all instruments based on their scientific rigor, ensuring the validity and reliability of measurements. All items were rated on a four-point Likert scale from 1 (*strongly disagree*) to 4 (*strongly agree*). A full list of items can be found in the Appendix (see Tab. 5).

We used manifest indicators to model latent factors for all independent variables (social support, self-efficacy beliefs) and conducted confirmatory factor analysis (CFA) in Mplus 8.3, taking measurement errors into account. We estimated χ^2 statistics, RMSEA (root mean squared error of approximation), CFI (comparative fit index), and SRMR (standardized root mean squared residual) to evaluate model fit. Non-significant values for χ^2 indicate favorable models. Moreover, we used cut-off values of RMSEA <0.06, CFI >0.95, and SRMR <0.08 as recommended by Hu and Bentler (1999) to check if the model fit the data. Results from confirmatory factor analysis indicate a measurement model with good fit ($\chi^2 = 11.53$, $df = 8$ $p > 0.05$; RMSEA = 0.05; CFI = 0.99; SRMR = 0.03) and standardized factor loadings varying between 0.63 and 0.95 (Hair et al., 2014). Latent factors for social support and student teachers' self-efficacy beliefs showed moderate correlation ($r = 0.40$). We further evaluated internal consistency of all scales by estimating McDonald's ω (Hayes & Coutts, 2020; McDonald, 1999; Zinbarg et al., 2005). As recommended by Nájera Catalán (2019), values of $\omega > 0.65$ indicate satisfactory reliability. Results from reliability testing indicated that all scales showed high internal consistency (social support: $\omega = 0.87$, self-efficacy: $\omega = 0.73$, work-related stress: $\omega = 0.86$). In sum, the instrument we used showed good validity and reliability.

2.3. Analyses

We assessed whether data were missing at random by conducting Little's (1988) MCAR test using the IBM SPSS Statistics software. As indicated by a non-significant MCAR test, results revealed that missing data were missing completely at random and, hence, not biasing further analyses ($\chi^2 = 8.96$, $df = 9$, $p > 0.05$). This allowed us to conduct all further analyses using the FIML algorithm in Mplus 8.3 (full information maximum likelihood) that produces unbiased estimates without imputing missing values (Graham, 2003; Schafer & Graham, 2002).

To answer RQ1, we conducted a series of latent class analyses (LCA) with an increasing number of classes in Mplus 8.3 (Collins & Lanza, 2009; Geiser, 2010). LCA uses categorical indicator variables to detect latent heterogeneity in samples and, hence, identifies latent groups within a population (Weller et al., 2020). In this regard, LCA assigns probability estimates to individuals that indicate how likely they are to belong to a latent group. We used five items on the instructional activities of student teachers (e.g., tutoring individual students) to assess whether there were subgroups in our sample that differed with regard to their activities. We based our decision on the number of latent classes following statistical and theoretical recommendations by Nylund et al. (2007) and Spurk et al. (2020), respectively. In terms of statistical recommendations, we used comparative fit indices, such as AIC (Akaike information criterion), BIC (Bayesian information criterion), and aBIC (sample-size adjusted Bayesian information criterion). For each of these indices, models with lower values better fit the data (Akaike, 1974; Nylund et al., 2007; Schwarz, 1978). Moreover, we calculated entropy (> 0.80; Celeux & Soromenho, 1996) and conducted the adjusted Lo-Mendell-Rubin likelihood ratio test (aLMR) to determine the best solution (Lo et al., 2001; Muthen & Muthen, 2000). However, different fit indices may allow for different solutions. In such cases, the fit values can be overruled by theoretical decisions (Spurk et al., 2020). One criterion that should be considered is how well an additional latent group can be distinguished from an already retained group (e.g., Berlin et al., 2014). If the additional group adds a substantial new variable formation (e.g., a qualitatively new profile) to the previous solution, the new group could be retained. In contrast, if an additional group is relatively close to another group in the previous solution (e.g., only minor level differences in all variables) and thus does not add significant new insight, the new group might not be retained for reasons of parsimony (e.g., Vermunt & Magidson, 2002). To compare latent groups of student teachers with regard to their professional characteristics, we finally conducted chi-squared tests in IBM SPSS Statistics using φ to estimate effect sizes. Values of $0.10 < \varphi < 0.30$ indicate small effects, $0.30 < \varphi < 0.50$ indicate moderate effects, and $\varphi > 0.50$ indicate large effects (Cohen, 1988).

In terms of RQ2, we calculated descriptive statistics and scale means for all variables using IBM SPSS Statistics. We further conducted a multivariate analysis of variance (MANOVA) to compare latent groups among student teachers with regard to differences of their social support, self-efficacy, and work-related stress. Estimates for η^2 represent effect sizes. Values of $0.01 < \eta^2 < 0.06$ indicate small effects, $0.06 < \eta^2 < 0.14$ indicate moderate effects, and $\eta^2 > 0.14$ indicate large effects (Cohen, 1988).

Regarding RQ3, we used structural equation modeling (SEM) to examine the association between student teachers' instructional

activities and their work-related stress. We conducted a moderation analysis to investigate the interaction of social support and student teachers' self-efficacy beliefs with this relationship. Mplus 8.3 does not compute absolute fit indices for evaluating model fit, such as RMSEA, CFI, and SRMR in moderation analyses. For this reason, we first estimated a model without the interaction term and assessed its fit to the data using RMSEA, CFI, and SRMR. Our results indicate that the model without interaction fits the data well (RMSEA = 0.04, CFI = 0.98, SRMR = 0.05). We then deployed a log-likelihood ratio test to evaluate whether the model with interaction (null model) differs significantly from the model without interaction (alternative model; Meng & Rubin, 1992). We used the following formula to determine Δ:

$$\Delta = 2\, ln\left(\frac{likelihood\ value\ _{null\ model}}{likelihood\ value\ _{alternative\ model}}\right)$$

Drawing on chi-squared distribution for $\Delta df = 4$ and $p = 0.05$ as the threshold for statistical significance, we used a critical value of 9.49 for determining model fit of the alternative model. Our result for $\Delta = 0.005$ indicates that the alternative model (with interaction) does not differ significantly from the null model (without interaction). For this reason, we can conclude that the model with interaction shows satisfactory model fit.

3. Findings

3.1. Latent class analysis

In the present study, we were first interested in finding out if there are distinguishable groups of student teachers with regard to their instructional activities in schools (RQ1). Results from latent class analysis (LCA) do not determine a definite solution for the number of latent groups based on statistical criteria. As can be seen in Table 2, AIC and aBIC suggest a three-class solution. However, BIC and results from the Lo-Mendell-Rubin adjusted likelihood ratio test indicate a two-class solution. Moreover, entropy does not differ for the two-class and the three-class solution. For this reason, we compared the two-class and three-class solutions with regard to the theoretical assumptions. We decided in favor of the three-class solution, as adding a third group appears to provide an additional explanation for differences in the instructional activities of student teachers (see Fig. 2). Also, all three groups consist of a reasonable number of student teachers ($n = 69$ in Group 1, $n = 39$ in Group 2, and $n = 64$ in Group 3).

As Fig. 2 shows, student teachers in Group 1 mainly tutored individual students (e.g., helping with homework), but also co-taught with other teachers and covered for colleagues as substitute teachers. They did not regularly teach on their own, nor did they hold sole responsibility for classes as homeroom or class teachers. In contrast, the student teachers in Group 2 mainly taught classes on their own and did not carry out other instructional activities. Student teachers in Group 3 performed several instructional activities: They covered for colleagues and taught classes on their own, but also occasionally tutored individual students, co-taught with colleagues, or held sole responsibility for classes as homeroom or class teachers.

Table 2
Statistical results from latent class analysis (LCA).

Fit Indices	1	2	3	4
AIC	1087.88	1045.92	**1037.58**	1042.71
BIC	1103.62	**1080.54**	1091.09	1115.10
aBIC	1087.79	1045.71	**1037.26**	1042.27
Entropy	–	0.81	0.81	0.73
aLMR	–	52.27	19.70	6.57
p aLMR	–	0.00	0.26	0.09

Note: AIC = Akaike information criterion; BIC = Bayesian information criterion; aBIC = sample-size adjusted BIC; aLMR = Lo-Mendell-Rubin adjusted likelihood ratio test; smallest estimates for AIC, BIC, and aBIC are highlighted in bold.

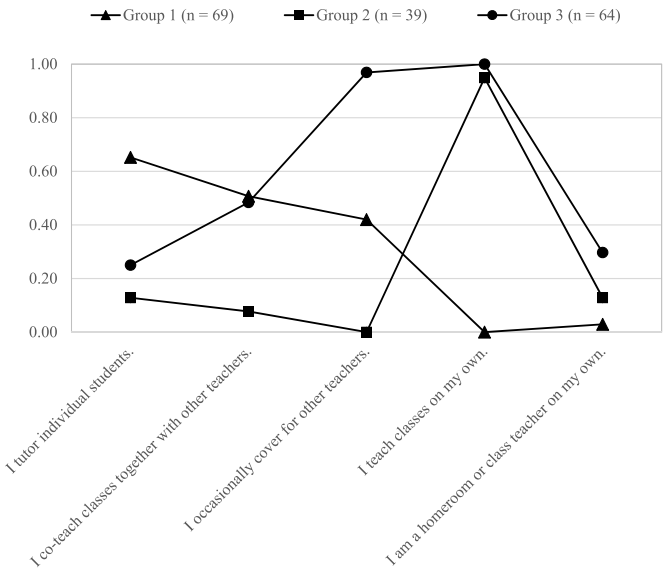


Fig. 2. Results from latent class analysis (LCA).

We were also interested in the relationship between student teachers' instructional activities and their professional characteristics. As can be seen in Table 3, results from chi-squared tests show that there is a statistically significant difference between latent groups with regard to the level of teacher training programs student teachers were enrolled in (bachelor's or master's) (χ^2 (2, $N = 171$) = 14.95, $p < 0.001$, φ = 0.30) and the type of school where they worked (χ^2 (2, $N = 171$) = 24.43, $p < 0.001$, φ = 0.38). Both effects are of moderate size (Cohen, 1988). Fifty-four percent of undergraduate student teachers in our sample were assigned to Group 1, consisting of teachers who tended to engage in less complex instructional activities, such as tutoring individual students. In contrast, only 15 percent of undergraduate student teachers regularly taught classes on their own (Group 2). Forty-four percent of student teachers who were enrolled in a master's program were assigned to Group 3—that is, they carried out several instructional activities of differing complexity. Fifty-one percent of student teachers who worked at primary schools were assigned to Group 1 and, hence, tended to perform less complex instructional activities. Only 14 percent of student teachers at primary schools regularly taught classes on their own (Group 2), whereas 42 percent of student teachers at secondary schools taught classes on their own (Group 2). Another 42 percent of student teachers at secondary schools were engaged in several instructional activities at their schools.

3.2. Descriptive findings and results from multivariate analysis of variance

In terms of RQ2, student teachers in all groups reported moderate levels of work-related stress (see Table 4; Group 1: $M = 2.08$, $SD = 0.74$; Group 2: $M = 2.74$, $SD = 0.87$; Group 3: $M = 2.60$, $SD = 0.83$). We found a significant difference between latent groups for student teachers'

Table 3
Results from chi-squared tests on the distribution of student teachers' academic course and school type across latent groups..

Factor	Percentages of observations			χ^2 (*df*)	*p*	φ
	Group 1	*Group 2*	*Group 3*			
Level of teacher training program						
Bachelor's	54%	15%	31%	14.95 (2)	<0.001	0.30
Master's	25%	31%	44%			
School type						
Primary	51%	14%	35%	24.43 (2)	<0.001	0.38
Secondary	16%	42%	42%			

Table 4
Results from multivariate analysis of variance of student teachers' work-related stress, social support, and self-efficacy across latent classes.

Variable	Group 1		Group 2		Group 3		*F*	*p*	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*			
Work-related stress	2.08	0.74	2.74	0.87	2.60	0.83	9.32	<0.001	0.11
Social support	3.42	0.64	3.28	0.79	3.41	0.70	0.55	0.58	0.01
Self-efficacy	3.07	0.56	2.93	0.50	3.16	0.56	2.21	0.11	0.03

Note: All items were rated on a four-point Likert scale from 1 (*strongly disagree*) to 4 (*strongly agree*).

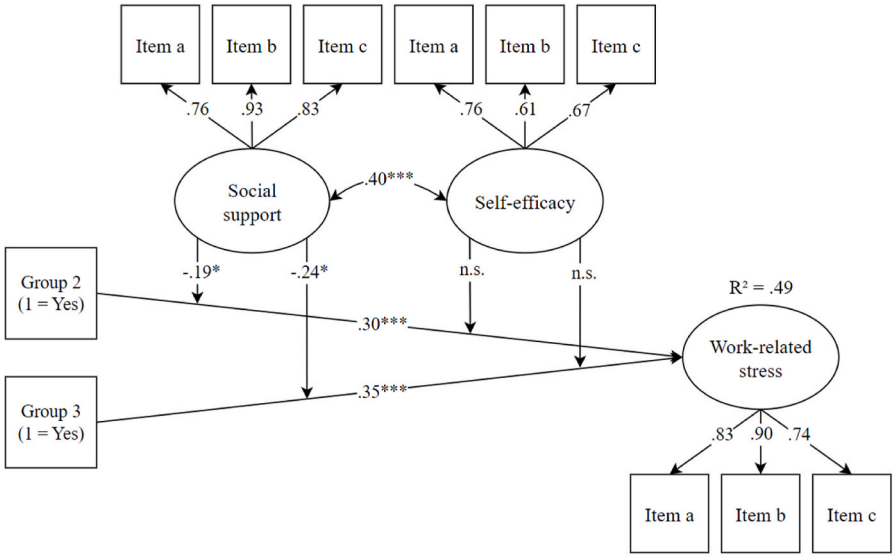
work-related stress with moderate effect size (F (6/306) = 4.17, $p < 0.001$, $\eta^2 = 0.08$). In particular, results from post-hoc comparisons showed that student teachers in Group 2 ($p < 0.001$) and Group 3 ($p < 0.01$) reported significantly higher work-related stress than student teachers in Group 1. That is, student teachers who were engaged in activities, such as teaching classes on their own, or being a homeroom or class teacher, reported higher levels of work-related stress. We further found that student teachers in all groups reported high levels of social support from their colleagues (Group 1: $M = 3.42$, $SD = 0.64$; Group 2: $M = 3.28$, $SD = 0.79$; Group 3: $M = 3.41$, $SD = 0.70$) compared to the theoretical scale mean of 2.50. Similarly, student teachers in all groups reported moderate to high levels of self-efficacy beliefs (Group 1: $M = 3.07$, $SD = 0.56$; Group 2: $M = 2.93$, $SD = 0.50$; Group 3: $M = 3.16$, $SD = 0.56$). However, there were no significant differences between latent groups in terms of social support or self-efficacy.

3.3. Structural equation modeling and moderation analysis

Regarding RQ3, results from structural equation modeling showed that being assigned to Group 2 ($\widehat{\beta} = 0.30$, $p < 0.001$) and Group 3 ($\widehat{\beta} = 0.35$, $p < 0.001$)—in contrast to Group 1—was significantly associated with student teachers' work-related stress (see Fig. 3). This means that student teachers who mainly taught classes on their own (Group 2) or carried out a variety of instructional activities in their school (Group 3) experienced higher work-related stress. Based on moderation analysis, we also found that social support from colleagues significantly moderated this relationship for both groups (Group 2: $\widehat{\beta} = -0.19$; Group 3: $\widehat{\beta} = -0.24$). That is, when student teachers carried out instructional activities in their schools, such as covering for other teachers, teaching classes on their own, or being a homeroom or class teacher, social support from colleagues appears to be a factor that contributed to lower levels of work-related stress. However, we did not find a significant moderation effect for student teachers' self-efficacy beliefs. All predictors explained 49 percent of variance in student teachers' work-related stress.

4. Discussion

The present study examined the instructional activities of student teachers in schools. We define student teachers as teacher candidates who have not completed their teacher training and certification but take up part-time positions in schools, where they carry out a variety of instructional activities. Student teachers appear to be a vulnerable group as they lack professional skills and may not yet be able to sufficiently cope with professional challenges. In this respect, we were first interested in whether student teachers differ latently in their instructional activities. We were further interested in their work-related stress, the social support they receive from colleagues, and their self-efficacy beliefs. Based on theoretical rationales from the JD–R model, we examined the relationship between instructional activities of student teachers and their work-related stress. Finally, we investigated the moderating effect of social support and self-efficacy on this relationship.



Note. Reference group is Group 1; * $p < .05$, ** $p < .01$, *** $p < .001$; n.s. statistically non-significant

Fig. 3. Structural equation model of student teachers' social support and self-efficacy beliefs moderating the relationship between their instructional activities and work-related stress.
Note. Reference group is Group 1; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; n.s. statistically non-significant.

4.1. Can student teachers be classified into latent groups based on their instructional activities? How do these groups differ in terms of student teachers' professional characteristics?

Our findings suggest that student teachers can be classified into three groups based on their instructional activities. A first group of student teachers tended to be engaged in less complex activities, such as tutoring individual students, whereas a second group was mainly engaged in teaching classes on their own. A third group was engaged in a variety of instructional activities. Our findings indicate that less qualified student teachers (teacher candidates enrolled in undergraduate education programs) tended to engage in less complex instructional activities (Group 1). In turn, more qualified student teachers (teacher candidates enrolled in master's programs) tended to engage in more complex activities, such as teaching regular classes (Group 2) or carrying out a variety of activities (Group 3). In this context, we interpret the "complexity" of instructional activities based on research by Kounin (1970) and Doyle (1977), who investigated the *complexity of classrooms* and found that the teaching profession is characterized by a variety of tasks that occur rapidly, unpredictably, and sometimes simultaneously (see also Doyle, 2006). This aligns with the sequence of consecutive activities that teacher candidates typically engage in during teaching internships that are part of formal teacher training programs (e.g., Arnold et al., 2014; Beck & Kosnik, 2002; Gröschner et al., 2015). To this end, we assume that increases in responsibility (i.e., co-teaching vs. teaching classes individually) and class size (i.e., tutoring individual students vs. teaching regular classes) result in higher complexity and, hence, in higher job demands.

From a normative perspective, this is a favorable result as it suggests that student teachers are not involved in activities that might be excessively challenging, given their limited professional resources for coping with work-related stressors. This finding agrees with results from Winter et al. (2023), who show that undergraduate student teachers work fewer hours than their peers enrolled in a master's program. Moreover, it is in line with the sequence of activities that teacher candidates are involved in during a teaching internship (i.e., observing classes of expert teachers, planning and teaching classes; Arnold et al., 2014; Beck & Kosnik, 2002; Ronfeldt & Reininger, 2012). To our knowledge, there are no empirical studies that have thoroughly investigated instructional activities specifically for student teachers. In this respect, we provide some first insights that can act as a starting point for future research. The person-centered approach we chose in this study allowed us to examine latent groups of student teachers in our sample more thoroughly. This helped us to derive more nuanced practical implications, as we will discuss in the following (Kusurkar et al., 2021).

4.2. How do student teachers assess their work-related stress, the social support they receive from colleagues, and their self-efficacy?

Our findings show that student teachers report moderate levels of work-related stress. This is in line with results from other studies, such as Dicke et al. (2014, 2015), Fives et al. (2007), Hartl et al. (2022), Schmidt et al. (2017), and Voss and Kunter (2020), who found similar levels of stress in novice teachers (i.e., emotional exhaustion). When novice teachers enter the profession (e.g., in teaching internships or the teacher induction phase), they encounter a full range of professional challenges—coping with classroom disruptions, handling student misbehavior, navigating relationships with parents, and mastering administrative responsibilities (Veenman, 1984). Novice teachers may therefore experience "practice shock", which is associated with adaptations of their beliefs, motivations, and professional practices (Brouwer & Korthagen, 2005; Veenman, 1984; Voss & Kunter, 2020). The opportunity to work in an authentic teaching context and gain mastery experience could help novice teachers to overcome practice shock (Bandura, 1993; Brouwer & Korthagen, 2005).

Aligning with our assumption, the student teachers in our study further reported moderate to high levels of self-efficacy. This might indicate the presence of a *Matthew effect* suggesting that student teachers are a selective group of teacher candidates with above-average levels of motivation (i.e., self-efficacy) who actively seek out new challenges by taking jobs in schools, thereby experiencing additional increases in professional learning and motivation. To validate this conclusion, however, further studies are needed that incorporate reports from teacher candidates who are not employed part-time in a school.

Finally, findings from this study suggest that student teachers receive social support from colleagues in the schools where they work. This result contradicts our theoretical assumption, however, as we expected student teachers to report low levels of social support due to limited staff capacities resulting from teacher shortages (Ingersoll & Tran, 2023; Sutcher et al., 2019). Yet this finding corresponds with results from Winter et al. (2023) and Hartl et al. (2022), who found high levels of instructional support in student teachers and high levels of and emotional support in teacher candidates during their teaching internships. However, it is conceivable that the student teachers in our sample did not need extensive support from colleagues given their high levels of self-efficacy. They might therefore be more inclined to report a perception of high social support even if they receive relatively little actual support from colleagues. In this case, interpreting the social support score from an absolute standpoint becomes questionable. Instead, we would need information from a reference group to reasonably interpret the scale mean (e.g., from teacher candidates in a teaching internship). Moreover, evidence on student teachers' help-seeking behavior would help to understand whether student teachers are actively reaching out to colleagues in search of informational or instrumental support and using this to overcome individual challenges (e.g., Butler, 2007).

4.3. What is the moderating effect of self-efficacy and social support on the relationship between student teachers' instructional activities in schools and their work-related stress?

We find that student teachers who tended to engage in more complex activities in their schools reported higher levels of work-related stress. This corresponds with theoretical rationales drawn from the JD–R model, which posits that work demands are positively associated with job-related strain (Bakker & Demerouti, 2007; Demerouti & Bakker, 2011; Karasek, 1979). This theoretical framework further assumes that job resources (e.g., social support from colleagues) and personal resources (e.g., self-efficacy) moderate this relationship (Bakker & Demerouti, 2017; Xanthopoulou et al., 2007). In line with this assumption, we found that social support has a buffering effect on the relationship between student teachers' instructional activities and their work-related stress (Collie, 2023; Jolly et al., 2021; D. Richter et al., 2013; Rupp & Becker, 2021). This holds especially true for student teachers from Groups 2 and 3. That is, when student teachers were engaged in more challenging instructional activities (e.g., teaching classes on their own), they are more likely to benefit from social support from colleagues than student teachers engaged in less challenging activities in schools. However, we did not find evidence that student teachers' self-efficacy beliefs played a moderating role as a personal resource (Chan, 2002; Kaplan & Madjar, 2017; Kücholl et al., 2019; Skaalvik & Skaalvik, 2007). This may be due to the low variance in self-efficacy beliefs across latent groups, as student teachers in all groups report similarly high levels of self-efficacy. In this regard, operationalizing student teachers' job demands using latent groups may not be sensitive enough to observe a moderating effect of self-efficacy. Instead, it may be more appropriate to observe job demands using a continuous variable.

4.4. Limitations

The results of this study should be interpreted, however, in light of its

methodological limitations. First, we used a cross-sectional study design, which does not allow causal conclusions to be drawn from the results. Second, we used a convenience sample, which is not representative of the overall population of student teachers. In this regard, student teachers' responses in our study might be distorted by sampling bias. Third, we measured student teachers' instructional activities using five items rated on a dichotomous scale. This list of items could be expanded in future studies to include more differentiated activities, such as communicating with parents or evaluating student performance. We also recommend using a frequency-based scale to increase the variance in participants' responses (e.g., 1 = never, 4 = always). In general, we measured student teachers' job demands using a person-centered approach (i.e., latent class analysis; Kusurkar et al., 2021), but future studies could use a variable-centered approach and operationalize student teachers' job demands as a continuous variable measuring physical, social, or organizational stressors inherent to the job, such as noise, workload, or time pressure (Demerouti et al., 2001). Finally, we only had basic information about the social support that student teachers receive from colleagues. We lacked differential evidence on different aspects of this social support (e.g., emotional, instrumental, informational; Jolly et al., 2021). Qualitative studies could provide deeper insights into what forms of social support student teachers receive and how this contributes to their motivation and professional learning. Moreover, it is advisable for future studies to adopt comparative approaches to better understand the extent of perceived social support by analyzing, for example, the responses of teacher candidates during teaching internships.

4.5. Implications for researchers and practitioners

The present study contributes to filling a gap in the empirical literature by offering a better understanding of what instructional activities student teachers carry out in schools, how they perceive the field experiences they have sought out for themselves, and how well their needs for professional well-being are being met (Scheidig & Holmeier, 2022). Moreover, our study provides new insights into the moderating effects of social support and self-efficacy beliefs as job-related and personal resources, respectively, that (might) help to reduce the association between job demands and job stress. Future studies could consider further potentially relevant variables as personal resources in addition to self-efficacy, such as emotional stability or self-regulation. They could also operationalize student teachers' job demands using a continuous variable that allows more sensitive investigations of moderation effects.

We recommend that future research employ longitudinal study designs to examine the trajectories of student teachers' motivation, work-related stress, and other aspects of their professional competence, such as instructional beliefs and instructional quality. More insights are needed into what teacher candidates who seek part-time employment in schools bring with them in terms of professional characteristics as a starting point. Future studies should also account for the professional learning trajectories of teacher candidates without such part-time employment to investigate the actual effects of working part-time in a school. This is of particular relevance, as findings from Scheidig and Holmeier (2022) indicate that student teachers perceive teacher training programs as less gainful than their peers who are not working part-time in schools.

In this respect, our findings also provide important information for educational practitioners and policy makers. As our results indicate that student teachers engaged in more complex instructional activities report higher levels of stress, we recommend that policy makers consider defining minimum requirements for teacher candidates applying for part-time employment in schools. It might be reasonable that student teachers be required to complete a meaningful portion of their teacher training program prior to part-time employment so that they have already confronted challenging activities such as teaching regular classes on their own. Undergraduate student teachers should be limited to less challenging activities, such as providing one-on-one support to students.

Universities might consider implementing programs to help teacher candidates find vacancies in schools. Such programs could identify schools where experienced teachers are given incentives to mentor student teachers and support their professional growth. These programs could also help teacher candidates contact school administrators or principals to find positions. Additionally, teacher educators at universities could offer support to student teachers through group coaching and peer discussion. At last, universities might consider accrediting student teachers' field experience gained through their part-time employment to count toward compulsory teaching internships, thereby providing incentives for additional efforts among teacher candidates.

In general, student teachers should not be discouraged by the teaching profession before even finishing their teacher training. Student teachers need to be provided with adequate social support from colleagues and other school faculty (e.g., school principals) who can help them to have a successful professional onboarding experience in the school. In this context, principals can assign student teachers mentors who teach the same subject or grade level. Additionally, student teachers should be integrated into subject-specific teaching faculty to share experiences with colleagues, observe classes taught by expert teachers, and receive feedback from them (Hobson & Maxwell, 2017). This is particularly important as evidence suggests positive effects of successful field experiences on the professional learning of novice teachers (i.e., teacher candidates in teaching internships, pre-service teachers; Brouwer & Korthagen, 2005; Martins et al., 2015; Ronfeldt & Reininger, 2012). However, successful field experience depends on contextual prerequisites in schools (e.g., social support; D. Richter et al., 2013).

5. Conclusion

As teacher shortages are becoming more and more common in educational systems worldwide, and as teacher candidates continue to seek authentic field experiences, the number of student teachers will likely increase in the years to come. In the present study, we investigated the instructional activities of student teachers, their work-related stress, self-efficacy, and the social support they receive from colleagues. The results highlight the importance of providing student teachers with appropriate resources to cope with the challenges of the teaching profession. Social support from colleagues appears to be a crucial factor in this regard. In conclusion, we recommend that educational researchers and practitioners observe and evaluate the experiences of student teachers in schools more closely.

CRediT authorship contribution statement

André Meyer: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Eric Richter:** Writing – review & editing, Methodology, Conceptualization. **Sebastian Kempert:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tate.2024.104633.

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