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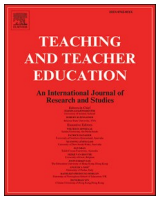

Research paper

Profiling pre-service teachers' motivational and behavioral characteristics: Relationships with psychological wellbeing and occupational commitment

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ABSTRACT

This study examines the motivational and behavioral profiles of 677 pre-service teachers in Australia. The motivational characteristics assessed include autonomous motivation, controlled motivation, and teacher self-efficacy, whereas the behavioral characteristics assessed include engagement coping and disengagement coping. Latent profile analysis identified four profiles for the participating pre-service teachers: Low Functioning (24.2 %), Vulnerable (31.8 %), Low Motivation (6.9 %), and High Functioning (37.1 %). These profiles differed in their psychological wellbeing and occupational commitment and varied by gender and the completion status of professional experience. We discuss implications for enhancing pre-service teachers' commitment and well-being by supporting their motivational and coping characteristics.

Quality teaching plays a crucial role in fostering student achievement and personal growth, which not only requires a confluence of effective pedagogical practices, teaching strategies, and professional knowledge, but also hinges on the qualities of those who deliver it (e.g., Darling-Hammond, 2000; Wang et al., 2011). Thus, cultivating quality teachers has been universally acknowledged as a cornerstone of quality education (Hollins, 2011). For instance, strengthening initial teacher education (ITE) to deliver classroom-ready pre-service teachers is one of the national priorities to address teacher workforce shortages in Australia (Teacher Education Expert Panel, 2023). Given high levels of stress and attrition in this profession, examining the motivational and behavioral characteristics of pre-service teachers in relation to their wellbeing and occupational commitment is pivotal in contributing to their professional success, the longevity in the field, and a stable and experienced teaching workforce.

Motivational characteristics of pre-service teachers—autonomous motivation, controlled motivation, and self-efficacy—are essential drivers of their wellbeing and commitment. Pre-service teachers with strong agency and autonomy are more likely to pursue their professional goals with a sense of purpose and fulfillment, invest in professional development, maintain teaching enthusiasm, and find their contributions meaningful and valuable (Kaplan & Madjar, 2017). Behavioral characteristics, including engagement coping and disengagement coping, reflect how pre-service teachers manage stress. There is an increase in research on the sources of teachers' stress, associated coping strategies, and their influence on mental and physical health (e.g., Aulén et al., 2021; Dias-Lacy & Guirguis, 2017; Herman et al., 2018, 2020; Salami, 2010). Similar outcomes were found among university students (e.g., Smith et al., 2016). Yet less attention has been paid to pre-service teachers whose coping mechanisms may be different from teachers and university students (Klassen & Durksen, 2014). Prior research has separately examined the relationships between these motivational and behavioral characteristics with other variables using variable-centered approaches, such as structural equation modeling (SEM, e.g., Canrinus & Fokkens-Bruinsma, 2014; Chesnut & Cullen, 2014; Kaplan & Madjar, 2017). Such approaches are based on the assumption of sample homogeneity and thus generalize findings to the population (Howard & Hoffman, 2018). However, given the heterogeneity in individual characteristics and experiences, it is possible that specific subgroups of pre-service teachers exist for whom these general relationships do not apply. By considering the interaction of multiple variables, person-centered latent profile analysis (LPA) allows for the identification of heterogeneous subgroups within a population based on similar levels of attributes.

Previous studies have explored the configuration of teacher profiles focusing on teacher motivation (e.g., Watt & Richardson, 2008) or coping (e.g., Aulén et al., 2021; Wang et al., 2022). Yet, very limited research has applied person-centered analysis to pre-service teachers. Exploring this population is necessary because pre-service teachers are in a formative stage where their motivation, beliefs, and strategies to

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address stress can significantly shape their wellbeing and commitment to stay in the profession (Holzberger et al., 2021). They face unique challenges distinct from those of in-service teachers, have little work experience and fewer teacher responsibilities. Thus, gaining a more nuanced understanding of pre-service teachers' motivation, coping ability, wellbeing, and intention to teach is timely and important. To our knowledge, only two studies have examined cognitive, motivational, and affective profiles of pre-service teachers and their associations with job satisfaction and burnout (i.e., Guo & Xu, 2024; Holzberger et al., 2021). No study has yet examined the distinctive motivational-behavioral profiles of this population and their associations with psychological wellbeing and occupational commitment. To address these gaps, this is the first known study to use LPA to understand the variation of motivational (i.e., autonomous motivation, controlled motivation, and self-efficacy) and behavioral characteristics (i.e., engagement coping and disengagement coping), as stated above, across different subpopulations (i.e., profiles) of pre-service teachers by transforming these five characteristics from predictors into profile indicators. This method will group subpopulations with common attributes across a broader population, demonstrating how these profiles relate to pre-service teachers' wellbeing and occupational commitment (Morin et al., 2016). This empirical evidence can guide the development of tailored supportive initiatives that enhance professional growth and sustainability in the teaching profession among targeted subgroups of pre-service teachers.

To understand the multidimensionality of pre-service teachers, this study will first discuss motivation through the lens of Self-Determination Theory (SDT; Ryan & Deci, 2017) and Social Cognitive Theory (SCT; Bandura, 1997), both of which position motivation as preceding and influencing personal performance and psychological wellbeing within the broader nomological network. The use of coping strategies by pre-service teachers will then be explained via the Transactional Model of Stress and Coping (TMSC; Lazarus & Folkman, 1984). The next section will review these key conceptual underpinnings in relation to psychological wellbeing and commitment among pre-service teachers.

1. Conceptual underpinnings

This study is grounded in the triadic reciprocal interactions of SCT complemented by SDT and TMSC, which provides a comprehensive understanding of the interplay between motivational and behavioral determinants among pre-service teachers. At the core of SCT is the concept of triadic reciprocal interactions, which posits that personal factors (including cognitive and affective components), behavior (e.g., coping), and environmental influences interact reciprocally (Bandura, 1986). Within this framework, *self-efficacy*—a person's belief in their own abilities to achieve goals—emerges as a pivotal personal determinant in constituting the mechanisms of human agency and manifesting the pure intention to make things happen (Bandura, 1997). This construct focuses more on the subjective conviction of one's abilities in successfully achieving an outcome (Bandura, 1997). Such convictions can influence a person's coping behaviors, enhance persistence in the face of obstacles and effort in a given situation, while low self-efficacy may shift coping behaviors, reduce performance, and threaten wellbeing (Bandura, 1982). Based on this theory, *teacher self-efficacy* specifically represents teachers' self-beliefs in their classroom teaching capacities (Tschannen-Moran et al., 1998). Several meta-analyses have demonstrated its effects on teacher wellbeing, job satisfaction, burnout reduction, and occupational commitment (e.g., Chesnut and Burley, 2015; Malinen & Savolainen, 2016; Zee & Koomen, 2016).

Another personal determinant comes from SDT, a comprehensive framework for understanding the interaction of organisms with their social contexts on human development, psychological growth, and engagement (Ryan & Deci, 2017). This theory distinguishes two higher-order types of motivation based on their relative autonomy, which are key contributors to wellbeing and commitment (Gagné et al., 2020; Slemp et al., 2020; Van Den Broeck et al., 2021; Zhou et al., 2024). *Controlled motivation* represents behavior that is driven by external pressures and obligations (rewards or punishments). By contrast, *autonomous motivation* represents behaviors driven by internal forces, such as value or interests placed on an activity (Vansteenkiste et al., 2018). When individuals feel autonomously motivated, their sense of self-efficacy is likely to be enhanced as they aspire to master skills in activities and perceive their behaviors as self-endorsed, meaningful, and purposeful (Bandura, 1982). External events, such as feedback, rewards, and evaluation, can enhance or undermine autonomous motivation and self-efficacy depending on efforts to obtain external contingencies. These external events, however, can alienate values and limit the possibility of maximizing one's mastery experience (Ryan & Deci, 2017; Schunk, 1991). Meanwhile, the influences of these events are attributed to the degree of autonomy that individuals have over their behaviors and the outcomes they can produce.

In addition, the intertwined connection between these motivational characteristics and coping mechanisms in shaping pre-service teachers' experiences is considered. According to Lazarus and Folkman's (1984) TMSC, coping is a process of managing and addressing stressful situations. This process involves conflicts between internal forces (e.g., motivation to cope), external demands, and personal performance (Lazarus et al., 1952). When individuals appraise threats or stressors, they evaluate their coping resources (e.g., self-efficacy) and use different strategies to tackle challenges, which can be grouped into two mechanisms: *engagement coping*, which involves actively confronting and addressing stressors (e.g., planning) and *disengagement coping*, which involves avoiding and escaping stressors or threats (e.g., self-blame; Skinner et al., 2003). Individuals who are competent and capable of solving stress or threats with low costs of performing adaptive behaviors, increase the probability of preventing potential harms and processing engagement responses to stress (Maddux & Rogers, 1983). However, individuals who are driven by receiving immediate external rewards but fail to estimate the severity of the threats and their vulnerability, will likely experience disengagement coping behavior (Rogers, 1975, 1983).

A synthesis of these three theoretical perspectives suggests an interconnection between motivational and behavioral characteristics. Pre-service teachers who are competent in teaching and managing challenges in academic studies at university and teaching practicums at schools may feel a sense of meaningfulness and vitality in the profession. They tend to adopt engagement coping to handle the demands of teaching and academic learning, resulting in less stress and more positive learning experiences. Empirical studies have supported this, showing that pre-service teachers with high autonomous motivation and self-efficacy are more likely to use engagement coping strategies, such as problem-solving and seeking social support, which could enhance wellbeing and increase occupational commitment (e.g., Bonneville-Roussy et al., 2017; Chesnut & Cullen, 2014; Klassen & Chiu, 2011). In line with previous findings, it is possible that pre-service teachers with high controlled motivation or low self-efficacy may lack confidence in their capacity to handle stressors. They are more likely to feel pressure, adopt disengagement coping strategies, invest limited effort in task completion or achieving specific goals without being intrinsically motivated to pursue personal growth. This lack of confidence, autonomy, and the use of disengagement coping strategies could undermine pre-service teachers' wellbeing and commitment. In addition to examining relationships among these constructs, there is a need to identify distinct subgroups with unique combinations of these characteristics and to investigate to what extent pre-service teachers classified into these subgroups differ in their wellbeing and commitment.

2. Complementary variable-centered and person-centered research

As elaborated above, many studies have used a variable-centered

approach to explain the relationships between variables in pre-service teacher populations (e.g., Braun & Hooper, 2024; Klassen & Chiu, 2011). However, analyzing the interaction of multiple variables simultaneously using SEM is very complicated and difficult to interpret (Bauer & Shanahan, 2007). Person-centered analyses can address the limitations of SEM by interpreting the intricate interplay between multiple variables, especially those with opposing characteristics (e.g., engagement vs disengagement coping) while identifying qualitative profiles of participants with similar patterns (Howard & Hoffman, 2018). For instance, it is possible that one group of pre-service teachers is driven primarily by one type of motivation (e.g., autonomous or controlled) whereas another group could be driven by both, or neither. Similarly, some pre-service teachers might use both coping strategies (engagement and disengagement) whereas others might predominantly use one or the other. Such heterogenous profiles are likely to have important consequences for pre-service teachers' wellbeing or commitment, and such questions cannot be examined by SEM (Spurk et al., 2020). Thus, research that adopts this approach could provide a holistic view of their experience during ITE programs, supporting the design of tailored interventions to enhance their wellbeing and commitment, potentially reducing attrition rates. For example, future studies could develop specific practices or interventions for pre-service teachers who are low on autonomous motivation and engagement coping or high on controlled motivation and disengagement coping. These practices would aim to promote more optimal forms of motivation and active stress-coping abilities, thus improving wellbeing and occupational commitment.

A few studies have begun examining motivational and behavioral profiles of in-service teachers, but we only found two studies focused on pre-service teachers. Holzberger et al. (2021), for instance, explored graduating pre-service teachers' cognitive (i.e., professional knowledge and beliefs) and motivational-affective (i.e., self-efficacy, enthusiasm, and self-regulation) characteristics, identifying three profiles: highly knowledgeable and engaged, low mindset, and less knowledgeable. Guo and Xu (2024) identified a more-adaptive profile with high levels of basic psychological needs, enjoyment, and self-efficacy and a less-adaptive profile with all indicators at lower levels, while the level of pre-service teachers' anxiety was similar in both profiles. Gillet et al. (2017) identified six motivational profiles among university students: autonomous, strongly motivated, moderately autonomous, moderately motivated, poorly motivated, and controlled. Subsequent studies have examined these characteristics separately in the profiles of in-service teachers. For instance, Perera et al. (2019) identified six profiles of teachers' self-efficacy: highly inefficacious, moderate globally-and-instructionally-confident, highly-efficacious, globally-unconfident, student-engagement-efficacious, and student-engagement-inefficacious. Regarding behavioral characteristics, both Wang et al. (2022) and Aulén et al. (2021) identified three coping profiles, named problem-avoidant copers, adaptive copers, and social-withdrawal copers, as well as low-, problem-focused-, high- and emotion-focused coping users, respectively. Herman et al. (2021) identified four profiles based on stress, coping, efficacy, and burnout: high coping/low burnout, moderate coping and burnout, low coping/high burnout, and well adjusted. In this study, the mean levels of efficacy were high across four profiles.

3. Conceptual support for profile decisions

Spurk et al. (2020) recommended drawing upon relevant theoretical work to understand the shape and meaningfulness of each profile, combined with the fit statistics of profile solutions, to determine the optimal number of profiles. To so do, we draw on the "Arbeitsbezogenes Verhaltens-und Erlebensmuster" typology (AVEM: Pattern of Work-related Behavior and Experience; Schaarschmidt & Fischer, 2003) to support content-related decisions. This typology aims to identify three dimensions: *professional commitment* (including the subjective significance of work, professional ambitions, tendency to exert, striving for perfection, and emotional distancing), *coping capacity* (including resignation tendencies, offensive coping with problems, and balance and mental stability), and *subjective wellbeing* (including satisfaction with work, satisfaction with life, and experience of social support) in response to stressful workplace situations (Kieschke & Schaarschmidt, 2008).

Professional commitment reflects one's assessment of how important their work is, their career aspirations, and the degree to which their personal values align with their profession. This perspective shares similar attributes to the motivational factors examined in this study (see Mašková et al., 2022). However, this dimension is distinct from occupational commitment, which involves one's emotional attachment and a sense of obligation to remain in a profession, as well as an evaluation of the costs and time investment associated with leaving the profession (Meyer et al., 1993). One sub-scale of professional commitment, emotional distancing, along with resignation tendencies in the coping capacity dimension, refer to disengagement tendencies and are therefore closely linked to disengagement coping. However, the other two sub-scales of coping capacity, which are offensive problem-solving and balance, and mental stability, are closely associated with engagement coping.

Wellbeing and commitment are identified as outcomes of motivation and coping for several reasons. First, SDT (Ryan & Deci, 2000, 2017) posits that individuals with more autonomous forms of motivation typically present higher levels of wellbeing and stronger occupational commitment, as supported by SDT research (e.g., Collie et al., 2016; Galletta et al., 2011). Similarly, research on coping mechanisms indicates that engagement coping strategies generally lead to more favourable wellbeing outcomes (e.g., Bonneville-Roussy et al., 2017). Further reinforcing this sequence is the broader organizational behavior literature, where occupational commitment is classified as a job attitude (Judge et al., 2017; Judge & Kammeyer-Mueller, 2012). This aligns with the perspective of commitment as a potential outcome related to motivation and coping (e.g., Fernet et al., 2012; Searle & Lee, 2015). These theoretical frameworks and empirical findings collectively support our approach of examining wellbeing and commitment in relation to motivation and coping profiles. Although this study does not include the subjective wellbeing dimension from the AVEM typology as an indicator, the following four patterns presented in this typology can still guide profile selection based on the inclusion of the other two dimensions.

Pattern G is a desirable pattern, that presents healthy functioning and a positive attitude toward work, showing high levels of all three dimensions. Pre-service teachers who exhibit this pattern are likely to have strong motivation to teach, use engagement coping strategies to actively solve problems, and display strong wellbeing (Mašková et al., 2022). *Pattern S* presents individuals with a low level of ambition and a tendency to reduce their contribution to work but having sufficient coping capacity to address stressors. Pre-service teachers who exhibit this pattern are likely to have low levels of motivation as they are neither concerned about their volition to teach nor about their abilities to teach and use any types of coping strategies to address stressors. Individuals in the following two patterns tend to be at risk of wellbeing. *Pattern A* is characterized by excessive motivation and ambition at work (workaholism) but experiencing difficulties emotionally distancing from demands and lacking adequate strategies to proactively overcome challenges. This suggests that pre-service teachers who exhibit this pattern may be likely to have health problems but high levels of commitment. *Pattern B* stands for burnout-at-risk, characterized by diminished professional commitment/motivation, limited capacity to solve stressors, overwhelm, resignation, and negative work-related emotions, indicating the final stage of burnout syndrome. Taken together, these patterns suggest the possible interactions of motivational and behavioral characteristics that could guide the profile hypotheses and decisions in this study.

4. Predictors of profile membership

To further understand the distinct groups of pre-service teachers, we are interested in how gender differences and the completion status of professional experience could affect profile membership in person-centered research. Gender has emerged as a noteworthy factor influencing pre-service teachers' early career experiences. For instance, some research using variable-centered approaches has reported that female pre-service teachers show stronger autonomous motivation than their male counterparts (e.g., Bastick, 2000; Bruinsma & Jansen, 2010; Spittle et al., 2009). Conversely, other studies have demonstrated that male teachers report significantly higher extrinsic motivation to teach, coupled with non-significant but lower intrinsic motivation to teach relative to females (e.g., Canli & Karadağ, 2021). Regarding person-centered research, Holzberger et al. (2021) found that male pre-service teachers were more likely to be classified into the low mindset profile, characterized by below average enthusiasm, self-efficacy, and work engagement. This suggests that male pre-service teachers may lack motivation to teach and confidence to cope with stress. Likewise, another profile analysis has revealed that male pre-service teachers were more likely to exhibit a profile characterized by below average intrinsic value and other motivational indicators (Bergey & Ranellucci, 2021). Nonetheless, previous studies using person-centered approaches have yet to investigate potential gender differences in the interplay between motivational orientations (e.g., autonomous motivation) and behavioral characteristics (e.g., coping) among pre-service teachers, which will be tested in this study.

Professional experience, also known as practicums and internships, is an important component in teacher education programs. It aims to provide authentic teaching experience for pre-service teachers, integrating theoretical knowledge, refining teaching strategies under supervision, and preparing classroom-ready teachers (Allen & Wright, 2014). Pre-service teachers might gain pedagogical mastery and vicarious experience as sources of teacher self-efficacy during this experience (e.g., Eğinli & Solhi, 2021; Gurvitch & Metzler, 2009; Klassen & Durksen, 2014; Martins et al., 2015). Conversely, pre-service teachers who only take coursework might overestimate their teacher self-efficacy levels based on prior successful academic performance and idealistic imaginations of the teaching profession, which may result in lower levels of teacher self-efficacy upon completion of professional experience (Garvis, 2009; Hong, 2010). Likewise, coping strategies have been applied to solve challenges during professional experience, suggesting the relationship between practicums and coping mechanisms (e.g., Mahmoudi & ÿzkan, 2016; Yayli, 2017). Overall, gender and the completion status of professional experience will be considered as predictors in this research to identify their relationships with profiles.

5. Outcomes of profile membership

Psychological wellbeing refers to one's optimal functioning and is strongly related to teachers' personal, social, and work-related characteristics (Slemp et al., 2020; Zhou et al., 2024). Occupational commitment refers to attachment and dedication to a profession, reflecting the likelihood to which individuals intend to stay (Meyer et al., 1993). Previous variable-centered research has demonstrated the relationships between either pre-service teachers' motivational or behavioral factors, wellbeing (e.g., Gonzalez Olivares et al., 2020; Gustems-Carnicer et al., 2019; Hohensee & Weber, 2022), and commitment (e.g., Chesnut & Burley, 2015; Rots & Aelterman, 2009). In terms of profile analysis, Lee et al. (2024) found relationships between pre-service teachers' wellbeing profiles and teacher self-efficacy. As elaborated above, three cognitive and motivational-affective profiles identified by Holzberger et al. (2021) were correlated with occupational wellbeing: job satisfaction and emotional exhaustion at the time when graduating pre-service teachers became in-service teachers. Likewise, three coping profiles identified by Wang et al. (2022) showed relationships with in-service teachers' job satisfaction, negative emotions, and turnover intentions. Specifically, adaptive copers reported a high level of positive emotions (e.g., a facet of subjective wellbeing), a low level of negative emotions, and turnover intentions. However, no research has investigated how profile membership varies from pre-service teachers' psychological wellbeing and occupational commitment to our knowledge. Thus, this study will include these two constructs as outcomes, providing a comprehensive understanding of how different motivational states and coping mechanisms interact to influence pre-service teachers' overall wellbeing and commitment. This approach can help identify specific profiles of pre-service teachers who are at risk of lower wellbeing and commitment, allowing for the development of targeted interventions to support these individuals in teacher education, thus contributing to a more sustainable and resilient teaching workforce.

6. The present study

The present study aims to adopt a latent profile analysis to examine motivational and behavioral profiles of pre-service teachers based on their autonomous motivation, controlled motivation, self-efficacy, and (dis)engagement coping. This study will also explore the relationships between the derived profiles, the predictors (gender and the completion status of professional experience), and the outcomes (psychological wellbeing and occupational commitment) (see Fig. 1). Given the mixed findings on the different motivational factors and coping mechanisms, we adopt an exploratory approach without formulating specific hypotheses, and in doing so aim to examine the following research questions.

1. To what extent are there different profiles in pre-service teachers based on different combinations of motivation and coping?
2. How do different combinations of pre-service teacher motivation and coping relate to their wellbeing and occupational commitment?
3. How do pre-service teachers who have completed professional experience group into these different profiles?
4. To what extent do gender differences emerge in the specific motivation- and coping-based profiles?

7. Method

7.1. Participants and procedure

Survey data were collected after receiving ethics approval from the Office of Research Ethics and Integrity at the University of Melbourne (reference number 2022-25319-34841-3). Simple random sampling was used to recruit participants by sending recruitment invitations to all ITE providers in Australia. Approvals were obtained from the institutional leaders, such as Associate Deans of Learning and Teaching. In addition, recognizing that this population is hard to reach and to mitigate the risk of excluding participants from institutions that did not grant approvals, we used a complementary sampling method by distributing the survey through relevant social media communities known to be frequented by pre-service teachers (e.g., Australian Pre-Service Teachers Facebook group and university clubs) after receiving permissions from group administrators.

Participants were informed about the research, consent process and the opportunity to win one of several $50 vouchers by participating. The study comprised 677 pre-service teachers from 16 tertiary institutions and five social platforms across Australia. Of the sample, 470 (69 %) had completed at least one professional experience, 480 (71 %) were Australian, 339 (50 %) were studying for a bachelor's degree in teaching, and the mean age was 29.3 ($SD = 9.01$). Our sample is statistically comparable to the broader pre-service teacher population in Australia. For example, our dataset included 79 % females similar to 74 % females commencing ITE programs in 2021 as reported by the Australian Institute for Teaching and School Leadership's [AITSL] ITE Pipeline (2024).

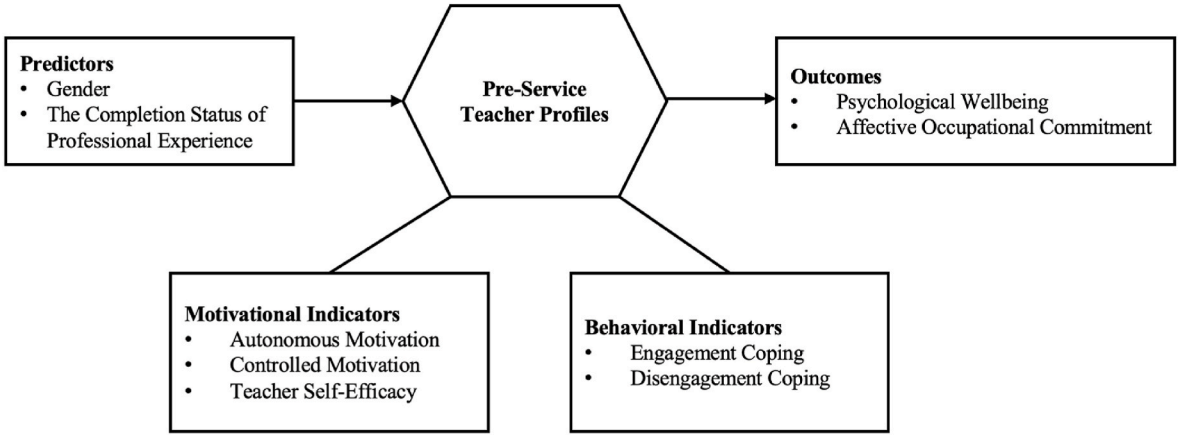

Fig. 1. The hypothesized model.

Our dataset also included 1 % Indigenous compared to 2 % Indigenous students commencing ITE programs in 2017, as reported by the AITSL (2019). Our dataset included 11 % enrolled in early childhood education programs, 39 % in primary education programs, 42 % in secondary education programs, and 8 % in mixed or specialization programs, compared to 16 %, 39 %, 34 %, and 10 % reported by the ITE Pipeline report (2020), respectively.

7.2. Measures

7.2.1. Autonomous motivation and controlled motivation

We adapted the Work Tasks Motivation Scale for Teachers (WTMST; Fernet et al., 2008) to assess pre-service teachers' motivation to teach, excluding the items measuring amotivation, as it was not the focal construct of this study. We reworded items where necessary to ensure they were relevant for pre-service teachers. For instance, we replaced the original item for external regulation ("I'm paid to do it.") with a new item suitable for ITE contexts: "I feel the situation demanded me to become a teacher (e.g., government incentives, to obtain a visa)." This study included three items each to measure intrinsic motivation (e.g., "I find teaching enjoyable."), identified regulation (e.g., "I find teaching important for the success of my life."), introjected regulation (e.g., "I would feel bad if I don't become a teacher."), and external regulation (e.g., "I feel like I am obliged to be a teacher."). Previous studies have demonstrated the adequate reliability of this scale in the pre-service teacher population (e.g., Kaldi & Xafakos, 2017; Kim & Cho, 2014). The McDonald's omega for these two motivation types were .90 and .92, respectively.

7.2.2. Teacher self-efficacy

We used the 12-item Teachers' Sense of Efficacy Scale (short form) (TSES; Tschannen-Moran & Hoy, 2001) to measure pre-service teachers' self-efficacy in three dimensions: instructional strategies (e.g., "To what extent can you use a variety of assessment strategies?"), classroom management (e.g., "To what extent can you control disruptive behavior in the classroom?"), and student engagement (e.g., "To what extent can you help your students value learning?"). This scale has demonstrated adequate reliability in the pre-service teacher population (e.g., Chesnut & Cullen, 2014). The McDonald's omega was .94 in the current study.

7.2.3. Coping

We used the 14-item Brief COPE scale (Carver, 1997) to measure the coping strategies used by pre-service teachers in response to adversity. This scale encompasses seven facets with two items each: active coping, planning, positive reinterpretation, denial, behavioral disengagement, mental disengagement, and self-blame. The first three facets were grouped as engagement coping (e.g., "I've been thinking hard about what steps to take."), and the remaining four facets were grouped as disengagement coping (e.g., "I've been criticizing myself."; Skinner et al., 2003). Prior research conducted by Bonneville-Roussy et al. (2017) has used this scale in the pre-service teacher population, showing reliability coefficients of .78 for engagement coping and .68 for disengagement coping. The McDonald's omega for these two coping types were .86 and .88, respectively, in the current study.

7.2.4. Psychological wellbeing

We used the eight-item Flourishing Scale (e.g., "I lead a purposeful and meaningful life."; Diener et al., 2010) to measure pre-service teachers' psychological wellbeing. This scale has demonstrated sound psychometric properties in previous studies of pre-service teachers (e.g., $\alpha = .84$ in Asici, 2021; $\alpha = .86$ in Kaya & Çenesiz, 2020). The McDonald's omega was .92 in this study.

7.2.5. Affective occupational commitment

We adapted the six-item subscale of the affective dimension of the Occupational Commitment Scale developed by Meyer et al. (1993) so that it was more suitable for pre-service teachers. First, we modified the career references from "nursing" (e.g., "I am passionate about nursing") to "teaching" (e.g., "I am passionate about teaching"). Additionally, following Blau's (2003) adaptation process, we positively reworded three negatively phrased items. For instance, "I regret entering nursing" was changed to "I am happy to enter the teaching profession". The reliability of the adapted scale was .91 among graduated medical technicians (Blau, 2003). This scale has been widely used in studies involving the teacher population and demonstrated adequate reliability (e.g., $\alpha = .88$ in Christophersen et al., 2016; $\alpha = .84$ in Meyer et al., 2019). The McDonald's omega was .92 in this study.

7.2.6. Predictors and distal outcomes

Two individual characteristics were examined as predictors on profile membership: gender (0 = male, 1 = female) and the completion status of professional experience (0 = have not completed any professional experience, 1 = had completed at least one professional experience). Both characteristics have been related to pre-service teachers' motivation, coping, wellbeing and commitment (e.g., Bonneville-Roussy et al., 2017; Bruinsma & Jansen, 2010; Corcoran & O'Flaherty, 2022; Garvis et al., 2012). We also examined the relationship between the profile membership and two distal outcomes: psychological wellbeing and affective occupational commitment.

8. Data analysis strategy

To develop more parsimonious measurement models, we used the correlation parceling method and the domain representative parceling method described by Little et al. (2022) to aggregate multiple similar items to form parcels for observed indicators of latent variables. These analyses were performed in R (version 4.2.3; R Core Team, 2023), using the RStudio interface (2023.06.2) and the lavaan package (Rosseel, 2012). This approach could reduce the impact of item-specific variance and measurement errors while increasing reliabilities and improving model fit (Little et al., 2013). Following this, we conducted a preliminary confirmatory factor analysis (CFA) to evaluate the psychometric properties of the measures. The measurement model was estimated using the maximum likelihood with robust standard errors (MLR) and the full information maximum likelihood (FIML) estimation to handle missing data, which was low (<3 %). We reported model fit in these four indices: chi-square (χ^2), the comparative fit index (CFI), Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). The cutoff values greater than .90 for CFI and TLI and less than .06 for both RMSEA and SRMR were considered an acceptable fit (Hu & Bentler, 1999).

While the preliminary analyses described above were conducted using R, the LPA was conducted using M*plus* version 8 (Muthén & Muthén, 2017) as this software offers advanced and diverse estimation techniques specifically suited for this approach. First, factor scores account for measurement error and provide more precise estimates of underlying constructs than scale scores (Morin & Marsh, 2015). Thus, we saved standardized factor scores ($M = 0$ and $SD = 1$) from the preliminary measurement model in M*plus* and used them as profile indicators. In LPA, means and variances were freely estimated in all profiles as the number of profiles cannot be accurately predicted. We examined solutions up to seven profiles, using 10,000 random start values with 1000 iterations, and 250 final stage optimizations to avoid the problem of local maxima (Morin et al., 2020). To determine the optimal solution, we considered several indices: the Akaike information criterion (AIC), the consistent AIC (CAIC), the Bayesian information criterion (BIC), the sample-size adjusted Bayesian information criterion (SSA-BIC), entropy levels, the adjusted Lo–Mendel–Rubin Likelihood Ratio Test (LMR) *p*-value, and the bootstrap likelihood ratio test (BLRT) *p*-value. AIC, CAIC, BIC, and SSA-BIC were presented in the form of an elbow plot to visually inspect the optimal number of profiles, identifying a turning point (i.e., an elbow) where the decrease in information criteria values becomes lower and the slope flattens (Litalien et al., 2017; Nylund et al., 2007). In addition, the LMR *p*-value was used to compare the *k*-profile model to the *k-1* profile model, where a non-significant *p*-value for the *k*-profile suggested that the *k-1* model was the optimal solution (Spurk et al., 2020). Combined with these indices, we also considered the theoretical and conceptual relevance (i.e., the AVEM typology) to determine the final solution.

After selecting the optimal solution, we investigated the relationships between the derived profiles, two predictors (i.e., gender and the completion status of professional experience), and two outcomes (i.e., psychological wellbeing and affective occupational commitment) using the manual three-step procedure in M*plus* (Vermunt, 2010). In this procedure, we used multinominal logistic regressions to test the relationships between each profile and predictors. We reported odds ratios to reflect the likelihood of participants in one or another profile based on either their gender or the completion status of professional experience. Furthermore, we used the MODEL CONSTRAINT function to examine the mean differences of each distal outcome across all profile memberships while controlling for the predictors (Nylund-Gibson et al., 2019; Raykov & Marcoulides, 2004).

For scientific transparency, our dataset and the syntax of analyses are fully available on the OSF (see https://osf.io/vq76c/).

9. Results

9.1. Preliminary results and descriptive analyses

The CFA results reveal an excellent fit of the measurement model: χ^2 (67) = 165.679, $p < .001$, CFI = .983, TLI = .976, RMSEA = .043, SRMR = .035. Table 1 shows the descriptive statistics, correlations, and reliability coefficients of the variables. For motivational factors, autonomous motivation and teacher self-efficacy were positively associated with each other, as well as with engagement coping, psychological wellbeing, and affective occupational commitment, with correlations ranging from .28 to .62. Autonomous motivation was negatively correlated with disengagement coping, which was positively correlated with controlled motivation. In addition, pre-service teachers with high levels of controlled motivation tended to use fewer engagement coping strategies and reported lower levels of psychological wellbeing. Regarding the two coping mechanisms, engagement coping was also positively correlated with psychological wellbeing ($r = .45$) and affective occupational commitment ($r = .40$), but negatively correlated with disengagement coping and controlled motivation ($r = -.14$, $r = -.15$; respectively). Conversely, disengagement coping showed the opposite relationships with these factors. Regarding the two predictors, female pre-service teachers exhibited lower levels of controlled motivation, used more engagement coping strategies, and perceived higher levels of psychological wellbeing and stronger occupational commitment compared to their male counterparts. Participants who did not report completing professional experience showed positive associations with autonomous motivation, teacher self-efficacy, engagement coping, and occupational commitment. In contrast, those who had completed at least one professional experience were likely to have more controlled motivation.

9.2. Latent profile analyses

Table 2 shows the fit indices for profile solutions from one to seven. The log likelihood, AIC, CAIC, BIC, SSA-BIC decreased across all these profiles, while the entropy values increased from Profiles 2 to 5, and the *p*LMR was not significant until Profile 6. Since none of these indices reach the minimum, we reported an elbow plot to further suggest the optimal solution and mainly evaluated the values of CAIC and BIC, as suggested by Masyn (2013) and Morin et al. (2016) (see Fig. 2). The plot shows that the decrease in CAIC and BIC values stabilized (i.e., having a flattening slope) around the 4-profile model. Despite the values of AIC and SSA-BIC still decreasing beyond the 4-profile model, a profile in the 5-profile solution only comprised 13 participants (1.9 %), which is below the minimum threshold of 25 cases (Lubke & Neale, 2006). In addition, compared with the pattern of each profile based on the mean levels in the 3-profile solution, we found a new pattern resembling a suggested pattern in the AVEM in the 4-profile solution. This suggests that the latter solution reveals a more theoretically meaningful and statistically reasonable distinction than the former solution (Morin et al., 2017). The entropy value of the 4-profile solution was also higher than the 3-profile solution.

Table 3 presents the means, variances, and 95 % confidence intervals of the 4-profile solution. Fig. 3 shows the graphical depiction of the solution and the indicator values relative to sample mean level ($M = 0$). Pre-service teachers in Profile 1 (24.2 %) were labelled *low functioning* as they were characterized by a high level of controlled motivation ($M = 1.62$) coupled with disengagement coping ($M = .51$), moderately low levels of autonomous motivation, teacher self-efficacy, and engagement coping, with means ranging from −.06 to −.21. Pre-service teachers in Profile 2 (31.8 %) were labelled *vulnerable* as they were characterized by low levels of all indicators: autonomous motivation, controlled motivation, teacher self-efficacy, engagement coping, and disengagement coping, with means ranging from −.08 to −.50. Participants in this profile had low motivation and confidence to teach and showed limited

Table 1
Descriptive statistics, correlations, and reliability coefficients of the variables.

Variable	1	2	3	4	5	6	7	8	9
1. Autonomous motivation	–								
2. Controlled motivation	.02	–							
3. Teacher self-efficacy	.36	.06	–						
4. Engagement coping	.28	−.15	.34	–					
5. Disengagement coping	−.10	.38	−.02	−.14	–				
6. Psychological wellbeing	.37	−.19	.39	.45	−.38	–			
7. Affective occupational commitment	.62	.04	.42	.40	−.20	.54	–		
8. The completion status of PE	−.11	.08	−.09	−.13	.06	−.07	−.12	–	
9. Gender	.04	−.11	.07	.12	−.01	.14	.10	.01	–
N	677	677	677	662	662	645	643	677	677
ω	.90	.92	.94	.86	.88	.92	.92	–	–
M	5.75	3.28	4.91	3.81	2.66	5.68	5.71	.69	1.79
SD	.76	1.38	.82	.56	.66	.84	.88	.46	.40

Note. PE = Professional experience; ω = McDonald's omega; *M* = Mean; *SD* = Standard deviation; correlations with a value less than $r = -.08$ or greater than $r = .07$ are significant at $p < .05$. The correlation between age and psychological wellbeing is also significant. All other correlations are not significant.

Table 2
Fit indices for profile solutions 1 to 7.

	LL	fp	AIC	CAIC	BIC	SSA-BIC	Entropy	*p*LMR	*p*BLRT
1	−3596.93	10	7213.85	7269.03	7259.03	7227.28	NA	NA	NA
2	−3426.31	21	6894.62	7010.49	6989.49	6922.82	0.62	0.00	0.00
3	−3329.46	32	6722.93	6899.49	6867.49	6765.89	0.70	0.00	0.00
4	**−3277.56**	**43**	**6641.13**	**6878.39**	**6835.39**	**6698.86**	**0.77**	**0.02**	**0.00**
5	−3231.03	54	6570.06	6868.02	6814.02	6642.56	0.79	0.04	0.00
6	−3193.93	65	6517.85	6876.50	6811.50	6605.12	0.77	0.09	0.00
7	−3155.57	76	6463.14	6882.48	6806.48	6565.17	0.76	0.20	0.00

Note. LL = Log likelihood; fp = Free parameters; AIC = Akaike information criterion; CAIC = consistent Akaike information criterion; BIC = Bayesian information criterion; SSA-BIC = sample-size adjusted Bayesian information criterion; *p*LMR = *p* value associated with the adjusted Lo–Mendel–Rubin Likelihood Ratio Test; *p*BLRT = *p* value associated with the bootstrap likelihood ratio test.

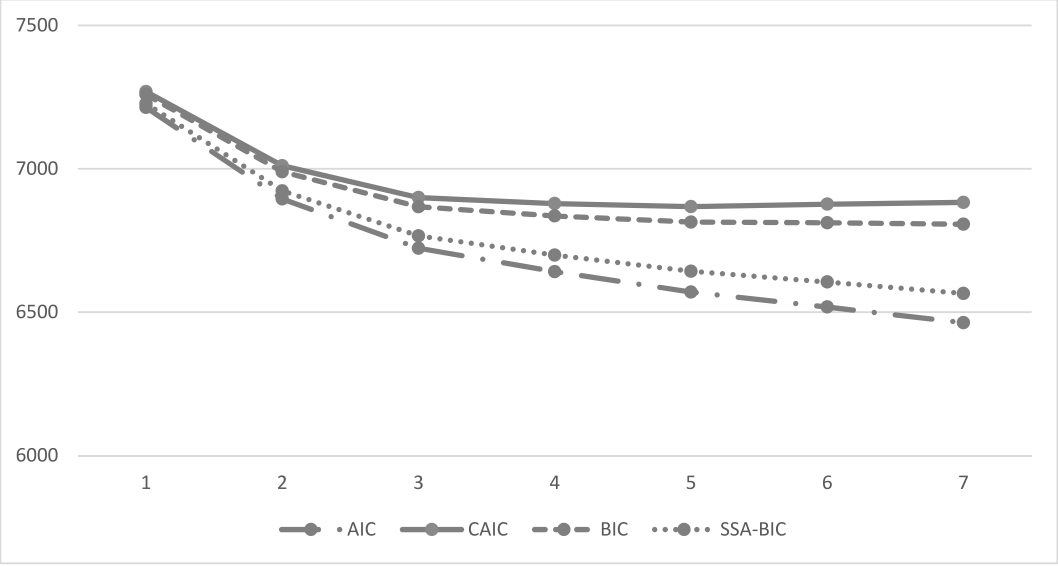

Fig. 2. Elbow plot for the information criteria.

engagement. Although pre-service teachers in Profile 3 (6.9 %) presented a relatively high level of engagement coping ($M = .13$), they reported the lowest level of controlled motivation ($M = -2.18$), followed by below-average levels of autonomous motivation, disengagement coping, and teacher self-efficacy, with means ranging from −.31 to −.51. Thus, this profile was labelled the *low motivation* profile. In Fig. 3, pre-service teachers in the rightmost profile (Profile 4, 37.1 %) were labelled *high functioning* as they were characterized by above-average levels of autonomous motivation ($M = .44$), teacher self-efficacy ($M = .53$), and engagement coping ($M = .32$), coupled with moderately low levels of controlled motivation ($M = -.31$) and disengagement coping ($M = -.21$).

9.3. Predictors and outcomes of profile membership

Table 4 shows the results from multinominal logistic regression after including predictors into the 4-profile solution. Results indicated that female pre-service teachers were more likely to be part of the vulnerable profile (OR = .42) and the high functioning profile (OR = .41) than the low functioning profile. Participants who had completed at least one

Table 3
Descriptive statistics in the 4-profile solution.

Indicators	Low Functioning (n = 164, 24.2 %)		Vulnerable (n = 215, 31.8 %)		Low Motivation (n = 47, 6.9 %)		High Functioning (n = 251, 37.1 %)	
	Mean (95 % CI)	Variance	Mean (95 % CI)	Variance	Mean (95 % CI)	Variance	Mean (95 % CI)	Variance
Autonomous Motivation	−.13 (−.28, .02)	.41	−.30 (−.41, −.19)	.24	−.51 (−.84, −.18)	.73	.44 (.35, .52)	.14
Controlled Motivation	1.62 (1.35, 1.89)	.59	−.46 (−.66, −.26)	.63	−2.18 (−2.29, −2.09)	.02	−.31 (−.57, −.06)	1.19
Teacher Self-Efficacy	−.06 (−.24, .12)	.59	−.50 (−.64, −.37)	.34	−.31 (−.63, .02)	.72	.53 (.41, .66)	.36
Engagement Coping	−.21 (−.33, −.10)	.26	−.23 (−.32, −.14)	.13	.13 (−.05, .30)	.19	.32 (.25, .39)	.10
Disengagement Coping	.51(.41, .61)	.21	−.08 (−.17, .00)	.16	−.34 (−.54, −.14)	.23	−.21 (−.30, −.12)	.20

Note. Indicators are estimated from factor scores. CI = Confidence interval.

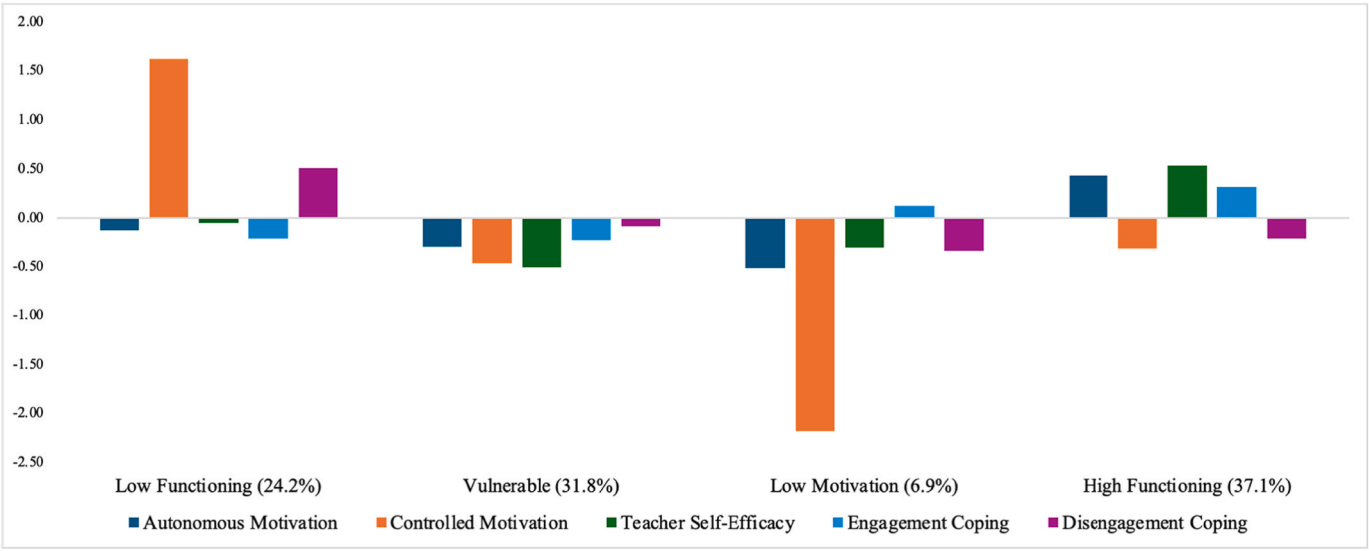

Fig. 3. Results from the 4-profile solution.

Table 4
The manual three-step procedure results for predictors.

Predictors	Low Functioning vs Vulnerable		Low Functioning vs Low Motivation		Low Functioning vs High Functioning		Vulnerable vs Low Motivation		Vulnerable vs High Functioning		Low Motivation vs High Functioning	
	Estimate (SE)	OR	Estimate (SE)	OR	Estimate (SE)	OR	Estimate (SE)	OR	Estimate (SE)	OR	Estimate (SE)	OR
Gender	−.86 (.32)**	.42	−.16 (.50)	.85	−.89 (.28)**	.41	.70 (.51)	2.02	−.03 (.29)	.97	−.73 (.51)	.48
PE Status	.59 (.31)	1.80	.57 (.51)	1.76	.85 (.29)**	2.34	−.02 (.49)	.98	.26 (.23)	1.30	.28 (.48)	1.33

Note. *$p < .05$, **$p < .01$, ***$p < .001$; SE = Standard error; OR = Odds Ratio; Gender was coded as 0 = male, 1 = female; PE Status = The completion status of professional experience, coded as 0 = have not completed any professional experience, 1 = had completed at least one professional experience.

professional experience were associated with a higher likelihood of membership in the low functioning profile than the high functioning profile (OR = 2.34). No significant associations were observed between these predictors and other profile comparisons.

Table 5 shows the results from pairwise comparisons of mean differences across profiles. Results indicate the high functioning profile presented a higher level of psychological wellbeing (M = .49) than the membership in the vulnerable profile (M = −.33), the low motivation profile (M = −.48), and the low functioning profile (M = −.69). The mean differences between all profiles were significant except for the difference between the low motivation (3) and both the vulnerable (2) and the low functioning (1) profiles. Likewise, the high functioning

Table 5
Outcomes means and pairwise comparisons between profiles.

Outcomes	Low Functioning (Profile 1)	Vulnerable (Profile 2)	Low Motivation (Profile 3)	High Functioning (Profile 4)	Profile 1 vs 2	Profile 1 vs 3	Profile 1 vs 4	Profile 2 vs 3	Profile 2 vs 4	Profile 3 vs 4
	Mean	Mean	Mean	Mean						
Psychological Wellbeing	−.69	−.33	−.48	.49	−.35***	−.20	−1.18***	.15	−.83***	−.97**
Affective Occupational Commitment	−.30	−.21	−.76	.49	−.09	.46	−.79***	.55*	−.70***	−1.25***

Note. *$p < .05$, **$p < .01$, ***$p < .001$.

profile had the strongest affective occupational commitment ($M = .49$), followed by the vulnerable profile ($M = -.21$), the low functioning profile ($M = -.30$), and the low motivation profile ($M = -.79$). Significant mean differences were found between the high functioning profile (4), and other three profiles: low motivation (3), vulnerable (2), and low functioning (1).

10. Discussion

This study aimed to identify the motivational and behavioral profiles of pre-service teachers based on three theoretical underpinnings: SDT, SCT, and TMSC. Clustered patterns from the AVEM were referenced to support the profile decisions. In addition, we examined the relationships between the identified four profiles (low functioning, vulnerable, low motivation, and high functioning), two predictors (gender and the completion status of professional experience), and two outcomes (psychological wellbeing and affective occupational commitment). This study complements variable-centered studies by using a person-centered approach to shed light on qualitatively distinct subpopulations of pre-service teachers. The construction of profiles was based on well-established theoretical frameworks in motivation and coping. In addition, the sample of pre-service teachers was comparable to the broader population, collected from various programs, backgrounds, and tertiary institutions in Australia. The salient identified profiles underscore the importance of types of motivation and coping mechanisms in shaping pre-service teachers' wellbeing and commitment, providing directions for researchers and educators to cultivate high-quality future teachers.

10.1. Pre-service teachers' profiles, psychological wellbeing, and occupational commitment

In response to the first and the second research questions concerning the optimal number of profiles and examining the relationship between profiles and outcomes, our results identified four profiles sharing distinctive motivational and behavioral characteristics. First, the high functioning profile and the low motivation profile represented 44 % of pre-service teachers. Only one third of pre-service teachers were identified as high functioning who presented high levels of autonomy and agency to become competent in-service teachers while actively coping with stressors, such as seeking support and having a plan to solve problems. In addition, this is the only profile that reported above-average and higher psychological wellbeing and affective occupational commitment compared to those in the other profiles. The results demonstrated that profiles high in motivation and engagement coping will present higher levels of wellbeing and stronger occupational commitment compared to other profiles. This implies that having above-average autonomous motivation, teacher self-efficacy, and engagement coping play important roles in promoting wellbeing and sustaining commitment, as corroborated in prior research (Klassen & Chiu, 2011; Zhou et al., 2024).

The low motivation profile (6.9 %) was characterized by an extremely low level of controlled motivation as well as below-average autonomous motivation, teacher self-efficacy, and disengagement coping, despite their tendency to use some engagement coping strategies. Pre-service teachers grouped into this profile may be neither intrinsically nor extrinsically motivated to teach and prefer to emotionally distance themselves from the heavy demands and stressors in ITE programs. Thus, we found that those in the low motivation profile reported below-average and the lowest levels of affective occupational commitment compared to the other profiles.

In contrast, the remaining pre-service teachers were in the low functioning profile and the vulnerable profile, representing 56 % of the sample. This implies that more than half of pre-service teachers are at risk based on their motivation and engagement, in addressing challenges and sustaining intentions to stay. Compared to pre-service teachers classified in the low motivation profile, those in the vulnerable profile had near-average coping mechanisms but below-average motivational indicators, especially reporting the lowest level of teacher self-efficacy across all profiles. These pre-service teachers may be mentally and emotionally exhausted, putting minimal effort into their studies, and may even consider leaving the profession, thus indicating below-average wellbeing and commitment. However, their levels of autonomous motivation and controlled motivation were not as low as those of the low motivation profile, and the pairwise comparison between these two profiles exhibited positive and significant differences on occupational commitment. This suggests that motivation level may play a key role in affecting commitment.

Regarding the low functioning profile, pre-service teachers in this profile were characterized by an extremely high level of controlled motivation and above-average disengagement coping. They reported not only the lowest levels of psychological wellbeing, but also significantly lower scores compared to both the vulnerable and high functioning profiles. This indicates that pre-service teachers in the low functioning profile are heavily influenced by external contingencies and obligations, which may motivate them to use more disengagement coping strategies to reduce their contributions and effort in teaching and learning. These two constructs are likely to reduce pre-service teachers' wellbeing and commitment, consistent with findings in prior research (Aulén et al., 2021; Slemp et al., 2020). Future research is needed to target pre-service teachers' motivational and behavioral characteristics in the latter two profiles.

10.2. Pre-service teachers' profiles, professional experience, and gender differences

The third research question examined how pre-service teachers who have completed professional experience are associated with different profiles. Our results indicated a strong association between the completion status of professional experience and the likelihood of being classified into the low functioning profile versus the high functioning profile. Pre-service teachers who had completed their professional experience were more than twice as likely to be in the former profile than in the latter profile, compared to those who have not completed it. This could be attributed to pre-service teachers facing real-world challenges and pressure from supervisors and institutions to meet higher expectations. This may trigger them to rely more on controlled motivation and disengagement coping strategies for self-protection, although these strategies are likely to increase stress further (Deasy et al., 2014; Paquette & Rieg, 2016). In contrast, those who have not yet completed professional experience may still hold idealistic views of teaching, maintaining higher levels of autonomous motivation, self-efficacy, and engagement coping (Hong, 2010). Thus, we suggest that the supportive mentoring and teaching experience perceived by pre-service teachers may stimulate their motivation, competence, and agency to overcome challenges, leading them to experience increased psychological wellbeing and commitment similar to those in the high functioning profile. Improving the quality of mentoring and strengthening mentors' understanding of the importance of their roles in the learning and teaching process of pre-service teachers warrant further attention (Ambrosetti, 2014).

In response to the fourth research question, gender differences between the profiles were examined. Our results showed that male pre-service teachers were more likely to be classified into the low functioning profile (high controlled motivation and disengagement coping). Female pre-service teachers were more likely to be classified not only into the high functioning profile (high autonomous motivation and high engagement coping), but also into the vulnerable profile (low on all indicators) than the low functioning profile. This could be because teaching is considered a female-dominated occupation. Male pre-service teachers studying and working in this environment may encounter more challenges stemming from societal perceptions of male teachers and stereotypes of masculine behaviors (Cruickshank et al., 2021). These

gender-related challenges may impact the formation of professional identity and work motivation for male pre-service teachers in a feminine environment, as well as a tendency to use more disengagement coping strategies as a means to avoid these challenges (Cruickshank et al., 2021; González-Morales et al., 2010). This suggests that female pre-service teachers are more inclined to develop a strong professional identity and connection with the teaching profession, while tending to use engagement coping strategies in this context. At the same time, it is possible that females perceive relatively more emotional exhaustion and prefer to use more emotion-focused or disengagement coping strategies than males in general (Kashahu Xhelilaj et al., 2021; Purvanova & Muros, 2010; Yokota et al., 2002). Future research is needed to identify ways in which to support pre-service teachers' capability in using engagement coping strategies to reduce burnout and stress and improve the quality of their professional experience.

10.3. Theoretical implications

There are theoretical implications regarding the interplay of motivational and behavioral indicators. Our results found a significant difference in occupational commitment between the vulnerable profile and the low motivation profile. This suggests that the level of controlled motivation may have more power to reduce commitment specific to some profiles, which is not shown in variable-centered studies (e.g., Fernet et al., 2012). However, the significant negative differences in psychological wellbeing between these two profiles compared to the high functioning profile suggest that the combination of autonomous motivation and teacher self-efficacy may attenuate the negative influences of controlled motivation and disengagement coping and have more power in increasing wellbeing and occupational commitment.

In line with SDT and TMSC, our findings support existing empirical evidence on the relationship between motivation and coping mechanisms in the broader university student population (e.g., Bonneville-Roussy et al., 2017; Ryan & Deci, 2017), as suggested by Ntoumanis et al. (2009). In addition, this study examined their interactions and extended them into the pre-service teacher population, which have not been demonstrated in previous studies. Specifically, we found that low autonomous motivation and controlled motivation coexisted with low levels of behavioral indicators in the vulnerable profile. This implies that different types and levels of motivation may coexist with different coping strategies, which may not always align with theoretical inferences and empirical evidence. Our findings thus highlight the importance and unique interplay between motivational and behavioral indicators among pre-service teachers within specific profiles, demonstrating their contributions to wellbeing and commitment. Future research is recommended to explore the complexity of pre-service teachers' motivational regulations in relation to their use of coping strategies.

10.4. Practical implications

Our results yield several implications for supporting pre-service teachers' motivation, coping resources, wellbeing, and commitment. With the exception of the membership of the high functioning profile characterized by above-average autonomous motivation and teacher self-efficacy, more than 60 percent of pre-service teachers were predominantly driven by controlled motivation or had limited to no motivation to teach. Their levels of wellbeing and commitment were also lower than those of the high functioning profile. This sizeable proportion and the associated findings underscore the need for interventions and training to enhance pre-service teachers' autonomous motivation and teacher self-efficacy, while mitigating the undermining effect of controlled motivation on commitment. For instance, research has shown that autonomy-supportive and structured teaching styles used by educators predict pre-service teachers' basic psychological needs, self-efficacy, and occupational commitment (e.g., Duchatelet & Donche, 2019; González et al., 2018; Leenknecht et al., 2017). The satisfaction of basic psychological needs, including autonomy, competence, and relatedness, through interpersonal supports, is a key resource to support one's autonomous motivation, wellbeing, and performance (Slemp et al., 2024). Therefore, it may benefit university educators to receive training on ways they can incorporate these need-supportive teaching styles into academic coursework during ITE programs (Reeve & Cheon, 2024). Relatedly, there is some additional evidence that when teachers are autonomously motivated, they tend to be more supportive in their teaching styles (e.g., Slemp et al., 2020), suggesting that if pre-service teachers are more autonomously motivated, they are in turn, more likely to be supportive in their teaching. ITE institutions could thus provide additional targeted training to guide pre-service teachers in applying such interpersonal styles across various teaching contexts (Roth, 2014). In doing so, they may teach in a similarly supportive manner during their practicum and future teaching careers, benefiting student learning, improving their teaching abilities and intrinsic motivation, thus leading to greater satisfaction and retention in the profession. In addition, many countries have provided financial incentives to attract individuals to join the teaching profession for extrinsic reasons, such as higher salaries, increased bursaries, and lower tuition fees for pre-service teachers. While these financial incentives may increase the number of teachers, evidence suggests that these types of strategies tend to foster more controlled forms of motivation in the short term (See et al., 2020; Steele et al., 2010), and motivation can become more difficult to sustain in the long-term (Ryan & Deci, 2017). In contrast, it is possible that intrinsic and other forms of motivation could be undermined if these types of extrinsic incentives become the predominant strategy to encourage more people to pursue the profession (Cerasoli et al., 2014; Deci et al., 1999). Burnout and job dissatisfaction may come to the forefront, especially when the stresses and demands are perceived to outweigh monetary benefits (Ryan & Deci, 2017). Thus, it is recommended that financial support be complemented by interpersonal support, the satisfaction of basic psychological needs, and guidance to manage stress that promotes autonomous motivation and teaching engagement.

The level of pre-service teachers' self-efficacy is similar to autonomous motivation across the four profiles, being below average in the low functioning, vulnerable, and low motivation profiles. To foster their initial self-efficacy, it is crucial for teacher educators, pre-service teachers, and supervisors to understand and support the four sources of self-efficacy (i.e., mastery experiences, social persuasion, vicarious experiences, and emotional/physiological states) in academic studies and practicums (Clark & Newberry, 2019; Pendergast et al., 2011). For instance, previous studies have demonstrated that providing evaluative feedback and encouragement contributes to pre-service teachers' self-efficacy (Kaldi & Xafakos, 2017; Martins et al., 2015; Pfitzner-Eden, 2016). In addition, some studies have found that pre-service teachers' overestimation and illusions about the teaching profession may be one of the reasons for the decrease in their self-efficacy over ITE programs (e.g., Kim & Cho, 2014; Pendergast et al., 2011). Thus, reflecting on personal experiences via peer support and inviting in-service teachers to share their real teaching experiences might help pre-service teachers manage stress, balance reality and expectations, prepare for challenges, and maintain their teaching motivation and wellbeing.

Pre-service teachers in the low functioning profile are more likely to use disengagement coping strategies to address stressors, and those in the vulnerable profile present limited intention to cope with stressors. To support these pre-service teachers, ITE institutions can provide various types of interventions and workshops combined with their teaching subjects (e.g., music, science, history), year levels (e.g., at the beginning of the program), practicums, and coursework. For instance, several interventions, such as mindfulness-based stress reduction programs (e.g., Ansley et al., 2021; Frank et al., 2013; Gold et al., 2009; Roeser et al., 2013), and Building Resilience in Teacher Education program (Mansfield, 2020; Mansfield et al., 2016), have shown practical

impacts in reducing stress and the risk of burnout, as well as increasing pre- and in-service teachers' resilience to overcome adversity and improve wellbeing. Thus, we encourage future research to not only investigate the nuanced distinctions and needs of specific subgroups within the pre-service teacher population, but also to design contextual interventions that support this subpopulation.

10.5. Limitations and future directions

There are several noteworthy limitations. First, the cross-sectional design of the study limits the ability to observe transitions among the motivational and behavioral patterns of pre-service teachers over time. Future studies are encouraged to examine the longitudinal changes in these indicators. For example, it would be interesting to research how changes in motivation co-occur with changes in coping mechanisms for pre-service teachers from the beginning to the end of the program. Understanding these pattern changes might further support the needs of pre-service teachers in each profile. Second, we did not assess amotivation because it was not central to our research questions and therefore, out of scope for the current study. Future researchers could examine this aspect further, which might provide distinctive profiles. Finally, the reliance on self-reported responses might increase the risk of common method variance and biases (Podsakoff et al., 2003) as well as ceiling effects. Incorporating reports from third parties, such as tutors, supervisors, and peers, to supplement pre-service teachers' own perceptions of their teaching and learning experience could address this limitation.

11. Conclusion

The present study uses latent profile analysis to understand the unique combinations of pre-service teachers' motivational and behavioral characteristics and how these combinations relate to wellbeing and commitment across different subpopulations. We identified four distinctive profiles: low functioning, vulnerable, low motivation, and high functioning profiles, where only pre-service teachers classified as high functioning exhibited high levels of psychological wellbeing and occupational commitment compared to those in other profiles. Overall, our results provide a more nuanced understanding regarding the distinct subgroups within the population of pre-service teachers, highlighting the need for targeted interventions and training supported by ITE institutions and practicum schools to increase their autonomous motivation, teacher self-efficacy, and the use of engagement coping strategies.

CRediT authorship contribution statement

Sijing Zhou: Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Gavin R. Slemp:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization. **Dianne A. Vella-Brodrick:** Writing – review & editing, Writing – original draft, Supervision, 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

For scientific transparency, our dataset and the syntax of analyses are fully available on the OSF (see https://osf.io/vq76c/).

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